Insights Imaging (2016) 7 (Suppl 1):S162–S465
DOI 10.1007/s13244-016-0475-8

B

Scientific Sessions and Clinical Trials in Radiology (B)

Scientific session numbers are prefixed by SS.
Presentation numbers are prefixed by the letter B.
Sessions and abstracts are listed by days.

The Clinical Trials in Radiology sessions are listed at the end of section B. (page 460)

Wednesday, March 2..... 163
Thursday, March 3 250
Friday, March 4..... 323
Saturday, March 5..... 359
Sunday, March 6 404

Wednesday, March 2

10:30 - 12:00 **Room B**

Abdominal Viscera

SS 201a

Pancreas and bile ducts

Moderators:
B. Choi; Seoul/KR
G. Zamboni; Verona/IT

B-0001 10:30

Distribution and correlation of pancreatic gland and duct dimensions on MRCP in patients without evidence of chronic pancreatitis

F. Akisik, Q. Wang, G. Jennings, T. Tirkes, K. Sandrasegaran; *Indianapolis, IN/US (makisik@iupui.edu)*

Purpose: To determine pancreatic gland and duct dimensions by age and gender and their correlation in a large series of patients without chronic pancreatitis who underwent MRCP.
Methods and Materials: We identified all MRCP patients from 2003 to 2012 at our tertiary care institution, without evidence of chronic pancreatitis at ERCP and one-year clinical follow-up. Age and gender were recorded; an abdominal radiologist measured gland and duct dimensions in the pancreatic head, body, and tail. Mean/SD size was calculated by gender for each site. Pearson correlation was performed amongst the six measurements. Regression model fitting was performed to determine contribution of age and gender for each measurement.
Results: 274 patients (140 male) were identified with age mean/SD 54.4/19.7 years (range 20-88). Mean size (mm) for each site was (mean/SD, male and female respectively): 25.0/3.9 and 23.5/4.1 (gland head), 18.1/4.3 and 16.9/4.5 (gland body), 17.8/4.5 and 17.0/5.3 (gland tail), 1.99/0.50 and 1.99/0.57 (duct head), 1.57/0.35 and 1.53/0.33 (duct body), and 1.27/0.23 and 1.27/0.24 (duct tail). Pearson coefficients were 0.45-0.57 amongst gland sites and 0.54-0.73 amongst duct sites; gland versus duct sizes showed weak negative correlations (0.10-0.31). Regression analysis showed gland size decrease and duct size increase with age at all sites, and significant age-gender interaction in the gland body.
Conclusion: In patients without chronic pancreatitis, pancreatic gland size is slightly larger in males; duct size varies little by gender. Duct size is slightly negatively correlated with gland size. The gland decreases and the ducts increase in size with increasing age.

B-0002 10:38

Use of grape molasses "Pekmez" as a negative oral contrast agent for magnetic resonance cholangiopancreatography

B. Degirmenci, M. Kara, H. Demirtas, A. Umul, O. Yılmaz, A. Senol, M. Kayan; *Isparta/TR (raddrkara38@gmail.com)*

Purpose: To investigate the feasibility of grape molasses as a negative oral contrast agent in magnetic resonance cholangiopancreatography (MRCP) examination.
Methods and Materials: Phantom study was performed using bottles containing grape molasses solution at different concentrations. Twenty percent solution was selected for in vitro use. Ninety-three patients undergoing MRCP examinations for suspected biliary or pancreatic abnormalities were included. All patients underwent MRCP before and 10 minutes after ingestion of 300 mL of grape molasses. Common hepatic duct, common bile duct, cystic duct and Wirsung were evaluated in terms of image quality. T2 signal values were measured in the stomach and duodenum. The T2 signal values were compared before and after ingestion of grape molasses.
Results: Statistically significant improvements were observed after the ingestion of molasses solution in image quality of common hepatic duct, common bile duct and the cystic duct ($P < 0.001$, $P < 0.001$, and $P = 0.022$, respectively). There was no significant difference in the pancreatic duct image quality assessment ($P = 0.37$). There were significant reductions after the ingestion of molasses solution in T2 signal of stomach and duodenum ($P < 0.0001$ for both the regions).
Conclusion: Grape molasses (Pekmez) 20% solution can be used as a negative oral contrast agent for suppression of gastro-duodenal T2 signal in MRCP examination.

B-0003 10:46

MRCP pancreatic dimensions as predictors of chronic pancreatitis severity

F. Akisik, Q. Wang, G. Jennings, T. Tirkes, K. Sandrasegaran; *Indianapolis, IN/US (makisik@iupui.edu)*

Purpose: To determine the contributions of age and pancreatic dimensions on MRCP, to predict chronic pancreatitis presence and severity.
Methods and Materials: We identified all MRCP patients from 2003 to 2012 at our tertiary care institution who underwent ERCP and one-year clinical follow-up. Severity (none, mild, moderate, severe) of chronic pancreatitis at ERCP was noted. Age and gender were recorded; two readers independently measured gland and duct dimensions in the pancreatic head, body, and tail. Multinomial logistic regression was performed to find disease severity predictors amongst age and the six measurements, compared with normals. Chi-square p values and odds ratios (95% confidence level) were calculated. A classification tree analysis was performed to calculate sensitivity/specificity of a combination of age and dimensions to predict pancreatitis severity.
Results: 609 patients (301 males) were identified (274 normal, 110 mild, 107 moderate, 118 severe), with mean/SD age (years) 54.4/19.7 for normals and 50.0/17.1 for chronic pancreatitis. Interobserver agreement was excellent. Age and all six measurements had significant ($p < 0.05$) predictive value for the presence of pancreatitis. Age, body duct, and tail duct size were predictors for each severity level, compared with normals; tail duct size was the best predictor. Use of age and all dimensions allowed classification that was 98.6% sensitive for normals and 91.2% specific for severe disease.
Conclusion: Age and body/tail duct size on MRCP are associated with chronic pancreatitis severity level. A combination of age and pancreatic dimensions is very sensitive for detecting patients without chronic pancreatitis and very specific for severe pancreatitis.

B-0004 10:54

Type 1 and type 2 autoimmune pancreatitis: is there any difference in MRI?

R. Negrelli, G. Avesani, E. Boninsegna, L. Frulloni, R. Manfredi, R. Pozzi Mucelli; *Verona/IT (ricky.negrelli@gmail.com)*

Purpose: To evaluate the MRI-MRCP findings of autoimmune pancreatitis (AIP) in order to find radiological patterns which could differentiate type 1 and type 2 AIP.
Methods and Materials: 84 patients with diagnosis of AIP were included in this retrospective study, who satisfied ICDC criteria for type 1 (n=66) and type 2 (n=18) AIP and performed MR-MRCP before treatment. Patients who underwent other imaging techniques and type not otherwise specified (NOS) AIP (n=28) were excluded. Image analysis included: signal intensity abnormalities, pancreatic enhancement, biliary and extrapancreatic involvement, main pancreatic duct (MPD) stenosis, presence of upstream MPD dilation.
Results: Pancreatic parenchyma resulted hypointense on T1-WI in 65/66 (98%) cases in type 1 and in 17/18 (94%) in type 2; hyperintense on T2-WI in 41/66 (62%) cases in type 1 and in 15/18 (83%) in type 2 (p=NS). The lesions were hypovascular in 64/66 (97%) cases in type 1 and in 16/18 (89%) in type 2 with delayed contrast retention in 56/66 (85%) and in 17/18 (94%) respectively (p=NS). Autoimmune cholangitis was found in 29/66 (44%) patients with type 1 AIP and in 3/18 (16%) with type 2 (p=0.02); renal involvement was found in 20/66 (30%) and 1/18 (6%) respectively (p=0.02).
The mean number of stenoses was 1.8 in type 1 AIP and 1.4 in type 2 (p=NS). Mild dilation of the upstream MPD was significantly more frequent in type 1 AIP than in type 2 (p=0.01).
Conclusion: MR-MRCP is useful to detect extra-pancreatic involvement, typically seen in type 1 AIP. The presence of a mild dilation of the upstream MPD suggests type 1 AIP.

B-0005 11:02

MRI-MRCP findings in focal and diffuse autoimmune pancreatitis and comparison of focal type of the head and of the body-tail

G. Avesani, R. Negrelli, E. Boninsegna, L. Frulloni, R. Manfredi, R. Pozzi Mucelli; *Verona/IT (giacomo.avesani@gmail.com)*

Purpose: To evaluate the MRI-MRCP findings of focal type and diffuse autoimmune pancreatitis (AIP) and to compare, amongst focal types, involvement of the head and the body-tail.
Methods and Materials: We retrospectively evaluated the MR-MRCP examinations performed before therapy in 112 patients with diagnosis of AIP. Image analysis included signal intensity on T1- and T2-WI, DWI, enhancement pattern, extra-pancreatic involvement and main pancreatic duct (MPD) characteristics.
Results: 61/112 (54.5%) patients had diffuse enlargement of pancreas and 51/112 (45.5%) focal involvement. The signal intensity of affected parenchyma

on T1-WI, T2-WI and DWI was not significantly different. The lesions were hypointense in arterial phase (93.4% vs 92.2%) with delayed enhancement (88.5% vs 80.4%) (p=NS). During venous phase, 39.2% of focal-type and 14.7% of diffuse AIP showed hyperintensity (p=0.003). Prevalence of stenosis, side-branch involvement and extra-pancreatic disease did not differ significantly in the two groups. The calibre of the upstream MPD was higher in focal type (3.1 mm vs 2.4 mm, p=0.017). Amongst patients with focal AIP, 21/51 (41.2%) showed involvement of the head and 30/51 (58.8%) of the body-tail. In 42.8% of head involvement and in 16.7% of body-tail, there was a multifocal stenosis of MPD (p=0.03); 42.8% and 16.7% respectively demonstrated stenosis of main bile duct (p=0.03). Calibre of upstream duct was higher in AIP of the head (4 mm vs 2 mm, p=0.03).
Conclusion: Focal-type AIP showed an earlier delayed enhancement and a greater dilation of upstream MPD. Head involvement demonstrated a higher frequency of multifocal stenosis of MPD and a greater calibre of it in comparison with body-tail involvement.

B-0006 11:10

Pancreatic cysts as incidental finding in population-based imaging: clinical relevance

M.-L. Kromrey, J.-P. Kühn, R. Bülow, J. Hübner, N. Hosten; *Greiswald/DE (marie-luise.kromrey@uni-greifswald.de)*

Purpose: To assess the phenotype pancreatic cyst detected as incidental finding in a population-based study in order to analyse their prevalence, incidence and clinical relevance.
Methods and Materials: During the population-based Study of Health in Pomerania (SHIP) 980 participants (478 men, 502 women, mean age 55.5±12.7 years) underwent a T2-weighted magnetic resonance cholangio-pancreaticography (MRCP) of the pancreas. MRCP was scrutinised for pancreatic cysts with a diameter of more than 2 mm. Additionally, 253 probands received a MRCP after 5-year follow-up. The prevalence and incidence of pancreatic cysts were assessed. In addition, the occurrence of pancreatic cysts was analysed according to age, gender and body mass index (BMI).
Results: Pancreatic cysts had a prevalence of 38.9% (341 subjects). A total of 1,278 cysts was observed with an average number of 4.1 (CI 95% 3.5; 4.7) cysts per subject. Cyst size ranged from 2-29.6 mm. The occurrence, number and maximum size of pancreatic cysts increased significantly with age. There was no significant association between pancreatic cysts and gender or BMI. The incidence of subjects with newly detected pancreatic cysts was 31.6%. 43% of the subjects initially harbouring pancreatic cysts, showed an increase of number and maximum cyst size. No subjects died of pancreatic diseases.
Conclusion: The prevalence of pancreatic cysts in general population is unexpectedly high and increased with age. The follow-up data suggest that most pancreatic cysts are harmless incidental findings. However, more studies are required to determine criteria for malignant progression.

B-0007 11:18

Multimodal MRI of the liver for detecting of acute inflammation in patients with primary sclerotic cholangitis

J. Yamamura, S. Keller, H. Kooijman, F. Kording, C. Schramm, T. Schuler, G. Adam; *Hamburg/DE (j.yamamura@uke.de)*

Purpose: The aim of this study was to detect circumscribed areas of inflammation using multimodal MRI of the liver in patients with PSC.
Methods and Materials: 37 patients with known PSC were examined using multimodal MR imaging consisting of diffusion-weighted imaging (DWI), T2-weighted imaging (T2wI), and dynamic hepatocyte-specific contrast-enhanced MRI (DHCE-MRI) on a 3.0-T MRI. DWI was performed using six b values of 0, 50, 100, 200, 400, and 800 s/mm2. The DHCE-MRI was performed using Gd-EOB-DTPA by calculating the functional parameters. Regions of interest (ROI) were placed manually in each liver segment to evaluate arterial and venous plasma flow (Fa/Fv), uptake fraction (UF) and ADC. The results of DWI, T2*, and DHCE-MRI were compared with a t test.
Results: Increased ADC, corresponding to decreased contrast agent uptake (UF), seems to be a sign of segmental inflammatory processes in PSC patients. T2* values do not play a significant role for the detection of acute inflammation but may be a marker of beginning fibrosis during disease course.
Conclusion: Multimodal DCE MRI may be a useful tool in clinical routine to identify areas of acute inflammation, thereby influencing therapeutic decisions and location of envisaged biopsies.

B-0008 11:26

MR cholangiography screening in longstanding IBD: prevalence of bile duct pathology indicative of sclerosing cholangitis in a population based cohort

A.K. Lunder[1], J.R. Hov[2], A. Borthne[1], E. Viktil[2], G. Johannesen[3], K. Tveit[4], J. Gleditsch[5], M. Vatn[1], A. Negård[1]; [1]*Lørenskog/NO*, [2]*Oslo/NO*, [3]*Skien/NO*, [4]*Kristiansand/NO*, [5]*Fredrikstad/NO (aida.k.lunder@gmail.com)*

Purpose: Primary sclerosing cholangitis (PSC) is a chronic hepatobiliary disease associated with inflammatory bowel disease (IBD). The prevalence of PSC in IBD is still debated and MRC screening has been discussed. Our aims were to estimate the frequency of MRC lesions indicating PSC in longstanding IBD and correlate these findings to clinical data.
Methods and Materials: A standardised MRC protocol (axial/coronal TSE T2, axial GRE T1 and 2D/3D MRC) was included in the 20 years follow-up of the IBD South-East Norway (IBSEN) population-based inception cohort. Two radiologists blinded for clinical history independently evaluated the presence of PSC-like lesions. Final diagnosis was made by consensus.
Results: MRC was performed in 322 patients, comprising 222 (68.9%) ulcerative colitis and 100 (31.1%) Crohns´ patients. The study subgroup was comparable to the total living population at the time of follow-up. N=24 (7.4%) had PSC-like lesions out of which 7 (2.2%) had known PSC. The sensitivity of diagnosing known PSC was 90.9%. The interobserver agreement was moderate (kappa 0.55; positive/negative agreement 0.57/0.98). Prevalence adjusted kappa was excellent (0.93). Mean alkaline phosphatase and alanine transaminase levels, as well as MRI progression score for PSC (Ruiz score) were significantly higher in patients with known PSC compared to patients with PSC-like changes ($p < 0.000$, $p < 0.000$, p=0.009 respectively).
Conclusion: Prevalence of PSC-like lesions on MRC was 3 times as high as the prevalence of clinically recognised cases. The newly discovered PSC-like lesions were however subclinical with no concomitant biochemical abnormalities and a low Ruiz progression score.

B-0009 11:34

Extra-hepatic portal vein obstruction (EHPVO) with cholangiopathy: imaging based criteria on the basis of CT and MRCP findings for disease classification and management

S. Thapar, S. Desai, A.S. Bhadoria, S. Pargewar, S. Rajesh, A. Mukund, K. Bansal, B. Surekha, S.K. Sarin; *New Delhi/IN (thaparshalini@gmail.com)*

Purpose: To study CT and MRCP findings of primary EHPVO with cholangiopathy in context to disease progression, management and follow-up and propose predictability criteria for the same.
Methods and Materials: A prospective study of 61 patients of EHPVO with cholangiopathy using dynamic CT and MRCP was performed from August 2010-15 at a tertiary liver institute. Patients with other etiologies of portal vein thrombosis were excluded. Bile duct (calculi, collaterals, caliber, contour, angle, stricture), spleen size, cholelithiasis, systemic collaterals, total bilirubin, SAP and GGT were recorded to assess predictability criteria for surgical management. Post operative imaging was analysed.
Results: Of a total of 61patients (mean age 23.5±10.7 years, 22 males and 39 females), 22 underwent splenectomy and shunt surgery. Age (26.9±8.4Vs21.6±11.5 years), gender (54.5 males Vs 25.6% females), mean CBD size (8.3±2.3Vs4.6±1.5), intraductal calculi (83.3Vs 24.5%), severity of grade 2 and 3 of stricture (23.1Vs5.7%), pre-stenotic dilatation (72.7Vs28%), spleen size (21.2±3.9Vs17.9±4.1), gallstones (57Vs25%) showed significant (p 0.05). Median post operative imaging follow-up was performed at 3 (IQR 3-10) months. Shunt thrombosis was seen in 27% patients at 12 (IQR3-22) months, $p < 0.05$. Median time for regression of collaterals and portal biliopathy was 3 (IQR 3-22) months, $p < 0.05$.
Conclusion: We propose an imaging based criteria for EHPVO with cholangiopathy based on bile duct caliber, calculus, contour, severity of stricture, prestenotic dilatation and spleen size for clinical management. This will help the clinician in segregating patients for conservative or surgical management and identify patients requiring intensive surveillance.

B-0010 11:42

Added value of point shear-wave elastography in the diagnosis of acute cholecystitis

J.E. Kim, D.S. Choi, K. Bae, C.Y. Jeong, H.O. Kim; *Jinju/KR (wldmsrla80@hanmail.net)*

Purpose: To evaluate the added value of point shear-wave elastography (pSWE) in diagnostic performance of conventional US for diagnosis of acute cholecystitis.
Methods and Materials: In this institutional review board-approved prospective study with written informed consent, B-mode and colour Doppler US, and pSWE were performed in 216 patients with clinically suspected acute cholecystitis. Qualitative (morphology and mural vascularity of gallbladder) and quantitative analyses (median shear wave velocity[SWV] of right liver) were

conducted. Two observers independently reviewed conventional US images, and subsequently reviewed combined conventional US and pSWE images. A four-point scale for likelihood of acute cholecystitis was used. The diagnostic performance was compared by using receiver operating characteristic (ROC) curves, accuracy, sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) analyses.
Results: Tense distention achieved the highest accuracy (68%) for diagnosis of acute cholecystitis, followed by internal echogenic debris (66%), striated intramual lucency (64%), increased mural Doppler signal (60%) and pericholecystic fluid (56%). Mean SWVs of acute cholecystitis group (n = 91) were significantly higher than those of control group (n = 85) in right liver within 2 cm lateral to gallbladder (1.56 versus 1.03 m/sec, 1.39 versus 1.04 m/sec, $P < 0.0001$). The area under ROC curve of observers 1 and 2 improved significantly from 0.790 and 0.777 to 0.963 and 0.962, respectively, after additional review of pSWE images ($P < 0.0001$). In addition, diagnostic accuracy, sensitivity, specificity, PPV and NPV of combined images sets were higher than those of conventional US images alone.
Conclusion: Adding pSWE to conventional US improves diagnosis of acute cholecystitis when compared with conventional US alone.

B-0011 11:50

CT differentiation of gallbladder neuroendocrine tumours from adenocarcinomas

T. Kim, S. Kim, K. Lee, J. Han; *Seoul/KR (kth1205@gmail.com)*

Purpose: To retrospectively investigate clinical outcome and differential CT features of gallbladder (GB) neuroendocrine tumours (NETs) from adenocarcinomas (ADCs).
Methods and Materials: This study was approved by IRB of our institute and informed consent was waived. Study population was comprised of 19 patients with histopathologically proven poorly-differentiated (PD) NETs and 19 patients with PD ADCs who served as control group. Clinical outcome was assessed by survival curves by Kaplan-Meier method. Multiple qualitative and quantitative CT features were assessed to identify significant differential CT findings of PD NETs from ADCs using univariate and multivariate analyses. ROC analysis was also used for quantitative CT features.
Results: PD NETs showed worse prognosis with significant shorter median survival days than ADCs (363 vs. 590 days, P=0.03). On univariate analysis, GB NETs more frequently manifested as GB replacing type, showed well-defined margin and accompanied with intact overlying mucosa. On multivariate analysis, well-defined margin was sole CT differentiator of NETs from ADCs (odds ratio=27.817, P=0.045). Mean maximum size of hepatic and lymph node (LN) metastases were significantly larger in NETs (11.0 cm and 4.62 cm) than in ADCs (2.40 cm and 2.41 cm)($P < 0.0001$). Areas under ROC curves for tumour-to-mucosa ratio on pancreatic phase, maximum size of hepatic and LN metastasis were 0.772, 0.932, and 0.919, respectively ($P < 0.05$).
Conclusion: GB PD NETs show worse prognosis than ADCs. On CT scan, well-defined margin, larger hepatic and LN metastases are useful CT differentiators of GB NETs from ADCs. In addition, higher tumour-to-mucosa ratio on pancreatic phase may help differentiate NETs from ADCs with high accuracy.

10:30 - 12:00 **Room C**

Breast

SS 202

Breast biopsy

Moderators:
S. Allen; Sutton/UK
N.N.

B-0012 10:30

True false negative rate of benign histology after stereotactic vacuum-assisted biopsy for BI-RADS IV calcifications in the breast

F.E.M. Dams, P.J. Westenend, H.S. Roodenburg-Kooij, M.C. Rozendaal, M.C.J.M. Kock; *Dordrecht/NL (inekedams@hotmail.com)*

Purpose: Currently there are no uniform guidelines in the Netherlands regarding the necessity and timing of follow-up after stereotactic vacuum-assisted biopsy of BI-RADS IV breast calcifications with benign histology. To determine whether follow-up is indicated for these benign lesions we wanted to know the false negative rate after stereotactic vacuum-assisted biopsy.
Methods and Materials: In our hospital stereotactic vacuum-assisted biopsy is performed since august 2004, consecutively with 10 Gauge en 9 Gauge needles. Retrospectively we identified the number of BI-RADS IV breast calcifications with benign histology for which stereotactic vacuum-assisted biopsy was performed between August 2004 and May 2014 and for which a follow-up period of at least one year is available. Subsequently we determined in which of these lesions a malignancy or DCIS developed and if so after what interval.
Results: In the study period for 744 BI-RADS IV breast calcifications a stereotactic vacuum-assisted biopsy was performed with a benign histology. In three lesions a ductal type adenocarcinoma developed (two T1 and one T2, all three N1). In one lesion a tubular carcinoma with DCIS grade I developed and in three lesions DCIS grade III developed. The interval between stereotactic biopsy and detection of DCIS or breast carcinoma was 21 to 88 months, with an average of 47 months.
Conclusion: According to our database the false negative rate after stereotactic vacuum-assisted biopsy of BI-RADS IV breast calcifications is 0.81%. In our opinion, in hospital follow-up is not necessary for women in the age group of the nationwide screening programme.

B-0013 10:38

A comprehensive analysis of factors contributing to marker migration during stereotactic core needle breast biopsies

M. Khalid, A. Jain, M.M. Qureshi, K. Buch, A. Hirsch, M.W. Grinstaff, J.A. Kaplan, B.N. Bloch; *Boston, MA/US (maria.khalid@bmc.org)*

Purpose: To assess the incidence of marker migration in stereotactic breast biopsies and to identify its contributing factors.
Methods and Materials: This retrospective IRB-approved study analysed 268 stereotactic biopsy markers placed in 263 consecutive patients undergoing uncomplicated stereotactic biopsies using 9G vacuum-assisted devices and 6 different markers from August 2010 to July 2013. Mammograms, obtained before, during and after biopsy were reviewed by two readers in consensus; relevant imaging findings and biopsy details [marker migration, breast density, needle approach (superior, inferior, medial, lateral), biopsy location, marker type/shape (6 different shapes), number of cores, haemorrhage, pathology] were documented. Basic descriptive statistics were calculated, and comparisons were performed using t test, Wilcoxon-Mann-Whitney, Chi-square or Fisher's exact.
Results: Of 268 placed stereotactic biopsy markers, 35 (13.1%) migrated ε1 cm from the biopsy cavity. Range of marker migration was 1-6 cm; mean ($\pm$SD) displacement was 2.35 ± 1.22 cm. Of the 35 migrated biopsy markers, 9 (25.7%) migrated ε3.5 cm. Patient age, biopsy pathology, number of cores, and left versus right breast were insignificantly correlated to marker migration (all $P > 0.10$). Fatty breast density (P= 0.025), superior biopsy approach (P= 0.025), t-shaped biopsy markers (P= 0.035) demonstrated significant correlations with marker migration.
Conclusion: Breast biopsy marker migration (ε1-6 cm) was identified in 35/268 (13.1%) biopsies. The shape of the breast marker, breast density, and needle approach were significantly associated with marker migration, suggesting that the risk of marker migration could be reduced by avoiding unfavourable marker shapes and the adverse superior approach, if reasonable.

B-0014 10:46

Vacuum-assisted breast biopsy guided by dedicated breast CT: first clinical experiences compared with conventional stereotactic breast biopsy

S. Wienbeck, E. von Fintel, J. Lotz, U. Fischer; *Göttingen/DE (susanne.wienbeck@med.uni-goettingen.de)*

Purpose: To prove the feasibility of vacuum-assisted breast biopsy (VAB) guided by a dedicated cone-beam breast CT.
Methods and Materials: In a prospective clinical trial VAB were performed in women with mammographically suspicious breast lesions within a dedicated clinical cone-beam breast CT (Koning Corp). Successful volume biopsy was proven by both specimen mammography and histologic workup. Technical success rate, examination time and complications were documented and compared to a matched group of women undergoing stereotactic VAB.
Results: In this ongoing trial CT-guided VABs have been done in 10 patients with 11 target lesions starting in August 2015 up to October 2015. Results were compared to stereotactic VAB performed in 10 matched patients with 10 target lesions in terms of type, distribution and size of calcifications. In all biopsies 12 biopsy specimens were obtained in a clockwise manner using 9-gauge needles. Clip markers were used if applicable according to current guidelines in both groups. The mean total procedure time for CT-guided VAB was 15.9 minutes (7.8-30.6 minutes) versus 21.1 minutes (19-27 minutes) for stereotactic VAB. All biopsies were technically successful. No major complications were observed in both groups. All specimens were sufficient for histologic workup.
Conclusion: CT-guided VABs are safe and feasible within the clinical available cone-beam breast CT. The use of CT-guided VAB in the diagnostic evaluation was faster compared with stereotactic VAB without an increase of complications. VAB guided biopsy is an added clinical value for the available dedicated cone-beam breast CT.

B-0015 10:54

Management strategies for benign papillomas without atypia diagnosed at percutaneous imaging guided breast core biopsy in recently published reports

S. Moon, H. Jung, K. Ko, S. Kim; *Seongnam-si/KR (msmoism@naver.com)*

Purpose: Surgical excision (SE) of benign papillomas without atypia (BPs) diagnosed at breast core biopsy is still controversial. Because of highly variable upgrade rates according to study designs, some studies advocated doing surgical excision of BPs, but other studies reported conservative follow-up (FU) to be adequate. The purpose of this study is to present updated perspectives on SE of BPs diagnosed at breast core biopsy and to analyse each study design by review of recently published reports.
Methods and Materials: From Pubmed database, we identified 35 retrospective studies evaluating underestimation rates of BPs diagnosed at breast core biopsy (2006 - 2015). They were categorized according to management strategy for BPs, and their study designs and upgrade rates to malignancy were analysed.
Results: Eleven of 35 studies supported SE (mean upgrade rate to malignancy 10.5%, range 3.1-19%; mean lesion number 101, range 43-234). Whereas, 6 studies recommended FU (mean upgrade rate to malignancy 1.4%, range 0-3%; mean lesion number 102, range 29-177). Eight studies (mean lesion number 82, range 10-199) proposed FU for selected BPs diagnosed at vacuum-assisted biopsy (mean upgrade rate to malignancy 0.4%, range 0-3%). The remaining 10 studies were equivocal for SE (mean upgrade rate to malignancy 6.1%, range 0-22.2%; mean lesion number 96, range 36 - 160), but suggested risk factors related to upgrade to malignancy in 7 studies.
Conclusion: Management strategy for BPs diagnosed at breast core biopsy is controversial. However, in many recent published reports, conservative followed up are being recommended for selected BPs.

B-0016 11:02

Effects on short-term quality of life of vacuum assissted breast biopsy: comparison between digital breast tomosynthesis and digital mammography

L. Gristina, F. Valdora, L. Cevasco, B. Bignotti, S. Tosto, F. Monetti, F. Rossi, A. Tagliafico, M. Calabrese; *Genoa/IT (licia.gristina@virgilio.it)*

Purpose: To compare the effects of Digital Breast Tomosynthesis (DBT) guided and Digital Mammography (MMx) guided Vacuum Assisted Breast Biopsy (VABB) on short-term Quality of Life (QoL).
Methods and Materials: From November 2014 through March 2015 women undergoing VABB in an Academic Medical Center participated in a survey after biopsy. VABB was performed under DBT (Group 1) or MMx guidance (Group 2). Biopsy experience was assessed with a modified Testing Morbidities Index (TMI). Ten attributes were assessed: six related to the procedures (pain or discomfort before and during testing,fear or anxiety before and during testing, physical and mental function after testing) and four not related to the procedures (familiarity for cancer and clinical history, embarrassment during testing, and overall satisfaction). Non-parametric standard statistics were used to compare data of Group 1 and data of Group 2.
Results: 90 women (mean age, 55.8 years) were enrolled: 45 underwent DBT-VABB and 45 MMx-VABB. The sum of the 6/10 items related to the procedures resulted significantly worst for DBT ($p < 0.02$), but no differences were observed for the single items. The median value for DBT-VABB and MMx-VABB was 95.2 and 90.1, respectively ($p < 0.02$). The 4/10 TMI items not related to the procedures did not differ significantly between the two groups. Four women fainted during DBT-VABB and three women during MMx-VABB: all of these patients underwent VABB procedures in sitting position.
Conclusion: Women in the DBT-VABB study group have a decreased short-term QoL compared to the MMx-VABB group. DBT-VABBs were less tolerated than MMx ones.

B-0017 11:10

Non-surgical complete excision of small suspicious breast lesions using the breast lesion excision biopsy system (BLES)

N.M. Abdel Razek; *Giza/EG (naglaabdelrazek@yahoo.com)*

Purpose: To assess the diagnostic efficiency of BLES in comparison to OB in diagnosis of small suspicious breast lesions.
Methods and Materials: The study is a prospective one conduced in a single centre during the period from February 2011 to July 2014. The ethical committee approval and patients written consents were obtained. The study included 290 patients with small suspicious non-palpable breast lesions. The procedures were done both under ultrasound and stereotactic guidance. We included lesions categorised as BIRADS 4 and BIRADS 3 with positive family history for breast cancer. The histopathology results were analysed and compared to the results of open surgery in the histopathologically proven malignant cases.
Results: 290 suspicious lesions were successfully removed using the BLES, 20 % (58/290) were diagnosed after histopathology as benign including fibrocystic disease, sclerosing adenosis, radial scars and papillomas without atypia. 31% (90/290) were diagnosed as high-risk lesions including, papillomas with atypia, ALH, ADH and 49 % (142/290) were diagnosed as malignant including DCIS, LCIS, IDC and ILC. The maximum size removed was 12 mm diameter. All histopathologically proven malignant lesions were exposed to re-surgery. There was no underestimation encountered by the BLES. The margin was free in 71.8% of cases (102/142 malignant lesions) and the margin was flushed in 28.2% (40/142) of malignant cases.
Conclusion: BLES is an efficient large-needle biopsy procedure for accurate histopathology diagnosis of suspicious small and borderline lesions as well as the unclassified microcalcifications. BLES offers complete lesion removal with available margin evaluation and no underestimation thus much indicated in borderline lesions offering good results similar to that of open surgery.

B-0018 11:18

Correlation of UK 5-point breast imaging classification and BI-RADS classification of calcification with final histology. Which is a better predictor of malignancy?

L. Metaxa[1], T. Suaris[1], K. Hunter[2], P. Dilks[1], S. Dani[1], S. O'Keeffe[1]; [1]*London/UK*, [2]*Dublin/IE (Sylvia.O'Keeffe@bartshealth.nhs.uk)*

Purpose: The 2013 version of BI-RADS altered the classification of calcification. In the UK 5-point breast imaging classification (UKS) radiologists grade calcifications from 1-5 according to suspicion for malignancy, however unlike BI-RADS, no morphological descriptors are published.
The purpose of our study was to determine whether strict categorisation according to BI-RADS was a better predictor of malignancy than the UKS.
Methods and Materials: A retrospective review of 241 patients, with microcalcifications on mammography, without associated mass, who underwent stereotactic VAB was performed. Magnification views were reviewed by 2 readers. Morphology, distribution and size according to BI-RADS, the UKS by the initial radiologist and pathological results recorded. The positive predicted value (PPV) of each classification system for malignancy was calculated.
Results: 27.8% of patients were diagnosed with DCIS/IDC. The PPV for the UKS was 17.9%, 69.4%, 100% for M3-5 respectively ($p < 0.001$). The PPV based on the BI-RADS morphology was Category< 4: 0%, 4B Amorphous: 7.1%, Coarse Heterogeneous: 33.3%, Fine Pleomorphic: 46.3% and 4C Fine linear/Fine linear branching: 81.5% ($p < 0.001$). The PPV based on the distribution was regional: 29%, grouped: 14.2%, diffuse: 33.3%, linear/linear segmental: 75.6% ($p < 0.001$)
Conclusion: Amorphous calcifications could be categorized as BI-RADS 4 A instead of 4B or UK M3 (malignancy < 10%). Other microcalcifications have malignancy rates of 33-82% and should be classified as UKS M4. The BI-RADS division of coarse heterogeneous and fine pleomorphic (4B) from fine linear/linear branching (4C) is an accurate predictor of increasing rate of malignancy. A similar division in the UKS between M4 A and M4B would be helpful.

B-0019 11:26

MR-only lesions: yield of biopsy

M. Boada, J. Vilanova, J. Barcelo, M. Villalón; *Girona/ES (mariaboada@comg.cat)*

Purpose: To assess the yield of MR-guided breast biopsy of MR-only lesions in a MR-interventional center, either using vacuum-assisted device or wire localization prior to surgical biopsy. To compare our results with other published studies.
Methods and Materials: We retrospectively studied the patients who underwent an MR-guided biopsy in our Center from January 2010 to July 2015. We included in the study all BI-RADS 4 and BI-RADS 5 lesions at MR with no corresponding mammography or ultrasound features (53 lesions in 50 patients). One lesion was excluded because it wasn't visible on MR the day of the procedure. 52 lesions were biopsied, 52% using vacuum-assisted device and 48% by wire localization prior to surgical biopsy. All procedures were performed on a 1.5 T MR with dedicated breast coil.
Results: 48% of the lesions biopsied were malignant, of which 44% IDC, 20% ILC and 36% DCIS; 13.5% were high-risk lesions and 38.5% benign lesions. Considering the malignant lesions and high-risk lesions as positive results, the PPV is 61.5%. One of the high risk lesions turned malignant at surgery.
Conclusion: The yield of MRI-guided biopsy in our centre is higher in comparison with literature reviewed. This result may be due to an accurate patient selection.

B-0020 11:34

Ultrasound-guided core-needle breast biopsy: comparison of small-sized needles (16G/18G) versus 14G needle diagnostic accuracy

R. Rella, M. Giuliani, F. Patrolecco, S.E. Di Giovanni, G. Carlino, M. Romani, P. Rinaldi, P. Belli, L. Bonomo; *Rome/IT (rossella.rella@gmail.com)*

Purpose: To assess the diagnostic accuracy of ultrasound-guided 16G/18G core-needle breast biopsy (US-CNB) versus 14G US-CNB, according to lesion characteristics.
Methods and Materials: A consecutive series of 2676 US-CNB performed from January 2011 to January 2015, were retrospectively reviewed. Inclusion criteria: availability of 1) Surgical histopathological examination of the entire lesion or 2) Radiological follow-up (FUP) ε24 months. The CNB results were compared with surgical pathological results or with FUP evolution (stable/benign or changed/malignant) in both needle size groups (16/18G and 14G). Needle size- and lesion characteristics-specific diagnostic accuracy parameters were evaluated: false negative rate (FNr), high-risk underestimation rate (HRr), DCIS underestimation rate (DCISr) and agreement rate (AGr).
Results: A total of 1118 US-CNB (1042 patients) were included: 488 (43.6%) performed with 16G/18G and 630 (56.4%) with 14G needles, respectively. Surgery was performed on 800 lesions: 619 were malignant (55.4%), 77 high-risk (6.9%) and 104 benign (9.3%). The remaining 318 lesions underwent imaging FUP: 316 (99.4%) were unchanged whereas 2 (0.6%) lesions changed their size/morphology, with final malignant histopathological demonstration. Needle size-specific diagnostic accuracy parameters were: FNr 5% 16G/18G and 4.9% 14G; HRr: 20.3% 16G/18G and 21.3% 14G; DCISr: 53.8% 16G/18G and 42.1% 14G; AGr: 93% 16G/18G and 94% 14G ($p < .01$). Diagnostic accuracy was lower for lesions δ10 mm ($p < .01$).
Conclusion: Smaller needles (16G/18G) are an accurate alternative for US-CNB, despite of lesion characteristics. Lesions δ10 mm have a higher risk of underestimation, regardless of needle size.

B-0021 11:42

Vacuum-assisted complete excision of solid intraductal/intracystic masses and complex cysts: is follow-up necessary?

V. Quinn-Laurin, J.-C. Hogue, S. Pinault, N. Duchesne; *Quebec, QC/CA (vanessa.quinn-laurin.1@ulaval.ca)*

Purpose: Follow-up of benign intraductal/intracystic masses (IM) and complex cysts (CC) is controversial and contributes to prolonged anxiety and increased costs while impacting on imaging and surgery scheduling. The purpose of this study was to determine if complete ultrasound-guided vacuum-assisted excision (US-VAE) of benign IM and CC is sufficient for their safe management.
Methods and Materials: This retrospective single institution study was performed between April 2007 and September 2013. Complete US-VAE of IM or CC obtaining a diagnosis of benignity were included. Size, morphology, and histological diagnosis were recorded in addition to surgical or imaging follow-up. These data were analysed with descriptive statistics.
Results: Three hundred and one lesions were biopsied with US-VAB during the study period and 131 met the inclusion criteria. Benign papilloma composed 32% of the studied lesions, the remaining lesions presenting various benign histology. Mean recorded size of the solid mass or the cysts' thickest septum was 7 mm (2-24 mm). Mean imaging follow-up was 30 months (5-99 months) without recurrence or malignancy in the post-biopsy bed observed during follow-up. Eleven lesions (8.4%) underwent surgery as follow-up: at biopsy site, no cancer was found and two lesions demonstrated atypia.
Conclusion: Completely excised IM or CC with US-VAE with benign histology do not require further imaging follow-up or surgery. Routine screening can be safely recommended.

B-0022 11:50

Quantitative 3D breast ultrasound analysis may reduce the number of biopsies for benign breast lesions

A.S.S. Meel-van den Abeelen, G. Weijers, J.C.M. van Zelst, J.M. Thijssen, R.M. Mann, C.L. de Korte; *Nijmegen/NL (aisha.vandenabeelen@radboudumc.nl)*

Purpose: In (3D) ultrasound, accurate discrimination of solid masses is difficult, resulting in a high frequency of biopsies for benign lesions. In this study, we investigate whether quantitative 3D breast ultrasound (QUS) analysis can be used for improved non-invasive discrimination of benign and malignant lesions.
Methods and Materials: 3D US studies of 104 biopsied solid breast lesions (size< 1 cm) were included (35 fibroadenomas and 69 invasive ductal carcinomas). The lesions were manually segmented, and 3 regions were defined for analysis: ROI (ellipsoid covering the inside of the lesion), HALO (0.5 mm around the lesion), and RET (retro-tumoural acoustic phenomena: region covering 5 mm below the lesion). For each region, the mean and standard deviation of the echo level were calculated. For the ROI and RET, also the attenuation coefficient was calculated. 70% of the cases (randomly selected) were used to construct a logistic regression model for lesion classification. This was subsequently validated in the remaining 30%. ROC curves were constructed to assess the optimal cut-off value of the model.
Results: The model achieved an area under the curve of 0.89 in the training set. At 98% sensitivity, a specificity of 65% was achieved. Using the same, cut-off in the validation set yielded a sensitivity and specificity of 95% and 60%. Consequently, QUS would have allowed a 60% reduction in biopsies for benign lesions, at a marginal decrease in sensitivity.
Conclusion: This study shows that 3D QUS is a promising technique to classify suspicious breast lesions as benign, possibly preventing unnecessary biopsies.

10:30 - 12:00 **Room Z**

Molecular Imaging

SS 206

PET/CT and MR in oncology

Moderators:
S. Chatziioannou; Athens/GR
N.N.

B-0023 10:30

Benefit assessment of 18 F-FDG-PET/CT in patients with advanced melanoma based on the analysis of clinical management changes using the "linked evidence approach"

S.-C. Schüle, P. Martus, A. Forschner, K. Nikolaou, C. la Fougère, B. Gückel, C. Pfannenberg; *Tübingen/DE (susann-cathrin.schuele@med.uni-tuebingen.de)*

Purpose: To evaluate the clinical benefit of PET/CT on clinical decision making and patient outcome in melanoma based on registry data and "linking" the results of management changes with the expected clinical value.
Methods and Materials: 336 patients with melanoma stage III/IV were prospectively enrolled in our oncologic PET/CT registry between 2013 and 2015. Referring dermatologists completed questionnaires regarding their intended treatment (e.g. metastasectomy or systemic therapy) for each patient before and after PET/CT. Based on these registered data, we analysed changes in intended management after PET/CT and compared these data with actually performed treatment. By applying "linked evidence" we combined the PET/CT-based management changes regarding surgically treatable metastases with the superior clinical outcome in case of curative R0 metastasectomy.
Results: Before PET/CT metastasectomy was scheduled in 99/336 patients based on CT-imaging. After PET/CT changes in management were actually carried out in 59/99 patients (60%) consisting of extension of surgical field (9 patients), shift towards systemic/radiation therapy (37 patients) and tumour exclusion (13 patients). Based on conventional imaging oncologic status was unclear in 22/336 patients. PET/CT clarified all 22 cases including shifting to R0-metastasectomy in 7/22 patients. Long-term survival will be observed in clinical follow-up.
Conclusion: The high impact of PET/CT on clinical management in patients with advanced melanoma is reflected in the frequent changes of intended and actually performed management, including optimal patient selection for potential curative RO-metastasectomy. The "linked evidence approach" can be used as a tool for clinical benefit assessment of PET/CT.

B-0024 10:38

Tumour heterogeneity measurement using [18 F] FDG PET/CT in patients with lung cancer

N.M. Hughes, P. Murphy, T. Mou, E. Wolsztynski, J. Huang, F. O'Sullivan, K.N. O'Regan; *Cork/IE (Nicolahughes@rcsi.ie)*

Purpose: This is a pilot study which measured primary tumour heterogeneity in patients with FDG-avid lung cancer on PET/CT, with the aim of optimising prognostic information from the metabolic signature of the tumour.
Methods and Materials: The initial pilot study included a retrospective analysis of 54 [18 F] FDG PET/CTs (32M:22 F) in patients with a diagnosis of primary lung malignancy. Data collected included patient demographics, tumour size, SUV max, radiological stage and tumour histology. Clinical follow-up and survival data were obtained from the available medical records. Tracer heterogeneity was evaluated by the lack of conformity of the FDG SUV pattern within the tumour region of interest to a simple 3-dimensional ellipsoidal form. A multivariate Cox regression analysis was used to assess the added prognostic benefit of heterogeneity information beyond PET/CT staging and other factors.

Results: Univariate and multivariate analysis which included PET/CT stage, SUVmax, and gender found that heterogeneity was an independent predictor of risk of death. More heterogeneous tumours are associated with significantly shorter survival ($p < .01$ and $p < 0.05$, respectively); the effect of heterogeneity was modified by gender. Further patient studies are being analysed to confirm the relationship found.
Conclusion: Quantification of the spatial heterogeneity of lung cancer tumours has potential to add prognostic information beyond that of PET/CT staging.
Author Disclosures:
F. O'Sullivan: Research/Grant Support; Supported in part by the National Cancer Institute grants CA42045 and Science Foundation Ireland grant PI 11/1027.

B-0025 10:46

FDG SUVmax and metabolic tumour burden are associated with major chemotherapy-related tumour markers in NSCLC patients

L. Bai, Y. Guo, X. Duan; *Xi'an/CN (lulu050622@163.com)*

Purpose: Metabolic activity and tumour burden are significant for prognosis and metastasis of NSCLC, including SUVmax, MTV and TLG. Chemotherapy resistance was a great challenge for NSCLC patients' treatment, and also closely related with several biomarkers such as EGFR, p53 and ERCC1. Our purpose was to determine the correlation between PET/CT parameters and tumour markers related chemotherapy resistantance in NSCLC.
Methods and Materials: 46 NSCLC chemotherapy naïve patients were enrolled. The SUVmax, MTV and TLG were calculated by PET-CT imaging, and expression of EGFR, p53 and ERCC1 were analysed by immunohistochemistry on tissues. SUVmax, MTV and TLG compared for their performance in predicting the expression of EGFR, p53 and ERCC1 were illustrated with statistical analysis.
Results: SUVmax was significantly correlated with p53 expression (p=0.001), and MTV and TLG were significantly associated with ERCC1 (p=0.000;p=0.000). Furthermore, multiple stepwise regression analysis revealed that p53 was the primary predictor for SUVmax, and ERCC1 was the primary predictor for MTV and TLG. SUVmax had a sensitivity of 91% and specificity of 50% for the detection of p53 positive. The sensitivities of MTV and TLG were 83% and 80% and specificities were 69% and 75% for the detection of ERCC1 positive respectively. When we suggested p53 or ERCC1 positive, the cut-off value of SUVmax, MTV and TLG were 7.68, 23.62 cm3 and 129.65, respectively.
Conclusion: SUVmax, MTV and TLG were closely associated with p53 and ERCC1' expressions. Therefore, 18 F-FDG PET/CT could be a new way of predicting p53 or ERCC1-related chemotherapy effect in NSCLC with more convenience.

B-0026 10:54

Morphological distribution and metabolic activity of brown adipose tissue in adult humans

A.S. Becker, H.W. Nagel, C. Wolfrum, I.A. Burger; *Zurich/CH (Anton.Becker@usz.ch)*

Purpose: To determine predictive factors for active brown adipose tissue (BAT) and establish a grading system for BAT activity.
Methods and Materials: 1060 consecutive scans of 1031 patients receiving a diagnostic ^{18}FDG-PET/CT from November 2014 to January 2015 were retrospectively examined by a dually-specialised physician (radiology and nuclear medicine) for the presence of active BAT. Patients were classified according to a 3-tier system (supraclavicular, mediastinal, infradiaphragmatic) depending on the anatomical location of their BAT depots, with the most caudal location being the determinant. In patients with active BAT, the metabolic parameters (maximum activity, total volume and glycolysis) were measured on a standard PET/CT workstation (AW version 4.6, GE-Health-Systems). Patient height and weight were extracted from the DICOM-data. Weather data for external temperature was acquired from a station close to the hospital.
Results: Mean age of the population was 60±14.6y. 41.61% of patients were female. Metabolically active BAT was found in 53 patients (5.1%). Female, younger and/or leaner patients tended to have more active BAT. No correlation with the external temperature could be established. 15 patients showed only supraclavicular, 27 additional mediastinal, and 11 infradiaphragmal activity. The activation of BAT always followed a strictly cranio-caudal gradient. Anatomical pattern and all metabolic parameters, including total glycolysis, correlated significantly ($p < 0.001$).
Conclusion: Brown adipose tissue in humans is activated in a cranio-caudal fashion. The activity can be graded by simply looking at the most caudally activated location, with excellent correlation to quantitative PET measurements.

B-0027 11:02

Evaluation of ^{68}Ga-PSMA-PET/CT in primary staging of prostate cancer patients

C. Uprimny, A. Kroiss, L. Geraldo Roig, C. Decristoforo, D. Kendler, E. von Guggenberg, I.J. Virgolini; *Innsbruck/AT (Christian.UPRIMNY@tirol-kliniken.at)*

Purpose: Prostate cancer (PC) cells show a high expression of prostate-specific membrane antigen (PSMA). The aim of this study was to assess the diagnostic usefulness of ^{68}Ga-PSMA-PET/CT in the primary staging of histologically proven PC patients using a ^{68}Ga-labelled PSMA-ligand with high affinity to PSMA.
Methods and Materials: 63 patients in whom transrectal ultrasound (TRUS) biopsy could verify PC (Gleason score 6-10; median PSA: 13.54 ng/ml) were referred for ^{68}Ga-PSMA PET/CT and retrospectively analysed. PET scans combined either with low-dose CT (n=49) or contrast enhanced diagnostic CT (n=14) were acquired 60 minutes after injection of ^{68}Ga-labelled PSMA-ligand Glu-NH-CO-NH-Lys-HBED-CC (median activity: 145 MBq). PET images were analysed visually and semiquantitatively by calculating maximum standardized uptake values (SUVmax) of the primary tumour and pathological lesions suspicious for lymphatic or distant metastases.
Results: 60 patients (95.2%) demonstrated pathological tracer uptake within the prostate gland (median SUVmax: 13.54). 19 patients (30.2%) showed lymphnodes (LN) with pathologic tracer accumulation consistent with metastases (n=71; median SUVmax: 12.15). In 8 patients (12.7%) pathologic skeletal lesions suspicious for bone metastases were found (n=18; median SUVmax: 6.5). No other sites of distant metastases were detected.
Conclusion: The majority of TRUS biopsy proven PC patients showed a significant pathological ^{68}Ga-PSMA-ligand accumulation in the primary tumour on ^{68}Ga-PSMA-PET/CT. As it was also possible to visualize PSMA-positive LN and bone lesions, highly suspicious for malignant involvement, ^{68}Ga-PSMA-PET/CT could add valuable information for an accurate primary staging of PC patients.

B-0028 11:10

Optimisation of iterative image reconstruction for high-definition digital PET/CT

K. Binzel, J. Zhang, T. Saif, A. Siva, C. Lehn, M.V. Knopp; *Columbus, OH/US (binzel.1@osu.edu)*

Purpose: The introduction of next-generation digital PET/CT enables high-definition reconstruction with decreased voxel volumes, improving image quality and quantification. This study overcomes perceived boundaries attributed to increased noise levels by re-optimisation of iterative reconstruction parameters.
Methods and Materials: 35 patients injected with 480 MBq 18 F-fluorodeoxyglucose were imaged 90 sec/bed on the Philips Vereos PET/CT. Listmode data were reconstructed with 4 and 2 mm3 voxel volumes, using 3 iterations with varied numbers of subsets, 9, 13, 17, 21, or 29 initially. Secondary reconstructions then used 13, 15, and 17 subsets for 4-mm images, 11, 13, and 15 for 2-mm images. We evaluated visual quality and quantitative precision in target tumours and background tissues, using 29 subset images as reference.
Results: Visual review revealed preferred 4-mm reconstructions to be with 15, 17, then 13 subsets. 2-mm images were rated best with 13, 15, then 11 subsets. Quantitative evaluation of secondary reconstructions was not significantly ($p > 0.3$) impacted by different numbers of subsets. On average, quantification of physiologic uptake varied less than 7.5% and 13% for 4 and 2 mm reconstructions. In target lesions, SUVmax decreased on average 4.4%, 3.4%, and 4.6% for 4-mm images with 13, 15, and 17 subsets. In 2-mm images, the average decrease was 10.0%, 5.5%, and 5.1% for 11, 13, and 15 subsets.
Conclusion: Higher definition PET imaging was achieved after optimisation of iterative reconstruction parameters. The optimisation must be tailored to chosen voxel volumes and expected count densities to leverage the capabilities of new digital photon counting PET.
Author Disclosures:
M.V. Knopp: Equipment Support Recipient; Philips Healthcare provided the pre-commercial release system. Research/Grant Support; Ohio Third Frontier.

B-0029 11:18

Phase Ia trial comparing digital photon counting detector PET/CT with current photomultiplier PET technology for Yttrium-90 imaging after radioembolisation

C.L. Wright[1], K. Binzel[1], J. Zhang[1], E. Wuthrick[1], P. Maniawski[2], M.V. Knopp[1]; [1]*Columbus, OH/US*, [2]*Cleveland, OH/US (chadwick.wright@osumc.edu)*

Purpose: Yttrium-90 (90Y) is used clinically for targeted microsphere radioembolisation of unresectable intrahepatic malignant and metastatic lesions. Conventional photomultiplier tube-based PET/CT (cPET/CT) systems

can image 90Y internal pair production but has not been widely adopted due to long acquisition times. A recent technology innovation has replaced photomultiplier tubes in the PET gantry with next-generation digital photon counting detectors (i.e., digital PET or dPET/CT). Our objective is to assess qualitative and quantitative 90Y imaging characteristics of dPET/CT compared to cPET/CT in patients following liver radioembolisation.
Methods and Materials: Digital PET/CT (Vereos, Philips Healthcare) was used to evaluate 12 patients following 90Y radioembolisation and compare image characteristics to cPET/CT (Gemini, Philips Healthcare). Digital PET/CT and cPET/CT imaging were performed at 4 - 50 h following radioembolisation. Image characteristics were assessed by matched comparison as well as quantitative volume-of-interest assessment using 1% threshold isocontours of 90Y activity within the liver.
Results: Digital PET detection of 90Y internal pair production is clinically feasible. For all patients, both dPET/CT and cPET/CT images were consistently rated as evaluable. Digital PET/CT demonstrates improved volumetric assessment of 90Y activity in the liver when compared with cPET/CT.
Conclusion: Digital PET/CT demonstrates improved quantitative volumetric assessment of 90Y activity in the liver when compared with cPET/CT and facilitated by the faster timing resolution of the digital photon counting detector technology. Furthermore, this new digital PET detector technology may also enable shorter image acquisition times than cPET technology for post-90Y radioembolisation assessment.
Author Disclosures:
P. Maniawski: Employee; Philips Healthcare. **M.V. Knopp:** Equipment Support Recipient; Philips Healthcare provided the pre-commercial release system. Research/Grant Support; Ohio Third Frontier.

B-0030 11:26

Accuracy of diffusion-weighted MR for distinguishing benign conditions from tumours of the anterior mediastinum: comparison of perfusion sensitive vs. perfusion free ADC measurements
A. Priola, S. Priola, D. Gned, A. Veltri; *Orbassano/IT (adriano.priola@inwind.it)*

Purpose: The apparent diffusion coefficient (ADC) in diffusion-weighted (DW)-MR is overestimated by using perfusion-sensitive measurements obtained with b=0sec/mm2. Although a lowest b> 100 sec/mm2 is recommended for obtaining perfusion-free ADCs, in clinical research perfusion-sensitive ADCs are generally used for the anterior mediastinum. Since the degree of perfusion is usually greater in tumours with greater overestimation of ADC, we compared perfusion-free vs. perfusion-sensitive ADCs for distinguishing benign conditions from tumours.
Methods and Materials: Seventy-six subjects were divided into "benign conditions" group (A, n=44) and "tumours" group (B, n=32), based on histological findings. The ADCs were obtained on ADC-MAPs by including (perfusion-sensitive=ADCb0-800) and excluding (perfusion-free=ADCb150-800) the b=0 sec/mm2. Mann-Whitney/U-test was used to detect differences in ADCb0-800 compared with ADCb150-800 values between all cases, benign conditions and tumours. The same test was used to evaluate differences in ADCs between groups for both measurements and ROC curves were obtained to evaluate discrimination abilities with comparison of Areas-Under-ROC-curves (AUROC). Optimal cut-points for group discrimination were determined with Youden-Index with computation of accuracy.
Results: The median ADCb0-800 was significantly greater than ADCb150-800 for all cases (p=0.0014), benign conditions (p=0.0412) and tumours (p=0.0001) (median percentage of increase: group-A=5.30%, group-B=22.39%; $p < 0.0001$). AUROC of ADC in discriminating between groups was significantly greater for ADCb150-800 (0.932) compared with ADCb0-800 (0.831) (p=0.001). The optimal cut-point for distinction between groups was 1.52x10-3 mm2/sec (accuracy=89.5%) for ADCb150-800 and 1.75x10-3 mm2/sec (accuracy=78.9%) for ADCb0-800 (p=0.003).
Conclusion: The use of perfusion-free ADC measurements significantly improves accuracy of DW-MR in differentiating benign conditions from tumours of the anterior mediastinum.

B-0031 11:34

Added value of apparent diffusion coefficient in the preoperative MRI staging of gastric cancer: comparison with postoperative histology
F. Giganti, A. Ambrosi, D. Chiari, A. Esposito, C. Staudacher, A. Del Maschio, F. De Cobelli; *Milan/IT (giganti.fra@gmail.com)*

Purpose: To investigate the influence of ADC in the diagnostic performance of MRI in the preoperative staging of gastric cancer.
Methods and Materials: Between October 2009 and October 2014 a total of 88 patients with biopsy-proved gastric cancer underwent 1.5 T MRI with T1, T2 and DWI sequences and then treated with radical surgery. Two radiologists independently measured minimum ADC from tumour and assessed T and N staging by MRI. All findings were then compared with final histology, considering T1-3 vs T4a-b and N0 vs N+ (according to 7th TNM staging).
Results: Minimum pathological ADC was significantly different both for T and N staging ($p < 0.01$). An optimal cut-off of 1.28 x 10-3 mm2/s could distinguish between patients with local invasion (area under the curve: 0.91; $p < 0.001$). For T staging, MR showed a sensitivity of 70% and a specificity of 68%, which increased to 87% and 88% respectively, when adding our ADC cut-off. For N staging, the sensitivity increased from 68% to 77% with similar results in terms of accuracy (69% and 70%, respectively), when adding our ADC cut-off.
Conclusion: ADC is different according to local invasion and nodal involvement in gastric cancer. Adding ADC to morphological T and N staging by MRI helps in the prediction of postoperative staging.

B-0032 11:42

Gd-EOB-DTPA-enhanced magnetic resonance imaging combined with T1 mapping predicts the degree of differentiation in hepatocellular carcinoma
Z.M.H.S. Peng; *Guangzhou/CN (37595198@qq.com)*

Purpose: Variable degrees of differentiation in hepatocellular carcinoma (HCC) under Edmondson-Steiner grading system has been proven to be an independent prognostic indicator for HCC. Up till now, there has been no effective radiological method that can reveal the degree of differentiation in HCC before surgery. This paper aims to evaluate the use of Gd-EOB-DTPA-Enhanced Magnetic Resonance Imaging combined with T1 mapping for the diagnosis of HCC and assessing its degree of differentiation.
Methods and Materials: 44 patients with 53 pathologically proven HCC had undergone Gd-EOB-DTPA enhanced MRI with T1 mapping before surgery. Out of the 53 lesions,13 were grade I, 27 were grade II, and 13 were grade III. The T1 values of each lesion were measured before and at 20 minutes after Gd-EOB-DTPA administration (T1p and T1e). The absolute reduction in T1 value (T1d) and the percentage reduction (T1d%) were calculated. The one-way ANOVA and Pearson correlation were used for comparisons between the T1 mapping values.
Results: The T1d and T1d% of grade I, II and III of HCC was 660.5±422.8 ms,295.0±99.6 ms,276.2±95.0 ms and 54.0±12.2%,31.5±6.9%,27.7±6.7% respectively. The differences between grade I and II, grade I and III were statistically significant ($p < 0.05$), but there was no statically significant difference between grade II and III. The T1d% was the best marker for grading of HCC, with a Spearman correlation coefficient of -0.676.
Conclusion: T1 mapping before and after Gd-EOB-DTPA administration can predict degree of differentiation in HCC.

B-0033 11:50

Investigation of a novel small field of view hybrid compact gamma camera (HCGC) for scintigraphic imaging
M.S. Alqahtani[1], J.E. Lees[1], S.L. Bugby[1], L.K. Jambi[1], B. Bhatia[1], N. Dawood[1], W. McKnight[1], A.H. Ng[2], A.C. Perkins[2]; [1]*Leicester/UK*, [2]*Nottingham/UK (msma7@leicester.ac.uk)*

Purpose: The Hybrid Compact Gamma Camera (HCGC) has been developed to provide additional localisation information during procedures such as sentinel lymph node (SLN) biopsies. In this study, a lymph-node contrast (LNC) phantom and an evaluative technique that involved idealised medical scenarios were modelled to study the HCGC detectability of varying radioactivity concentration and sentinel lymph node size.
Methods and Materials: The LNC phantom is made of Perspex plates, with simulated SLNs of diameters ranging between 10 and 2.5 mm (16 SLNs in total). These simulated SLNs are positioned beneath thicknesses of scattering material ranging between 5 mm and 40 mm. The LNC phantom has four different background wells to simulate activity uptake surrounding the SLNs. The simulated activities ranged between 4 MBq and 0.025 MBq for the SLNs following their sizes. The simulated background activity was 1/10 of the simulated activity in the SLN.
Results: Spatial resolution measurements and Signal to Noise Ratio (SNR) analysis of the SLN were used as the main criteria to compare imaging sets produced by the HCGC with acquisition times ranging between 60 and 240s. The HCGC can successfully detect 87.5% to 100% (depending on the acquisition time) and 75% to 93.75% of the SLNs that are positioned underneath 20 and 40 mm thicknesses of Perspex respectively. The HCGC provides good spatial resolution images for detected SLNs ranging between 9.5 and 12 mm.
Conclusion: The HCGC capability to detect low activity uptake in a small SLN indicates its usefulness as an intraoperative imaging system during critical surgical SLN procedures.

10:30 - 12:00 **Room O**

GI Tract

SS 201b

A guided tour through the GI tract

Moderators:
K. Skrobisz-Balandowska; Gdansk/PL
B.E. Van Beers; Clichy/FR

B-0035 10:30

MR enterography in Celiac disease: correlation with endoscopic, histopathologic, serologic and genetic features

A. Radmard, A. Hashemi Taheri, E. Salehian Nik, S. Kolahdoozan, B. Mirminachi, G. Ekhlasi, M. Sotoudeh, R. Malekzadeh, B. Shahbazkhani; *Tehran/IR (amir.radmard@gmail.com)*

Purpose: To determine bowel abnormalities of MR Enterography (MRE) in patients with Celiac disease (CD) and investigate their associations with endoscopic, histopathologic, serologic and genetic features.
Methods and Materials: Forty consecutive new or poorly controlled adult patients with CD, aged 17-76 years, underwent MRE. Two radiologists evaluated qualitative and quantitative findings. Endoscopic manifestations were categorized into normal/mild (erythema, erosions) and severe (scalloping, villous atrophy). Histopathological results were divided into mild (Marsh 1, 2 and 3 A) and severe (Marsh 3B, 3C). Genotyping of HLA-DQ2 and DQ8 was performed. Serum levels of tissue-trasnglutaminase, endomysial and gliadin antibodies were also determined.
Results: Eleven (27.5%) cases showed unremarkable MRE. Fold reversal pattern was significantly associated with severe endoscopic (OR=8.38, 95%CI 1.7-40.5) and pathologic (OR=7.36, 95%CI 1.3-40.5) features. In multivariate regression analysis, increased numbers of ileal folds/inch were significantly associated with severe MARSH score (OR=2.83, 95%CI 1.4-5.5) and HLA-DQ8 (OR=1.11, 95%CI 1.06-3.2). Mean numbers of duodenal and jejunal folds/inch did not exhibit significant associations with endoscopic, pathologic, serologic and genetic features. Among quantitative measures, ileal fold number demonstrated to have the highest areas under the curve for prediction of severe endoscopic and pathologic findings and anti-transglutaminase level.
Conclusion: Fold reversal pattern in MRE is highly associated with severe endoscopic and pathologic features of CD. Increased ileal folds showed higher correlation with endoscopic-pathologic features, HLA-DQ8 and anti-transglutaminase level. MRE might be more sensitive for detection of increased ileal folds in CD rather than reduction of duodenal and jejunal folds due to better distension of ileal loops.

B-0036 10:38

Initial experiences with ultra low-dose CT scanning in body packers

J.P.D. Noordmans, R.W.F. Geenen, A.M. Wagenvoort, W. Kool, P.R. Algra; *Alkmaar/NL (jnoordmans@hotmail.com)*

Purpose: Body packing is described as internal concealment of illegal drugs. Leakage can cause severe damage to the body packer. As a diagnostic, plain abdominal films will miss 50% of concealed drugs. Non-contrast CT-scanning seems to be the most reliable technique for the detection of the packets. Our purpose is to display our first experiences with ultra low-dose CT scanning.
Methods and Materials: From April to October 2015, using a Philips 64 slice CT scanner with iterative reconstruction techniques, we scanned the abdomen of 291 suspected body packers. The average dose was 0.5 mSv (3 non-contrast enhanced scanning protocols depending on body weight). The gold standard was the presence of drug packets in the faeces.
Results: In 291 suspected body packers, ultra low-dose CT scanning showed several types of packets from fluid coke to vaginal packets, containing several types of illegal drugs, some not visible on scout view. CT scanning also showed more incidental findings, which were better to be characterised by CT scanning compared to abdominal plain films.
Conclusion: Ultra low-dose CT scanning with iterative reconstructions of the abdomen is a very effective method to exclude or detect various types of packets of illegal drugs, superior to abdominal plain films. With an average dose of 0.5 mSv, the dosage administered to suspected body packers is almost as low as usage of plain abdominal films (0.3 mSv).

B-0037 10:46

CT characteristics and clinical relevance of the small-bowel faeces sign in patients with small-bowel obstruction: are there different faeces signs?

W. Khaled[1], L. Corno[1], A.-M. Chuong[1], M. Benadjaoud[2], I. Boulay-Coletta[1], M. Zins[1]; [1]*Paris/FR*, [2]*Villejuif/FR (wassefkhaled@hotmail.com)*

Purpose: To study CT characteristics of the small-bowel faeces sign (SBFS) and its clinical relevance to predict medical management success and the diagnostic of ischaemia in small-bowel obstruction (SBO) due to matted adhesions or adhesive bands.
Methods and Materials: Two senior radiologists retrospectively performed blinded and independent review of 237 consecutive CT scans amongst 216 patients with SBO due to matted adhesions or adhesive bands for assessment of the transition zone (TZ) (number, location) and the SBFS characteristics (presence, location related to the TZ, length, density, morphology) between the two groups: surgical (n = 108) or medical (n = 129) treatment.
Results: The prevalence of SBFS was 41.4%. SBFS was proximal to the TZ in 82 of 98 CT scans (83.7%). A unique TZ (OR = 0.25; IC95% 0.13-0.46, $p < 0.001$), an anterior location of the TZ (OR = 0.39; IC95% 0.18-0.86, p = 0.019) or an SBFS > 5 cm proximal to the TZ (OR = 0.43; IC95% 0.21-0.89, p = 0.022) were inversely predictive of surgery. More than two TZ (OR = 6.54, IC95% 2.96-14.41, $p < 0.001$) or an SBFS > 5 cm located in a closed loop (OR = 4.00; IC95% 1.11-14.42, p = 0.034) were predictive of ischaemia.
Conclusion: The SBFS is a common and useful sign to locate the TZ. There are multiple types of SBFS and their clinical relevance depends on their length and location.

B-0038 10:54

Meckel's diverticulum revisited: MDCT by tracing distal ileal artery of superior mesenteric artery for identifying origin of Meckel's diverticulum

Y. Ra, Y. Ku, S. Lee; *Gyeonggi-do/KR (johnrha@gmail.com)*

Purpose: To demonstrate the usefulness of the multi-detector row computed tomography (MDCT) for detecting Meckel's diverticulum by tracing distal ileal artery of superior mesenteric artery.
Methods and Materials: Fifteen patients (12 males and 3 females; age range, 2-48 years; median age, 23.2years) with surgical proven Meckel's diverticulum underwent preoperative MDCT and were finally included in our retrospective study.
Results: On preoperative MDCT, Meckel's diverticulum was identifed in ten patients (n=10). On the other hand, in remnant five patients (n = 5), diverticulum was not visualised on preoperative MDCT. However, twelve patients show positive superior mesenteric vessel branching tracing with Meckel's diverticulum or suspected transition zone. In other words, we could make a diagnosis additional two patients of five patients, not visualised on preoperative MDCT by tracing distal ileal artery of superior mesenteric artery.
Conclusion: The diagnosis of Meckel's diverticulum can be made with certainty when the diverticulum is visualised on preoperative MDCT. However, the preoperative diagnosis is difficult if the Meckel's diverticulum is not noted on the MDCT. When blind-end outpouching of the ileum is visualised on CT, near the terminal branch of the superior mesenteric artery, or transition zone are visualised near the midline, one should keep in mind that small bowel obstruction may be caused by Meckel's diverticulum, when the patient has no prior surgical history.

B-0039 11:02

Imaging of gastrointestinal melanoma metastases: correlation with surgical and pathological findings

A.E. Othman, T. Eigentler, G. Bier, C. Kloth, C. Pfannenberg, H. Bösmüller, C. Thiel, K. Nikolaou, B. Klumpp; *Tübingen/DE (ahmed.e.othman@googlemail.com)*

Purpose: Gastrointestinal melanoma metastases (GI-MM) are rare and potentially cause gastrointestinal (GI-)complications (e.g.bowel obstruction, perforation). Surgical resection of GI-MMs can improve patient survival. In this study, we aimed to assess imaging patterns and appearances of GI-MM, associated GI-complications and diagnostic accuracy of CT and PET/CT for the detection of GI-MMs.
Methods and Materials: Patients who underwent surgical resection of GI-MM during the past 10 years with available preoperative imaging data (CT, PET/CT or both) and pathological confirmation were retrospectively included (n=41, 56.1±13.5y, 18 F). Preoperative CTs were assessed independently by two blinded radiologists (experience in oncologic imaging: reader A 15y, reader B 3y) regarding presence, extent, localisation, type and potentially associated GI-complications of GI-MM. PET-CTs were assessed by both radiologists in consensus.
Results: Time between first melanoma diagnosis and diagnosis of GI-MM was 4.3 ± 3.0 years. 49% of the patients underwent curative surgery, 51% underwent palliative surgery. 37% of the patients presented with local GI-complications. GI-MM patterns were 24% cavitary, 29% infiltrating, 17%

exoenteric.and 29% polypoid. Polypoid GI-MMs were associated with the highest complication rate (p=.012). Lesion size did not correlate with complication rate (p=.008). Diagnostic accuracy was highest for PET-CT, followed by reader A and lowest for reader B (PET-CT: AUC=0.91, 95%-CI 0.83-0.99; reader A: AUC=0.88, 95%-CI 0.81-0.94, reader B: AUC=0.80; 95-CI 0.80; p=.05).
Conclusion: GI-MMs are rare but necessitate frequently surgical resection due to associated complications. On CT, GI-MM can be detected sufficiently by experienced radiologists. PET-CT contributes improved diagnostic accuracy for detection of GI-MMs.

B-0040 11:10

Gastrointestinal involvement from renal cell carcinoma: CT findings and clinicoradiologic features
H. Park, H. Kim, S. Park, J. Lee, A. Kim, H. Ha; *Seoul/KR (happyeahj@gmail.com)*

Purpose: The purpose of this study was to retrospectively evaluate the CT findings and clinical features of gastrointestinal (GI) involvement from renal cell carcinoma (RCC).
Methods and Materials: 22 patients with 26 lesions were included. Medical information was collected by reviewing electronic medical records of each patient. CT findings including involved bowel sites, the way of involvement, size, morphology, patterns of contrast enhancement of the lesions were analysed. Presence of combined lymphadenopathy, ascites, and complication were also assessed.
Results: The common clinical presentations were abdominal pain (31.8%) and GI bleeding (31.8%). The mean interval time between the diagnosis of RCC and GI involvement was 30.7 ± 37.0 months. GI involvement was most commonly found in duodenum (45.5%), followed by ileum and colon. The most common way of involvement was distant metastasis. The mean size of the lesions was 5.4 ± 4.0 cm. The lesions were commonly exophytic mass (50%) and intraluminal polypoid mass (46.2%) with hyper-attenuation (69.2%) and heterogeneous enhancement (86.4%). Complication occurred in 4 patients which were bowel obstruction, intussusception, perforation, bile duct dilatation and pancreatic duct dilatation.
Conclusion: GI involvement from RCC should be considered as possible differential diagnosis when CT scans depict heterogeneous, hyper-attenuated exophytic or intraluminal polypoid mass in small bowel with relative paucity of lymphadenopathy in patients with diverse interval period from treatment of advanced RCC.

B-0041 11:18

Midgut neuroendocrine tumours: is there a link between mesenteric fibrosis and carcinoid heart disease?
V. Rodriguez Laval, M. Pavel, I. Steffen, B. Wiedenmann, T. Denecke; *Berlin/DE (victor.rodriguez@charite.de)*

Purpose: Fibrosis is a hallmark of midgut neuroendocrine tumours (MNET). The fibrotic process can occur either locally as mesenteric fibrosis (MF) or distantly as carcinoid heart disease (CHD). The purpose of this study is to prove the relationship between these two fibrotic processes, and to analyse the radiological manifestations according to the presence of carcinoid syndrome and levels of 5-hydroxyindoleacetic acid (5-HIAA).
Methods and Materials: 95 patients treated in our centre between 2008 and 2014 with pathologically proven MNET were retrospectively studied. We analysed various imaging features on the diagnostic MRI/CT imaging as well as histology, grading, functionality and development of CHD.
Results: 84% of the patients developed lymphatic metastases and 68% had hepatic affection. 37% had MF. 13 (14%) patients developed CHD and 10 (77%) had MF (p=0.002). Multivariate regression models showed the following results. MF was significantly associated with a higher hepatic tumoural load, development of CHD and elevated levels of 5-HIAA. Functional tumours were significantly associated with a higher hepatic tumoural load, elevated number of lymphatic metastases and with the presence of distant non-hepatic metastases.
Conclusion: The development of CHD is related to the presence of mesenteric fibrosis. Both are related to elevated levels of 5-HIAA and with a higher hepatic tumoural load. It can be hypothesised, that these fibrotic processes are caused by secretion of mediators from hepatic metastasis. Functional tumours were related to a higher lymphatic and hepatic tumoural load and distant metastases, which suggests a causal relationship.

B-0042 11:26

Imaging in dengue: what every radiologist needs to know
K. Shirodkar, H. Mohanty, M. Bind, V. Mulla, S. Nandikoor, S. Reddy, S. H.N, G. Mallarajapatna; *Bangalore/IN (kapilshirodkar@gmail.com)*

Purpose: Dengue is endemic in tropical countries like India and is a leading cause of hospitalisation and death amongst children. A high index of suspicion is required for its early diagnosis and treatment. Dengue symptoms can vary from asymptomatic to fatal thrombocytopenia/haemorrhage.
Methods and Materials: A retrospective observational study was done using the data from RIS (Radiology Information System) from 1 October 2014 to 31 September 2015 in a tertiary level hospital in Indian Metropolitan city with a high incidence of dengue cases. 250 patients with a definitive laboratory positive infection (Dengue NS-1; Dengue Virus IgM/IgG; ELISA) were included in the study.
Results: Out of 250 seropositive dengue cases; 65 patients (26%) showed imaging features of acute acalculous cholecystitis (GB wall oedema, pericholecystic fluid, Sonographic Murphy sign); 50 patients (20%) did not show any radiological features; 44 patients (17.6%) had ascitis; 35 patients (14%) had pleural effusion; 32 patients (12.8%) had organomegaly (hepatomegaly, splenomegaly); 9 patients (3.6 %) had dengue encephalitis; 9 patients (3.6 %) had haemorrhagic manifestations (hemoperitoneum, perinephric haematoma, subdural haematomas, intraparenchymal bleed, GI bleed); 6 patients had atypical findings [portal vein thrombosis, pericardial effusion, ARDS, ARF, secondary infection (pyelonephritis), pancreatitis]. The combination of GB wall thickening, ascitis, pleural effusion and organomegaly was seen in 176 (70%) cases of dengue.
Conclusion: Radiological features of thickened GB wall, pleural effusion, ascitis and organomegaly (hepatosplenomegaly) should raise the suspicion of dengue in patients presenting with pyrexia with associated signs and symptoms, especially in a tropical country like India with a high incidence of dengue cases.

B-0043 11:34

Complex morbidity - perianal fistulae and involvement of external genitalia: MR imaging findings and significance of fistulogram
S. Devu, U. Matapathi, P. Pantrangam, K. Marathu, R. Sunnadkal; *Hyderabad/IN (sridhardevu@gmail.com)*

Purpose: To evaluate the significance of MR fistulogram in preoperative imaging of perianal fistulae extending to genitalia and other pelvic structures.
Methods and Materials: Retrospective evaluation of 469 MR pelvic studies done to evaluate perianal fistula done in our hospital from January 2013 to January 2015. MRI was done on 1.5 T GE HDX 16-channel using a surface coil, and in cases with external fistulous opening 50% diluted Gadolinium was injected (1-2 cc) through the external opening.
Results: 93 patients had perianal fistulae extending anteriorly to external genitalia and other closely related structures. In men, fistulous tracts extending to corpora cavernosa was identified in 27 patients, 24 extending to base of urinary bladder,15 involving seminal vesicles. In women, fistulae extending to base of bladder were identified in 12, extending to cervix in 8 and extending to labia majora was seen in 7 patients.
Conclusion: MR fistulogram enhances the information output in perianal fistula imaging. Involvement of genitalia adds to the complexity of perianal fistula management and preoperative delineation of tract morphology plays a vital role.

B-0044 11:42

Image quality and diagnostic acceptability of a novel 80 kVp CT low dose protocol with automated tube current modulation in screening of body packing
J. Aissa, J. Boos, C. Rubbert, J. Caspers, C. Thomas, P. Kröpil, G. Antoch, F. Miese; *Düsseldorf/DE (joel.aissa@med.uni-duesseldorf.de)*

Purpose: The aim of this study was to assess the diagnostic performance and image quality (IQ) of a novel 80 kVp CT protocol with automated tube current modulation (ATCM) compared to a 120 kVp CT protocol.
Methods and Materials: 80 patients examined between March 2012 and July 2015 in suspicion of body packing, were retrospectively included in this study. Thirty-one CT examinations were scanned using a fixed tube voltage of 80 kVp and ATCM (group A). Group B contained thirty-nine patients which were examined with a standard protocol (120 kVp and a fixed tube current time product of 40 mAs). Subjective and objective IQ were evaluated.
Results: All examinations were of diagnostic IQ. Contrast-to-noise ratio (group A: 0.56±0.36; group B: 1.13±0.91; $p < 0.05$) and Signal-to-noise ratio (group A: 3.69±0.98; group B: 7.08±2.67; $p < 0.05$) were significant lower for group A compared to group B but body packets could be reliably detected with the new protocol (group A: 362.2 ± 70.3 HU; group B: 210.6±60.2 HU; $p < 0.05$). CTDIvol and DLP were significantly ($p < 0.05$) lower in group A (CTDIvol 2.2±0.9 mGy, DLP 105.7 ± 52.3 mGycm) as compared to group B (CTDIvol 2.7±0.1 mGy, DLP 126.0±9.7 mGycm).
Conclusion: Compared to a standard 120 kVp CT protocol the novel 80 kVp protocol with ATCM leads to a significant dose reduction in screening of body packing. Retaining high attenuation and diagnostic IQ body packs were easily and reliably detected with the 80 kVp protocol.

10:30 - 12:00 **Room N**

Cardiac

SS 203a
Cardiomyopathies (1)

Moderators:
F. Bamberg; Tübingen/DE
R. Dore; Pavia/IT

B-0045 10:30

LGE cardiac imaging on a 3-T scanner: retrospective comparison of breath-holding two-dimensional (2D) phase-sensitive inversion recovery (PSIR) and breath-holding 2D IR sequences

V. Vellucci, A. Mancini, A. Di Sibio, F. Bruno, L. Panebianco, M. Paoli, R. Masi, E. Di Cesare, C. Masciocchi; *L'Aquila/IT (valentinavel@gmail.com)*

Purpose: To evaluate two-dimensional (2D) phase-sensitive inversion recovery (PSIR) in comparison with 2D IR sequences to establish which one offers the best image and diagnostic quality for myocardial fibrotic lesions assessment.
Methods and Materials: Eighty patients underwent CMR on a 3-T MRI scanner using two different LGE sequences: 2D phase-sensitive inversion recovery (PSIR) and 2D IR sequences. All LGE-positive patients were qualitatively assessed by two readers using a 4-point scale evaluating overall image quality, LGE contrast and margin sharpness, presence of artefacts. In the quantitative image quality assessment, contrast to noise ratio (CNR), LGE maximal surface and %LGE were evaluated. CNR was obtained by the signal intensity measurement of the LGE and the adjacent healthy myocardium. The largest surface of LGE was also measured for all sequences on the same cardiac view for every patient. The %LGE was measured such as the percentage of fibrotic tissue in myocardial mass.
Results: 2D-PSIR, in comparison with 2D-IR, showed significantly higher LGE largest surface values (mean 295.9; 95% CI 147.86 to 258.37 vs mean 195.45; 95% CI 147.86 to 258.37; p=0.018). Also CNR was significantly higher ($p < 0.0001$) on 2D-PSIR than 2D-IR (mean 8.66; 95% CI 7.64 to 9.81 vs mean 5.65; 95% CI 4.77 to 6.68). The percentage of LGE on 2D-PSIR (mean 6.52; 95% CI 3.71 to 11.48) did not significantly differ from the corresponding value on 2D-IR (mean 6.24; 95% CI 3.51 to 11.08; p=0.90).
Conclusion: 2D-PSIR is qualitatively and quantitatively superior to 2D-IR for myocardial fibrotic lesions assessment.

B-0046 10:38

Sphericity index (SI) of the left ventricle assessed by cardiovascular magnetic resonance imaging (CMRI) in non-ischemic dilated cardiomyopathies

A. Zidi, N. Mnif; *Tunis/TN (drzidiasma@yahoo.fr)*

Purpose: Determine the prognostic value of the SI of the left ventricle (LV) assessed by CMRI and domonstrate a relationship between SI and the occurrence of major cardiac events (MCE) in patients with nonischemic dilated cardiomyopathy (DCM).
Methods and Materials: This is a retrospective study including 31 patients with non-ischemic DCM who underwent CMRI. Delayed enhancement imaging was performed 10 minutes after gadolinium injection. We looked for correlations between the SI of the LV and the existence of late gadolinium enhancement (LGE +) and between SI and the occurrence of MCE.
Results: Our study demonstrated a correlation between the existence of LGE and SI which was significantly higher in patients with LGE+ ($p = 0.027$). The SI was significantly higher among patients with a MCE compared to patients who did not have MCE ($75.2 \pm 44.0\%$ against $63.0 \pm 43.0\%$; $p = 0.04$)
Conclusion: There are no published studies reporting the relationship between LGE and SI assessed by CMRI. Our study demonstrated a consistent relationship between a higher SI in patients with non-ischemic DMC and the existence of LGE in one hand and the occurrence of major cardiac events in the another hand.

B-0047 10:46

Diagnostic implications of feature tracking derived left and right atrial strain parameters in CMR-positive acute myocarditis

B. Baessler[1], A. Dick[1], F. Schaarschmidt[2], G. Michels[1], D. Maintz[1], A.C. Bunck[1]; [1]*Cologne/DE*, [2]*Hannover/DE (bettina.baessler@uk-koeln.de)*

Purpose: To evaluate the diagnostic value of cardiac magnetic resonance (CMR) feature tracking (FT) derived strain-analysis of the atria in patients with acute myocarditis (ACM).
Methods and Materials: CMR cine data of 42 patients with CMR-positive ACM were retrospectively analysed. 30 healthy volunteers (HV) served as a control. Analysis of longitudinal strain and strain rate (SR) of both atria was performed in two long-axis views using a dedicated FT-software. Left (LA) and right (RA) atrial performance was analysed including reservoir function (total strain [εs], peak-positive SR [SRs]), conduit function (passive strain [εe], peak-early-negative SR [SRe]) and booster-bump-function (active strain [εa], late-peak-negative SR [SRa]).
Results: ACM-patients showed a significantly reduced εeLA (25.0 ± 13.9 vs. 33.0 ± 10.3 %, p=.006) compared to HV. Conversely, conduit function SR of both atria were significantly higher in ACM-patients (SReLA: -1.41 ± 0.63 vs. -1.90 ± 0.62 s-1, p=.002; SReRA: -1.06 ± 0.54 vs. -1.39 ± 0.47 s-1, p=.006). In logistic regression, SReLA proved to be the best predictor of ACM (AUC 0.76 in ROC-analysis). In ACM-patients with preserved LV ejection fraction (EF; n=29), SReLA was significantly increased compared to HV (-1.51 ± 0.65 vs. -1.90 ± 0.62 s-1, p=.045) while all other strain parameters showed no significant differences between both groups. In logistic regression, again SReLA was the best predictor of ACM when EF is preserved (AUC in ROC-analysis: 0.73).
Conclusion: Peak early negative SR of the LA is the best predictor for the presence of ACM, even in patients with preserved EF. Our results point to a discriminative power of atrial strain analysis in the CMR-based diagnosis of ACM.

B-0048 10:54

Validation of a novel analytical approach to quantitative myocardial edema imaging in acute myocarditis using T2-mapping

B. Baessler[1], F. Schaarschmidt[2], A. Dick[1], M. Treutlein[1], B. Schnackenburg[3], C. Stehning[3], G. Michels[1], D. Maintz[1], A.C. Bunck[1]; [1]*Cologne/DE*, [2]*Hannover/DE*, [3]*Hamburg/DE (bettina.baessler@uk-koeln.de)*

Purpose: To validate the diagnostic value of T2-mapping for quantitative edema detection in patients with acute myocarditis (ACM).
Methods and Materials: CMR data of 103 patients with ACM were retrospectively analysed. 30 healthy volunteers (HV) served as a control. Patients and HV were examined on a clinical 1.5 T scanner using a Gradient-Spin-Echo T2-mapping sequence. T2-maps were segmented according to the 16-segments AHA-model. While averaging all pixels within one myocardial segment for segmental T2-calculation, their standard deviation ("pixel-SD") within segments was recorded.
Results: Means of global myocardial T2 or pixel-SD showed large overlaps between HV and ACM patients. Variation of T2-values and pixel-SD, however, was much larger in ACM patients. In random forests and multiple logistic regression analyses, the combination of the highest segmental T2-value within each patient (maxT2) and the mean absolute deviation of pixel-SD (madSD) over all 16 segments within each patient were the best discriminators between HV and ACM patients. In decision trees, a combined cut-off of 1.77 ms for madSD and of 67.8 ms for maxT2 resulted in 77% sensitivity and 80% specificity for classification between HV and ACM patients. In ROC-analyses, the combination of madSD and maxT2 showed superior diagnostic performance (AUC 0.85) when compared to LL criteria (AUC 0.81), and the combination of madSD, maxT2 and Late Gadolinium Enhancement (LGE) even resulted in an AUC of 0.95.
Conclusion: The proposed cut-off values for maxT2 and madSD in the setting of ACM allow edema detection with high sensitivity and specificity and in a quantitative manner.
Author Disclosures:
B. Schnackenburg: Employee; Philips Healthcare Germany. **C. Stehning:** Employee; Philips Research Europe.

B-0049 11:02

Prediction of the estimated 5 year risk of sudden cardiac death (SCD) by quantitative CMR sequences in patients with hypertrophic cardiomyopathy (HCM)

M. Avanesov, J. Münch, J. Weinrich, L. Well, D. Säring, C. Stehning, E. Tahir, G. Adam, G. Lund; *Hamburg/DE (m.avanesov@uke.de)*

Purpose: Quantification of myocardial fibrosis by extracellular volume (ECV) and late gadolinium enhancement (LGE). Feasibility of non-invasive CMR-based fibrosis calculation to predict the estimated SCD risk in patients with HCM.
Methods and Materials: CMR was performed in 65 patients with HCM (53 ± 16 years) and 16 healthy volunteers (51 ± 9years) using a 1.5 T scanner (Achieva,Philips) and 0.075 mmol/kg Gd-BOPTA as contrast agent. CMR evaluation of fibrosis size was performed independently by 2 observers. Mean fibrosis size in % of LV area was assessed on 3 short axes at the apex, center and basis of the left ventricle (LV).On LGE images, fibrosis was quantified as > 2SD above normal appearing myocardium. Pathologic ECV was defined as $\varepsilon 30\%$, representing > 2SD above the mean ECV of $25.8\% \pm 4.2\%$ assessed from control subjects. The estimated SCD risk score was evaluated by echocardiographic assessment. By ROC analysis optimal thresholds and areas under the curves (AUCs) were depicted for a risk score of $> 4\%$, thus advising a prophylactic ICD implantation. Using the Youden index, optimal cutoff values were depicted from the ROC curves.

Results: LGE was present in 68% of HCM patients and 88% showed increased ECV values. A significant higher correlation was found between ECV and the risk score compared to LGE (R=0.68 vs. R= 0.43,p=0.04).ROC curves revealed significant higher AUC for ECV compared to LGE (0.82 vs. 0.64, p=0.03) for prediction a risk score of > 4%.
Conclusion: ECV was superior to LGE in predicting the SCD score, indicating its potential value for non-invasive risk stratification in HCM.

B-0050 11:10

Delayed myocardial enhancement in paediatric hypertrophic cardiomyopathy: correlation with LV functional and demographic parameters

N.H. Behairy, W. EL Mozy, S. El Saeidi, M. Shafik; *Cairo/EG (nohabehairy@gmail.com)*

Purpose: Our aim was to correlate myocardial fibrosis in the paediatric age group with demographic and LV functional parameter.
Methods and Materials: We studied 30 paediatric HCM patients by clinical examination (NYHA classification, echocardiography and CMR. 2D echocardiography was done with measuring the pressure gradient across the LVOT. CMR was done on a 1.5 T Philips Achieva scanner in SSFP with delayed myocardial enhancement. Images were analysed functional parameters and percentage of myocardial enhancement. All demographic and functional parameters as well as pressure gradient were correlated with the percentage of myocardial enhancement. Approval was obtained from the patients guardian and the local ethical committee.
Results: We studied 11 female and 19 male patients from 45 days up to 18 yrs. Eight patients showed positive family history for HCM. The mean for percentage of myocardial enhancement was 9.7±9. Only 5 patients didn't show enhancement. We found significant correlation between the NYHA classification and the pressure gradient across the LVOT (P = < 0.001) as well as the percentage of myocardial enhancement (P = 0.004). The percentage of myocardial enhancement showed positive correlation with LV myocardial mass index (p = 0.042). It didn't correlate with any other demographic or LV functional cardiac parameters. A good positive correlation was detected between the percentage of myocardial enhancement and the severity of pressure gradient measured by echocardiography (r=0.69 and P=< 0.001).
Conclusion: We found a significant correlation between the percentage of myocardial enhancement in paediatric HCM and the pressure gradient, NYHA classification and LV myocardial mass.

B-0051 11:18

Quantitative T1 mapping for detecting fibrosis and myocardial interstitial expansion in hypertrophic cardiomyopathy

D. An, L. Wu, B. Chen, R. Ouyang, J. Xu; *Shanghai/CN (littlewhite118@163.com)*

Purpose: This study is to explore diagnostic performance of quantitative T1 mapping at 3.0 T in the assessment of fibrosis and accompanying myocardial interstitial expansion in hypertrophic cardiomyopathy.
Methods and Materials: Cardiac MRIs were used in 10 healthy volunteers and 29 HCM patients, and CMR including T1 mapping with a modified Look-Locker Inversion Recovery (MOLLI) pulse sequence and LGE (late gadolinium enhancement) with a 2D Phase-Sensitive Inversion-Recovery sequence. Patients were classified into 2 groups,12 with LGE (-),17with LGE (+). Then native T1 mapping, post contrast T1 mapping and ECV were determined in 16 segments per subject according to the 17-segment model of AHA. Statistical analysis were performed with student's t test and ROC analysis sequence.
Results: The native T1 value for normal myocardium and hypertrophic myocardium were 1258.37±58.6 ms and 1326.22±66.3, respectively (P < 0.01), and the ECV were 0.26±0.06 and 0.29±0.07 (P < 0.01). Besides native T1 value and ECV were lower in LGE negative HCM patients than in LGE positive HCM patients, with T1 values of 1302.55±60.12 and 1355.81±62.02 (p < 0.01), ECV 0.27±0.05 and 0.32±0.04 (p < 0.01), respectively. Adopting a threshold value of 1310.5 ms. T1 mapping resulted in 81.3 % sensitivity, 78.6 % specificity in the identification of normal myocardium and hypertrophic myocardium in HCM.
Conclusion: Quantitative T1 mapping sequence is a useful technique for diagnosis and quantification of fibrosis and myocardial intersititial expansion in hypertrophic cardiomyopathy. And hypertrophic cardiomyopathy with fibrosis can be reliable distinguished from normal myocardium using a threshold of native T1 value.

B-0052 11:26

Native myocardial T1-times are not necessarily increased with myocardial collagen: a preclinical study in hypertensive hypertrophic heart disease

U. Reiter[1], G. Reiter[1], G. Adelsmayr[1], M. Manninger[1], J. Schipke[2], A. Greiser[3], C. Mühlfeld[2], H. Post[4], M.H. Fuchsjäger[1]; [1]*Graz/AT*, [2]*Hannover/DE*, [3]*Erlangen/DE*, [4]*Berlin/DE (ursula.reiter@medunigraz.at)*

Purpose: To investigate, whether native left ventricular (LV) T1-times are increased with myocardial collagen in a large-animal model of hypertensive hypertrophic heart disease (HHD).
Methods and Materials: Five anaesthetised deoxycorticosterone-acetate (DOCA) salt-induced hypertensive, hypertrophic pigs and three healthy animals underwent ECG-gated 3 T magnetic resonance imaging, including assessment of LV mass and native myocardial T1-times [MOLLI protocol 5 (5)5 (5)5]. After in vivo measurements, animals were sacrificed and transmural biopsies were collected for stereological analysis. T1-maps were evaluated by manual segmentation according to the AHA 17-segment model. LV T1-times were calculated as averages from segmental values. Stereological evaluation included myocardial volume fractions of interstitium (V_int/LV) and collagen (V_coll/LV), as well as collagen volume related to the interstitium (V_coll/int). Parameter means of DOCA and control animals where compared by t test; relationships between parameters were analysed with correlation analysis.
Results: LV mass was higher in DOCA pigs (DOCA, 134±21 g; controls, 88±2 g; p < 0.001). LV T1-times did not differ between groups (DOCA, 1161±21 ms; controls, 1195±36 ms; p=0.094). Vcoll/int showed higher levels in DOCA (DOCA, 17±4%; controls, 8±3%; p=0.032). Related to LV mass, V_int/LV (DOCA, 17±5%; controls, 21±2%; p=0.202) and V_coll/LV (DOCA, 2.7±0.8%; controls, 1.7±0.5%; p=0.109) were not significantly different. Whereas myocardial T1-times did not correlate significantly with V_int/LV and V_coll/int, the negative correlation with V_coll/LV was significant (r=-0.71, p=0.047).
Conclusion: Although interstitial collagen content is elevated in the large-animal model of HHD, LV T1-times are decreased. The effect of cardiomyocyte hypertrophy (decreased interstitial space) dominates native T1-times in a voxel rather than increased myocardial collagen content.
Author Disclosures:
A. Greiser: Employee; Siemens Healthcare GmbH.

B-0053 11:34

Increased epicardial fat and signs of impaired sistolic left ventricular function in NAFLD patients: MRI evaluation and correlation with abdominal and liver fat

C. Berzovini, R. Faletti, G. Battisti, E. Vanni, C. Gallesio, E. Mosso, E. Bugianesi, M. Rizzetto, G. Gandini; *Turin/IT (claudioberzovini@yahoo.it)*

Purpose: Non Alcoholic Fatty Liver Disease (NAFLD) is associated with cardiovascular disease. Using MRI and transtoracic echocardiography (TTE), we investigated if NAFLD patients have increased epicardial fat, signs of left ventricular (LV) disfunction and their correlation with visceral and liver fat.
Methods and Materials: 19 biopsy proven-NAFLD patients without diabetes, dislipemy or hypertension (17 men, age 41±8 years, BMI 26.8±3 kg/m2) and 9 healthy controls (5 men, age 30±2 years, BMI 22.5±2 kg/m2) underwent TTE and MRI. Epicardial and visceral fat volume, liver fat fraction, end systolic LV volume (ESV) and ejection fraction (EF) were measured on MRI data; epicardial fat thickness and end-systolic LV diameter (ESD) were measured at echocardiography.
Results: Epicardial fat in NAFLD patients was higher than in controls at MRI (volume 228.1±112.8 vs 66.8±25.2 cm3, p = 0.001) and TTE (thickness 5.93±2.25 vs 0.26±0.5 mm). End-systolic LV diameter at TTE was higher in NAFLD patients (30.4±3.7 vs 27.2±3.5 mm, p = 0.044), whilst MRI didn't show a significant ESV increase. Only in NAFLD patients epicardial fat positively correlated with ESV and ESD (r = 0.46, p = 0.046) and inversely with EF. Epicardial fat tightly relates with visceral fat (r = 0.58, p = 0.03), but not with liver fat. Visceral fat inversely correlates with EF, whereas hepatic fat directly correlates with ESV (r = 0.63, p = 0.004).
Conclusion: MRI (and TTE) showed increased epicardial fat in non diabetic, non-dyslipidemic, normotensive NAFLD patients, and a relation between epicardial, visceral and hepatic fat and parameters of early systolic dysfunction

B-0054 11:42

Compared analysis of two different software for iron overload quantification in cardiac MRI

R. Malago, G. Sala, M. Tezza, C. Barbiani, G. Finetto, G. Tabacco, S. Catelan, R. Pozzi Mucelli; *Verona/IT (malagoroberto@gmail.com)*

Purpose: To compare the accuracy of two different software for iron overload measurement in cardiac-MRI.
Methods and Materials: The study population consists of 67 patients (33 [[male symbol]], 34[[female symbol]], mean age 36.6 YO) who performed 91 MR examinations selected for Cardiac MRI iron overload quantification who underwent Cardiac-MRI between 10/2013 and 07/2015 with high-field Magnetic Resonance (1.5 T) Philips Ingenia (Best, The Netherlands). Iron overload Multi-echo T2* sequence was used for each patient. Two operators in blind recorded the results of T2* values using both the software (Segment, Medviso ©) and C-Iron (Camelot © Biomedical Systems). A difference of 10 ms was considered acceptable. Iron overload was divided into normal, moderate or severe depending on the T2* values.
Results: The scans performed were 91. 17/91 scans were non evaluable with C-Iron because of technical failure of the software. The final examinations evaluated with these two software were 74 scans. Using Segment Software 63/74 resulted in no overload, 7/74 in moderate overload, 4/74 registered severe overload. Using C-Iron Software 65/74 resulted in no overload, 4/74 in moderate overload, 5/74 registered severe overload. No statistical difference was recorded in the results obtained with the two operators. Quantification of overload was equivalent in 69/ 74 scans, with a mean difference between the two software of 3.51 ms (range 0.15 to 10 ms).
Conclusion: We recorded a good match between the two different software in case of severe overload or in case of no overload, while C-Iron seems to be less reliable in borderline cases.

B-0055 11:50

Radiation-induced myocardial injury after mediastinal radiotherapy for esophageal cancer

N. Kadoya, H. Ota, R. Umezawa, Y. Nakajima, M. Saito, K. Takase, K. Jingu; *Sendai/JP (kadoya.n@rad.med.tohoku.ac.jp)*

Purpose: To evaluate radiation-induced myocardial injury after mediastinal radiotherapy for esophageal cancer using late gadolinium-enhanced (LGE) MR imaging.
Methods and Materials: This IRB-approved prospective study included 17 patients with primary esophageal cancer. All the patient received chemoradiotherapy with a median total dose of 60Gy (50.4-66 Gy). They underwent serial MR scans (pre- [n=17], 6-month post- [n=17] and 1.5-year post-treatment [n=7]). Using rigid registration, Irradiated dose distribution was overlaid on LGE MR images at the two or three time points. Myocardial signal intensities in individual MR images were normalized by the mean value in segments receiving low doses (< 5 Gy). Changes of the normalized signal intensities were compared among segments where irradiation doses were 0-10Gy,10-20Gy,20-30Gy,30-40Gy,40-50Gy and 50-60Gy.
Results: Dose-dependent signal increase on LGE MR images was observed in 65% (11/17) of patients at 6-month post-treatment and in 85% (6/7) at 1.5-year post-treatment. In the population-based dose-response curve, clear dose-dependent signal increase was observed in regions receiving more than 35Gy. The averages of relative signal increase at 6-month post-treatment were 5.2±26.1% at 30-40Gy and 48.7±47.6% at 50-60Gy, respectively, whereas those at 1.5-year post-treatment were 7.2±14.9% at 30-40Gy and 27.3±25.4% at 50-60Gy, respectively.
Conclusion: This study indicated dose-dependent myocardial injury after radiation therapy for esophageal cancer as identified by LGE MR imaging.

10:30 - 12:00 **Room L8**

Vascular

SS 215

Vasculopathy: form and function

Moderators:
M. Reiter; Vienna/AT
A. Van der Lugt; Rotterdam/NL

B-0056 10:30

^{18}F-fluorocholine PET-CT imaging of vulnerable atherosclerotic plaques: prospective study with immunohistochemical validation

S.A. Vöö[1], R. Kwee[1], J. Sluimer[1], F. Schreuder[1], R. Wierts[1], R. van Oostenbrugge[1], M.J. Daemen[2], F.M. Mottaghy[1], M. Kooi[1]; [1]*Maastricht/NL*, [2]*Amsterdam/NL (stefan.voo@mumc.nl)*

Purpose: 18 F-fluorocholine (18 F-FCH) emerges as a possible molecular tracer for positron emission tomography (PET) in assessing macrophage infiltration and detecting active inflammation. We hypothesized that 18 F-FCH PET is a valuable imaging tool for the identification of vulnerable plaques and associated intraplaque inflammation.
Methods and Materials: Ten consecutive stroke patients (90% men, median age 66.0 years, range 51.7-77.4) with ipsilateral > 70% carotid artery stenosis and who underwent carotid endarterectomy (CEA) were included. Prior to CEA, all patients underwent PET to assess maximum 18 F-FCH uptake in ipsilateral symptomatic carotid plaques and contralateral asymptomatic carotid arteries (given as maximum target-to-background ratio, TBRmax). Macrophage content was assessed in all CEA specimens as percentage of CD68+-staining per whole plaque area (CD68+) and as maximum CD68+ percentage (CD68max) in the most inflamed section/plaque.
Results: Dynamic PET imaging demonstrated that an interval of 10 minutes between 18 F-FCH injection and PET acquisition is appropriate for carotid plaque imaging. TBRmax in ipsilateral symptomatic carotid plaques correlated significantly with CD68+ (ρ=0.648, *p*=0.043) and CD68max (ρ=0.721, *p*=0.019). TBRmax was significantly higher in symptomatic carotid plaques compared to the asymptomatic carotid arteries (median of 2.0, interquartile range [IQR], 1.6-2.6 versus median of 1.2, IQR 1.1-1.5, *p*=0.047). In univariate linear regression, TBRmax was not significantly related to carotid artery stenosis grade.
Conclusion: 18 F-FCH uptake in human carotid atherosclerotic plaques correlated strongly with the degree of intraplaque inflammation and recent symptoms. Therefore, 18 F-FCH PET is a promising tool for the evaluation of vulnerable carotid plaques.
Author Disclosures:
M. Kooi: Research/Grant Support; Center of Translational Molecular Medicine (CTCM), Dutch Heart Foundation.

B-0057 10:38

Assessment of endothelial dynfunction, coronary and carotid atherosclerosis in juvenile diabetics

M.A.A.A. Salem; *Aguza - Giza/EG (masalem55@yahoo.com)*

Purpose: Atherosclerosis start developing in early life, first in the aorta and later in the carotid & coronary arteries. Juvenile diabetes increases the risk for atherosclerosis. We aim to assess the early atherosclerotic burden in diabetic adolescents.
Methods and Materials: The study included 62 type1 diabetic patients and 30 healthy volunteers of similar age and sex. Blood samples were taken for assessment of glycosylated hemoglobin, and lipid profile. Urine samples were taken for analysis of albumin/creatinine ratio. MSCT coronary calcium score, carotid intima-media thickness (cIMT) & flow mediated dilatation (FMD) via ultrasound were done. t-test or Mann Whitney-U were used (for non symmetrically distributed data). For independent variables, Pearson's or spearman correlation and stepwise multiple regression analysis were used.
Results: The mean age was 16.3 ± 1.5 yrs and mean duration of diabetes was 9.4 ± 2.9 yrs. cIMT was significantly higher, while FMD and FMD/ nitrate mediated dilatation (NMD) ratio were significantly lower in diabetics. cIMT had a significant negative correlation with FMD and FMD/ NMD. cIMT had a significant correlation with waist circumference, waist/height ratio, albumin/creatinine ratio, total cholesterol & triglyceride. Five patients had positive coronary calcium score (8.1%). CAC had significant negative correlation to FMD (p=0.002) & FMD/NMD (p=0.0001).
Conclusion: Diabetic patients had decreased FMD, increased cIMT, and increased incidence of coronary artery disease. This indicates endothelial dysfunction and early atherosclerosis. We recommend early frequent follow-up of juvenile diabetics for early detection of cardiovascular complications.

B-0058 10:46

3D black-blood T1-mVISTA for detection of temporal and ophthalmic artery involvement in patients with giant cell arteritis

N.N. Sommer[1], K.M. Treitl[1], E. Coppenrath[1], H. Kooijman[2], W.H. Sommer[1], M.F. Reiser[1], T. Saam[1]; [1]*Munich/DE*, [2]*Hamburg/DE*
(nora.sommer@med.uni-muenchen.de)

Purpose: To assess the diagnostic accuracy of a modified whole-brain 3D black-blood T1w-TSE sequence (T1-mVISTA) for the diagnosis of temporal and ophthalmic involvement in patients with giant cell arteritis (GCA).
Methods and Materials: 9 patients with clinical diagnosis of GCA (mean age 70.4; 5 male) and 19 controls (mean age 62.3; 7 male) were included. Among patients with GCA, 5 were also positive for non-atherosclerotic anterior ischaemic optic neuropathy (AION). Contrast-enhanced 0.8 mm isotropic T1-mVISTA was acquired at 3 T, additionally to the standard protocol. Temporal and short posterior ciliary arteries (SPCA) were evaluated for the presence of thickening and contrast enhancement of the vessel wall, indicating arteritis (112 arterial segments). Regional fat-suppression (3-point Likert scale), over all image quality (4-point Likert scale) and diagnostic confidence for the presence or absence of arteritis (5-point Likert scale) were also assessed.
Results: Contrast-enhanced T1-mVISTA had a high sensitivity and specificity (100% and 94.7%, respectively) for the diagnosis of temporal arteritis. Positive and negative predictive values (PPV and NPV) were 90.0% and 100%, resepectively. Sensitivity and specificity for vasculitis of the SPCA in patients with clinical confirmed AION was 83.3% and 75.0%, respectively resulting in PPV of 83.3% and NPV of 75.0%. Image quality (mean: 3.8±0.6; median: 4) and regional fat suppression were good (temporal 2.8±0.4; ophthalmic 2.5±1.2) and diagnostic confidence was high (4.8±0.5).
Conclusion: 3D black-blood T1-mVISTA allows accurate diagnosis of involvement of temporal and ophthalmic arteries in patients with GCA.
Author Disclosures:
H. Kooijman: Employee; Philips.

B-0059 10:54

Comparative study of neovascularisation in homogeneous and heterogeneous with juxtaluminal black area hypoechoic carotid plaques by SMI and CEUS

Q. Yong, L. Zhang, L. Feng, J. Yuan, S. Shi, J. Bao, T. Pu; *Beijing/CN*
(yongqianganzhen@163.com)

Purpose: To use SMI detect plaques neovascularisation in homogeneous and heterogeneous with juxtaluminal black area hypoecho, which can be confirmed by contrast-enhanced ultrasound.
Methods and Materials: 226 carotid artery plaques (180 male and 46 female) were examined. The plaque is divided into two groups: homogeneous hypoechoic (118) and JBA (108). Using SMI and CEUS detect the situation of neovascularisation. The SMI criteria: 0 grade-no obvious flow signal; 1st grade-less than two flow; 2nd grade-more than two flows. The CEUS criteria: 0 grade-no obvious contrast agent microbubble; 1st grade-less than 4 microbubbles; 2nd grade-more than 4 microbubbles.
Results: The positive rate in SMI and CEUS was no significant difference (95.6% and 98.7%). In homogeneous hypoechoic group, SMI showed 67.8% for 1st grade and 25.4% for 2nd grade, CEUS showed 17.8% and 77.1%, respectively. In JBA group, SMI explained 62.0% and 36.1%, CEUS explained 21.3% and 78.7%. In CEUS, neovascularisation between homogeneous hypoechoic and JBA group had no statistical difference (P=0.248). The grades between two groups had no significant statistical difference (P=0.72). The neovascularisation on the shoulder of proximal part of plaque was maximum, on the top is minimum.
Conclusion: The sensitivity of SMI and CEUS detection carotid plaque neovascularisation was satisfactory. However, CEUS was more sensitive which evaluated a higher neovascularisation grade. CEUS showed no significant difference and frequently occurrence area by two groups. Then the anatomic characteristic of plaques can be studied, which helps the prognosis.

B-0060 11:02

The relation between cardiovascular risk factors and aortic wall characteristics in healthy, young adults using 3D black-blood VISTA magnetic resonance vessel wall imaging

A.L.M. Eikendal[1], H.M. den Ruijter[1], C. Haaring[1], J.J.M. Westenberg[2], R.J. van der Geest[2], M.L. Bots[1], I.E. Hoefer[1], T. Leiner[1]; [1]*Utrecht/NL*, [2]*Leiden/NL (a.l.m.eikendal@umcutrecht.nl)*

Purpose: Finding proxies that reliably detect subclinical atherosclerosis early in life is important since preventive strategies started early in life may delay the development of clinically manifest atherosclerosis. Magnetic Resonance Imaging (MRI) has evolved as an attractive imaging modality for studying atherosclerosis in vivo. However, little is known about the relation of cardiovascular risk factors with atherosclerosis burden, quantified with MRI, early in adult life. This study evaluated the relation between cardiovascular risk factors and MRI derived aortic wall characteristics in healthy, young adults.
Methods and Materials: We obtained information on classical cardiovascular risk factors in 125 healthy, young adults (63 males, mean age: 31.8 years) of the Atherosclerosis-Monitoring-and-Biomarker-measurements-In-The-YOuNg (AMBITYON) study. The descending thoracic aorta was imaged with a 3.0 Tesla MRI system using an isotropic 3-dimensional, black-blood, T1-weighted, turbo-spin-echo sequence with variable flip angles (VISTA). Aortic wall characteristics were quantified using dedicated software. Multivariable linear regression analyses were used to assess the relation between cardiovascular risk factors and aortic wall characteristics.
Results: The multivariable linear regression analysis demonstrated that per standard deviation increase in age and BMI mean aortic wall area increased by 0.03 cm2 ([95% confidence interval: 0.01, 0.05], p=0.01) and 0.04 cm2 ([95% confidence interval: 0.01, 0.06], p=0.006), respectively.
Conclusion: The aortic wall area increases with increasing levels of cardiovascular risk factors. This implies that the aortic wall area is a potentially valuable marker of early atherosclerosis in asymptomatic young adults. This study may provide further insight into the key drivers of atherosclerosis in young adulthood.

B-0061 11:10

Common genetic influence on the carotid and femoral intima-media thickening: new potential in screening?

D.L. Tarnoki[1], A.D. Tarnoki[1], B. Fejer[1], L. Littvay[1], P. Maurovich Horvat[1], P. Lucatelli[2], C. Baracchini[3], G. Schillaci[4], M.A. Stazi[2]; [1]*Budapest/HU*, [2]*Rome/IT*, [3]*Padua/IT*, [4]*Terni/IT (tarnoki4@gmail.com)*

Purpose: Increased carotid and femoral intima-media thickness (IMT) are prognostic factors of future cardiovascular events. We aimed to estimate the common genetic effects of carotid and femoral IMT in a large twin sample.
Methods and Materials: 388 Hungarian and Italian twins from Rome, Padua, Perugia and Terni (121 monozygotic, 73 dizygotic pairs) underwent B-mode sonography of bilateral common carotid and femoral arteries (CCA, CFA). Philips QLAB software or electronic callipers were used to measure the IMT. Correlated factors model was applied.
Results: Correlation between CCA-IMT and CFA-IMT was 0.26 (95% confidence interval, CI 0.112 to 0.405). Age-, sex- and country-adjusted additive genetic factors for these parameters correlated well: 0.773 (95% CI, 0.153 to 1.0). Shared environmental correlation was found to be irrelevant. Unshared environmental factors did not correlate (-0.021, 95% CI, -0.239 to 0.178).
Conclusion: Strong genetic covariance was found, indicating common genetic influences on CCA and CFA IMT. Atherosclerosis screening needs to be extended to various sites of atherosclerosis due to this common genetic underpinning.

B-0062 11:18

Morphology of atherosclerotic plaques in carotid arteries determined by computed tomography and 10-year cardio-vascular risk assessment (risk SCORE) in patients with hypertension

P. Gac, P. Jazwiec, M. Poreba, G. Mazur, R. Poreba; *Wroclaw/PL*
(pawelgac@interia.pl)

Purpose: Determination of relationships between the morphology of atherosclerotic plaques in carotid arteries evaluated with the use of computed tomography angiography (CTA) and 10-year risk of fatal cardiovascular disease (SCORE) in patients with hypertension.
Methods and Materials: The study group included 61 patients with essential hypertension (mean age 69.8±9.1 years). Basing on the SCORE (determined according to age, sex, smoking habit, systolic blood pressure and total blood cholesterol concentration) the following subgroups were choses: 14 patients with low and moderate risk SCORE (group A, SCORE < 5%), 19 patients with increased SCORE risk (group B, SCORE 5-10%) and 28 patients with markedly increased risk SCORE (group C, SCORE ε10%). In all patients CTA of carotid arteries was carried out. CTA image were specially analysed regarding morphology of plaques in separate segments of carotid arteries.
Results: The number of segments with plaques was significantly lower in a group A in comparison with group C (A: 6.79±1.53, B: 7.47±1.58, C: 8.32±1.54, pA-C< 0.01). The number of segments with noncalcified and mixed plaques was significantly lower in group A than in groups B and C (noncalcified plaques- A: 2.21±1.25, B: 4.47±1.87, C: 4.86±1.63, pA-B< 0.001, pA-C< 0.001; mixed plaques- A: 2.29±0.99, B: 4.74±2.08, C: 5.57±1.75, pA-B< 0.001, pA-C< 0.001). There was no statistically significant difference in the number of calcified plaques between the analysed subgroups.
Conclusion: In patients with hypertension the presence of noncalcified and mixed plaques in a larger number of segments in carotid arteries seems to be connected with the higher 10-year risk of fatal cardiovascular disease.

B-0063 11:26

Sonographic assessment of brachial artery reactive hyperemia in patients with diabetes and polymorphism in the gene of nitric oxide endothelial synthase using time interval method

N. Nelassov, M. Morgunov, I. Hripun, V. Dombrovsky, S. Vorobiev, O. Eroshenko, T. Karkoshka; *Rostov-on-Don/RU (nelassov@rambler.ru)*

Purpose: To compare parameters of brachial artery reactive hyperemia using time interval and standard methods in patients with diabetes mellitus type 2 and polymorphism in the gene of nitric oxide endothelial synthase.
Methods and Materials: 144 males (mean age 53±6.4 years) with diabetes mellitus type 2 and with (64 subjects; group I) and without (80 subjects; group II) polymorphism in the gene of nitric oxide endothelial synthase were studied. The time of occurrence of maximal vasodilation of brachial artery after the end of occluding cuff test and its diameter maximal extension were determined using ultrasound machine Philips HD11.
Results: In patients of group.i. the mean time of occurrence of maximal flow mediated vasodilation and maximal diameter changes were 110±19s and 7±1.8%, and in patients of group II - 56±17s (p=0.0001) and 13±2.6% ($p < 0.5$), respectively.
Conclusion: Sonographic assessment of brachial artery reactive hyperemia in patients with diabetes and polymorphism in the gene of nitric oxide endothelial synthase revealed significant prolongation in time of occurrence of maximal vasodilation and decrease in standard parameter of arterial diameter variation. Differences in time interval parameters appeared to be more pronounced. Measurement of time interval between the end of cuff occlusion and occurrence of maximal vasodilation of brachial artery can be proposed as a new effective marker of endothelial dysfunction.
Author Disclosures:
M. Morgunov: Research/Grant Support; Russian scientific foundation grant # 14-25-00052. **I. Hripun:** Research/Grant Support; Russian scientific foundation grant # 14-25-00052. **S. Vorobiev:** Research/Grant Support; Russian scientific foundation grant # 14-25-00052.

B-0064 11:34

Genetic variability in the renin-angiotensin-aldosterone system and volume of carotid bodies evaluated by carotid artery computed tomography angiography in hypertensive patients

P. Jazwiec, P. Gac, M. Chaszczewska-Markowska, K. Bogunia-Kubik, G. Mazur, R. Poreba; *Wroclaw/PL (pawelgac@interia.pl)*

Purpose: The study aimed at evaluation of effects exerted by selected polymorphisms of genes of the renin-angiotensin-aldosterone system (RAAS) on volume of carotid bodies (CB) in patients with essential hypertension.
Methods and Materials: The study group included 49 patients with essential hypertension (mean age: 70.71 ± 8.59 years). In all the patients an analysis was conducted of selected SNP-type polymorphisms in angiotensinogen gene (AGT): rs4762, rs5049, rs5051 and rs699; gene of angiotensinogen convertase (ACE): rs4343; gene of angiotensin II receptor type 1 (AGTR1): rs5182 and rs5186; and gene of aldosterone synthase (CYP11B2): rs1799998. Evaluation of carotid bodies volume (VrCB+ICB) was performed using scans obtained in carotid artery computed tomography angiography, basing on the formula: VrCB+ICB = 4/3 x π x half of transverse dimension of CB in axial projection x half of longitudinal dimension of CB in the axial projection x half of craniocaudal dimension of CB in the sagittal/frontal projection.
Results: Among individuals with essential hypertension certain relationships were documented between rs5182 and rs5186 polymorphisms of AGTR1 gene and rs1799998 polymorphism of CYP11B2 gene on one hand and the mathematically appraised volume of carotid bodies. Patients carrying the C alleles within the rs5182 and rs5186 of AGTR1 gene and the rs1799998 of CYP11B2 gene seemed to be associated with higher appraised values of VrCB+ICB.
Conclusion: In patients with essential hypertension a higher volume of carotid bodies, evaluated using carotid artery computed tomography angiography, may be resulted from the presence of specific genotypes in the renin-angiotensin-aldosterone system.

B-0065 11:42

Is class III obesity increase cardiovascular risk?

M. Baykara, F.M. Yazar, N. Yurttutan, B. Kızıldağ, M.A. Sarıca; *Kahramanmaraş/TR (muratbaykara@hotmail.com)*

Purpose: To our knowledge, until now several studies have investigated the relationship between arterial stiffness and excessive body weight. In this study we aimed to compare arterial stiffness between patients with body mass index (BMI) scores ≥40 kg/m² (class III obesity) and < 40 kg/m².
Methods and Materials: Using a randomised-controlled design, we recruited 59 individuals (age from 20 to 61 years; median age 42 years; 76.3% women). Twenty-nine individuals were admitted to our institution for bariatric surgery with BMI scores ≥40 kg/m². Using a high-resolution Doppler ultrasound system, we measured the stiffness properties of the carotid and femoral arteries (compliance, distensibility, diastolic wall-stress, elastic modulus). Statistical assessment was carried out by using Student t Test on high significance level ($p < 0.05$).
Results: Comparing the patients with BMI scores higher than 40 kg/m²with those score lower than 40 kg/m², there was not significant difference between two groups in terms of age (p=0.091) and gender (p=0.426). Arterial diastolic wall-stress ($p < 0.001$) and elastic modulus ($p < 0.001$) were found higher in class III obesity group comparing to other one in both of carotid and femoral arteries. In addition an opposite trend for arterial compliance ($p < 0.001$) and distensibility ($p < 0.001$) was determined.
Conclusion: Arterial stiffness was more prominent in class III obesity group and not varied with gender and age. The mechanisms underlying the influence of BMI on the properties of arteries need further clarification.

B-0066 11:50

Ultrasonographic evaluation of CCA and FA IMT and compliance after atorvastatin treatment in premenopausal dyslipidaemic females

N. Yurttutan[1], M. Baykara[1], O. Gundogdu Secen[2], B. Kizildag[1], M.A. Sarica[1]; [1]*Kahramanmaras/TR*, [2]*Elazig/TR (muratbaykara@hotmail.com)*

Purpose: In this study we aimed to evaluate the effect of atorvastatin treatment on common carotid artery (CCA) and femoral artery (FA) intima media thickness (IMT) and arterial compliance by using ultrasonography (US) in premenopausal females with dyslipidaemia.
Methods and Materials: The current study consisted of 40 premenopausal women with a diagnosis of dyslipidemia. The participants received 80 mg/day atorvastatin for 60 days, baseline and post-treatment measurements were performed on the first day of menstruation to avoid the possible effect of the menstrual cycle. Ultrasonographic measurements were non-invasively taken using a high resolution US system. Arterial compliance was evaluated using several indicators, such as cross-sectional compliance (CSC), cross-sectional distensibility (CSD), diastolic wall stress (DWS), and elastic modulus (EM). Data obtained at baseline and in the second post-treatment month were compared via a Wilcoxon test, p values of < 0.05 were accepted as statistically significant.
Results: A significant thinning in IMT was detected in the CCA (p=0.025) and FA ($p < 0.001$) after 8 weeks' atorvastatin treatment. Measurements taken from the CCA revealed a statistically significant difference in CSC, CSD, and DWS arterial compliance indicators after 8 weeks' atorvastatin treatment ($p < 0.05$, $p < 0.001$, $p < 0.05$, respectively). Statistically significant differences were found in CSD, DWS, and EM values obtained from the FA ($p < 0.05$, $p < 0.001$, $p < 0.001$, respectively).
Conclusion: Determination of IMT and arterial compliance by high resolution US provides quantitative data for non-invasive monitoring of the atorvastatin treatment response in patients with dyslipidaemia.

10:30 - 12:00 **Room E1**

Musculoskeletal

SS 210

Trauma and inflammation

Moderators:
R. Hemke; Amsterdam/NL
I.-M. Noebauer-Huhmann; Vienna/AT

K-03 10:30

Keynote lecture

B. Vande Berg; *Brussels/BE*

B-0067 10:39

Identification of specific CT features for the diagnosis of CPPD arthropathy of the wrist

K. Ziegeler, T. Diekhoff, S. Hermann, A. Böttner, B. Hamm, K.-G. Hermann; *Berlin/DE (katharina.ziegeler@charite.de)*

Purpose: The aim of this study was to investigate the morphologic pattern of calciumpyrophosphate deposition disease (CPPD) manifestations of the wrist as detected by low-dose CT-scans.
Methods and Materials: In this retrospective study 46 patients with arthritis of the wrist were included. All patients underwent a low dose CT scan of both wrists on a 320-rows detector with 80 kV and 90 to 170 mA in volume mode. Multiplanar reconstructions (0.5 mm, bone kernel) were used for image evaluation. Based on literature research a structured scoring system was established containing osteoarthritis, drooping osteophytes, scaphoid subluxation, scapho-lunate dissociation, cartilage and ligamentous calcifications, cysts and erosions. Two blinded readers independently

evaluated these findings in 33 specified locations. An expert rheumatologist classified the patients as CPPD positive or negative based on blinded clinical data. Fishers exact test was applied to identify differences between both groups. Receiver operating characteristics (ROC) analyses with calculations of area under the curve (AUC) were carried out for both previously established and newly identified imaging findings for each reader individually.
Results: Twenty-seven patients were classified as CPPD, 19 patients as other diagnoses. Ligamentous calcifications were significantly more prevalent in the CPPD group ($p < 0.05$). All non-ligamentous findings revealed no difference in frequency. Especially AUC analysis for established findings (0.675; 0.619 - reader 1; 2) vs. ligamentous calcifications (0.801; 0.767) showed a markedly higher diagnostic accuracy for the latter.
Conclusion: Calcifications of carpal ligaments are the most specific morphologic feature of CPPD arthropathy. CT is a useful tool to detect these calcifications.

B-0068 10:47

Evaluation of inflammatory activity in psoriatic arthritis of the hand with integrated 18 F-PET/MRI

N. Guberina, A. Körber, M. Forsting, A. Bockisch, A. Sabet, T. Pöppel;
Essen/DE

Purpose: Psoriasis arthritis is a common comorbidity of Psoriasis vulgaris and affects approximately 25% of all patients with psoriasis. Early and complete detection of Psoriasis arthritis is essential to prohibit joint destruction and help to choose the right medication. Here we compare MRI and 18 F-PET for assessment of active inflammation in psoriatic arthritis.
Methods and Materials: We enrolled 21patients with a history of psoriasis vulgaris and active pain of joints of the hands. We examined the participants' hands according to a dual time point protocol with the Magnetom Biograph mMR PET/MRI-scanner (SiemensHealthcare, Germany) 5 and 90 min after injection of 150 MBq 18 F. Inflammation was individually assessed for each joint: 1) based on a MRI score which was calculated as the sum of ten different variables, divided by the number of affected joints: synovitis, tendonitis, bone oedema, bone erosions, soft tissue oedema, joint-space-narrowing, joint-subluxation, interphalangeal ankylosis, dactylitis and effusion; 2) based on 18 F uptake in terms of SUVmax, which was assessed for all joints in the PET images.
Results: Althogether 134joints showed signs of inflammation in MRI. The joint most often affected was the distal interphalangeal joint (47%), followed by the carpometacarpal (28%) and proximal interphalangeal joint (17%). The mean MRI-score was 7.3 (SD4.2), and the mean SUVmax in 18 F-PET was 4.9 (SD3.0). Pearson's coefficient demonstrated significant correlation between mean values of MRI-score and SUVmax ($p < 0.05$;$r=0.525$).
Conclusion: Our results show the diagnostic potential of simultaneous 18 F-PET/MRI for the assessment of disease severity in patients with psoriasis arthritis, revealing a significant correlation between joint inflammation and bone metabolism.

B-0069 10:55

Diagnostic value of MRI changes within the sacroiliac joint space in spondyloarthritis

F. Laloo[1], N. Herregods[1], G. Varkas[1], J. Jaremko[2], X. Baraliakos[3], D. Elewaut[1], F. Van den Bosch[1], K. Verstraete[1], L. Jans[1]; [1]*Ghent/BE*, [2]*Edmonton, AB/CA*, [3]*Herne/DE (lennart.jans@ugent.be)*

Purpose: To evaluate the diagnostic value of MRI changes within the sacroiliac (SI) joint space in spondyloarthritis (SpA).
Methods and Materials: A retrospective study of MRIs of SI joints was performed in 363 patients, aged 16-45 years, with clinically suspected sacroiliitis. MR signal within the SI joint space was recorded as: (1) normal signal intensity, (2) high signal intensity on T1-weighted images, indicating new bone formation, (3) vacuum phenomenon (VP), indicating collection of gas, (4) fluid signal, or (5) ankylosis. These MRI findings were correlated with the final diagnosis, according to the ASAS classification criteria. Sensitivity, specificity, positive and negative likelihood ratios of these MRI findings were calculated for the diagnosis of SpA.
Results: MRI findings, within the SI joint space, of high signal intensity on T1-weighted images, fluid signal, and ankylosis had a moderate to low sensitivity of 38.4%, 19.2%, and 17.9%, respectively, and a high specificity of 95.8%, 95.3%, and 99.5%, respectively, for the diagnosis of SpA. The presence of VP within the SI joint space had the lowest sensitivity (13.2%) and specificity (79.2%) for the diagnosis of SpA.
Conclusion: The MR signal within the SI joint space is often overlooked, but may help to diagnose SpA. MRI findings, within the joint space, of high signal intensity on T1-weighted images, fluid signal, and ankylosis are highly specific for the diagnosis of SpA. The presence of VP within the joint space makes the diagnosis of SpA less likely.

B-0070 11:03

Does a multiplanar precontrast approach improve our diagnostic confidence for bone marrow edema detection and localisation in the sacroiliac joint of patients with spondyloarthritis?

C. Giraudo, M. Weber, A. Puchner, J. Grisar, F. Kainberger,
C. Schueller-Weidekamm; *Vienna/AT (chiara.giraudo@meduniwien.ac.at)*

Purpose: To assess the difference of diagnostic confidence (DC), in detecting (dDC) and localising (lDC) areas of bone marrow edema (aBME) in the sacroiliac joint (SIJ), between a multiplanar-without-contrast (MWC) and a multiplanar-postcontrast method (MPC) in patients with Spondyloarthritis (SpA).
Methods and Materials: Paracoronal STIR (pcSTIR), MWC (pcSTIR and para-axial fat-satured Proton Density), MPC (postcontrast para-axial and para-coronal fat-sat T1w) were used to analyse aBME in the SIJ of 74 patients with SpA's clinical findings. For each SIJ 12 areas were investigated. A 4 points scale was applied to assess BME dDC (1=certainly no BME; 2=probably no BME; 3=probably BME; 4=certainly BME) and lDC (1=unable to localise; 2=probably unable to localise; 3=probably able to localise; 4=able to localise with confidence). lDC and confident rating percentages (dDC) of each method were compared by Friedman (lDC) and Cochran Q (dDC) Tests (post hoc Bonferroni corrected Wilcoxon (lDC), McNemar (dDC)).
Results: On pcSTIR, 130 aBME were surely positive, 46 were equivocal; MWC increased the dDC in 32 areas, the remaining 14 were confidently rated by MPC. 20 areas with equivocal lDC on pcSTIR were surely localised with MWC and MPC. A statistically significant difference occurred between pcSTIR and MWC and between pcSTIR and MPC for dDC ($p <.001$) and lDC ($p <.001$). No statistically significant difference emerged between MWC and MPC for dDC ($p=.405$) and lDC ($p=1.00$).
Conclusion: MWC increased BME's dDC and lDC without significant difference from MPC; the proposed precontrast-multiplanar method may further reduce contrast medium application in SpA patients for BME assessment.

B-0071 11:11

Sacroiliac radiographic progression after a 2 years follow-up period in recent onset spondyloarthritis: data from the DESIR cohort

M. Dougados, C. Demattei, R. van den Berg, F. Thevenin, M. Reijnierse,
D. Loeuille, A. Feydy, P. Claudepierre, D. van der Heijde; *Paris/FR (antoine.feydy@cch.aphp.fr)*

Purpose: The natural of history axial spondyloarthritis (axSpA) is not well known. Our objectives were to evaluate 1) the rate of radiographic SIJ structural progression in two years 2) the predisposing factors of such progression.
Methods and Materials: Patients with inflammatory back pain of less than 3 years duration suggestive of axial SpA (DESIR cohort). Outcome measures: Radiographic SIJ score according to mNew-York criteria. The main analysis consisted in the evaluation of the switch from non radiographic to radiographic axSpA.
Results: Of the 708 enrolled patients, 449 were analysed. The % of switch from non radiographic to radiographic axSpA was low (16/326: 4.9%) and similar to the switch from radiographic to non radiographic axSpA: 7/123 (5.7%). The changes in the total SIJ score was small 0.1 ± 0.8 but highly statistically significant ($p < 0.001$). The baseline predisposing factors were current smokers, HLAB27 positivity and MRI-SIJ positivity with the following respective odds-ratio: 3.3 [1.0 - 11.5], 12.6 [2.3 - 274] and 498 [9.3 - 904].
Conclusion: Our study suggest that in early SpA : a) The structural progression in 2 years is observed in a small number of patients b) The relative high rate of improvement makes the assessment of the true progression rate difficult c) The total SIJ score and/or the progression defined by a change of at least one grade in at least one SIJ are the more sensitive measures d) Both environmental (smoking status), genetic (HLAB27 positivity) and inflammatory (MRI-SIJ) markers are independent predisposing factors of such progression.

B-0072 11:19

Value of Dixon based MRI for the evaluation of inflammatory activity on sacroiliac joint - comparative with variety of fat suppression and water-fat separation methods

B. Alvarez de Sierra Garcia[1], J. Calatayud[2], D. Exposito[2]; [1]*Madrid/ES*, [2]*Mostoles/ES (beitas83@hotmail.com)*

Purpose: In this study, the potential contribution of Dixon-based MR imaging with a rapid, low-resolution breath-hold sequence, which is a technique used for MR-based attenuation correction (AC), was evaluated for detection inflammatory activity on sacroiliac joint compared to variety of fat suppression and water-fat separation methods 1) chemically selective fat suppression pulses "FAT-SAT"; 2) short inversion time (TI) inversion recovery (STIR) imaging; 4) chemical shift based water-fat separation methods.
Methods and Materials: 101 patients with low back pain underwent clinical and MRI evaluation for axial spondyloarthritis or early ankylosing spondylitis.

Patients were evaluated for ASAS criteria. Dixon 3-D volumetric interpolated breath-hold examination, STIR, T1-weighted and fat- satured T2 weighted images were obtained. Diagnosis of sacroilitis was established when there is a presence of active lesion at the sacroiliac joint. Bone edema or osteitis are suggestive of spondyloarthritis as long as they affected the subcondral bone. Diagnostic accuracy of DIXON was assessed and compare with fat suppression and water-fat separation methods.
Results: DIXON showed high sensitivity (89.3%), specificity (90%), positive (93.1%) and negative predictive value (91.2%) for detection of active lesion at the sacroiliac joint, bone edema and osteitis. DIXON showed sensitivity for detecting bone edema in early sacroilitis similar to that of STIR image 89.3% DIXON vs 90.5% STIR.
Conclusion: DIXON is a sensitive, fast sequence and does not require a contrast agent, which it a good and cost-effective alternative for imaging sacroiliac joints. Both DIXON and STIR images show satisfactory performance for diagnosis of sacroilitis.

B-0073 11:27

Medial collateral ligament avulsion fracture of the knee: classification and imaging features

H.-S. Koo, W. Jin, S. Park, J. Kim, J. Park, K. Ryu; *Seoul/KR (heydole@naver.com)*

Purpose: To classify the patterns of avulsion fracture of medial collateral ligament (MCL) at the knee on MRI or CT and to evaluate incidence, imaging features, and associated injuries of each types.
Methods and Materials: Twenty two patients with MCL avulsion fracture were retrospectively reviewed (12 MR, 8 MR and CT, and 2 CT). The patterns of MCL avulsion fractures were classified according to involved MCL layer, as follows; superficial layer in type I, deep layer in type II, and both layers in type III. Incidence of each type, extent of torn layers of MCL, and size/location of fracture fragment were evaluated. In 20 cases with MRI, other associated traumatic lesions were evaluated.
Results: MCL avulsion fractures classified as type I in 3 cases (13.6%), type II in 11 cases (50%), and type III of 8 cases (36.4%). For the extent of torn layers of MCL, 6 cases of type II revealed tear of deep MCL layer only with intact superficial MCL layer and the others had tear of all MCL layer. Compared with type I and III, the avulsed fragments in type II were much smaller and located at lower portion of MFC on coronal scan and mainly at posterior portion of MFC on axial scan. Associated injuries showed no significant difference among three types.
Conclusion: Avulsed fragments of type II were much smaller in size and located lower and posterior aspect of MFC, which may be enable to distinguish a type of MCL avulsion even on plain radiographs.

B-0074 11:35

Comparison of ssEPI-DWI derived ADC maps with standard FS PD-TSE sequences for detection of traumatic bone marrow lesions (BML) after knee trauma

A. Klengel[1], S. Klengel[2], I. Boettger[2], N. Roenisch[2], T. Kahn[1], P. Stumpp[1]; [1]*Leipzig/DE*, [2]*Riesa/DE*

Purpose: To compare single-shot echo-planar diffusion weighted imaging (ssEPI-DWI)-derived ADC maps with fat-saturated proton-density weighted turbo-spin-echo (FS-PD) imaging in detection of bone marrow lesions (BML) after knee trauma.
Methods and Materials: In this IRB-approved study 97 consecutive MRIs (performed < 90 days after trauma) of patients with knee injury were retrospectively re-examined by three radiologists independently. Following sequences were used: 1) sagittal T1w-TSE and FS-PD-TSE; 2) sagittal T1w-TSE and ssEPI-DWI derived ADC maps. The BML localisation was documented in five subregions and BML-volume was measured.
Results: In FS-PD-TSE 88% and in ADC maps 98% of patients showed at least one bone bruise lesion (178 and 295 affected regions, respectively). Of the affected regions detected in FS-PD-TSE 97.2% were consistently identified in ADC maps. Of the affected regions detected in ADC only 58.7% were identified in FS-PD. Of the major BMLs measured concordantly, median lesion volume was 40.1 cm^3 in FS-PD and 85.7 cm^3 in ADC maps. 45% of the additional lesions found in ADC maps were located in the patella.
Conclusion: Traumatic BML are significantly more prevalent and appear significantly larger on ADC maps than on corresponding FS-PD TSE images. Although the origin of the additionally identified lesions remains subject to further investigation, the high sensitivity of ADC maps in detection of FS-PD-verified BML in combination with their larger extent is indicative of a trauma-associated nature of these additionally detected lesions. With ongoing technical improvement, the use of diffusion weighted sequences might further improve detection of trauma related bone injuries.

B-0075 11:43

A systematic review of studies assessing the anatomic centres of the femoral and tibial footprints of the anterior cruciate ligament

A.P. Parkar[1], M.E.A.P. Adriaensen[2], S. Vindfeld[1], E. Solheim[1]; [1]*Bergen/NO*, [2]*Heerlen/NL (apparkar@gmail.com)*

Purpose: A ruptured anterior cruciate ligament (ACL) is regularly reconstructed. "Anatomic" placement of tunnels is considered important for an optimal clinical outcome. Varying post-operative imaging and measurement methods are used for placement assessment. However, a consensus on the exact location of the centres of the femoral and tibial footprints is lacking. Purpose of this study was to systematically review the literature regarding anatomic location of the femoral and tibial ACL footprint.
Methods and Materials: A systematic literature search was performed in Pubmed/Medline database in August 2015. Search terms were: ACL, anatomic footprint, cadaver, tibial and femoral insertion, tunnel placement and quadrant method. English language papers which reported anatomic location of the ACL footprints according to the the Bernard&Hertel-grid in the femur and Stäubli&Rauschning tibial-ratio were included.
Results: The search initially yielded 1367 papers. 203 abstracts were selected based on the titles. 49 full texts were included after reading abstracts. Finally, 14 cadaver (femur and tibia) and 2 normal population (tibia only) papers were included. Weighted averages were calculated for the femoral ACL footprint in 218 included knees, and for the tibial ACL footprint in 300 included knees.Weighted average of the centre of the femoral footprint was 28.6% (range:23.9-37.3) in the deep-shallow direction and 34.5% (range:26.6-44.3) in the high low direction. Weighted average of the centre of the tibial footprint was 42.5% (range:35.7-46.5) anterio-posteriorly.
Conclusion: Knowledge of the anatomic ACL footprint locations may be helpful for radiologists reporting post-operative images and be used to improve surgical tunnel placements in ACL reconstruction.

B-0076 11:51

Visualisation of the popliteomeniscal fascicles in the posterolateral corner of the knee with 3D-MRI: a feasibility study

A.L. Falkowski[1], R.W. Huegli[2], J.A. Jacobson[3], M.T. Hirschmann[2], O. Magerkurth[4]; [1]*Basle/CH*, [2]*Bruderholz/CH*, [3]*Ann Arbor, MI/US*, [4]*Baden/CH*

Purpose: Better understanding of the clinical significance of injuries to the posterolateral corner of the knee has led to an increasing focus on clinical evaluation and treatment of this region. The popliteomeniscal fascicles function as stabilizers of the lateral meniscus. In the literature there is usually described an anteroinferior fascicle and a posterosuperior fascicle. More recently in a cadeveric MR-arthrography study a third, the posteroinferior fascicle was described. To identify all three popliteomeniscal fascicles on 3D T1 weighted images of the meniscus.
Methods and Materials: Patients with normal MR Imaging of the knee were included. Radial reformats of routinely performed 3D T1 weighted sequence were evaluated retrospectively by two blinded readers. The following measurements and observations were obtained: visibility/non-visibility of the anteroinferior, posterosuperior and posteroinferior fascicle; the region where the fascicles are visualized in degrees compared to the tangential to posterior surface of the menisci. Intra-/Inter-reader agreement were tested.
Results: 37 patients with 40 MR examinations of the knee were included in the study. 115 of 120 fascicles could be identified. The fascicles were visible anteroinferiorly from 44°-40° (range:70°/-1.8°), posterosuperiorly from 63°-55° (range 93°/-89.7°), and posteroinferiorly from 56°-36° (range 89.6/-88.9°). Intra- and inter-reader agreement showed moderate to substantial agreement.
Conclusion: In this study all three popliteomeniscal fascicles were visible in almost all subjects. Hence 3D imaging seems to be useful to diagnose pathologies of the meniscopopliteal attachement.

10:30 - 12:00 **Room E2**

Neuro

SS 211a

Paediatric and epilepsy

Moderators:
N. Bargalló; Barcelona/ES
I. Koerte; Munich/DE

B-0077 10:30

Connectivity-based parcellation of the developing foetal thalamus: topological changes during gestation

A. Jakab, G. Kasprian, G.M. Gruber, D. Prayer, G. Langs; *Vienna/AT (andras.jakab@meduniwien.ac.at)*

Purpose: Our aim was to describe the changes of connectional topology of the human thalamus during foetal development by utilising in utero diffusion MRI and connectivity-based parcellation.
Methods and Materials: Sixty-seven foetuses showing normal brain development were enrolled in this cross-sectional study (gestational week: 26.7 ± 4.4, range: 19-36), and in utero diffusion MRI with fifteen diffusion encoding directions was performed on a 1.5-T scanner. We used probabilistic tractography to reconstruct the fibres emerging from the thalamus. Cluster analysis by the k-means algorithm was performed to parcellate the thalamus into subdomains that featured the most distinct connectivity profiles. We controlled our results using an identical analysis on a specimen that underwent high-resolution post-mortem foetal diffusion imaging.
Results: We revealed three clusters that were aligned along the fronto-occipital axis, partially matching the known cytoarchitectural subdivisions and connectivity gradients within the lateral thalamic nuclei. The anterior cluster, representing connections to the putative fronto-parietal subplate, significantly increased in relative volume during gestation (correlation with age: R=0.26). The middle cluster overlapped with the ventrolateral thalamic nuclei, its connections were predominantly terminating in the pre-and post-central gyri, and the relative cluster volume gradually decreased with gestational age (R=-0.31).
Conclusion: In utero tractography identifies distinct anatomical subunits within the thalamus during gestation, based on the changing profile of short-range connectivity. We revealed that the topology undergoes reorganisation between the 19th and 36th week of gestation, the relative volume of somatomotor and sensory connections gradually decreasing at the expense of more frontal connectivity.

B-0078 10:38

Accuracy in antenatal ultrasound in diagnosis of posterior fossa lesions with postnatal MRI correlation

S. Bhatnagar[1], D. Shah[2]; [1]*Delhi/IN*, [2]*Mumbai/IN (digishdr@gmail.com)*

Purpose: To evaluate the accuracy of antenatal imaging in differentiating posterior fossa lesions and to follow-up with postnatal outcome of the affected infants.
Methods and Materials: This was a retrospective study.The study of fetuses with posterior fossa lesions was carried out in a tertiary hospital between 2010 to 2015. All the fetuses underwent antenatal ultrasound which was further followed up with fetal magnetic resonance imaging (MRI). Postnatal MRI was also done to confirm the prenatal diagnosis.
Results: 50 fetus were examined during the study period. Sonographic diagnoses -megacisterna magna, n = 25; Dandy-Walker malformation, n = 10;arachnoid cyst, n = 5;Blake's pouch cyst, n = 5; vermian hypoplasia, n = 3; cerebellar hypoplasia, n = 2. The findings were accurate in 80% of the 40 cases in which confirmation was possible. MRI proved more informative in 3 cases. Blake's pouch cysts and megacisterna magna underwent spontaneous resolution in utero in 20 % of cases.
Conclusion: Antenatal Sonography is similar to MRI in diagnosis posterior fossa lesion.Dandy-Walker malformation and vermian hypoplasia were associated with an abnormal outcome in half of cases.Conversely, Blake's pouch cyst and megacisterna magna when isolated have an excellent prognosis, with a high probability of antenatal resolution and a normal brain development in most of the cases.

B-0079 10:46

Graph theory analysis of single-subject grey matter structure may be beneficial in the diagnostic work-up of malformations of cortical development

L.R. Kozák, G. Gyebnár, Z. Klimaj, G. Rudas, P. Barsi; *Budapest/HU (lkozak@mrkk.sote.hu)*

Purpose: Malformations of cortical development (MCDs) are important causes of drug-resistant epilepsy. Proper characterisation of their structural correlates may help in diagnostic and therapeutic decision making. Tijms et al. recently showed significant differences in MRI-derived grey matter (GM) similarity graphs in Alzheimer patients. We aimed to investigate the use of similar metrics in MCDs.
Methods and Materials: High-resolution 3D T1W volumes of 20 patients with MCDs and 31 controls acquired on a 3 T Philips Achieva scanner were analysed. MCD types included polymicrogyria (7), schizencephaly (2), subependymal heterotopia (2), and focal cortical dysplasia (14). We used our in-house scripts and the Single-Subject Grey Matter Networks, Brain Connectivity, and SPM12 toolboxes for GM graph analyses. We calculated global and a spatially transformed voxel-wise local graph metrics, assessed voxel-wise within-control stability using the leave-one-out approach and single patient vs. control group differences using Z scores.
Results: We found significant global GM graph differences in patients (higher graph density and global efficiency, lower characteristic path length and betweenness centrality, $p < 0.005$ for all comparisons). ROC analysis yielded 84% sensitivity and 90% specificity for the graph density metric. Moreover, the voxel-wise significance distributions of local graph metrics matched the spatial locations of MCDs in most cases.
Conclusion: Graph theoretical analysis of GM similarities may be valuable in the diagnostics of MCDs. Nevertheless, as the causes and effects of changes in GM graph metrics are not yet fully understood, further investigation is required to establish the clinical potential of this approach.
Author Disclosures:
L.R. Kozák: Research/Grant Support; National Brain Research Project, Hungary (KTIA_NAP_13-1-2013-0001), Bolyai Research Fellowship of The Hungarian Academy of Sciences. **G. Gyebnár:** Research/Grant Support; National Brain Research Project, Hungary (KTIA_NAP_13-1-2013-0001).

B-0080 10:54

Data-driven identification of white matter (WM) changes can help finding hard-to-identify malformations of cortical development (MCDs)

G. Gyebnar, Z. Klimaj, G. Rudas, P. Barsi, L.R. Kozak; *Budapest/HU (gyebnargyula@gmail.com)*

Purpose: MCDs are important causes of drug-resistant epilepsy. Some subtypes, e.g. focal cortical dysplasias (FCDs), pose serious challenge to identify in MRI. We aimed to develop an automated post-processing tool for the identification of such lesions based on T1 and diffusion-weighted MRI data.
Methods and Materials: 18 patients with MCDs and 31 controls were involved. MCD subtypes included polymicrogyria (7), schizencephaly (2), subependymal heterotopia (2), and FCD (12). DWI (32 directions with b=800 s/mm2, one b=0 image) and high-resolution 3D T1W images were acquired on a 3-T Philips Achieva scanner. We used ExploreDTI for data processing and calculation of tensor-based diffusion metrics (fractional anisotropy, mean, axial and radial diffusivity), and SPM12 for anatomical segmentation and spatial normalisation. Patients were compared to controls by calculating the multi-dimensional voxel-wise Mahalanobis-distance using diffusion metrics and tissue probability as variables in WM. Significance of distances was assessed using Chi-squared-based statistics. MCD ROIs were marked by an automated toolbox (MAP07) and reviewed and corrected by experienced radiologists for validation purposes.
Results: We found significant ($p < 0.001$) alterations of white matter microstructure adjacent to the lesions in 15 of 18 cases, with 10 of 18 patients showing changes in contralateral white matter, as well.
Conclusion: Our new data-driven approach can serve as an aid in the identification of minute structural changes in MCDs; however, further research is needed to improve the specificity of the method.

B-0081 11:02

Quantitative approach to the posterior cranial fossa and cranio-cervical junction in asymptomatic children with achondroplasia

M. Panfili, R. Calandrelli, G. D'Apolito, G. Di Lella, C. Colosimo; *Rome/IT (panfilimarco@gmail.com)*

Purpose: We proposed a MRI-based quantitative morpho-volumetric approach to the posterior cranial fossa (PCF) and cranio-cervical junction (CCJ) to understand PCF changes responsible of ventriculomegaly and life-threatening medullary compression in achondroplastic patients.
Methods and Materials: We analysed brain MRI of 13 achondroplastic children (mean age 39 months) and no surgical treatment. 3DFSPGR-

T1weighted images were used for: 1)evaluation of PCF synchondroses; 2)volumetric analysis of PCF (PCF volume=PCFV, PCF brain volume=PCFBV, PCFV/PCFBV ratio, cerebellar hemispheres volume=CeV, cerebellar vermis volume=VeV, brainstem volume, cerebrospinal fluid spaces volume, IV ventricle volume; 3)morphometric analysis of PCF (clivus, supraocciput, exocciput lengths, tentorial angle) and CCJ (A-P and L-L diameters of foramen magnum); 4)measurements of foramen magnum and jugular foramina areas; 5) volumetric analysis of supratentorial ventricles. These patients were compared with age-matched control group.
Results: All patients showed synostosis of spheno-occipital synchondroses, six patients showed synostosis of anterior and posterior intra-occipital synchondroses, cervical myelopathy. Compared to control group, clivus and exocciput lengths, A-P and L-L diameters of foramen magnum, foramen magnum area and jugular foramina area were significantly reduced; supraocciput length, tentorial angle, PCFV, PCFBV, CeV, VeV, brainstem volume and supratentorial ventricular system volume were significantly increased ($p < 0.05$); PCFV/PCFBV ratio, subarachnoid spaces volume of PCF and IV ventricle volume were not significant ($p > 0.05$).
Conclusion: Quantitative approach to PCF and CCJ shows a complex relationship among maldevelopment of PCF, foramen magnum stenosis, development of ventriculomegaly and medullary compression. These modifications should be evaluated together to the status of synchondroses in order to plan the prophylactic cervicomedullary decompression.

B-0082 11:10

Structural brain alterations of Down syndrome in early childhood evaluation by DTI and volumetric analyses

H. Günbey[1], M. Ceyhan Bilgici[1], K. Aslan[1], A. Has[2], M. Ogur[1], A. Alhan[2], L. Incesu[1]; [1]*Samsun/TR*, [2]*Ankara/TR (hpgunbey@hotmail.com)*

Purpose: Down syndrome (DS) is the most common chromosome abnormality in humans. There are few brain imaging studies of DS in children. In this study, we aimed to analyse the grey and white matter integrity of children with DS using diffusion tensor imaging (DTI) and volumetric analyses.
Methods and Materials: The study consisted of 10 children with DS (age 2.6±0.69) and 8 healthy controls (2.5±0.707). DTI images evaluated with a whole brain voxel-wise analysis using tract-based spatial statistics (TBSS) and subsequently with a complementary atlas-based, region-of-interest (ROI) analysis. MRI-based quantification of cortical thickness was performed using FreeSurfer software package.
Results: TBSS analysis revealed significant FA decrement on right cerebral peduncle (cp), right uncinate (unc) fasciculus (fas), right anterior limb of internal capsule (alic), corpus callosum (CC) body, bilateral inferior longitudinal (ilf) and inferior fronto-occipital (ifo) fas and MD increment on bilateral anterior talamic radiatio, unc, ifo, anterior corona radiata, right ilf, bilateral cin, alic, forceps minor, left external capsule, right cp in children with DS compared to controls. The ROI analyses of FA values were significant at right cerebral peduncle (p=0.033), right (p=0.016) and left unc fas (p=0.016). The volumetric analyses showed significant difference of total grey matter, brain stem, cerebellar cortex, and basal ganglia between DS and controls.
Conclusion: As the preliminary findings, DTI and volumetric analyses may reflect the earliest complementary changes of ageing process and serve as a surrogate biomarker of specific aspects of white and grey matter for cognitive development in DS.

B-0083 11:18

The role of combined structural MR imaging and spect in refractory epilepsy

H. Taha, K. Rahmat, K.-S. Lim, F. Fadzli, N. Ramli; *Kuala Lumpur/MY (katt_xr2000@yahoo.com)*

Purpose: The purpose of this study was to investigate the collaborative role of MRI, SPECT and EEG in the work up of epilepsy patients in evaluating the concordance of functional SPECT to clinical lateralization by EEG and structural imaging by MRI.
Methods and Materials: 45 patients with refractory focal epilepsy who had undergone video-EEG telemetry between April 2011 till May 2015 were recruited into the study. Anti-epileptic drugs were rapidly withdrawn in all cases and patients were monitored in video EEG monitoring unit in the neurology laboratory. The radiotracer 99m Tc-HMPAO was injected within 60 seconds of ictal EEG, and this was termed ictal injection. If no seizures occurred during the period of injection, this was considered as an interictal injection. SPECT (Philips Brightview XCT) images were co-registered with MRI (GE Signa HDxt 3.0 Tesla) FSPGR Ictal scans delineated the symptomatic zone as areas of hyperperfusion. Seizure foci showed areas of hypoperfusion in interictal scan.
Results: 36 patients had interictal and 9 were ictal scans. The concordance rate between ictal SPECT and MRI/EEG was higher than interictal SPECT and MRI/EEG. Ictal SPECT were concordant with the EEG localization in 100% and concordant to MRI in 77.8%. Interictal SPECT concordance were 72.2% and 66.7% respectively.
Conclusion: Ictal SPECT shows better concordance compared to interictal SPECT. Combination of ictal SPECT, MRI and ictal EEG provides complementary information in presurgical evaluation of refractory epilepsy patients.

B-0084 11:26

Combing interictal arterial spin-labelling (ASL) MRI perfusion and FDG PET in assessment of focal cortical dysplasia (FCD) causing intractable epilepsy

A. Garg, K. Bhullar, S. Gaikwad, M. Tripathi, M. Tripathi, G. Shukla, M.B. Singh, S. Chandra, C.S. Bal; *New Dehli/IN (drajaygarg@gmail.com)*

Purpose: ASL has the capability of quantifying local relative cerebral blood flow (rCBF) and can be used in the presurgical work-up of intractable epilepsy. We hypothesise that ASL can provide supplemental information to routine MRI that is comparable to interictal FDG PET.
Methods and Materials: We retrospectively reviewed 18 patients of FCD who had VEEG monitoring and interictal brain MRI with ASL. Brain MRI was performed on a 1.5 T MR scanner. CBF (ml/100 g/min) was estimated using 3D pseudocontinuous ASL. Regional perfusion from interictal ASL was also compared to regional metabolism from interictal FDG PET in 13 patients. 3D-FLAIR images were co-registered with ASL perfusion images and PET images on AW workstation.
Results: Of the 18 patients that had both EEG and ASL, 9/18 had regional hypoperfusion and 5/18 had regional hyperperfusion abnormalities on ASL corresponding to FCD on 3D-FLAIR images; 4/18 had no perfusion abnormalities. Of these 14/18 had corresponding lateralisation on EEG, 3/18 had conflicting lateralisation on EEG, and 1/18 had normal or global changes on EEG. With respect to PET findings in 13 patients, 8/13 had regional hypometabolism and 3/13 had regional hypermetabolism corresponding to FCD on 3D-FLAIR images; 2/13 had normal PET examination. Two patients who had normal ASL perfusion had hypometabolism in PET corresponding to FCD. In rest, ASL findings correlate with PET localisation.
Conclusion: Given the correlation between ASL and PET and electrophysiology, perfusion with ASL could become part of the standard work-up in patients with epilepsy and helps in seizure focus localisation.

B-0085 11:34

Comparison of the diagnostic success of MR imaging, FDG- PET imaging and FDG-PET/MR fusion images in the imaging of pharmacoresistant epilepsy

C. Eraslan, M. Calli, A. Oral, O. Kitis, S. Yilmaz; *Izmir/TR (eraslancenk@hotmail.com)*

Purpose: We aim at comparing the diagnostic success of MR imaging, FDG-PET imaging and FDG-PET/MR fusion images in the detection of the lesions causing epilepsy in pharmacoresistant epileptic patients.
Methods and Materials: 20 patients have been examined by 3-Tesla MRI and PETCT. The MRI and PET-CT images of the patients were evaluated retrospectively. FDG-PET and MRI images were fused using a software program. The fusion images obtained were analysed. After the assessment of MRI, FDG-PET and FDG-PET/MR fusion images, their success in the detection of the lesions that could cause epilepsy was compared.
Results: In 9 patients, any lesion that might cause epilepsy was not observed in any imaging method. In the remaining 11 patients, at least one of the defined pathologies varied depending on different methods. As a result of the evaluation of images, epileptic lesions were determined in 7 of 20 patients (%35) with MRI, 9 of 20 patients (%45) with PET-CT and 11 of 20 patients (%55) with FDG-PET/MR fusion.
Conclusion: The results of our study support that diagnostic success will be improved through the use of FDG-PET/MR fusion images in the detection of pathologies that might cause pharmacoresistant epilepsy.

B-0086 11:42

Hippocampal malrotation in benign temporal lobe epilepsy: a volumetric study

K. Rahmat, C.-Y. Lau, K.-S. Lim, N. Ramli; *Kuala Lumpur/MY (katt_xr2000@yahoo.com)*

Purpose: In hippocampal malrotation (HIMAL), hippocampal inversion fails to occur in intrauterine. Here, we present five patients with benign TLE associated with HIMAL. The purpose of this study was to determine the correlation of HIMAL using EEG and hippocampal volumetry.
Methods and Materials: Five subjects who fulfil the clinical and imaging criteria were selected from the epilepsy institutional database. Using 3 T MRI epilepsy protocol, the images were reviewed and categorised by consensus method. The assessment on HIMAL is based on the following criteria; HF medial position; HF round, globular shape and vertical orientation; empty choroidal fissure; misplaced fimbria; deep and verticalised collateral sulcus; collateral sulcus protruding into empty choroid fissure; reduction of horizontal

portion of parahippocampal gyrus and thick subiculum. Hippocampus volume was measured using ITK-SNAP 2.4.0 software with semi-automated method.
Results: Four patients have left HIMAL and one showed bilateral HIMAL. Three of the unilateral HIMAL had ipsilateral EEG interictal epileptiform discharges (IEDs), whereas another patient had normal EEG. The onset age of seizure onset was 6-month old for bilateral HIMAL and 17- to 59-year old for the unilateral HIMAL patients. We demonstrated round globular-shaped hippocampus with vertical orientation, deep and verticalised collateral sulcus and reduction of horizontal portion of parahippocampal gyrus in all the subjects. There was no evidence of abnormal signal change or significant volume loss.
Conclusion: HIMAL can be epileptogenic and associated with benign temporal lobe epilepsy.

B-0087 11:50

Epilepsy cases: fMRI and MR tractography as qualitative and quantitative tools for proper localisation and pre-operative planning
M.K. Metkees[1], A.M. Sarry El Din[1], Y. Abbas[2], E. Geneidi[2], A. Gaber[2], W. Reda[2]; [1]*Giza/EG*, [2]*Cairo/EG (drmohamed_meetkees@yahoo.com)*

Purpose: To demonstrate the role of fMRI and MR tractography as qualitative and quantitative tools for delineation of memory functions and language lateralisation and localisation in partial epilepsy cases candidates for surgery thus for proper detection of promising partial epilepsy patients who are candidates for surgery.
Methods and Materials: 16 known epilepsy patients were investigated for brain fMRI and MR tractography before surgical interference. Evaluation for the memory and language brain centers was done for localising and lateralising language function. Functional MR imaging and DTI measurements, data processing, and evaluation were fully done using dedicated software.
Results: FA values of the hippocampal formation (HF) in TLE patients were decreased while ADC values were increased on comparing the affected side to the normal side. The mean FA value of the diseased side is 0.183×10-3 as compared to normal side 0.264× 10-3. The mean ADC value of the lesion side is 1.143×10-3 mm2/s as compared to 0.954×10-3 mm2/s of the normal side. Lateralisation of language was possible in all patients while lateralisation of memory was possible in 15 patients out of the 16 patients. Results of fMRI and MR tractography were integrated and correlated to EEG findings. Results of those who are promising candidates for surgery and those who are not were tabulated.
Conclusion: Combined fMRI with MR tractography are valuable qualitative and quantitative tools for proper localisation and lateralisation of the eloquent areas including memory, language areas and Meyer's loop in pre-operative planning and selection of promising epilepsy surgery candidates.

10:30 - 12:00 **Room F1**

Oncologic Imaging

SS 216a

Hepatocellular cancer: characterisation, response and recurrence

Moderators:
M.A. Bali; Brussels/BE
A. Fohlen; Caen/FR

B-0088 10:30

Comparison of HCC tumour size measured in MRI and histopathology: does the sequence matter?
M. Armbruster, D. Nörenberg, K. Hoffmann, J. Andrassy, H. Kramer; *Munich/DE (harald.kramer@med.uni-muenchen.de)*

Purpose: The exact size of hepatocellular carcinoma (HCC) lesions plays an important role in treatment algorithms of this disease. Therefore, the objective of our study was to compare size measurements of HCC lesions between different MRI sequences and to evaluate their accuracy using histopathology as the standard-of-reference.
Methods and Materials: We included 53 patients with known HCC who underwent contrast-enhanced MRI of the liver prior to liver transplantation or tumour resection. Pathologically assessed tumour size was available for all patients. The MRI protocol contained axial T2-weighted sequences as well as T1-weighted sequences before and after application of Gd-EOB-DTPA. Tumour diameters were measured on all available MRI sequences. Furthermore, the sharpness of lesions and the presence of artefacts were evaluated visually. MRI measurements and pathologically assessed dimensions were correlated using Pearson's correlation coefficient.
Results: Mean time between MRI and resection was 21±19 days. Artefacts were present in 9% of T2w turbo-spin-echo (tse) images, 6% of portal-venous-, and 4% of arterial-phase datasets, whilst there were no artefacts present in hepatobiliary-phase images. HCCs frequently showed up with fuzzy edges in arterial- and late-venous-phase datasets (49%, 45% respectively), whilst they presented sharply delineated in 85% of all hepatobiliary-phase images. On average there was a deviation from the pathologically measured tumour diameter of 0.93 cm±0.89 cm (R=0.93) for T2w tse images, 0.86 cm±0.97 cm (R=0.93) for the arterial-, 0.83 cm±0.93 cm (R=0.94) for the late-venous-, and 0.79 cm±0.82 cm (R=0.95) for the hepatobiliary phase.
Conclusion: The hepatobiliary phase delineates HCC lesions sharply and seems to be most accurate along commonly used MRI sequences to measure HCC tumour size.

B-0089 10:38

The correlation between the minimum and average ADC values of hepatocellular carcinoma and pathological grade
X. Li, K. Zhang, Z. Ye; *Tianjin/CN (lixb@bjmu.edu.cn)*

Purpose: To investigate the correlation between the minimum and average apparent diffusion coefficient (ADC) values of hepatocellular carcinoma (HCC) and pathological grade.
Methods and Materials: Preoperative MRI images of 241 patients with HCC confirmed by pathology were retrospectively analysed. All patients underwent plain and contrasted MR imaging and diffusion-weighted imaging (DWI). According to enhanced MR images to avoid the tumour necrosis and vascular, mean and minimum ADC values of the solid parts of the tumour were measured. The mean and minimum ADC values of the solid parts of the tumour were compared and the correlations between mean and minimum ADC values and pathological grade were analysed in tumours with different pathological grades, respectively. ROC of the minimum ADC value was analysed to distinguish poorly and non-poorly differentiated HCCs, and the optimal threshold, sensitivity and specificity were obtained.
Results: The mean ADC values of poor, moderate, well-differentiated HCC were 0.99×10-3 mm2/s, 1.14×10-3 mm2/s, 1.14×10-3 mm2/s, respectively. Minimum ADC values were 0.84×10-3 mm2/s, 0.98×10-3 mm2/s, 1.02×10-3 mm2/s, respectively. The mean and minimum ADC values of differentiated HCCs were lower than poor and moderate-differentiated HCCs ($P < 0.05$). The minimum ADC value was negatively correlated with pathological grade ($rs=-0.118$, $P < 0.05$). When the minimum ADC value≦0.925×10-3 mm2/s was considered as a threshold of the diagnosis of poorly differentiated HCC, the sensitivity was 60%, and the specificity was 70%, and the area under the ROC curve was 0.648.
Conclusion: The minimum ADC value of HCC could be helpful to predict the tumour histological grade before surgery.

B-0090 10:46

Hepatocellular carcinoma: preoperative gadoxetic acid-enhanced MRI to predict early recurrence, microscopic vessel invasion and tumour grade using image features and texture analysis
S. Ahn[1], J. Kim[1], S. Kim[1], J. Han[1], Y. Jang[2]; [1]*Seoul/KR*, [2]*Incheon/KR (joa0827@gmail.com)*

Purpose: To investigate whether MR image features and texture analysis of preoperative MRI is useful for predicting of early recurrence, microscopic vessel invasion (MVI), tumour grade after curative resection of HCC.
Methods and Materials: 179 patients with single HCC who underwent gadoxetic acid-enhanced MRI prior to surgery were included. Two reviewers retrospectively analysed MR findings including margin, peritumoural enhancement, peritumoural hypointensity on HBP, diffusion restriction, radiological capsule, intra tumoural fat, washout, portal vein thrombus, and satellite nodule. Computerised texture analysis of HCC on HBP was quantified.
Results: For early recurrence, satellite nodule, peritumoural hypointensity, tumour size, and radiologic capsule on MRI, and GLCM Entropy on texture analysis were significant independent predictors ($P < 0.05$). For MVI, PVT, satellite nodule, washout, and peritumoural hypointensity on MRI, and sphericity on texture analysis were significant independent predictors ($P < 0.05$). Satellite nodules, peritumoural hypointensity, intra-tumoural fat, and low signal intensity on HBP on MRI were significant predictor for higher tumour grade ($P < 0.05$) but, any texture analysis data were not helpful to predict tumour grade. The sensitivity, specificity, PPV, and NPV for satellite nodule detection on MRI were 47.36%, 96.25%, 60%, and 93.9%, respectively and satellite nodules show significant correlation with early recurrence, MVI, and grade ($P < 0.05$).
Conclusion: Specific MR findings and texture features of preoperative MRI are useful to predict early recurrence, MVI, higher grade after curative resection of HCC. And satellite nodule is important to predict early recurrence and MRI provide high specificity for detecting satellite nodule.

B-0091 10:54

The role of diffusion weighted MR imaging in follow-up of response of loco regional interventional therapy of hepatocelleular carcinoma

H.M.K. Imam, H.M.A.H. Seif, G.S. Seifeldein, W.M. Abbas; *Assuit/EG (gehanseifeldein@aun.edu.eg)*

Purpose: To compare the agreement of tumour response of unresectable HCC evaluated by MDCT and diffusion weighted imaging (DWI) according to mRECIST guidelines after transcatheter arterial chemoembolisation (TACE).
Methods and Materials: Thirty-three patients were enrolled who had chronic liver disease related to hepatitis C. They were undergone follow-up using triphasic study using 64-rows MDCT scanner, then followed by DWI using 1.5 T machine using a transverse spin-echo echo-planar sequence using b values of 50, 400, 800 s/mm2. Quantitative ADC maps were calculated. The images were assessed by two radiologists for lesion relapse. The agreement was tested by K statistics. Group comparison was completed with the Mann-Whitney's non-parametric test or the $\chi 2$ test.
Results: Of 33 patients, 27 (81.8%) are responders (complete or partial response) and 6 (18.2%) are non-responders depending on MDCT criteria according to the mRECIST guideline. On DWI, 20 (60.6%) show low signal intensity, 9 (27.3%) show eccentric high signal and 4 (12.1%) show heterogeneous signal intensity. On the basis of 3 months follow-up, recurrence is detected in 9 cases on DWI (P=0.009) compared to 6 cases on MDCT (P=0.000). The mean diameter of recurrent hepatic focal lesions is 4±25 cm. A highly significant difference was found between mean ADC value of well ablated lesion and mean ADC value of the recurrent lesion (1.18±0.30x10-3 mm2/s versus 1.11±0.23x10-3 mm2/s, $P < 0.05$). Moderate agreement of detection of recurrence was found ($\kappa = 0.564$, $p < 0.05$).
Conclusion: DWI gives a qualitative and quantitative map of liver after TACE and it has higher detection rate of recurrence comparable to MDCT.

B-0092 11:02

The role of perfusion-CT as an early predictor of survival in patients with advanced hepatocellular carcinoma treated with Sorafenib

G. Querques, D. Ippolito, C. Talei Franzesi, P. Bonaffini, A. Nasatti, S. Sironi; *Monza/IT (giulia.querques@hotmail.it)*

Purpose: To assess the role of quantitative perfusion-CT (pCT) as an early predictor of survival in patients with advanced hepatocellular carcinoma (HCC) treated with Sorafenib.
Methods and Materials: Twenty cirrhotic patients with biopsy proven HCC underwent pCT before and every 3 months after Sorafenib administration: 16 dynamic slices/scan per 40 scans were performed on a 256-slice-MDCT scanner after iv bolus injection of iodinated contrast agent. Patients were stratified according to mRECIST: complete (CR) or partial response (PR), stable (SD) or progressive disease (PD). Hepatic perfusion (HP,ml/s/100 g) and arterial perfusion (AP,ml/s) percentage variation, before and 3 months after treatment (Δ), were calculated. Kaplan-Meier analyses estimated the time to survival in the overall population and after stratifying patients into mRECIST.
Results: A significant reduction in median ΔHP of 83.7% vs 61.9% vs 14.3% was observed in CR vs PR vs SD, respectively. Conversely, ΔHP increased of 19.9% among PD (p=0.01). Similarly, a significant reduction in median ΔAP of 85.4% vs 62.4% vs 32.8% was observed in CR vs PR vs SD, respectively, while ΔAP increased of 28.1% among PD (p=0.003). Median follow-up was 15 months with an overall survival rate of 47.7% at 18 months follow-up. When patients were stratified into mRECIST, the overall survival rate was 83.3% (CR) vs 33.3% (PR) vs 40% (SD) vs 0% (PD).
Conclusion: ΔHP and ΔAP significantly differ among mRECIST categories, showing good correlation with overall survival. These parameters might represent prognostic indicators of response to anti-angiogenic therapy, thus permitting the selection of patients who will benefit from treatment.

B-0093 11:10

Diagnostic accuracy of dual-energy CT with spectral imaging compared to single-energy CT in hepatocellular carcinoma: radiologic-pathologic correlation

G. Lorenzoni, I. Bargellini, D. Lauretti, F. Turini, V. Caciagli, D. Campani, R. Cioni, C. Bartolozzi; *Pisa/IT (lorenzoni.giulia@hotmail.it)*

Purpose: To retrospectively evaluate accuracy of dual-energy CT (DECT) compared to single-energy CT (SECT), in the diagnosis of hepatocellular carcinoma (HCC) in transplanted cirrhotic patients.
Methods and Materials: IRB approval was obtained. The study included all consecutive cirrhotic patients who underwent liver transplantation (LTx) < 120 days after multiphasic SECT or DECT with spectral imaging in late arterial phase from May 2012 to December 2014. Three sets of DECT images (group A: 140 kVp polychromatic; group B: 70-keV monochromatic; group C: "iodine-based" material decomposition images) and SECT images (group D) were reviewed by two independent radiologists, assessing image quality (scale 1-5), lesion conspicuity (scale 1-3) and lesion-to-liver contrast-to-noise ratio (CNR). Using pathology as gold standard, accuracies in HCC diagnosis were compared.
Results: We included 164 patients (132 male; mean age 52.8±7.9 years) after SECT (n=96) or DECT (n=68), with 76 pathologically demonstrated HCCs in 59 (35.9%) patients. Group B showed significantly higher image quality compared to the remaining groups; lesion conspicuity scores were significantly higher in groups B and C; CNR was highest for group C. On the nodule-by-nodule and patient-by-patient analyses, group C obtained the highest diagnostic accuracy (AUCs 0.92 and 0.96, respectively, for Reader 1; 0.90 and 0.91 for Reader 2), with a statistically significant difference compared to groups A and D for both readers, and to group B only for Reader 1.
Conclusion: Iodine-based images produced by DECT with spectral imaging can significantly improve sensitivity in HCC detection, resulting in > 90% diagnostic accuracy.

B-0094 11:18

Advanced hepatocellular carcinoma: pre-treatment contrast-enhanced CT texture as prognostic biomarker in patients treated with sorafenib

S. Mulé[1], B. Ganeshan[2], A. Dohan[3], G. Thiéfin[1], C. Hoeffel[1]; [1]*Reims/FR*, [2]*Brighton/UK*, [3]*Paris/FR (sebastien.mule@gmail.com)*

Purpose: To determine whether texture features on contrast-enhanced computed tomography (CECT) images can predict progression-free survival (PFS) and overall survival (OS) in patients with advanced hepatocellular carcinomas (HCC) treated with sorafenib.
Methods and Materials: 44 patients (2 F/42M, mean age 65) with advanced HCC undergoing treatment with sorafenib and in whom pre-treatment CECT was performed were retrospectively included. CT texture analysis (CTTA) was performed using a commercial research software TexRAD (TexRAD Ltd, Cambridge, UK) by manually delineating a region of interest on the slice with the largest tumour cross-sectional area. CTTA comprises a filtration-histogram technique. Filtration step selectively extracts features of different anatomic scales corresponding to fine, medium and coarse texture scales followed by quantification of the histogram using kurtosis, entropy, skewness, standard deviation (SD), and mean value of positive pixels (MPP). Univariate Kaplan-Meier survival analysis assessed the association between the texture parameters and PFS and OS.
Results: Pre-treatment entropy and SD without filtration (p=0.002 and p=0.03), at fine (p=0.01 and p=0.01), medium (p=0.02 and p=0.02) and coarse (p=0.02 and p=0.03) scales predicted OS. MPP at fine (p=0.02) and medium (p=0.03) scales, kurtosis at medium (p=0.01) and coarse (p=0.01) scales also predicted OS. Pre-treatment entropy without filtration (p=0.04), entropy and SD at fine (p=0.02 and p=0.03), medium (p=0.03 and 0.02) and coarse (p=0.03 and p=0.03) scales predicted PFS.
Conclusion: Pre-treatment texture parameters derived from CECT images of advanced HCC have the potential to act as prognostic biomarkers. Particularly, low pre-treatment entropy and SD values were associated with better OS and PFS.

B-0095 11:26

Contrast-enhanced ultrasound features for differentiation of histologically proven small solitary (≤ 2 cm) liver metastases and hepatocellular carcinomas

W. Wang, Y. Dong, X.-L. Zhang, F. Mao; *Shanghai/CN (puguang61@126.com)*

Purpose: We analysed quantitative and qualitative contrast-enhanced ultrasound (CEUS) features of histologically proven small (≤ 2 cm) and solitary liver metastases, in comparison to small (≤ 2 cm) hepatocellular carcinomas (HCC), to define the differentiate diagnoses value of CEUS.
Methods and Materials: Eighty-two cases of small (≤ 20 mm) and solitary liver metastases and 84 cases of small (≤ 20 mm) HCC were retrospectively reviewed. All patients had CEUS images. Two radiologists assessed CEUS enhancement pattern and time of enhancement in consensus. Time-intensity curves (TICs) and quantitative indexes were conducted with SonoLiver (TomTec Imaging Systems, Germany). Statistical analyses were performed using SPSS v.19.0 (SPSS Inc., Chicago, IL, USA). The $\chi 2$ test and the independent sample t test were used to compare the differences.
Results: Rapid rim-like hyper-enhancement in arterial phase (56.1 % in liver metastases vs 2.3 % in HCCs, $P < 0.01$), rapid wash-out and become hypo-enhancement in late arterial phase or early portal venous phase (96.4 % in liver metastases vs 22.6 % in HCCs, $P < 0.01$) were valuable features for differentiating small solitary metastases from small HCCs. Compared with small HCC, small liver metastases had shorter time-to-peak (TTP) (16.9 ± 4.1 sec vs 23.0 ± 5.6 sec, $P < 0.05$), quicker regression and lower peak intensity (PI) (20.7 ± 3.5 dB vs 37.0 ± 2.1 dB, $P < 0.05$).
Conclusion: CEUS imaging findings and quantitative analyses offer typical signs of small liver metastases. CEUS can help to improve the diagnostic confidence of small solitary liver metastases and HCC.

B-0096 11:34

Diagnostic value of quantitative perfusion maps with CT-perfusion technique in assessment of tumour response to Sorafenib treatment in patients with advanced HCC lesions

D. Ippolito, G. Querques, C. Talei Franzesi, P.A. Bonaffini, S. Lombardi, S. Sironi; *Monza/IT (davide.atena@tiscalinet.it)*

Purpose: To investigate the role of dynamic contrast-enhanced perfusion-CT imaging in detection of blood flow changes related to sorafenib antiangiogenic treatment in patients with HCC lesions, being the mRECIST criteria the standard of reference.
Methods and Materials: Twenty-two patients with advanced HCC underwent p-CT study (256-MDCT scanner) before and 3 months after Sorafenib administration. Dedicated perfusion software generated a quantitative perfusion map and calculated the following perfusion parameters in liver parenchyma and in target lesions: hepatic perfusion (HP), time-to-peak (TTP), blood volume (BV), arterial perfusion (AP), and hepatic perfusion index (HPI). Changes in tumour perfusion measurements between baseline and during follow-up were assessed and compared with mRECIST progression criteria, and patients were defined as responders (complete response,partial response,stable disease) and non-responders.
Results: descriptive analysis of perfusion parameters measured in HCC lesions after treatment as mean values ± SD in the different mRECIST categories showed following **Results:** Complete response (n=6): HP (mL/s/100 g) 12.8±8.5; BV (mL/100 g) 7.5±5.3; AP (mL/s) 11.4±7.0; HPI (%) 24.9±10.7; TTP (s) 28.7±8.8; Partial response (n=4): HP 23.2±16.4; BV 6.0±3.8; AP 22.1±13.4; HPI 51.3±33.8; TTP (s) 23.3±6.7; Stable disease (n=6): HP 40.9±25.4; BV 17.8±14.1; AP 42.1±24.9; HPI 59.5±38.7; TTP 16.8±4.2; Non-responder (n=6): HP 42.5±28.3; BV 9.7±6.4; AP 37.5±22.6; HPI 100.0±0.0; TTP (s) 15.7±2.4. A significant higher values ($p < 0.001$) was obtained for all perfusion parameters evaluated in non-responders patients than those in responders group, due to residual arterial high vascularity within viable portion of treated lesions.
Conclusion: Preliminary results suggest that CT-p adds quantitative data of vascularisation, related to the presence of residual neoplastic arterial structures,useful in assessment of therapeutic response to sorafenib treatment in advanced HCC.

B-0097 11:42

Imaging of tumour vessel normalisation under anti angiogenic therapy

M. Bouaboula, L. Mauge, D. Bouda, I. Galy-Fauroux, G. Autret, D. Helley, D. Balvay, L. Fournier; *Paris/FR*

Purpose: The role of blood vessels in the body is to bring nutrients and oxygen. When the tumour reaches the size of 1-2 mm, diffusion of nutrients is limited, resulting in hypoxia, stimulating the formation of new vessels, which are structurally and functionally abnormal, targeted by antiangiogenic therapy.In this study, we wished to determine whether we could detect vascular normalisation under anti-angiogenic therapy in a mouse model of renal cancer.
Methods and Materials: RENCA cells were injected to Balb/c mice. After seven days of tumour growth, mice underwent pre-treatment imaging (day 0) before being randomised into two treatments groups. Treatment consisted in an administration of sunitinib or placebo. Imaging was performed on days 4 and 11 after beginning therapy. R2* relaxivity, sensitive to oxygenation was measured. Perfusion parameters were calculated : Blood Flow (BF), Blood Volume (BV) and Permeability Surface area product (PS). A subgroup of mice was randomly chosen for histological analysis at each imaging time point.
Results: Twenty-two mice were implanted (44 tumours). We did not observe significant difference between groups of tumour size, R2 relaxivity. PS decreased transiently at day 4 (p=0.015) only in the treated group. BF decreased in the control group at day 11 (p=0.013), whereas it was maintained in treated tumours. Histological analysis did not show significant difference between groups.
Conclusion: At low dose, sunitinib leads to transient vascular permeability decrease and allows maintaining perfusion, compatible with vascular normalisation.
Author Disclosures:
M. Bouaboula: Research/Grant Support; Société Francaise de Radiologie, IDV.

B-0098 11:50

RGD modified nano iron probe targeted hepatocellular carcinoma cells

Y. Xu, Y. Xu; *Shanghai/CN (xyh1892@126.com)*

Purpose: To develop a magnetic resonance imaging (MRI) nanoparticle RGD-PEG-VSOP for hepatocellular carcinoma (HCC) targeted imaging of integrin αvβ3.
Methods and Materials: Synthetize and characterise the RGD-PEG-VSOP nanoparticles. The cell cytotoxicity was evaluated by MTT test. The RGD-PEG-VSOP and PEG-VSOP nanoparticles allow for the efficient targeting to human hepatoma HepG2 cells that overexpress αvβ3 receptors, which was confirmed via in vitro cell MRI. To detect RGD-PEG-VSOP nanoparticles targeted integrin αvβ3 in vivo. Nine nudes with HCC were adopted in our experiments and then randomly divided into three groups (each group n=3), which received RGD-PEG-VSOP, PEG-VSOP and Gd-DTPA, respectively. The biodistribution of the materials, the prussian blue staining and TEM were preliminarily performed to observe the Fe3O4 in tumours.
Results: The signal intensity from the HepG2 cells treated with RGD-PEG-VSOP is clearly higher than that of similar cells treated with PEG-VSOP at the same Fe concentration. There was a significant difference of signals between RGD-PEG-VSOP and PEG-VSOP in vitro ($p < 0.05$). The tumour MRI signal from the mice administrated with RGD-PEG-VSOP increased from 15 min, and the high was achieved in 60 min. In contrast, only slightly signal increasing was observed for the tumours in mice treated with PEG-VSOP in 60 min during this period. There was a significant difference of signals between RGD-PEG-VSOP and PEG-VSOP in vivo ($p < 0.05$).
Conclusion: RGD-PEG-VSOP nanoparticles have positive reinforcement effect of T1 in MRI. RGD-PEG-VSOP nanoparticles can target integrin αvβ3 in vitro. RGD-PEG-VSOP nanoparticles can target integrin αvβ3 in vivo.

10:30 - 12:00 **Room F2**

Physics in Radiology

SS 213

CT imaging: effects of body size and use of iterative reconstruction

Moderators:
B.M. Gramer; Munich/DE
A. Jahnen; Esch-sur-Alzette/LU

K-04 10:30

Keynote lecture

J. Andersson; *Umea/SE*

B-0099 10:39

Is body mass index superior to body weight as a surrogate parameter in the calculation of size specific dose estimates (SSDE)?

J. Boos, J. Aissa, P. Heusch, R.S. Lanzman, C. Schleich, C. Thomas, G. Antoch, P. Kröpil; *Düsseldorf/DE (joel.aissa@med.uni-duesseldorf.de)*

Purpose: To investigate the performance of body mass index (BMI) as compared to body weight to surrogate effective diameter (Deff) in the calculation of SSDE in thoracoabdominal CT.
Methods and Materials: Fourhundred-one CT-examinations in 235 patients (196 chest, 205 abdomen, 95 female, 140 male, mean age 62.5±15.0 years) were included in the retrospective study and analysed in regard to body weight, height and BMI (kg/m²). Lateral and a.p. diameters were measured on midslice axial CT-images and Deff was calculated. Correlation coefficients for BMI and Deff as well as weight and Deff were assessed. Deff, weight and BMI were used to calculate patients' SSDE whereas calculation based on Deff was regarded as the reference standard.
Results: Mean values for Deff, body weight and BMI were 30.1±4.3 cm, 79.5±19.1 kg and 26.6±5.6 kg/m2, respectively. Overall, correlation coefficients were r=0.85 for BMI and Deff and r=0.84 for body weight and Deff ($p < 0.05$, respectively). Correlation was significantly better for BMI in abdominal CT (r=0.89 vs. r=0.84; $p < 0.05$) whereas body weight was superior in chest CT (r=0.87 vs. r=0.81; $p < 0.05$). Surrogated SSDE values did not differ significantly from the reference standard with a mean variation of less than 6%.
Conclusion: BMI and body weight exhibit a strong correlation with Deff in adult patients and can be used as surrogate parameters in the calculation of SSDE. BMI is superior to body weight in abdominal CT whereas weight is superior in chest CT.

B-0101 10:47

Body mass index based GSI assist in abdominal CT: investigation of radiation dose and image noise

Y. Chai, J. Gao, P. Lv; *Zhengzhou/CN (chaiyarucyr@163.com)*

Purpose: To investigate the radiation dose and image noise of gemstone spectral imaging (GSI) assist mode in abdominal CT based on the body mass index (BMI) compared with conventional CT.
Methods and Materials: 68 patients underwent CT plain scan with 120 kVp and enhanced CT with GSI mode. The optimal GSI parameters were automatically selected with GSI assist on and giver noise index. 65 keV images in venous phase were reconstructed. Image noises of liver, muscle and fat were measured, CTDIvol and ED were recorded in plain and venous phase images. All patients were divided into four groups based BMI (kg/m2): A,n=12,BMI< 18.5; B,n=28,BMI 18.5~23.9; C,n=19,BMI 24~28.9; D,n=9,BMI≥29. Differences between the two scanning modes in each group were compared using paired t-test.
Results: Between 120 kVp and GSI assist mode for all patients, the CTDIvol and ED showed no significant differences (P=0.071.0.059), while the image noises for GSI assist were significant lower (all $P < 0.001$). In group A, the CTDIvol, ED and image noises for GSI-assist all were lower than 120 kVp (all $P < 0.001$). The CTDIvol and ED had no significant difference between the two scanning mode in group B (P=0.058.0.077) and C (P=0.073.0.059), but higher for the GSI assist in group D (both $P < 0.001$). Image noises in group B, C and D for GSI assist were all lower than 120 kVp (all $P < 0.001$) except the image noise of fat in group D (P=0.055).
Conclusion: GSI assist mode can reduce radiation dose in patients with BMI under 18.5 kg/m2 and reduce image noise in patients with BMI range between 24 kg/m2 and 28.9 kg/m2.

B-0102 10:55

The effect of KV Assist on radiation dose reduction and image quality for abdominal CT in different BMI groups

P. Hou; *Zhengzhou/CN (houping1221@163.com)*

Purpose: To evaluate the effect of KV Assist on radiation dose reduction and image quality for abdominal CT in different BMI groups.
Methods and Materials: 100 patients underwent abdominal CT were divided into 2 groups: group A used KV assist protocol, while group B with the conventional 120 kVp scan. Then the 2 groups were both further divided into two subgroups according to BMI (BMI < 24 kg/m2for group A1/B1 and BMI≥24 kg/m2 for groupA2/B2). CT values, SD values, CNR of CA, PV, liver, pancreas and image quality score in abdomen were measured. CTDIvol and DLP of each patient were recorded. Image quality scores of the protocols were assessed and compared using Rank-sum test.The student T test was used to analyse other all data.
Results: Image noise of protocol A and B in dual-phase were statistically significant (p=0.00). However, CNR values in group A vs B were comparable or higher in both LAP and PVP. Besides, the difference of the subjective rating scores in protocol A and B was statistically insignificant (p=0. 554). Percentages of 80 kVp, 100 kVp, 120 kVp and 140 kVp scans using KV assist were 31%, 58%, 11% and 0% for group A1, while 0%, 0%, 35%, and 65% for group A2. The radiation dose reduction in group A1 and A2 were 30.18% and 22.71% compared with group B1 and B2.
Conclusion: Abdominal enhanced CT scans using KV assist can provide better image quality and 30.31% radiation dose reduction compared with 120 kVp scans, especially for patients with BMI < 24 kg/m2.

B-0103 11:03

Iterative reconstruction comparison in CT: model base (MBIR-VEO), adaptive statistical (ASIR) and new adaptive statistical iterative (ASIR-V)

P. De Marco, M. Guernieri, D. Origgi; *Milan/IT (paolo.demarco@ieo.it)*

Purpose: To investigate the effect on physical CT parameters of the new adaptive statistical iterative algorithm ASIR-V in comparison to the currently used ASIR and the fully iterative reconstruction (VEO).
Methods and Materials: Acquisitions of a CATPHAN 500 and a water phantom at 120 kV, 0.5 s/rot, 40 mm collimation, pitch close to 1, 0.625-mm slice thickness and mA to obtain a CTDIvol of 1, 2, 4, 7 and 15 mGy were performed prior to reconstruction on GE Discovery 750 with ASIR (40%-60%-100%) and VEO and on GE Revolution with ASIR-V (40%-60%-100%). Images were also reconstructed on both scanners with FBP. Noise Power Spectra (NPS) were calculated on 80 water slices, MTF was evaluated on the CATPHAN with the bead method and image noise as SD of the water phantom at each dose.
Results: Both ASIR and ASIR-V in comparison to FBP showed progressive shift (15%-45%) towards low frequencies with increasing IR% whilst greater shift was seen for VEO. MTF curves for ASIR and ASIR-V were similar to FBP, whereas VEO significantly improved MTF. ASIR-V showed greater noise reduction (30%-65%) than ASIR (25%-55%) both independent of dose, where noise reduction with VEO was maximal (67%) at the lowest dose.
Conclusion: Whilst VEO has the best physical performance for all investigated parameters, ASIR-V represents a good solution to further reduce noise whilst maintaining faster reconstruction time and image texture.

B-0104 11:11

Assessment of new model-based iterative reconstruction kernels for the detectability of small hypervascular liver lesions: a phantom study

H. Pasquier, F. Gardavaud, M. Chiaradia, F. Legou, A. Rahmouni, A. Luciani; *Creteil/FR (hugo.pasq@gmail.com)*

Purpose: To evaluate Model Based Iterative Reconstruction (MBIR) new kernels for the detection of low contrast hepatic lesions based on a Non-PreWhitening matched filter with Eye filter (NPWE) model observer.
Methods and Materials: A CATPHAN 600 phantom (The Phantom Laboratory, NY) was imaged on a Discovery CT750 HD scanner (GE Healthcare, Wisconsin) under variable tube current configurations (Noise Index (NI) from 15 to 70). Images were reconstructed using filtered back projection (FBP), Adaptive Statistical Iterative Reconstruction (ASIR) 50% and MBIR associated to Standard, Noise Reduction (NR05, NR40) and Resolution Improvement (RP05, RP20) kernels. Noise Power Spectrum and Task based Modulation Transfer Function measurements were combined into a NPWE observer to assess the detectability index (d') for a clinical imaging task representative of the detection of small liver lesions (contrast of 20 HU and 11 mm diameter). The dose potential reduction of each MBIR kernel was evaluated regarding the protocol clinically used at our institution (NI 25, ASIR 50%).
Results: At comparable dose, the d' for MBIR Standard, NR05 and NR40 was higher than the one of FBP by 20%, 24% and 53%; and ASIR by 5%, 10% and 34% respectively. The d' for MBIR RP05 and RP20 wasn't improved compared to ASIR. In comparison to our routine protocol, MBIR Standard, NR05 and NR40 can lead to dose reductions of 15%, 22% and 56% respectively.
Conclusion: New MBIR NR05 and NR40 can offer further dose reduction than Standard kernel. Alternatively, at fixed dose, they can improve detectability of small hepatic lesions.

B-0105 11:19

Comparison of different iterative and FBP reconstruction techniques with respect to image quality in chest CT examinations

H.K. Andersen[1], D. Völgyes[2], A. Stray-Pedersen[1], A.C.T. Martinsen[1]; [1]*Oslo/NO*, [2]*Gjøvik/NO (uxsthf@ous-hf.no)*

Purpose: The CT vendors have introduced different iterative reconstruction techniques for reducing radiation dose and improving image quality. It is claimed that this new techniques may give potential for 50 to 80% dose reduction. No comparison of the different techniques has been performed for chest CT. This study aims to compare image quality in chest CT for high-end CT scanners from GE, Philips, Siemens and Toshiba using different reconstruction techniques.
Methods and Materials: Kyoto chest phantom with nodules and Catphan600 phantom were scanned on GE Discovery 750HD, Philips Ingenuity, Siemens Definition Flash and Toshiba Aquilion ONE. Clinical settings with fixed dose levels (2.5, 5 and 10 mGy) were used. 2-mm reconstructed slice thickness, using the recommended chest filtered back-projection and iterative reconstruction techniques: ASIR and Veo (GE), iDose4 and IMR (Philips), Safire (Siemens) and AIDR3D (Toshiba). 210 series were reconstructed for chest phantom, 105 series for Catphan600. Contrast-to-noise ratio was measured for all nodules in the chest phantom. MTF, noise and NPS were measured in the Catphan600 for all scans.
Results: Image quality varies substantially between scanners and between reconstruction techniques. Further analyses of contrast-to-noise ratio, noise properties and spatial resolution are still under investigation.
Conclusion: There are substantial differences in image quality for different reconstruction techniques and different vendors. It is important that the users are aware of how the reconstruction techniques affect the image quality as new techniques are introduced into clinical practice. Further conclusions are pending.

B-0106 11:27

Model-based iterative reconstruction technique for low radiation dose abdominal CT: comparison with hybrid iterative reconstruction and filtered back projection techniques

Y. Ueno[1], T. Yoshikawa[1], Y. Ohno[1], N. Negi[1], H. Inokawa[2], N. Sugihara[2], T. Murakami[1], Y. Fujisawa[2], K. Sugimura[1]; [1]*Kobe/JP*, [2]*Otawara/JP (yoshiu@med.kobe-u.ac.jp)*

Purpose: To investigate the utility for radiation dose reduction on abdominal CT among newly developed model-based iterative reconstruction (i.e. forward projected model-based iterative reconstruction solution: FIRST) method, hybrid iterative reconstruction (i.e. adaptive iterative dose reduction using three-

dimensional processing: AIDR 3D) and filtered back projection (FBP) techniques.
Methods and Materials: Body phantom was scanned by 64-detector CT with applying automatic exposure control and reconstructed by FBP, AIDR 3D and FIRST. All CT data were divided into three different radiation dose levels; low (4.5-5.9 mGy), medium (6.6-10.9 mGy), high (13.7-30.8 mGy) groups. For quantitative assessments, ROIs were drawn at simulated organs and fat tissue to measure image noise. For qualitative assessment, the clarity of organ margin, visibility of vessel, image contrast, absence of streak artifact and objective image noise and overall image quality were evaluated by two radiologists by 5-point visual score. Each image noise and visual score was compared by Wilcoxon signed-rank test. To assess inter-observer agreements, kappa statistics were performed.
Results: Image noise of each CT with FIRST was significantly lower than that with AIDR 3D and FBP in all groups ($p < 0.05$). Agreements of all visual evaluations were substantial or almost perfect ($0.70<\kappa< 0.89$). The clarity of organ margin, absence of streak artifact and objective image noise and overall image quality of CT with FIRST were significantly better than those with AIDR 3D and FBP in low and medium radiation exposure groups ($p < 0.05$).
Conclusion: Model-based iterative reconstruction method was more useful than AIDR 3D and FBP techniques for radiation dose reduction of abdominal CT.
Author Disclosures:
Y. Ohno: Grant Recipient; Toshiba Coporation Research Grant, Koninklijke Philips Electronics NV Research Grant, Bayer AG Research Grant, DAIICHI SANKYO Group Research Grant, Eisai Co, Ltd Research Grant, Terumo Corporation Research Grant. **H. Inokawa:** Employee; Toshiba Medical Systems Corporation. **N. Sugihara:** Employee; Toshiba Medical Systems Corporation. **Y. Fujisawa:** Employee; Toshiba Medical Systems Corporation. **K. Sugimura:** Grant Recipient; Toshiba Corporation Research Grant, Koninklijke Philips NV Research Grant, Bayer AG Research Grant, Eisai Co, Ltd Research Grant, DAIICHI SANKYO Group.

B-0107 11:35

Standard deviation and noise power spectrum as critera for achievable dose reduction with three types of iterative reconstruction
G. Van Gompel, N. Buls, J. de Mey; *Brussels/BE*
(Gert.vangompel@uzbrussel.be)

Purpose: To explore the dose versus noise relationship for selected reconstruction methods and to investigate their achievable dose reduction based on standard deviation (SD) and noise power spectrum (NPS).
Methods and Materials: A 22 cm diameter cylindrical water-filled container was scanned on two systems (750HD and Revolution CT, GE Healthcare) with identical protocols (120 kVp, helical, 4 cm collimation) and identical set of 14 calibrated CTDIvol dose levels [0.26 mGy-32 mGy]. Images were reconstructed with standard FBP and iterative (IR) ASIR60, VEO (750HD) and ASIR-V60 (Revolution). SD and radial NPS were computed from the 0.625 mm images. Achievable dose reductions with the IR methods compared to FBP were calculated following two criteria: (1) preservation of SD and (2) preservation of NPS over the whole spatial frequency domain.
Results: Unlike ASIR, the dose-SD relationships of ASIR-V (SD~CTDIvol^(-0.35)) and VEO (SD~CTDIvol^(-0.22)) do not follow the typical dose-SD trend of FBP (SD~CTDIvol^(-0.5)). At 10 mGy, SD based dose optimisation results in dose reductions of 63% (ASIR60), 93% (VEO) and 59%(ASIRV60) compared to FBP, however at the cost of NPS shift towards lower spatial frequencies. With NPS based optimisation, much lower dose reductions could be achieved: 10%(ASIR60), 32%(VEO) and even a 3% dose increase for ASIRV60.
Conclusion: Noise structure is known to affect detectability of small low-contrast objects. With iterative reconstruction methods, radiation dose has a large impact on the NPS peak shape, height and position. The choice between an aggressive (preserved SD) versus a conservative (preserved NPS) dose optimisation criterion results in a large difference in achievable doses.
Author Disclosures:
N. Buls: Advisory Board; GE Healthcare. **J. de Mey:** Advisory Board; GE Healthcare.

B-0108 11:43

Effect of tube voltage on CT radiation dose: compared with 100 kVp vs 120 kVp using iterative reconstruction algorithm
K. Sim, M. Kim, B. Park, D. Sung, N. Han; *Seoul/KR (ha2sky@hanmail.net)*

Purpose: To compare image quality and radiation dose of abdomen-pelvis CT performed in the hemato-oncologic patients using different tube voltage (kVp) of 120 and 100 kVp with iterative reconstruction (IR).
Methods and Materials: The study group for this retrospective study was 56 patients who have colorectal cancer or lymphoma. All patients underwent abdomen-pelvis CT scan on portal phase performed using 120 and 100 kVp while other scanning parameter were kept constant with the same machine. The iterative reconstruction was used. One radiologist measured region-of-interest in six organs (liver, aorta, spleen, portal vein, muscle, and fat). The CT dose index (CTDI), dose-length product (DLP), contrast-to-noise ratio (CNR), signal-to-noise ratio (SNR), and scan length were compared with the Wilcoxon rank test. Two observers performed qualitative analysis for overall image quality and conspicuity using a 5-point grading scale.
Results: Decreasing tube voltage from 120 to 100 kVp resulted in a 15.6% decrease in CTDI, 8.95 to 7.55 ($p <.001$) and 15.18% decrease in DLP, 453.27 mSv to 384.45 mSv ($p <.001$). The mean HU of six organs were significantly different at 100 and 120 kVp ($p <.001$). The reduction of tube potential caused image noise to increase by 3~15%. However, there was no statistical difference of SNR and CNR between the two groups except the spleen. A Wilcoxon rank test revealed no significant difference in overall image quality between two groups.
Conclusion: The 100 kVp setting with IR in abdomen-pelvis CT scan significantly decreases radiation dose without an adverse effect on diagnostic image quality.

10:30 - 12:00 **Room D1**

Chest

SS 204

Pulmonary vessels and perfusion

Moderators:
E.E.J.G. Coche; Brussels/BE
N.N.

B-0109 10:30

Whole lung dynamic perfusion CT for risk stratification of arterial occlusions
L. Jimenez-Juan[1], H. Mehrez[1], C. Dey[1], S. Homampour[1], P. Salazer-ferrer[2], N. Paul[1]; [1]*Toronto, ON/CA*, [2]*Minnetonka, MN/US (Narinder.Paul@uhn.ca)*

Purpose: Assess the utility of dynamic perfusion CT (DP-CT) in evaluating lung parenchyma haemodynamics during pulmonary artery occlusion.
Methods and Materials: Whole lung DP-CT in 10-pigs was performed. Reversible luminal stenosis of: 0%, 40-59%, 60-79%, 80-99%, and 100% were created using balloon catheter inflations in the left basal pulmonary artery. DP-CT was performed using continuous scan mode for 25s. CT images were reconstructed with a timestamp of 0.35s, and were quantitatively analysed using a deconvolution model to generate Blood Flow (BF), Blood Volume (BV), and Mean Transit Time (MTT) 3D-perfusion maps. Lung parenchymal perfusion maps were analysed by comparing perfusion values downstream of the balloon in the left lower lobe (Stenosis-Region, R_S) and mirror location in right lower lobe (Normal-Region, R_N). Normalized left lung perfusion values (R_S/R_N) were calculated for different occlusion levels and compared to baseline (0%-occlusion). Spearman rank coefficient determined correlation between perfusion values and occlusion severity. $P < 0.05$ determined statistical significance.
Results: 150-perfusion maps (10-pigsx5-occlusionsx3-parameters) were analysed. MTT was most sensitive to occlusion and increased by 43% at 60-79% stenosis level. BV is the least affected and decreases only at occlusion levels > 80%. Perfusion value changes for 40-59%, 60-79%, 80-99%, 100% stenosis were as follows: BF was -5±13%,-23±12%,-52±23%,-72±13%; BV was 0±6%,4±10%,-25±24%, -58±9%; MTT was 5±8%, 43±36, 76±52%, 71±64%. Spearman rank correlation between perfusion values and occlusion severity was strong: r=-0.98,-0.85, and 0.94 for AF, BV, and MTT ($p < 0.05$).
Conclusion: Pulmonary artery occlusions of 60-80% significantly affect BF and MTT, but do not influence BV. Luminal occlusion> 80% decrease BV and may impact tissue viability.
Author Disclosures:
H. Mehrez: Employee; Toshiba Medical Systems. **P. Salazer-ferrer:** Employee; Vital Images. **N. Paul:** Research/Grant Support; Toshiba Medical Systems.

B-0110 10:38

Dual-energy pulmonary blood volume CT for treatment evaluation of balloon pulmonary angioplasty for chronic thromboembolic pulmonary hypertension
H. Ota, H. Takagi, K. Sugimura, K. Takase; *Sendai/JP*
(h-ota@rad.med.tohoku.ac.jp)

Purpose: To evaluate whether the degree of perfusion defect assessed by dual-energy lung perfused blood volume (LPBV) is useful to monitor the severity of chronic thromboembolic pulmonary hypertension (CTEPH) treated by balloon pulmonary angioplasty (BPA).
Methods and Materials: Fourteen patients with CTEPH underwent BPA procedures (2-6 sessions per patient). Serial dual-energy CT examinations were performed before and after BPA. Two radiologists independently scored the degree of perfusion defects in each lung segment according to the

following criteria: score 0, no defect, score 1, defect in < 50% of a segment, score 2, defect in ≥50% of a segment. The LPBV score was defined as the sum of the scores of 18 lung segments. Pulmonary vascular resistance (PVR) and mean pulmonary artery pressure (mPAP) were measured by right heart catheterization (RHC) before and after BPA. Correlations between LPBV score and RHC findings were evaluated by Spearman's rho. Weighted kappa values with bootstrapped 95% confidence interval (CI) were used for interobserver agreement. $P < 0.05$ indicated statistical significance.
Results: Interobserver agreements for scoring perfusion defects were excellent for pre-BPA (k=0.83, 95%CI, 0.76, 0.88) and good for post-BPA (k=0.799, 95%CI, 0.72, 0.86), respectively. Pre-BPA LPBV scores were significantly correlated with mPAP (rho=0.62, p=0.02) and PVR (rho=0.56, p=0.04). However, post-BPA LPBV scores were not correlated with mPAP (rho=0.08, p=0.79) or PVR (rho=0.45, p=0.10).
Conclusion: The LPBV score was useful to estimate the severity of CTEPH at baseline. However the score was not useful to monitor treatment effect of angioplasty procedure.

B-0111 10:46

A new CT-score predictor of haemodynamic changes in patients with chronic thromboembolic pulmonary hypertension
M.B. Leone, M. Giannotta, M. Palazzini, M. Cefarelli, S. Martìn Suàrez, M.L. Bacchi Reggiani, N. Galiè, M. Zompatori; *Bologna/IT (leone.barbara@hotmail.it)*

Purpose: The aim of this study was to retrospectively assess the relationship between radiological and haemodynamic parameters in patients with chronic thromboembolic pulmonary hypertension (CTEPH). We introduced a new CT score to evaluate haemodynamic changes, only employing CT-Pulmonary-Angiography (CTPA).
Methods and Materials: Between February 2006 and September 2015, one hundred and forty-five patients (M:F=64:81, mean age 60) affected by CTEPH underwent haemodynamic and CTPA evaluation. Of these one hundred and forty-five patients, sixty-nine underwent Pulmonary Endarterectomy (PEA) and performed a CTPA evaluation also after surgery. Haemodynamic assessment considered the values of mean Pulmonary Artery Pressure (mPAP) and Pulmonary Vascular Resistance (PVR), obtained through right heart catheterisation. Radiological evaluation included CTPA signs of pulmonary hypertension. Pearson correlation was used to analyse linear associations between continuous variables for statistical analysis.
Results: A high significant statistical difference was observed between our new CT score and both mPAP and PVR ($p < 0.000$). In addition, mPAP and PVR showed an important relationship with the severity of mosaic perfusion ($p < 0.000$). mPAP also correlated with main pulmonary artery ($p < 0.01$); a significant relationship was found both between PVR and tricuspid regurgitation ($p < 0.000$) and with PVR and presence of unilateral or bilateral pulmonary thromboembolic occlusion ($p < 0.05$).
Conclusion: Our results confirm the diagnostic role of CTPA in evaluating patients with CTEPH and in addition open a new horizon in assessing haemodynamic changes in patients with CTPE, also after PEA, especially when right heart catheterisation is contraindicated or not possible.

B-0112 10:54

Pulmonary vessel volume (PVV) change vs change in forced vital capacity (FVC) as a predictor of mortality in IPF
J. Jacob[1], B. Bartholmai[2], R. Karwoski[2], A. Nair[1], S. Raghunath[2], S. Rajagopalan[2], S.L.F. Walsh[1], A. Wells[1], D. Hansell[1]; [1]*London/UK*, [2]*Rochester, MN/US (akelajacob@gmail.com)*

Purpose: FVC change is the most widely used measure of disease progression in IPF but problems with interpretation of small FVC changes remain. Mortality prediction using a novel computer-derived CT parameter, PVV change, was compared to FVC change.
Methods and Materials: Serial volumetric CT imaging performed between 6-24 months in 69 IPF patients were analysed by a computer algorithm (CALIPER) developed at the Biomedical Imaging Resource, Mayo Clinic, Rochester, USA. Absolute change thresholds of PVV derived using regression analysis, were compared to thresholds of &lt10% relative and absolute FVC decline using multivariate Cox proportional hazards analysis.
Results: Results: Absolute PVV threshold change equivalent to 10% relative FVC decline was calculated as 0.88%. Absolute PVV change thresholds of 0.38%, 0.88% and 1.38% were compared to relative and absolute FVC decline thresholds of &lt10%, corrected for baseline disease severity and rate of disease progression. PVV change was independently predictive of mortality at thresholds of 0.38% (p=0.01) and 0.88% (p=0.04), but not 1.38%. In contrast absolute and relative FVC decline &lt10% were not independently predictive of mortality at any PVV threshold on multivariate analysis. PVV thresholds identified a greater percentage of patients with change than FVC thresholds: absolute FVC decline &gt10%=28%; relative FVC decline &gt10%=49%; PVV change &gt0.88%=55%, PVV change &gt0.38%=74%.
Conclusion: CALIPER PVV change thresholds are stronger and more sensitive predictors of mortality than FVC decline. The current study provides proof of concept for PVV change being evaluated as a future key variable in both clinical practice and drug trials in IPF.

B-0113 11:02

Prognostic value of CT-angiographic features of right ventricular dysfunction in patients with acute pulmonary embolism
M. Wiśniewska, P. Palczewski, M. Gołębiowski, M. Bielecki, S. Goliszek, P. Pruszczyk; *Warsaw/PL (mavi1980@o2.pl)*

Purpose: To assess a prognostic value of CT-angiographic features of right-ventricular dysfunction (RVD) in predicting a complicated clinical course of acute pulmonary embolism (PE).
Methods and Materials: Between October 2009 and April 2014, 251 patients underwent MDCT pulmonary angiography for suspected APE. APE was confirmed in 105 patients (50 male, 55 female, aged 19-91 years, mean 62.2, SD = 19.2). Complicated clinical course (CCC) was experienced by 13 (12.4%) patients. Admission angio-CTs were performed either with 16-row (n=78) or 64-row (n=27) detector scanner. The RVD signs assessed by consensus by two experienced radiologists included: RV/LV diameter and volume ratio, pulmonary trunk diameter, pulmonary trunk aortic ratio, azygos vein diameter, septal bowing, and contrast medium (CM) reflux into the IVC. Statistical analysis was performed using R statistical environment. Mann-Whitney test was used in group comparisons due to the non-normality of distributions and differences in group size. Differences in dichotomous variables distributions were tested using Chi2 or Fisher's exact test.
Results: When compared to patients with benign clinical course, patients with CCC had significantly higher values of pulmonary trunk diameter: M = 32.46 (SD = 4.14) vs M = 28.43 (SD = 4.42, p = 0.005) and were more often characterised by CM reflux (69.2% vs 33.7%, p = 0.029). ROC curve analysis of continuous variables identified pulmonary trunk diameter (AUC = 74.2%) as the only significant predictor of CCC.
Conclusion: Amongst signs of right-ventricular strain, only increased pulmonary trunk diameter emerged as the predictor of a complicated clinical course.

B-0114 11:10

The relation between severity of contrast reflux into the inferior caval vein on CTA and mortality in patients with acute pulmonary embolism
W. Kroon[1], A. Braber[2], J.-W.C. Gratama[2], F. van Raamt[2], P.E. Spronk[2], H.J. van der Zaag-Loonen[2]; [1]*Deventer/NL*, [2]*Apeldoorn/NL (wouterkroon05@gmail.com)*

Purpose: Pulmonary embolism is a major cause of death, morbidity and hospitalisation. Individual clinical outcome of pulmonary embolism depends on several risk factors. The aim of this study is to determine if reflux of contrast into the inferior vena cava is one of the signs indicating adverse patient outcome.
Methods and Materials: Medical charts of 202 included patients were reviewed for age, sex, co morbidities, received therapy, ICU admission, resuscitation and the overall in-hospital, 30-day mortality. Contrast of reflux into the inferior vena cava was divided into substantial and non-substantial.
Results: The overall 30-day mortality was significantly higher in the group of patients with substantial reflux (5 (13.9%) vs 5 (3.0%) respectively (p = 0.02)), Odds Ratio (OR) 5.19 (95% CI: 1.42 - 19.0). This group of patients also had a substantial higher amount of thrombolysis (4 (11.1%) vs 1 (0.6%), p = 0.04) and ICU admission due to hemodynamic or respiratory instability (7 (20%) vs 4 (2.5%), p = 0.01).
Conclusion: The presence of severe contrast reflux indicates an adverse patient outcome, with a higher mortality rate, more thrombolysis and more ICU admissions, even despite more aggressive treatment.

B-0115 11:18

Automatic assessment of cardiac load due to acute pulmonary embolism: saddle vs. central and peripheral emboli distribution
G. Aviram, O. Sadovnik, E. Soikher, A. Bendet, T. Ziv-Baran, S. Berliner, H. Shmueli, L. Friedensohn, Y. Topilsky; *Tel-Aviv/IL (aviramgalit@hotmail.com)*

Purpose: Changes in the four cardiac chambers' volumes in relation to different distributions of pulmonary embolism (PE) have not been investigated. Our aim was to compare those volumes of patients with acute saddle, central or peripheral PE using volumetric analysis of computerized tomographic pulmonary angiography (CTPA) data.
Methods and Materials: This cross-sectional study included consecutive patients diagnosed with PE by CTPA between 1/2007-12/2010, divided according to emboli distribution. Software automatically provided the volumes of each cardiac compartment of the CTPA. Area under the curve (AUC) measured the ability of each chamber's volume and ratios between the right

and left ventricles (RV/LV) and atria (RA/LA) to discriminate between emboli locations.
Results: Among the 636 patients, 325 (51%) had peripheral, 278 (44%) had central and 33 (5%) had saddle emboli. Patients with saddle emboli had lower LV and LA volumes than those with central PE (p≤0.001) and peripheral PE ($p < 0.001$), and higher RV and RA volumes than patients with central ($p < 0.04$) and peripheral emboli ($p < 0.01$). The RV/LV and RA/LA volume ratios discriminated well between saddle and central PE (AUC ≥0.74) and between saddle and peripheral PE (AUC ≥0.83), but not between central and peripheral PE (AUC ≤0.6). Most (97%) of the patients with saddle emboli had an RV ≥88 ml, and 94% had an LA < 69 ml. An RA/LA volume ratio ≥2 was rare (4%) in peripheral PE.
Conclusion: Automatic volumetric analysis of diagnostic CTPAs provides a rapid quantitative tool which can discriminate between cardiac responses in patients with saddle, central or peripheral PE.
Author Disclosures:
G. Aviram: Research/Grant Support; Dr. Galit Aviram declares financial activity outside the submitted work: her institution received a research grant from Philips Medical Systems. All other authors declare having no conflict of interes.

B-0116 11:26

Acute pulmonary embolism among patients with and without malignancy: comparison of cardiac measurements using CT pulmonary angiography
G. Aviram, Y. Hadad, E. Soikher, A. Bendet, S. Berliner, S. Greenberg, Y. Topilsky, T. Ziv-Baran, A. Milwidsky; *Tel-Aviv/IL (tzemer77@gmail.com)*

Purpose: Pulmonary embolism (PE) in patients with malignancy is highly prevalent but its specific clinical and computed tomography pulmonary angiogram (CTPA) characteristics are not well known. Our aim was to compare among patients with acute PE, the cardiac chambers' measurements of CTPA data, between patients with and without malignancy, and their correlation to short term mortality.
Methods and Materials: Retrospective analysis of 636 consecutive patients diagnosed with acute PE by CTPA between 1/2007-12/2010. Each CTPA was assessed for thrombi distribution (central vs. peripheral), the diameters of the ventricles (measured manually) and volumes of the four cardiac chambers (using automatic software). Multivariate logistic regression adjusted to age, gender and co-morbidities was used to assess the association between CT measurements and 30-days mortality in patients with and without malignancy.
Results: Two-hundred nineteen patients (34%) had malignancy. Thrombi distribution was not different (p=0.25). Patients with malignancy had higher rates of mortality (27% vs. 6%, respectively, $p < 0.001$).Mortality was higher when left atrial volume was less than 62 ml (OR 2.47, CI [1.33-4.60]; p=0.004) among patients with malignancy, and when right to left ventricular (RV/LV) volume ratio was more than 1.52 among patients without malignancy (OR 6.48, CI[1.46-28.79]; p=0.01), and did not correlate to the RV/LV diameter ratio in both groups.
Conclusion: Short term mortality among acute PE patients with malignancy seems to be associated with different cardiac characteristics compared to patients without malignancy. These findings suggest the need for differential risk stratification among these two distinct groups.
Author Disclosures:
G. Aviram: Grant Recipient; Dr. Galit Aviram's institution received a research grant from Philips Medical Systems not related to this study.

B-0117 11:34

Pulmonary arteriovenous malformations in hereditary haemorrhagic telangiectasia: correlations between computed tomography findings and cerebral complications
J. Etievant, N. Vinurel, S. Dupuis-Girod, E. Decullier, D. Gamondes, C. Khouatra, V. Cottin, D. Revel; *Bron/FR (johan.etievant@yahoo.fr)*

Purpose: Thoracic computed tomography (CT) is the modality of choice to detect and characterise pulmonary arteriovenous malformations (PAVM) in patients with hereditary haemorrhagic telangiectasia (HHT). We investigated potential associations between CT findings of PAVM and cerebral complications such as embolic stroke and brain abscess.
Methods and Materials: This retrospective study included patients with HHT-related PAVM visualized by chest CT. All CTs were reviewed by two radiologists. PAVM presentation was classified as unique, multiple, diffuse, or disseminated. The number of PAVM and the largest afferent artery size were also taken into consideration. CT results were analysed, along with genetic and clinical data.
Results: On 170 patients, 57.1% had multiple (28.8%), disseminated (21.2%), or diffuse (7.1%) PAVM. There were more PAVM in the 15 patients with cerebral abscess compared to those without cerebral abscess (11.53 versus 6.23, respectively; p=0.025). In the 26 patients with stroke, the mean diameter of the major feeding artery was larger than in the other patients (4.87 versus 3.19 mm, respectively; p=0.0098). The majority of patients had an endoglin mutation (HHT type 1, 70.6%).
Conclusion: More complex forms of PAVM were more frequently associated with cerebral complications. The number of PAVM correlated with risk of brain abscess, and a larger afferent artery lumen was associated with more strokes. There was no association between the severity of PAVM and the type of genetic abnormality.

B-0118 11:42

Coronary and vascular calcification assessed by computed tomography in patients with pulmonary embolism
M.C. Williams[1], N. Morley[1], K. Muir[1], E.J.H. van Beek[1], J.H. Reid[2], J. Murchison[1]; [1]*Edinburgh/UK*, [2]*Melrose/UK (michelle.williams@ed.ac.uk)*

Purpose: Coronary (CAC) and vascular calcification (VC) can be identified on computed tomography pulmonary angiogram (CTPA) and may be associated with PE severity.
Methods and Materials: 400 consecutive patients with pulmonary embolism (PE) were assessed. PE severity was assessed with the Miller score (1-5 mild; 6-11 moderate; 12-16 severe). Ratio of right/left ventricular size was assessed on axial orientations, with > 1.5 suggesting right heart strain. Calcium was assessed on a four-point scale (0, none; 1, mild; 2, moderate; 3, severe). CAC was assessed in left main stem, left anterior descending, left circumflex and right coronary arteries and summed to give a total score. VC was assessed in ascending, arch and descending aorta and summed to give a total score.
Results: Mean age was 66 years (95% CI 65, 68) and 50% were male. Median Miller score was 6 [IQR 2, 14] and 48% were mild, 21% moderate and 32% severe PE. Mean ventricular ratio was 1.08 [1.05, 1.11] and 10% had right heart strain. Median ordinal CAC was 2 [0, 7] and median ordinal VC was 1 [0, 3]. PE score and ventricular ratio were higher in patients with mild or moderate CAC or VC, vs patients with no calcification. However, patients with severe CAC or VC had a lower PE score (NS) and lower ventricular ratio (p 0.035 and 0.012).
Conclusion: Calcification is associated with more severe PE and cardiovascular compromise, except in patients with the most severe calcification. This suggests an association between calcification and pre-hospital mortality.

B-0119 11:50

Diagnostic imaging in the diagnosis of suspected pulmonary embolism during pregnancy and the immediate post-partum period
S. Reddy, A. Hill, D. Patel; *Edinburgh/UK (sue.reddy@luht.scot.nhs.uk)*

Purpose: Pulmonary embolism (PE) is a preventable cause of maternal mortality during pregnancy. The diagnosis is complicated by normal physiological changes that may mimic symptoms and signs of PE. Our aim was to determine the efficacy of perfusion scintigraphy (Q-scan) and CT pulmonary angiography (CTPA), in pregnant and immediate post-partum women with suspected PE.
Methods and Materials: All pregnant or within six weeks post-partum patients referred for imaging for suspected PE during an 8 year period were included. All imaging studies and patient records were reviewed retrospectively.
Results: Total of 584 patients were imaged (median age 28 years), with the majority (48.4%) in their third trimester of pregnancy. Two of 410 (0.5%) Q-scans demonstrated high probability for PE. Twenty-six (6.3%) were indeterminate with no PE demonstrated on subsequent CTPA. One false negative low-probability Q-scan (0.2%) with subsequent positive CTPA, performed due to high index of clinical suspicion. Therefore Q-scan specificity 93.6% (95%CI:90.8%-95.8%) and negative predictive value 99.7% (95%CI:98.6%-100%). Nine of 207 (4.3%) CTPA demonstrated PE (n=5 pregnant and n=4 post-partum patients). Seven patients (3.5%) required repeat CTPA due to sub-optimal pulmonary arterial opacification. CTPA specificity 96% (95%CI:92.9%-98.6%); negative predictive value 100% (95%CI:98.1%-100%). Overall PE was present in 1.9% (n=11) of the study population with no adverse events in the follow-up period.
Conclusion: Perfusion scintigraphy in pregnant and immediate post-partum patients is of good diagnostic value. However the overall positive yield in this suspected population is low suggesting a more robust clinical screening system may be required prior to radiological referral.

10:30 - 12:00 **Room D2**

Interventional Radiology

SS 209

Ablation outside the liver

Moderators:
G. Carrafiello; Varese/IT
M. Tsitskari; Athens/GR

B-0120 10:30

Ultrasound-guided radiofrequency ablation (RFA) to treat benign thyroid nodules: effectiveness after one and six months

C. De Angelis, C.G. Monaco, L.C. Pescatori, F. Sardanelli, L.M. Sconfienza, G. Mauri; *San Donato Milanese/IT (cristianmonaco87@gmail.com)*

Purpose: To estimate the effectiveness of ultrasound-guided RFA to treat benign thyroid nodules.
Methods and Materials: We treated 28 patients (6 males; age 60 years, IR 53-68) with a biopsy-proven benign thyroid nodule causing compression and/or aesthetic dissatisfaction. Ultrasound-guided RFA was performed using a 0.7- or 1.0-cm exposed tip electrode. Contrast-enhanced ultrasound (CEUS) was performed to determine the avascular part and the need for immediate re-intervention. Follow-up included ultrasound and CEUS after 1 and 6 months. Volume measures were performed, percent variations were calculated and compared using the Wilcoxon test. Data were given as median and interquartile range (IR).
Results: Pre-treatment volume was 20 (10-31) ml; avascular portion after treatment 13 (6-22) ml. At one-month follow-up, the nodule volume reduced to 9 (5-14, $p < 0.001$) ml, corresponding to a reduction of 60% (41-66%); the avascular part reduced to 5 (3-8) ml, corresponding to a reduction of 59% (50-67%). At six-month, the nodule volume reduced to 4 (2-10, $p < 0.001$) ml, corresponding to a reduction of 74% (58-85%); the avascular part reduced to 2 (1-3) ml, corresponding to a reduction of 84% (74-92%). After RFA, 5/28 patients reported moderate pain whilst 2/28 patients developed a haematoma, spontaneously reabsorbed. All patients reported relief of initial symptoms at 1 and 6 months.
Conclusion: US-guided RFA of benign thyroid nodules is a feasible, safe and effective procedure with reduction of the nodule volume at six months of 74%. CEUS is useful to check the effectiveness of the procedure, both immediately and during the follow-up period.

B-0121 10:38

Radiofrequency ablation as an alternative local treatment for hyperfunctional solid thyroid nodules: a single centre experience

R. Cervelli, S. Mazzeo, B. Pontillo Contillo, L. De Napoli, P. Miccoli, D. Caramella; *Pisa/IT (rosa.cervelli@virgilio.it)*

Purpose: To validate the efficacy and safety of radiofrequency ablation (RFA) for treating autonomously functioning thyroid nodules (AFTN).
Methods and Materials: 15 patients (4 males and 11 females; 59±11 years) with toxic and pre-toxic AFTN, who refused or were not suitable for surgery or radioiodine therapy, were treated in a single session of RFA. RFA was performed in real-time with ultrasound guidance and local pericapsular anaesthesia, using an 18-gauge, internally cooled electrode. Nodule volume, thyroid function (fT4-fT3-TSH), ultrasound and scintigraphic evaluations, before therapy and during 6 months of follow-up, were performed. Physical parameters (basal impedance, power, application time) of the machine were recorded.
Results: Radiofrequency power ranged between 35 and 45 W; mean application time was 9.34±5.09 minutes, depending on nodule size. The mean of pre-treatment nodule volume was 13.5±13.3 mL. The nodule size decreased in all cases (3.9±3.1 mL at 6-month follow-up) with a mean Volume Reduction Rate of 74.2% after 6 months from treatment (p=0.0005). Significant improvement of fT4-fT3-TSH was observed at last follow-up. As to scintigraphy, all hot nodules became cold or normal when scanned. No major complications were detected.
Conclusion: Our study confirmed the efficacy and safety of RFA in treating AFTN. RFA can be considered a suitable treatment instead of conventional therapy (surgery or radio iodine therapy), especially for patients with pre-toxic benign nodules; in fact this technique only affects pathological areas and preserves all the remaining thyroid gland.

B-0122 10:46

Thermal ablation of benign thyroid nodules: a systematic review and meta-analysis

A. Pisani Mainini[1], L.M. Sconfienza[1], M. Ali[1], G. Di Leo[1], F. Sardanelli[1], G. Mauri[2]; [1]*Milan/IT*, [2]*San Donato Milanese/IT (anna.mainini@hotmail.it)*

Purpose: To systematically review the effectiveness of thermal ablative treatments of thyroid benign nodules.
Methods and Materials: In June 2015 a literature cross-referencing systematic search was performed (MEDLINE/EMBASE) using the keywords: "laser", "radiofrequency","microwave", " HIFU" and "thyroid nodule". After initial screening of title/abstract, we analysed full-text of eligible articles. Volumes were extracted before treatment, at 3-6 months and 1 year after treatment. We pooled the overall percentage mean change in nodule volume using the fixed- or random-effect model according to heterogeneity. Comparison between radiofrequency and laser was performed.
Results: A total of 234 articles were initially retrieved, 203 being excluded. The remaining 31 papers were analysed, for a total 1696 patients (range 11-302) with 2129 nodules (range 7-477). Five papers analysed 2 independent groups, for a total of 36 groups. Laser was used in 20/36 (56%), radiofrequency in 13/36 (36%), microwave in 2/36 (6%) and HIFU in 1/36 (2%) groups. At 3-6 months, the overall % mean change was 66% (range 63-68%), 54% (range 38-69%) for laser and 66% (range 63-68%) for radiofrequency; at 1-year the same data were: 76% (range 68-84%), 68% (51-85%) and 78% (range 68-88%). The comparison between laser and radiofrequency was not statistically significant neither at 3-6 months (p=0.211) or 1 year (p=0.580).
Conclusion: This systematic review highlights a poor evidence for HIFU and microwave. At 1 year the percentage mean change was 76% with no difference between laser and radiofrequency ablation.

B-0123 10:54

Primary breast tumour percutaneous cryoablation in patients with metastatic breast cancer

E. Mavrovi, H. Beji, O. Tredan, T. Bachelot, I. Ray-Coquard, P. Heudel, M. Peix, N. Guerin, F. Pilleul; *Lyon/FR (ertimavrovi@gmail.com)*

Purpose: To evaluate safety and efficacy of palliative breast percutaneous cryoablation (PC) in the treatment of primary tumours in patients with stable metastatic breast cancer in a retrospective and single-center study.
Methods and Materials: Ten female patients (median age 59.5 years; range 37 - 68) underwent PC of metastatic, biopsy-proven primary breast cancer under ultrasonographic (US) and computed tomography (CT) guidance. All patients had clinical and MRI evaluation before and after the procedure at 1, 3, 6, 12 and 24 months. The primary objective was to evaluate the feasibility and complications. Efficacy was defined as the complete disappearance of the primary tumour during the follow-up period.
Results: All the procedures were performed under local anesthesia and fully completed. Only one minor complication occurred (post-operative breast hematoma rapidly resolved) and no major complication as ulceration, infection or skin burning. The mean tumour size was 21±10 mm (range: 9-34). One relapse of primary tumour was observed on breast-MRI during the follow-up period who required a second session of PC. Complete radiological regression of the disease was achieved in nine patients.
Conclusion: These results show that palliative PC of primary tumour in metastatic breast cancer is feasible and suggest that it is a minimally invasive and effective treatment option to limit the local progression of the cancer.

B-0124 11:02

Management of renal tumours by US-guided radiofrequency ablation: our experience in 140 patients

A.C. Montealegre Angarita, M. Rendon Villa, X. Serres, E. Trilla, M. Juarez Garcia; *Barcelona/ES (miltonrendonvilla@gmail.com)*

Purpose: Evaluate the efficacy of ultrasound (US) guided percutaneous radiofrequency ablation (RFA) for small renal tumours. Describe the complications of RFA guided by US. Illustrate postablation findings of residual or recurrent renal tumour by using Contrast-enhanced US (CEUS). Evaluate the effect of renal function in patients undergoing RFA guided by US.
Methods and Materials: Over a 7 year 140 patients with 158 small renal tumours were reviewed treated with US-guided percutaneous RFA. Biopsy was performed at the same moment of the procedure from 2009. Cool-tip RFA system was percutaneously inserted under ultrasound guidance. RF was emitted at 100-120 W for 12 minutes. The patients were followed up with CEUS and computed tomography at 3.6 months and every 6 months thereafter. Multivariate analysis was performed to determine variables associated with procedural outcome.
Results: Follow-up ranged from 3 months to 96 months.The initial treatment success rate was 95%. The overall technical success rate was 98.7%. Complications were self-limited included hematomas subcapsular or perirenal. Only one patient developed significant renal function deterioration associated

with perirenal hematoma. There were no bowel complications despite the fact that 6 of the tumours were within 1 cm of bowel.
Conclusion: Our experience to date suggests that US-guided RFA of small renal tumours is a safe, effective and minimally invasive technique in selected patients.

B-0125 11:10

US/CT guided percutaneous treatment of renal tumours using radiofrequency and microwave ablation

G. Mauri, G.M. Varano, P. Della Vigna, G. Bonomo, F. Orsi; *Milan/IT (vanni.mauri@gmail.com)*

Purpose: To report our results in US/CT guided treatment of renal tumours using radiofrequency (RFA) and microwave (MWA) ablation.
Methods and Materials: 165 patients (110 males, 55 females, mean Age 67 ± 11 years) underwent US/CT guided treatment for 195 renal tumours (mean diameter 25 ± 11 mm) using RFA or MWA. 168 tumours (mean diameter 25±11 mm) in 141 patients (95 males, 46 females, mean Age 67±12 years) were treated using RFA (LeVeen ©, Boston Scientific, USA) and 27 renal tumours (mean diameter 26±14 mm) in 24 patients (15 males, 9 females, mean age 61±19 years) were treated using MWA (Emprint©, Medtronic, USA). Sex distribution, rate of complete ablation and of major complications were compared between RFA Group and MWA group by using Mann-Whitney *U* test. Age and diameter of the treated lesions were compared by using Fisher's Exact Test.
Results: Complete ablation was achieved in 178/195 (91.2%) tumours. Major complications occurred in 10/165 patients (6%). No differences were found between RFA group and MWA group regarding age (p=0.528), sex (p=0.645), and diameter of the treated lesions (p=0.692). Complete Ablation was achieved in 151/168 (89.8%) tumours treated with RFA and in 27/27 (100%) tumours treated with MWA (p=0.136). Major complications occurred respectively in 9/141 (6%) RFA patients and 1/24 (4%) MWA patients (p=1.000).
Conclusion: US/CT guided treatment of renal tumours is effective and with low rate of major complications. No significant differences between RFA and MWA were noted regarding the rate of complete ablation or rate of major complications.

B-0126 11:18

Renal T1 tumours and ablative techniques: which one to use?

A. Velarde Pedraza, A. Gil Sierra, J. Abadal Villayandre, E. Galvez Gonzalez, M. Alvarez Perez; *Madrid/ES*

Purpose: To review the role of different ablative percutaneous techniques in the treatment of malignant renal tumours.
Methods and Materials: We reviewed 32 patients with T1N0M0 kidney tumours treated from June 2008 to July 2015, with thermal and non-thermal ablation techniques guided with ultrasound or CT. Intervention modality was selected depending on tumour location, availability of the technique and patient's health status. Indications were renal tumour <= 4 cm without extended disease, single kidney, bilateral renal tumours (especially in familiar syndromes), high surgical risk, patients who reject surgery or more than 75 years. Post-treatment follow-up was made with contrast CT scan at 3, 6, 9, 12 months and each 6 months during first 3 years.
Results: We treated 38 tumours from 32 patients, 3 of them with microwave (MW), 33 patients with radiofrequency (RFA) and 2 patients with irreversible electroporation (IRE). Technical success rate was 94.7% above all cases. Complications were noted in 7.9 % of cases (one subcapsular haematoma and two urinary fistulas). Persistence of the tumour was noted in 5.3% of cases. Recurrence occurred in 5.3% of cases, which were re-treated with RFA and/or conservative surgery.
Conclusion: Ablative percutaneous techniques in T1 kidney tumours have demonstrated supporting evidence as curative treatment, but long-term follow-up is not yet available. Thermal ablative techniques are increasingly used, preferring RFA with cortical lesions and MW for lesions near vascular or urinary structures. IRE is a non-thermal ablative technique still in investigation, with good early results, especially in lesions near blood vessels.

B-0127 11:26

Comparison of cryoablation and microwave ablation for percutaneous renal ablation: focus upon safety and efficacy

S. Grigoriadis[1], D. Filippiadis[2], J. Zechlinski[3], A. Mazioti[2], A. Kelekis[1], S. Tutton[3], N. Kelekis[1]; [1]*Athens/GR*, [2] *Wisconsin, WI/US (grigoriadis_stavros@hotmail.com)*

Purpose: Small, incidental renal masses require a thoughtful treatment strategy which preserves renal function and minimises procedural morbidity. Percutaneous ablation is an expanding, minimally invasive approach. Ablative modalities vary across institutions. Purpose of our study is to report our comparative experience with cryoablation and microwave ablation across institutions, to further examine these equally accepted treatment modalities.
Methods and Materials: We compared retrospective series of patients undergoing percutaneous cryoablation with a similar cohort undergoing microwave ablation for small renal masses. Patient and tumour characteristics, cryoablation technique, complications, and pattern of recurrence were evaluated. IRB approval was obtained.
Results: Technical success of 98% and 97% was achieved for cryoablation and microwave ablation, respectfully. Lesions were on average larger in the microwave ablation cohort. Local recurrence of 9% was observed irrespective of treatment modality. Recurrences occurred early after ablation (within 12 months) and delayed (beyond 12 months) with similar frequency (Table). Major complications occurred with greater frequency with cryoablation (3%) versus microwave ablation (0%). Minor complications also occurred with greater frequency with cryoablation (21%) versus microwave ablation (6%).
Conclusion: Percutaneous renal cryoablation and microwave ablation offer similar efficacy in the treatment of small renal masses. Local recurrence occurs with similar frequency irrespective of treatment modality. Complications appeared higher for cryoablation, although most were classified as minor.

B-0128 11:34

Evaluation of pain reduction after percutaneous thoracic cryoneurolysis in chest wall metastatic patients

E. Mavrovi, M. Cuinet, B. Richioud, C. Mastier, F. Pilleul, G. Chvetzoff, A.-C. Kalenderian; *Lyon/FR (ertimavrovi@gmail.com)*

Purpose: To prospectively determine the safety and effectiveness of percutaneous cryoneurolysis for pain reduction in patients with painful metastatic lesions involving chest wall.
Methods and Materials: From January 2012 to June 2014, 32 cryoneurolysis of chest intercostal nerves were performed on 12 patients (six men, six women; mean age: 60 years, range: 17-79) with neurological pain and failure of third level opioid treatment. Median pre-operative EVA was 7 out of 10 (range: 8-5) for worst pain in a 24-hour period. Chest nerve roots incriminated of the pain were determined after clinical examination and confirmed by recent CT or MRI exams. Relief of pain through the use of pain treatment or medications was recorded on a 0%-100% scale (0%, no relief; 100% complete relief). Cryoneurolysis was done under CT guidance under general anesthesia or neuroleptanalgesia. A single cryoprobe was placed on each chosen chest wall root.
Results: Technical success was 100%. No major complication occurred. The median hospital stay was 2 days (range: 1-4). At day 1, week 1, week 2, week 4, median EVA was respectively 1.5, 2.5, 3.3.5 of 10. After the first month, median EVA was 5 of 10. Because of poor performance status and palliative state, median follow-up was 5 months (max 15.5 months, min 10 days).
Conclusion: Cryoneurolysis is a safe and effective method for palliation of pain due to metastatic disease involving chest wall. Pain reduction is sharper during the first month. Pain recurrence can be explained by disease progression itself in multi metastatic patients.

B-0129 11:42

Evaluation of microwave ablation (MWA) of lung malignancies with real-time enhanced spatial energy control to achieve a spherical ablation zone

T.J. Vogl, L. Basten, B. Panahi, N.-E. Nour-Eldin, N.N.N. Naguib; *Frankfurt a. Main/DE (t.vogl@em.uni-frankfurt.de)*

Purpose: To retrospectively evaluate the performance of a microwave ablation (MWA) system with Thermosphere™ technology for treatment of lung metastases in formation of a spherical ablation zone.
Methods and Materials: In this retrospective study 38 lung metastases of 32 patients (16 men, 16 women; mean 57.4 years; range 27-73) were treated from May 2014 to September 2015 in 38 sessions using MWA with Thermosphere™ technology. For comprehensive evaluation of the ablation zone`s morphology the following parameters were ascertained in CT images: (a) Ratio ablation volume longitudinal/volume transverse and (b) length, width and their ratio of every single ablation zone section in transverse and longitudinal plane. Corresponding to a sphere, target value for both ratios was set to 1.00.
Results: Technical success in the context of an A0 ablation was achieved in 97.4% (37/38) with a complication rate of 21.05% (8/38). Major complications 5.3% (2/38) detected were pneumothoraces requiring treatment, minor complications 15.8% (6/38) were minimal pleural effusion and pneumothorax. Median deviation of the ratio
ablation volume longitudinal/transverse from target 1.0 was 0.122 (mean: 0.142; 25th-percentile: 0.073, 75th-percentile: 0.195). For diameter measurements a median deviation from 1.0 of 0.184 (mean: 0.225; 25th-percentile: 0.157, 75th-percentile: 0.289) was seen.
Conclusion: MWA of lung malignancies with real-time enhanced spatial energy control achieves a nearly spherical ablation zone in the majority of treatments. Rates for technical success and complications are comparable to MWA common values.

B-0130 11:50

MWA, RFA and LITT in patients with non-colorectal lung metastases: comparative evaluation of tumour volume and recurrence rates

T.J. Vogl, S. Exner, S. Zangos, K. Eichler, N.-E. Nour-Eldin;
Frankfurt a. Main/DE (t.vogl@em.uni-frankfurt.de)

Purpose: Retrospective comparison of tumour response with volumetric assessment for tumour size after treatment of non-colorectal lung metastases with microwave ablation (MWA), radiofrequency ablation (RFA) and laser-induced thermotherapy (LITT).
Methods and Materials: From April/2002-September/2013 data were collected in 109 patients (43 men/66 women) with 175 lesions for LITT, RFA and MWA. At 24 hours, 3.6,12.18,24 months diagnosis and follow-up were evaluated using MRI and CT. Local control and survival rates were calculated.
Results: For LITT (n=17; 22 lesions) recurrent foci were found in 27.3% of lesions (6/22) and in 29.4% of patients (5/17). Recurrence rate (RR) for 3.6,12.18,24 months was 16.7%, 7.1%, 0%, 10% and 11.1%. For RFA (n=29; 49 lesions) recurrent foci were found in 20.4% of lesions (10/49) and in 20.7% of patients (6/29). RR for 3.6,12.18,24 months was 2.1%, 7.7%, 12.5%, 11.1% and 0%. For MWA (n=63; 104 lesions) recurrent foci were found in 7.7% of lesions (8/104) and in 9.5% of patients (6/63). RR for 3.6,12.18,24 months was 1%, 5.2%, 0%, 2.9% and 11.1%. In comparison, lowest RR was found for MWA (p=0.087). Concerning the lesions there was a significant difference in rates of recurrent foci (P = 0.012, Fisher test) with the lowest RR in the MWA group. Mean survival was 1075 days for LITT (n=17), 1039 days for MWA (n=63) and 1059 days for RFA (n=29) using the log-rank test (P=0.078).
Conclusion: LITT, RFA, and MWA are effective treatment options for non-colorectal lung metastases with an advantage for MWA regarding recurrence and survival rates.

10:30 - 12:00 **Room K**

Genitourinary

SS 207

Technical advances

Moderators:
U.G. Mueller-Lisse; Munich/DE
R. Turkay; Istanbul/TR

B-0131 10:30

Preoperative CT findings to predict postoperative inguinal hernia after robot-assisted laparoscopic radical prostatectomy

K. Sim, D. Sung, N. Han, B. Park, M. Kim, Y. Cho, S. Cho; *Seoul/KR (ha2sky@hanmail.net)*

Purpose: The development of postoperative inguinal hernia (IH) after robot-assisted laparoscopic radical prostatectomy (RALRP) has been described in several studies. We investigated the preoperative computed tomography (CT) features that predict the possibility of the occurrence of postoperative IH after RALRP.
Methods and Materials: One hundred sixty men (mean age, 63.4 years) who underwent preoperative CT and RALRP were enrolled in this study. All patients had at least two years of follow-up. The preoperative CT imaging was retrospectively reviewed in consensus by two radiologists. The presence or absence of asymmetry of spermatic cord and scrotal fluid collection were assessed. Sensitivity and specificity of each CT feature for predicting development of postoperative IH were calculated. Binary logistic regression was performed to analyse the association between CT features and postoperative IH development.
Results: During follow-up period, IH developed in fifteen (9.4%) patients and it was surgically confirmed. On preoperative CT imaging, asymmetry of spermatic cord was demonstrated in 13 (8%) patients and scrotal fluid collection in 49 (31%) patients. Sensitivity and specificity of asymmetry of spermatic cord were 42% and 98%, respectively, and for scrotal fluid collection, they were 89% and 70%, respectively. In binary logistic regression analysis, postoperative IH was positively associated with asymmetry of spermatic cord (Odds ratio = 150.2; $p < 0.001$) and scrotal fluid collection (Odds ratio = 23.4; $p < 0.001$).
Conclusion: The presence of asymmetry of spermatic cord and scrotal free fluid collection on preoperative CT imaging were significantly associated with postoperative inguinal hernia development after RALRP.

B-0132 10:38

MR spectroscopy in the differentiation of benign, borderline and malignant cystic epithelial ovarian tumours

F. Ma, J. Qiang, G. Zhang; *Shanghai/CN (mafenghua9602@163.com)*

Purpose: To prospectively investigate the ability of proton magnetic resonance spectroscopy (1H-MRS) in the differentiation of benign, borderline and malignant cystic epithelial ovarian tumours (EOT).
Methods and Materials: Fifty-eight patients with 64 histologically proven cystic EOT underwent multi-voxel 2D-chemical shift imaging (CSI) using the point resolved spectroscopy. Resonance peak integrals of choline (Cho), N-acetyl aspartate (NAA), creatine (Cr), lactate (Lac), and lipid (Lip) were analysed and the Cho/Cr, NAA/Cr, Lac/Cr and Lip/Cr ratios were compared using one-way analysis of variance.Receiver operating characteristic (ROC) curves were used to evaluate the diagnostic performance of 1H-MRS in the differentiation of benign, borderline and malignant EOT.
Results: The mean Cho/Cr ratios of benign, borderline and malignant tumours were 1.17±0.4, 3.13±1.1 and 5.31±1.7, respectively. There were statistically significant differences between any two groups ($P < 0.05$). The mean NAA/Cr ratios of benign, borderline and malignant tumours were 2.77±2.2, 8.64±5.2 and 2.78±1.8, respectively. Statistically significant differences were found between borderline and benign groups ($P < 0.05$), between borderline and malignant groups ($P < 0.05$).Area under the curves (AUC) of the Cho/Cr and NAA/Cr ratios were 0.900 and 0.903 for differentiating benign from borderline tumours; 0.816 and 0.888 for differentiating borderline from malignant tumours, respectively.
Conclusion: The 1H-MRS patterns of benign, borderline and malignant cystic EOT are different. The Cho/Cr ratio increases with the higher malignancy and a high Cho peak indicates a malignant tumour. A significantly elevated NAA peak indicates a borderline tumour.
Author Disclosures:
F. Ma: Research/Grant Support; National Natural Science Foundation (No. 81471628).

B-0133 10:46

Sonoelastography in differentiation between endometrial hyperplasia and endometrial carcinoma

M. Shady, M. Abdel Latif, H. Nabil; *Mansoura/EG (Magdashady@gmail.com)*

Purpose: Sonoelastography in differentiation between endometrial hyperplasia and endometrial carcinoma
Methods and Materials: Between September 2014 and September 2015, Forty-five perimenopausal female patients presented with abnormal uterine bleeding and showed endometrial thickness more than 6 mm were examined by transvaginal ultrasound including sono-elastography procedure. The results of ultrasound study with elastography were compared with the pathological data that was used as the reference standard.Strain ratios (SR) were calculated and compared between endometrial hyperplasia without atypia, atypical endometrial hyperplasia and endometrial carcinoma. The accuracy of SR in differentiating hyperplasia and endometrial cancer were assessed with the Student t test, and cut-off values were determined with receiver operating characteristic curve analysis (ROC)
Results: There was statistical difference between mean SR ratio of endometrial carcinoma (11.4) and endometrial hyperplasia (2.7) ($P < 0.001$). Mean SR of atypical endometrial hyperplasia (5.6) was significantly higher than that of typical endometrial hyperplasia (1.9) with ($P < 0.001$). Using the SR of 7.2 as a cut off value resulted in 92.3% sensitivity, 100% specificity and 97.8% accuracy for differentiation between endometrial carcinoma and endometrial hyperplasia. while when the SR of ≤ 4 was used as a cut off value, a 100% sensitivity, 85.7% specificity and 96.9% accuracy in differentiation between typical and atypical endometrial hyperplasia was resulted.
Conclusion: Transvaginal sono-elastography can aid in the differentiation between endometrial hyperplasia without atypia, endometrial hyperplasia with atypia and endometrial carcinoma.

B-0134 10:54

Evaluation of slice encoding for metal artefact correction (SEMAC) sequences in patients with intrauterine contraceptive device: removing metal artifacts in MR scans of female pelvic regions

C. Guo[1], Z. Wang[1], H. Zhang[1], T. Qian[2], N. Yutaka[3]; [1]*Changchun/CN*, [2]*Beijing/CN*, [3]*California, CA/US (guochunjie@hotmail.com)*

Purpose: The objective of this study was to evaluate the effectiveness of SEMAC sequences for reducing metal artifacts in the female pelvic regions and to improve MR image quality for patients with intrauterine contraceptive device (IUCD).
Methods and Materials: 12 IUCD users underwent MR scans with both a prototype SEMAC sequence and a conventional turbo spin echo sequence (TSE). All MR data were collected on a Avanto 1.5 T scanner (Siemens Healthcare). The maximal size of areas with metal artifacts were manually

measured and compared between SEMAC and conventional TSE. Two radiologists assessed the image quality for the presence of artifacts (5-point reverse scale), level of anatomic detail, and diagnostic confidence (5-point ordinal scale) separately. Inter-examiner agreement was measured by Cohen's kappa (k) values. Paired-samples T-test analysis was applied to assess the significance of differences between obtained values.
Results: Overall image quality was significantly improved with SEMAC sequences. Metal artifacts were objectively smaller (26.42 ± 7.64 cm2), and the subjective scores of presence of artifacts (2.25 ± 0.13) reduced in images collected by SEMAC compared to conventional TSE (81.43 ± 13.84 cm2; 4.25 ± 0.25) ($P < 0.001$). Furthermore, the SEMAC sequences were superior for evaluation of grading local anatomy depiction (4.42 ± 0.23) as adequate for making a diagnosis (4.42 ± 0.23) compared to TSE sequences (2.42 ± 0.31; 2.25 ± 0.30) ($P < 0.001$).
Conclusion: Our findings indicate that the SEMAC sequences could reduce the severity of metal artifacts in the IUCD users in the female pelvic regions, and therefore significantly increase the diagnostic sensitivity.

B-0135 11:02

Perfusion and diffusion characteristics of endometrial malignancy based on intraxovel incoherent motion MR imaging at 3.0 T: differentiation from uterine non-malignant tissues

J. Liu, Z. Wang; *Tianjin/CN (liujingyan6@163.com)*

Purpose: To study the characteristics of endometrial malignancy (EM) based on the intravoxel incoherent motion (IVIM) model and to assess the differential performance of IVIM parameters in EM and non-malignant tissues.
Methods and Materials: 67 EMs confirmed by surgery and 66 age-matched subjects (totally 66 normal myometrium, 60 leiomyomas, 14 adenomyosis and 31 normal endometrium) were prospectively recruited for diffusion-weighted (13 b-values, b=0-3,000 s/mm^2) and standard MRI. Biexponential analysis was performed to derive perfusion parameters f (perfusion fraction), D* (pseudodiffusion coefficient) and fD*, as well as diffusion parameter D (true molecular diffusion coefficient) in EM and non-malignant tissues. Apparent diffusion coefficient (ADC) was calculated. One-way analysis of variance (ANOVA), Student-Newman-Keuls (SNK) test and receiver operating characteristics (ROC) curve analysis were performed.
Results: EM had the lowest f (40.072±12.997%) and was significantly different from non-malignant tissues ($p < 0.05$). Both D* (24.084±29.342×10^{-3} mm^2/s) and fD*(8.206±8.532×10^{-3} mm^2/s) were highest in EM and significantly different from non-malignant tissues ($p < 0.05$). D (0.495±0.255×10^{-3} mm^2/s) of EM was significantly different from non-malignant tissues ($p < 0.05$). f ≤43.7%, D ≤0.682×10^{-3} mm^2/s, D*> 5.55×10^{-3} mm^2/s, fD*> 3.523×10^{-3} mm^2/s and ADC ≤0.511 ×10^{-3} mm^2/s could differentiate EM from non-malignant tissues with high negative predictive value.
Conclusion: EM have distinctive perfusion and diffusion IVIM characteristics with promising potential for tissue differentiation.

B-0136 11:10

Acustic radiation force impulse (ARFI) evaluation of small (< 4 cm) renal masses-preliminary results

C. Bruno, A. Bucci, C. Dallaserra, R. Pozzi Mucelli; *Verona/IT (costanza_bruno@libero.it)*

Purpose: to evaluate if ARFI can be a reliable technique in distinguish ccRCCS from other solid and fluid-containing small renal masses.
Methods and Materials: 31 small (< 4 cm) renal masses (27 were solid - 17/27 ccRCCs, 3/27 papillary RCCs, 2/27 chromophobe RCCs, 4 oncocytomas and 1 angiomyolipoma - and 4 were cysts) were prospectively evaluated using US and ARFI. Each lesion was assigned an ARFI value obtained from the average of 12 measurements.All the solid masses underwent resection; all the cystic lesions were Bosniak 2, so were evaluated with follow-up.The difference existing between the two groups was evaluated by means of Student's t test.A cut off value was determined to distinguish between ccRCCs and other lesions and sensibility, specificity, PPV, NPV and accuracy were determined.
Results: ccRCCs are characterised by an higher ARFI value and - when compared with all the other lesions - the difference existing between the two groups was statistically significant ($p < 0.001$). Considering a cut off value of 1.95 m/sec sensibility, specificity, PPV, NPV and accuracy were respectively 94.1%, 78.6%, 84.2%, 91.7% and 87.1%.
Conclusion: ccRCC is characterised by an higher ARFI value which can be used to distinguish it from other solid and fluid containing masses.

B-0137 11:18

Addition of diffusion-weighted imaging for the clinical MR assessment of acute pyelonephritis (APN): a prospective multicentric study

F. Albarello[1], G.C. Parenti[2], I. Nanni[2], F. Ansaloni[2], A. Passari[2], M. Giganti[1], P. Campioni[1], M. Valentino[3]; [1]*Ferrara/IT*, [2]*Ravenna/IT*, [3 T]*olmezzo/IT (fabrizioalbarello@yahoo.it)*

Purpose: Acute pyelonephritis (APN) is a very common diagnosis in the emergency department, usually clinically assessed and managed. Nevertheless, a color-Doppler ultrasound (CDUS) is often requested to exclude hydronephrosis or renal abscess. Several reports addressed diffusion weighted imaging (DWI) helpful in defining APN. Aim of this study was to consider a short MRI protocol with DW sequences for diagnosing APN after a negative CDUS. A second objective was to prospectively evaluate the accuracy of quantitative apparent diffusion coefficient (ADC) values to assess APN in comparison of normal parenchyma.
Methods and Materials: In two community hospital 55 consecutive patients (2 male and 53 female) suspected for APN, prospectively underwent CDUS for hydronephrosis and parenchimal lesions, followed by DW-MRI within 48 hours from the admission. Our DW-MRI protocol lasted less than 10' with b-values of 0-400-800-1000. Circular regions of interest were drawn on areas of signal alteration and normal renal parenchyma to obtain ADC values, subsequently compared using the one-way analysis of variance test. A $p < 0.05$ was considered statistically significant.
Results: DW-MRI had a higher sensitivity then CDUS (76.3% and 12.7% respectively) in diagnosing APN. At CDUS 19/55 patients had hydronephrosis and 7/55 focal area of color signal absence. At DW-MRI 42/55 patients presented areas of restricted diffusion, 2/55 patients had renal abscess and 6/55 negative. ADC values were significantly different for APN (1.8), abscesses (1.26) and normal kidneys (2.06) ($p < 0.0001$).
Conclusion: DW-MRI may be proposed in diagnosing APN also in emergency being achievable when CDUS is negative and improving the diagnosis.

B-0138 11:26

MRI to evaluate the response of the locally advanced cervical cancer to CCRT: MRS (magnetic resonance spectroscopy), DWI (diffusion weighted image) and T2WI

H. Kwon, B. Kang; *Seoul/KR (mokil1004@gmail.com)*

Purpose: The objective of this study was to investigate whether T2 weighted images, MR spectroscopy, diffusion-weighted imaging (DWI) of the locally advanced cervical cancer (LACC) could be used to assess to post-treatment response of CCRT at the higher magnetic field strength of 3.0 T.
Methods and Materials: Retrospectively thirty-nine women with LACC received magnetic resonance were enrolled at one more different times after CCRT. If high signal intensity was still observed on T2WI after CCRT we considered as viable cancerous tumour area. In MRS pattern, we considered as positive viable cancer if the calculated choline peak were 2 times than the creatinine peak. In DWI, we considered as positive viable if high signal intensity observed in cervix. Confirmative diagnoses were determined with PET-CT or cervical biopsy. Accuracy rates were analysed between MR images and confirmative diagnosis statistically. For the statistical analysis, chi-square test was used with SPSS version 18.0.
Results: 73 MR studies of 39 patients were obtained after CCRT. Diagnostic accuracy rates were 66% in T2Wi, 73.1% in diffusion-weighted images, and 66.7% in MRS. Correlations of MRS and DWI with the cervical biopsy or PET-CT were all statistically significant (p= 0.01 in MRS, p=0.008 in DWI). Correlations of T2Wi with the cervical biopsy or PET-CT were not statistically significant (p= 0.02).
Conclusion: MRS as well as DWI may be used to evaluate the response of LACC to CCRT.

B-0139 11:34

Renal allograft shearwave elastography: a new diagnostic tool to assess chronic allograft alterations compared with biopsy

C. Sportoletti, S. Brocchi, A. Croci Chiocchini, A. Scrivo, G. Comai, C. Serra, A. Marchetti, M. Zompatori; *Bologna/IT (stefano.brocchi85@gmail.com)*

Purpose: The aim of our study is to evaluate the reliability of Shearwave Elastography (SWE) in the assessment of renal allograft chronic alterations, compared with the histo-pathological data.
Methods and Materials: From July 2013 to August 2015 we prospectively enrolled twenty-six kidney transplant recipients (9 women and 17 men; age range 40-61 years) who underwent SWE the day before a graft biopsy. Two operators assessed ten valid measurements of Kidneny Stiffness (KS) in each patient; intra and inter-observer reproducibility was assessed. The biopsies specimens were categorised using the Banff 2007 updated criteria.
Results: Patients were divided in two groups based on the severity of histo-pathological alterations: group 1 (absent or mild alterations) and group 2 (moderate or severe alterations). The mean KS value in patients with stable

creatinine was 34.18±10.36 kPa. The average KS significantly correlated with the increase of the chronic mesangial matrix (p = 0.009) and chronic tubular atrophy (p = 0.044), being higher in the patients of group 2. The interclass correlation coefficient has shown that SWE is reliable and reproducible among the two operators. Using ROC curve we identified a cut-off value of 43.9 kPa for which the probability of medium-severe fibrosis significantly increased.
Conclusion: Our preliminary data show that SWE is a non invasive, reliable imaging technique that can identify chronic allograft alterations. SWE follow-up of the renal allograft may give a further and maybe earlier prognostic index for chronic disfunction in addition to S-creatinine, facilitating patients selection for biopsy.

B-0140 11:42

The contribution of diffusion tensor imaging in chronic kidney disease
N. Gaini[1], E. Yilmaz[1], B. Çağlı[1], S.A. Tuncel[1], M. Bulakci[2], H. Genchellac[1], M.E. Ünlü[1]; [1]*Edirne/TR*, [2]*Istanbul/TR (yilmazerdem79@yahoo.com.tr)*

Purpose: The aim of our study was to evaluate the contribution of diffusion tensor imaging (DTI) in chronic kidney disease.
Methods and Materials: Sixty patients with decreased kidney function (study group) and 60 patients without kidney diseases (control group) were evaluated with DTI. Study group were divided in subgroups according to glomerular filtration rate (GFR). Regions of interest were placed to cortex and medulla on upper pole, middle pole and lower pole of both kidneys to achieve the apparent diffusion coefficient (ADC) and the fractional anisotropy (FA) values. The mean ADC and FA values were compared. The correlation between ADC, FA values and GFR were examined.
Results: The ADC and FA values of cortex and medulla were different in both study and control group. The ADC values in the cortex were significantly higher than medulla and the FA values in the medulla were significantly higher than cortex in all groups. The FA values were significantly lower in patients with decreased kidney function compared to patients without kidney diasease ($p < 0.05$). Although positive correlation between the ADC and FA values with GFR exist, they were not statistically significant. Impairment is viewed in tracts between medulla and cortex by tractography in patients with decreased kidney function.
Conclusion: In patients with decreased kidney function, DTI could be a beneficial method and FA values could assess the kidney damage.

B-0141 11:50

Zoomed EPI-DWI of the kidney using two-dimensional spatially-selective radiofrequency excitation pulses
Y. He[1], P. Riffel[2], D. Hausmann[2], S.O. Schönberg[2], U. Attenberger[2]; [1]*Beijing/CN*, [2]*Mannheim/DE (ylhe_526@163.com)*

Purpose: To assess the feasibility and clinical robustness of a zoomed diffusion-weighted EPI (z-EPI) sequence in MR imaging of the kidney compared to conventional single-shot EPI (c-EPI).
Methods and Materials: From 11/2012 to 9/2015, 75 patients (median age 58.2 years±13.5, range 23-83 years, 52 men, 23 women) who underwent renal MR examination at our institution were enrolled in this study. Examinations were performed on a 3 T whole-body MR system (Magnetom Skyra, Siemens) equipped with a two-channel fully dynamic parallel transmit array (TimTX TrueShape, Siemens). The acquired sequences consisted of a conventional EPI DWI and a zoomed EPI DWI of the kidney. For z-EPI, the standard sinc excitation was replaced with a two-dimensional spatially-selective RF pulse using an echo-planar transmit trajectory. Images were blinded evaluated by two radiologists with regard to image blur, delineation of the kidney, distortion artifacts, overall image quality, diagnostic confidence and overall scan preference. Sequences were compared using paired Wilcoxon tests. ADC values of the upper pole, mid-zone, lower pole of the bilateral kidneys as well as renal lesions were calculated and compared between sequences using paired t test.
Results: Readers preferred z-EPI overall to c-EPI in 94.7% cases (71/75). The median image quality scores of z-EPI were significant higher than that of c-EPI ($p < 0.05$). Diagnostic confidence was statistically significantly better with z-EPI (p=0.046). No statistically significant differences in calculated ADC values were observed between the two sequences.
Conclusion: Zoomed diffusion-weighted EPI leads to substantial image quality improvements with reduction of susceptibility artifacts in renal DWI.

10:30 - 12:00 **Room G**

Radiographers

SS 214

Radiographers' education: the curriculum

Moderators:
P.H. Hogg; Manchester/UK
N.N.

B-0142 10:30

Continuing professional development (CPD) considerations in a newly state registered profession
J.M. Grehan, M.-L. Butler, L.A. Rainford; *Dublin/IE (jennifer.grehan@ucd.ie)*

Purpose: CPD becomes a mandatory condition of state registration for Irish radiographers from the 3 1st October 2015. This study investigated motivators and barriers around CPD participation, current mechanisms of delivery and confidence of radiographers in using e-learning.
Methods and Materials: A questionnaire containing six sections covering: demographics and CPD: experience, delivery, topics, finance, motivators/barriers was distributed nationally. This was available in electronic and paper format. Radiographers opinion was captured through the use of closed and open questions.
Results: Overall 58 from 72 centres participated, rendering 453 responses in total. Radiographers as characterised by age were well represented: 21-29 years cohort to the 60+ (mode=30-39); 48% categorised themselves as "basic" grade. Post qualification experience ranged from 1-51 years.Respondents indicated use of several CPD options: study days (85%); online courses (27%); formal postgraduate qualifications (55%). The majority of respondents considered CPD to be either: important, very important or critical (78.6%). Social media as a mechanism of CPD delivery was considered acceptable by 48% whilst 17% remained undecided. Respondents ranged from not confident to absolutely confident in undertaking online learning. Top motivators for CPD activity included "interest in topic area" (62.9%) and "developing new professional knowledge" (58.3%) with "competency" as third (54%). Principal barriers included: funding (36.9%), time allocation (33.6%) and location issues (30.9%).
Conclusion: This study identified Radiographers' desire to undertake CPD and the need for developing online CPD offerings. An overall positive perception towards CPD was noted however barriers to CPD were identified and require the development of redress strategies.

B-0143 10:38

Emotional intelligence and academic performance in radiography education
J. Mc Nulty[1], S. Lewis[2], S. Lane[3], P. White[4], S. Mackay[3]; [1]*Dublin/IE*, [2]*Sydney/AU*, [3]*Liverpool/UK*, [4]*Hong Kong/HK (jonathan.mcnulty@ucd.ie)*

Purpose: Studies have identified emotional intelligence (EI) to be an important personality trait for both healthcare workers and students alike, and links between EI and student's clinical performance are suggested. This study aims to explore for an EI-academic performance relationship for radiography students.
Methods and Materials: All students from radiography programmes in one Irish (n=40) and one UK institution (n=92) were invited to complete an online Trait EI questionnaire, at multiple time points during their first and second year. Ethical approval was granted to collect EI data and assessment results. Associations between Trait EI scores and assessment scores were then evaluated using Spearman's Rank correlation.
Results: Repeat responses to allow statistical analysis were available from 35 students from Ireland (BSc Diagnostic Radiography) and 36 and 18 students respectively from the UK BSc Diagnostic Radiography and BSc Radiotherapy. No strong correlations between assessment scores and Global EI scores were seen, nor for the EI sub-domains of Well-being, Self-Control, Emotionality or Sociability across the three programmes in either the first or second year of the programmes. The strongest positive association between assessment scores and Global EI (r=0.52) was found for an assessment in one of the BSc Radiotherapy modules in first year while the strongest negative association was between the Self-Control domain and a presentation assessment in second year of the BSc Radiotherapy programme (r=-0.54).
Conclusion: The lack of strong correlation supports the concept that Trait EI is unrelated to cognitive ability but its relationship to clinically orientated assessments warrants further investigation.

B-0144 10:46

Social media and simulation: using a simulation suite and digital media to develop analytical and reflective skills in the undergraduate radiographer

E.M. Carver; *Wrexham/UK (rds002@bangor.ac.uk)*

Purpose: Graduate radiographers in the UK must be able to reflect and analyse clinical practice using an evidence base, whilst accurately and safely performing quality imaging procedures. An assessment was designed to measure student performance in these areas.
Methods and Materials: Second year students watch a video of a demonstration of radiographic practice that relates to trauma imaging and modification of technique; there is no limit to the number of times this can be viewed. In groups, they critique the video demonstration in order to judge its suitability for UK undergraduate radiographers at the level of their own study. The students then devise a demonstration in the radiography simulation suite, improving upon the less effective aspects of the video and retaining the effective aspects of it. Using role play, each group presents their improved demonstration to the examiners and provides a referenced summary of the critique to which their improvements relate.
Results: Student feedback shows that they feel more confident in their ability to reflect on clinical practice and related professional issues. Measurable results include an increased average mark of 5% for analytical essays in the same study module.
Conclusion: The assessment could be developed for use in formative or summative assessment at different levels of study. Useful points to consider when designing scenarios are: use clear guidelines, set group behaviour ground rules and discuss the use of peer evaluation to ensure equal student contribution to the activity.

B-0145 10:54

Inter-professional simulation-based education in trauma: human factors

M.L. Howard, C. Brown, J. Morse; *Aberdeen/UK (m.l.howard@rgu.ac.uk)*

Purpose: It has been reported that graduate radiographers feel unprepared in terms of proficiency in major trauma cases (1) when a cohesive trauma team is paramount. Our aim was to explore the views of radiography, nursing and medical undergraduate students regarding their preparedness for dealing with major trauma cases and describe inter-professional learning experiences.
Methods and Materials: A high fidelity 'in situ' trauma inter-professional simulation-based (IPSE) programme as a joint venture between two universities was developed. All second-year student radiographers (n=39) and a convenience sample of nursing (n=10) and medical (n=5) students participated in the trauma scenarios. Students completed pre and post-scenario questionnaires. Paired responses were analysed using Wilcoxin paired tests (SPSS v22). Thematic analysis of free text responses was performed using NVIVO 10.
Results: Prior to completing the scenario, the minority (n=8) indicated they felt prepared to deal with trauma. Post-scenario significantly more students felt prepared to undertake their role in the trauma team (n=38) and had better understanding of their and other professions roles in trauma ($P < 0.01$). Analysis of student's perspectives regarding challenges in the trauma setting revealed a desire for 'still giving patient centred care while under pressure' and 'knowing what the other team members do'. The students' responses allude to the human factors that exist in the pressurised trauma setting and reveal a need for best practice.
Conclusion: IPSE is an effective and safe means of preparing undergraduate health care students to understand their and others roles within the trauma team in preparedness for professional practice.

B-0146 11:02

Blending healthcare and educational technologies to enhance radiography healthcare information technology education

J.G. Stowe, J. McNulty; *Dublin/IE (john.stowe@ucd.ie)*

Purpose: To explore the impact of blending healthcare and educational technologies, together with a blended learning approach, as a means of effective healthcare information technology (HCIT) instruction.
Methods and Materials: A predominantly didactic delivery module, in the third year of a four year undergraduate radiography programme, was replaced with a blended delivery module that also blended a RIS/PACS system, cloned from the national implementation, with educational technologies including interactive content embedded within a virtual learning environment. Student progress and development was monitored throughout and assessed via an ongoing process, involving real clinical scenarios, that provided not only dynamic and context focused feedback but also reflection on personal and professional development.
Results: This redesign of learning and assessment using technologies led not only to improved academic performance but also allowed students to develop a clear appreciation of the wider diagnostic imaging service delivery workflow and a heightened awareness of the professional relevance of HCIT. Students also demonstrated greater retention and more effective application of the knowledge gained in the module. Unexpected benefits were the additional recognition by students of the value of alternative teaching methods and an appreciation of the impact of their own learning practices.
Conclusion: The use of live HCIT systems and true clinical scenarios, combined with educational technologies, greatly enhanced the learning experience and effectiveness of HCIT instruction. The use of innovative instruction delivery yields positive outcomes far in excess of the achievement of good academic grades and can also enhance the development of a more mature learner.

B-0147 11:10

The impact of education on radiologic technology as a developing scientific discipline in Austria

G. Unterhumer, L. Handlechner; *Vienna/AT (gerold.unterhumer@fh-campuswien.ac.at)*

Purpose: Radiologic Technology has a relatively short educational history at Austrian Universities of Applied Sciences (UAS), having started in 2006. The requirement of R&D in this professional field ensures well-educated lecturers who are able to carry out scientific projects and involve their students in research projects. The aims of this study were to explore (1) which research methods were taught at Austrian UAS and (2) if the lecturers recommend the inclusion of Radiologic Technology in the Austrian Classification of Science and Technology Fields 2012 (ÖFOS).
Methods and Materials: Lecturers teaching research methods from all seven (7) Austrian UAS were invited to submit an online survey in May 2015.
Results: 14 replies were evaluated. 13 lecturers teaching research methods are Radiologic Technologists, 90% of them holding a (postgraduate) master's degree. The main course contents (n=50) regarding research methods are "general overview" (32%), "qualitative research methods" (20%), "internet inquiry" (14%), "searching for literature" (12%), "empirical methods" (10%), "interviews" (6%), "surveys" (4%), and "evidenced-based practice" (2%). Research projects (n=26) are mainly carried out during the supervision of Bachelor projects (38%), as university in-house projects (27%), in cooperation with clinical sites (23%) and in projects financed by third-party grants (11%). 10 of 13 (77%) lecturers recommended the inclusion of Radiologic Technology in ÖFOS.
Conclusion: "Information literacy" and "Statistics" should be given higher priorities in the undergraduate education of radiographers in Austrian UAS. Further scientific empowerment and empirical research done by lecturers is needed to develop Radiologic Technology as a scientific discipline.

B-0148 11:18

A national survey on radiographers and research: roles and attitudes

K.G. Vikestad[1], L. Hafskjold[2], E. Kjelle[2], S. Sebuodegaard[1], S. Hofvind[1]; [1]*Oslo/NO*, [2]*Kongsberg/NO (karivi@hioa.no)*

Purpose: To describe the Norwegian radiographers' attitudes and roles in research projects.
Methods and Materials: A survey was e-mailed all members of the Norwegian society of radiographers (n=2273). The survey covered four aspects; background and demographics (8 questions), role in research projects (1 to 7 questions), projects performed at the responders workplace (1 to 2 questions), and attitudes on research related to radiography (10 questions). The questionnaire consisted of closed questions, except the last part, which also included Likert's scale. Different terms used in the survey was defined in relation to the questions. The study was aproved by The Norwegian Social Science Data Services and the patient Ombudsman for Oslo and Akershus University College. Responding to the questionnaire was considered as an informed consent.
Results: 31% of the population responded. 20% answered they had taken part in various research activity, of which 90% in data collection. 95% stated a need for radiographic related research projects, and this should preferably be led by radiographers or radiotherapists. 20% attributed no ongoing research targeting their field of interest as the main reason for not participating in a research project. 75% were not familiar with the research strategy at their work place.
Conclusion: We found that radiographers in Norway seem to be motivated to take initiative and responsibility for evidence-and research based activity. The response indicate that the radiographers need to increase research competence and skills to be able to realize these ambitions

B-0149 11:26

Validation of a competence profile for MR radiographers using a formal research process

J. Castillo[1], C.J. Caruana[1], P.S. Morgan[2], C. Westbrook[3], A. Mizzi[1]; [1]*Msida/MT*, [2]*Nottingham/UK*, [3]*Cambridge/UK (josecast@melita.com)*

Purpose: In the European Qualifications Framework competence is defined in terms of "responsibility and autonomy". A competence profile is a list of key responsibilities for a given class of health care professionals. These are expressed in terms of observable outcomes and are used to measure performance, assist in recruitment, employee development and to provide a guide for the development of accredited curricula. This study identifies a competence profile for radiographers that would be sufficient to deliver the MRI service portfolio and MRI care pathway in Malta in 2020.
Methods and Materials: A blueprint of competence statements were subjected to a validation process using a Delphi technique among a group of radiographers, radiologists and medical physicists. Level of agreement was assessed as the median value on a 6 point Likert scale ranging from 1 (complete disagreement) to 6 (complete agreement). A median value between 5 and 6 was considered as agreement with the competence. The level of consensus among the participants was assessed using the interquartile range. Consensus was achieved when IQR ≤1.
Results: In first round of the Delphi, agreement and consensus was obtained for 38 out of 43 competence statements. The agreement was low (median 4) regarding breast MRI competence. There was low consensus (IQR≥1) regarding review of MRI referrals, appropriateness criteria, prioritisation guidelines and participation in educational programmes. In the second round further agreement and consensus was obtained on the majority of the statements.
Conclusion: A competence profile for MRI radiographers was successfully developed using a formal research process.

B-0150 11:34

Radiographer's expectations for role development: a survey in the perspective of Norwegian radiography students

F. Tavares, A.F.C.L. Abrantes, L.P. Ribeiro, R.P.P. Almeida, J.P. Pinheiro, K.B. Azevedo, S. Rodrigues; *Faro/PT (ftavaresradiologia@gmail.com)*

Purpose: To assess the role development expectations of radiography students with a view to predicting the potential impact of a misalignment of these expectations on quality of the service provided and staff retention.
Methods and Materials: A self-applied questionnaire developed by Williamson and Mundy (2009) was used with permission of the authors and assigned to the 1st, 2nd and 3rd year radiography students from a Norwegian university. A total of 51 valid questionnaires, in the Likert scale format, utilised 20 attitude questions in relation with 3 main themes of research (expectation, valence and knowledge) were interpreted and statistically analysed through descriptive statistics and ANOVA tests.
Results: The radiography students stated an expectation for role development opportunities with 80.3%, indicating that these expectations would be realised within 2 (29.5%) and 5 years of graduation (11.8%). However, only 41.2% related these expectations with job satisfaction. Further, there were no significant differences between expectation, valence and knowledge, except between the 1st and 3rd year students for the dimension knowledge (p=0.012).
Conclusion: There is an expectation and value assigned for role development opportunities and students consider very important the continuing professional development in order to improve their professional role and to expand their skills, knowledge and competencies. The misalignment of expectations could have a potentially negative impact on motivation, job satisfaction and retention of the future radiography workforce. Besides, there is a lack of social recognition of the radiographer, suggesting the need to promote measures to increase the profession recognition.

B-0151 11:42

Good practice: lumbosacral spine x-ray examination

K. Paalimäki-Paakki, A. Henner; *Oulu/FI (karoliina.paalimaki-paakki@oamk.fi)*

Purpose: Aim of this study was to find out how criteria for good practice of plain lumbar spine examination given in DIMOND3 project are pursued.
Methods and Materials: Student radiographers collected data during practical training around Finland. Imaging protocols and exposure parameters were collected, documented and compared to DIMOND3 criteria.
Results: In Finland, plain lumbar spine examination is primarily performed with pa and lateral projections while patient is standing. Source to image distance (SID) is 150 cm and automatic exposure control (AEC) central field is widely used. Exclusion of pregnancy is a standard procedure. On the contrary, variation was noticed in the use of added filtration and sensitivity of AEC. The added filtration varied between 2 mmAl and 0.2 mm Cu+1 mmAl; sensitivity of AEC field between 200 and 800. Tube voltage varied in pa projection from 70 kV to 85 kV and in lateral projection from 75 kV to 95 kV. Variation was also found in the use of lead shielding: from nonexistent lead shielding to careful protection of breasts and gonads. Image criteria were fulfilled perfectly.
Conclusion: Number of lumbar spine examinations is decreasing both due to information about doses and better availability and performance of MRI and CT. The radiation dose is relatively high compared to diagnostic value of the examination. Benefits include evaluation of structures in standing position, good availability and low cost. In Finland pa projection is taken instead of ap. There is variation but mostly the criteria given in DIMOND3 are fulfilled.

B-0152 11:50

Accuracy of the interpretation of chest radiographs for the radiographers

L.P. Ribeiro[1], D. Pinto[1], A.F.C.L. Abrantes[1], R.P.P. Almeida[1], K.B. Azevedo[1], J.P. Pinheiro[1], S. Rodrigues[1], C.A. da Silva[2]; [1]*Faro/PT*, [2]*Evora/PT (lpribeiro@ualg.pt)*

Purpose: To evaluate the performance and accuracy of the interpretation of chest radiographs for the radiographers and to check if factors such as work experience and participation in continuing professional development and training programs about chest imaging influences the performance rates.
Methods and Materials: 90 participants, including radiographers and undergraduated radiography students from 3rd and 4th year, were invited to participate in this study. Each participant examined 20 chest radiographs with the purpose to identify pathologic changes, according to the options presented for each radiograph. ViewDEX software was used to display all images and record the answers. Sensitivity, specificity and accuracy values were calculated. Cramer's V test was applied to check for statistically significant relationships between participants.
Results: The sensitivity, specificity and accuracy values were, respectively, 59.1%, 89.6%, and 86% for radiographers; 47.6%, 85% and 83.2% for 4th year students and 36.6%, 85.1% and 78.4% for 3rd year students. Radiographers who underwent to additional training programs obtained better results in terms of performance on the correct identification of pathological changes and it was found that this factor most positively influences the performance and accuracy. No significant linear relationship between work experience and performance was observed (p=0.945).
Conclusion: Radiographers have skills that qualify them for the detection of pathologic changes in chest radiographs (e.g. to use a red dot system or an abnormality detection scheme). Despite the global results obtained, it should be noted that holding additional training programs improves performance and accuracy in interpretation of radiographic images.

10:30 - 12:00 **Room M 1**

Head and Neck

SS 208

Orbits and olfaction

Moderators:
L.S. Politi; Worcester, MA/US
T. Rodt; Hannover/DE

K-02 10:30

Keynote lecture

P.-Y. Marcy; Ollioules/FR

B-0153 10:39

Usefulness of colour Doppler flow imaging in the management of lacrimal gland lesions

A. Lecler, F. Lafitte, P. Koskas, E. Nau, P.-V. Jacomet, O. Berges; *Paris/FR (alecler@fo-rothschild.fr)*

Purpose: To assess the role of color Doppler flow imaging (CDFI) in the diagnosis and management of lacrimal fossa lesions.
Methods and Materials: Institutional ethical committee approval was obtained. 51 patients with 62 lacrimal fossa lesions were retrospectively included between 2003 and 2015. All patients underwent CDFI, with a qualitative and quantitative analysis of the vascularisation. All patients had lacrimal gland surgery. Definitive diagnosis was based on pathological examination.
Results: The study included 47 non-epithelial lesions (NEL) and 15 epithelial lesions (EL), with 24 (39%) malignant lesions and 38 (61%) benign lesions. NEL were significantly more likely to present with septa ($p < 0.001$), hypoechogenicity ($p < 0.001$), high vascular intensity ($p < 0.001$), specific vascularisation pattern ($p < 0.05$) and a low resistance index (RI) ($p < 0.0001$). EL were significantly more likely to present with the presence of cysts ($p < 0.001$), and a higher RI. Receiver operating characteristic curves identified a RI value of 0.72 as the best cut-off to differentiate NEL from EL, with a sensitivity and specificity of 100%.

Conclusion: CDFI is a simple, valuable and reliable tool in the differential diagnosis of lacrimal fossa lesions. Resistance index measurement enables perfect segregation of epithelial and non-epithelial lesions, thus providing crucial data for surgical management.

B-0154 10:47

Morphometric symptoms of dacryocystitis in non-enhanced computed tomography

A. Ageev[1], A. Dergilev[2], V. Obodov[1], O. Zykov[1]; [1]*Ekaterinburg/RU*, [2]*Novosibirsk/RU (ageev.artem@gmail.com)*

Purpose: CT is a routine method of pre-operative dacryocystostomy planning, yet no published reports exist of normal dimensions of the lacrimal sac using this modality. Statistically proved criteria of dilatation of the lacrimal sac are introduced in this study.
Methods and Materials: CT morphometry processed for 142 lacrimal sacs in 71 adult patients, including 86 sacs with clinically and visually proved dacryocystitis: 43 (50%) of them were one-sided and 22 (25.6%) with bilateral lesion. Inferior pole of the sac in CT scans was defined as the centre of bone lacrimal canal entrance plane. Long, short and middle axis of the lacrimal sac were measured in normal sac as well as in affected sac. Two groups were formed: work group included 86 cases with clinically proved dacryocystitis, and control group included 56 cases with no clinical and radiographic presentation.
Results: Statistically proved criteria of normal variants and pathological dilatation were obtained and presented in Table 1. The volume of lacrimal sac was significantly increased in most cases with clinically proved dacryocystitis. In the first group lacrimal sac volume was 0.066-2.82 cm^3 (mean 6.95±0.61 cm^3); in control group it was 0.046-0.411 cm^3 (mean 0.205 ± 0.02 cm^3). Therefore, normal variants of lacrimal sac volume are below 0.18 cm^3, whereas volume over 0.46 cm^3 correlates with dacryocystitis.
Conclusion: Lacrimal sac volume was suggested for evaluation as the most sensitive numeric criterion of dilatation. Correlation between displacement of the lacrimal sac and its linear dimensions and volume change are poorly understood and require further study.

B-0155 10:55

Can real-time ultrasound elastography be used in early period of Graves' ophthalmopathy instead of MRI?

K. Agladioglu, E.N. Cetin, G. Pekel, R. Yagci, K. Yilmaz; *Denizli/TR (kadiragladi@yahoo.com)*

Purpose: In Grave's ophthalmopathy (GO), it is important to distinguish early-stage acute inflammation which is responsive to immunosuppressive treatment and from fibrotic end-stage phase of the disease. The goal of our study was to evaluate the real-time ultrasound elastography (RTE) of medial rectus muscle (MRM) in GO patients with acute-phase involvement of the medial rectus on MRI examination and compared with those in healthy controls. Also, we aimed to investigate the effectiveness of RTE instead of MRI in GO.
Methods and Materials: 36 early affected MRM that were detected on MRI examination with GO and 21 MRM with healthy controls were evaluated with RTE. Patients were assessed with clinical activity scores (CAS). Sonoelastography parameters (elasticity index and elasticity ratio) were measured from the MRM and retrobulbar fat tissue on both the patients with GO and healthy controls. These sonoelastography parameters were compared with the CAS. Correlation between sonoelastography parameters and MRM thickness, the signal intensity ratio (SIR) in the STIR sequences were analysed.
Results: There was significant difference in the elasticity index and elasticity ratio of the MRM in patients vs controls ($p < 0.05$). The elasticity index and elasticity ratio of these MRM were lower in patients than control groups. There was no significant difference between elasticity ratio of MRM with GO and CAS (p values are 0.073 and 0.319, respectively).
Conclusion: Although the incremental value of RTE is limited that using the orbita, it might have a role that detected to the early-stage GO.

B-0156 11:03

Diffusion tensor imaging of extraocular muscle in thyroid associated orbitopathy

J. Han, H. Seo, H. Lee, Y. Lee; *Ansansi Gyunggido/KR (tock486@gmail.com)*

Purpose: Thyroid associated orbitopathy is an unique autoimmune disease of extraocular muscle (EOM). CT scan is widely used for diagnosis but is not sensitive in mild patient.The purpose of this study is to investigate the diagnostic value of DTI in thyroid orbitopathy.
Methods and Materials: 20 thyroid orbitopathy patients (M:F=8:12,mean age=43.5±10.0 years) and age and sex matched 20 normal controls (M:F=8:12, mean age=44.5±10.2years) were included. Single-shot interleaved multiple inner volume imaging (IMIV)diffusion-weighted EPI were used,to reduce the susceptibility artifacts. DTI with IMIV were performed on the oblique axial plane with b=0 and 500 s/mm^2,10 gradient encoding directions, 2 mm slice thickness and 8 contiguous slices at 3 T with 32-element phased array head coil. Mean diffusivity (MD) and Fractional anisotrophy (FA) values were obtained at medial and lateral rectus EOMs in both orbits.The Student t-test was used to compare the MD and FA of both medial and lateral EOMs between thyroid orbitopathy and control groups. The correlation between the DTI values of muscle and muscle thickness on axial CT were assessed with Pearson correlation test.
Results: The FA value of the medial rectus EOM was lower in thyroid orbitopathy patients (p=0.000).The muscle thickness was correlated to the FA of medial rectus muscles.(r=-0.604, p=0.000). The radial diffusivity of the medial rectus EOM was higher in patient group (p=0.010).The muscle thickness was correlated to the radial diffusivity of medial rectus muscles.(r=0.349, p=0.027)
Conclusion: The FA and radial diffusivity of EOM has sensitive diagnostic value in thyroid orbitopathy. DTI imaging can be a helpful tool in diagnosis of thyroid orbitopathy.

B-0157 11:11

Infra-orbital nerve involvement on MRI in IgG4-related ophthalmic disease (IgG4-ROD): a specific sign?

A. Lecler, J. Bensoussan, R. Deschamps, H. Picart, O. Galatoire, M. Zmuda, J.-C. Sadik; *Paris/FR (alecler@fo-rothschild.fr)*

Purpose: To study the frequency of infra-orbital nerve (ION) involvement in IgG4-ROD, comparatively to a control group with non-IgG4 orbital inflammation, in a European sample.
Methods and Materials: This retrospective single-center study reviewed consecutive serie of patients with orbital inflammation between January 2006 and April 2015. Eligibility criteria included: the age older than 18 years, a unilateral or bilateral clinical orbital inflammation, an available and interpretable pretherapeutic orbital MRI, and an orbital biopsy with pathologic examination and IgG4 immunostaining. We excluded patients with orbital lymphoma or thyroid associated orbitopathy. Patients were divided in two groups according to the diagnosis or not of IgG4-ROD using the Umehara criteria. Major MRI reading criterion was the enlargement of the ION, comparatively to the contralateral ION, or to the optic nerve in case of bilateral involvement.
Results: 38 patients were included in our study, with a mean age of 49.1 years. 15 patients were diagnosed as IgG4-ROD. IONE was observed for 8 on 15 cases (53%) in the IgG4-ROD group, and was significantly more frequent than in the control group with 3/23 (13 %) (p = 0.01). Involvement of inferior quadrants and contact between the inflammation and the ION were significantly related to the IONE in the IgG4-ROD group ($p < 1.10\text{-}9$), IONE was observed in all cases of contact and never when absent. Interobserver agreement was substantial (kappa = 0.78).
Conclusion: IONE is a sensitive, specific and reproducible sign of IgG4-ROD, and the diagnosis should be considered when it is observed.

B-0158 11:19

Post-orbital exenteration: CT findings

S.M. Elkhamary; *Riyadh/SA (selkhamary@hotmail.com)*

Purpose: To describe the CT characteristics of orbital hyperostosis related to exenteration, analyse the factors associated with this particular form of bony growth.
Methods and Materials: Medical records of all patients who underwent exenteration over a 20-year period.Data recorded demographic, clinical and radiologic findings including detailed operative procedure.
Results: Out of 68 patients exenterated, 23 had pre and post-exenteration CT scan images. 17 of 23 (73.9 %) displayed orbital hyperostosis. The sample comprised of 14 male and 9 females, with ages ranging from 15 to 99 years. Hyperostosis was associated with the type of surgical procedure diagnosed only in patients who had their sockets left to heal by second intention. Patients who had their orbital cavity covered by lid skin-muscle flaps did not show any bone changes. Sequential CT scans showed that bony thickening had specific time appearance. It begins as endo-osteal minimal thickening along the superior, lateral, and medial walls, followed by laminated appearance, then progressing to a more homogenous and diffuse circumferential hyperostosis. New bone formation and bone overgrowth was a late finding. Hyperostosis extend to involve the adjacent facial bone more obvious on maxilla and in some cases had minimal thickening the adjacent frontal and squamous temporal bone frontal bone. Adjacent para nasal sinus showed over pneumatization changes.
Conclusion: Development of hyperostosis in orbital bones following exenteration has been largely overlooked in the radiology literature. The radiologist should pay attention to this normal healing process in order to avoid misdiagnoses of tumour recurrence/radionecrosis or infection.

B-0159 11:27

Residence times of non-specific gadolinium-based contrast media in orbital mass lesions: results of pharmocokinetic contrast-enhanced MRI studies

K. Erb-Eigner, P. Asbach, M. Taupitz, R. Lawaczeck; *Berlin/DE (Katharina.Erb@charite.de)*

Purpose: To differentiate benign from malignant orbital tumours on the basis of a novel pharmacokinetic approach where a tumour model is integrated into whole-body pharmacokinetics.
Methods and Materials: This study is IRB approved. Sixty patients with orbital mass lesions were investigated at 3 T MRI including dynamic sequences with gadolinium-contrast media (75 measurements within 5.49 min). The time-dependent contrast-enhanced signal intensities from the region of interest form the basic set for the model calculations, i.e. the distribution of contrast media within the tumour and various organs. In this tumour model two intravascular extracellular subunits communicate with a common interstitial space while the extravascular intracellular space is not available for the contrast media. One output of the model is the tumour-flow residence time τ defined as the ratio of the tumour volume and the tumour-flow rate.
Results: In 31 patients the mass lesions were benign, in 29 patients they were confirmed to be malignant (reference standard: histopathology or clinical follow-up). The mean values of the residence times of malignant and benign orbital masses are 85 and 319 s, respectively, with corresponding median values of 71 and 325 s. The distribution of the residence times of the two groups differs significantly ($P \leq 0.001$, Mann-Whitney U test).
Conclusion: This pharmacokinetic model indicated different tumour blood-flow residence times of benign and malignant orbital tumours. These residence times may be helpful in the diagnostic work-up of orbital tumours and may also provide baseline data for assessing changes in vascularity, e.g. during therapy response.
Author Disclosures:
R. Lawaczeck: Consultant; Bayer Healthcare.

B-0160 11:35

Ocular color Doppler ultrasound (OCDUS) assessment of blood flow velocities changes in central retinal artery (CRA) and vein (CRV) after islet transplantation in type 1 diabetic patients

A. Di Chiara, M. Venturini, P. Maffi, L. Piemonti, P. Fiorina, A. Secchi, F. De Cobelli, A. Del Maschio; *Milan/IT (dichiara.alessandra@hsr.it)*

Purpose: In type-1-diabetic, non-uremic patients, islet transplantation can prevent diabetes-related complications, such as retinopathy, restoring a good metabolic control. OCDUS can give quantitative and reproducible measurements of CRA and CRV flow velocities, typically reduced in diabetic patients. Our aim was to assess CRA and CRV blood flow velocities changes, correlating them with markers of graft function in 29 type-1-diabetic, islet-transplanted patients
Methods and Materials: CRA (peak-systolic-velocity and end-diastolic-velocity) and CRV (maximum-velocity and minimum-velocity) were evaluated with OCDUS (ATL-Philips, IU-22.5-12 linear probe)in both eyes of 29 consecutive islet-transplanted patients. All the examinations were performed by same experienced radiologist for 4 years. Pearson and Spearman correlations were performed between CRA and CRV with C-Peptide and β-score, conventional markers of islet function, to find possible associations
Results: Mean CRA peak-systolic-velocity showed good correlation with C-Peptide ($R=0.691$ $p < 0.05$) and β-score ($R=0.761$ $p < 0.05$) at 4 years. Also mean CRV maximum-velocity also presented a significant correlation with C-Peptide ($R=0.778$ $p < 0.05$) and β-score ($R=0.809$ $p < 0.01$) 4 years after islet transplantation. Mean values of β-score of the four years, taking into account the trend of graft function, also showed a significant correlation ($p < 0.01$) with mean CRA peak-systolic-velocity at 4 years
Conclusion: Hemodynamics of retinal artery and vein are usually impaired in patients suffering from long-term T1DM unless they are treated with islet transplantation. Since these parameters seem to deteriorate in the presence of retinopathy and show some kind of association with indices of graft function, we propose OCDUS for the long-term follow-up of transplanted T1DM patients

B-0161 11:43

Diffusion-weighted magnetic resonance imaging in diabetic retinopathy

V. Burulday, K. Örnek, M. Inal, H. Güler, B. Ünal Daphan, N. Örnek; *Kirikkale/TR (vedoctor@hotmail.com)*

Purpose: To investigate the diffusion-weighted imaging (DWI) technique in the vitreous of patients with diabetic retinopathy (DR).
Methods and Materials: This prospective study included 100 consecutive patients with DR and 100 age- and gender-matched controls. All experiments were performed by using a head coil in conduction with a Achieva 1.5 T MRI system (Philips Medical Systems, Best, The Netherlands). The mean values were calculated and used for statistical comparisons.
Results: Mean duration of diabetes was 12.22±10.13 years. Compared to controls, both eyes of the DR group had statistically significantly lower values of apparent-diffusion-coefficient (ADC) ($p=0.025$ and $p=0.002$, respectively). No significant correlations were found between the ADC values and central macular thickness, disease duration and stage of DR (all $p > 0.05$). Mean ADC values revealed no significant differences among the subgroups of patients at different stages of DR (all $p > 0.05$).
Conclusion: Decreased ADC in the vitreous of diabetes patients seem to be associated with the presence of diabetic retinopathy.

B-0162 11:51

Evaluation of olfactory functional MRI in major depressive patients before and after treatment

S. Hibat-Allah, K. Tran Dong, D. Ducreux; *Paris/FR (salimahibat@hotmail.com)*

Purpose: Olfactory disorders have been shown in major depressive patients with increase sensitivity to unpleasant odors. The aim of our study is to evaluate patients with major depression after 3 months of treatment using olfactory functional MRI.
Methods and Materials: 10 subjects with major depression according to DSM-V criteria were included during 15 months. Olfactory functional MRI (using BOLD method) was performed before and after 3 months of treatment. 3 scents were used: spearmint for pleasant odor, sandalwood for neutral odor and wine lee for unpleasant odor. Data processing and statistical analysis was executed using matlab software (linear regression and t student test). We performed individual analysis for every scent for the limbic lobe and for every cluster, and global analysis.
Results: 10 patients were including during 15 months. There were 80% of women with a medium age of 36.7 years old ± 14.9 (18-65). For the global analysis, 100% of patients show activation for wine lee versus 80% for spearmint and sandalwood with high Zscore superior to 2. For the individual analysis, after 3 months of treatment, we observe a significant difference of activation for wine lee scent, for anterior cingulum and para-hippocampic gyrus ($p<0.05$ and Zscore > 2).
Conclusion: Olfactory functional MRI shows a significant difference of activation for unpleasant odors in patients with major depression after 3 months of treatment. The structures mostly involved in this mechanism seem to be the cingular gyrus with the anterior cingulum.

10:30 - 12:00 **Room M 2**

Paediatric

SS 212

Brain and neck

Moderators:
D. Prayer; Vienna/AT
N.N.

B-0163 10:30

Arterial spin labeling predicts cerebellar tumour grading in children: correlations between histopathological vascular density and perfusion MRI

V. Dangouloff-Ros[1], C. Deroulers[2], E. Shotar[1], D. Grévent[1], R. Calmon[1], S. Puget[1], F. Brunelle[1], P. Varlet[1], N. Boddaert[1]; [1]*Paris/FR*, [2]*Orsay/FR*

Purpose: Morphological MRI remains insufficient in preoperative grading of paediatric brain tumours. We compared Arterial Spin Labeling (ASL) data between low and high-grade children cerebellar tumours, and looked for cut-off distinguishing it. We correlated cerebral blood flow (CBF) with quantitative histological microvascular data.
Methods and Materials: We retrospectively analysed ASL in 85 children with posterior fossa tumours (29 pilocytic astrocytomas, 33 medulloblastomas, 9 ependymomas, 14 rare tumours). We quantified CBF and relative-CBF (rCBF) in the most perfused area of each neoplasm, and contrast enhancement using a semi-quantitative ratio. We analysed the correlation between CBF and microvascular density, for specimens immunostained with anti-CD34.
Results: CBF was significantly higher for high-grade neoplasms than for low-grade tumours ($p < 0.0001$). For an equal CBF, low-grade tumours displayed higher contrast uptake. Therefore, the use of a ratio of CBF over contrast enhancement to grade tumours gave a sensitivity and specificity of 96% and 97%. Using a simple algorithm based on these values to grade cerebellar brain tumours gave an accuracy of 94% in our cohort. Lesions with a CBF over 50 mL/min/100 g (or a rCBF at 1.00) are classified high-grade, whereas less than 25 mL/min/100 g (rCBF 0.60) indicates a low-grade lesion. Between these values, the addition of the contrast enhancement ratio in the algorithm is needed. CBF was strongly correlated with microvascular density ($R=0.66$; $p < 0.0001$).

Conclusion: Our ASL algorithm provides a powerful tool to grade paediatric brain tumours using quantitative and easily measurable data. This non-invasive technique could help manage children for preoperative assessment and follow-up.

B-0164 10:38

Dynamic susceptibility-weighted contrast-enhanced (DSC) perfusion MR imaging in paediatric neuro-oncology, first step: a clinical feasibility study

M. Martucci, A. Botto, G.M. Di Lella, E. Ruberto, R. Russo, T. Verdolotti, S. Gaudino, C. Colosimo; *Rome/IT (matia.martucci@gmail.com)*

Purpose: Dynamic susceptibility-weighted contrast-enhanced perfusion (DSC-PWI) is rarely used to assess paediatric brain tumours (BT), because of several challenges: obtaining proper venous accesses, reaching high-flow contrast injection, producing compact bolus, guaranteeing patient immobility. We investigated the feasibility of DSC-PWI in paediatric BT, using lower bolus injection rates (3-4 mL/s), variable venous accesses (arm, foot, hand) and a standard dose (0.1 mmol/kg) of gadolinium (gadobutrol).
Methods and Materials: DSC-PWI (1.5 T; GE-EPI) was performed in 25 patients with histologically proven BT. Age, weight, catheter gauge and location, sedation and contrast infusion parameters were recorded. Arterial bolus quality was evaluated basing on signal intensity-time curves, using a five-point-scale (no, poor, moderate, good, excellent). Qualitative and quantitative assessment of CBV were performed from ROIs in gray and white matter. Percentage of signal drop (PSD) and the full width half-maximum (FWHM) were determined from the signal time curves.
Results: Patients (10M, 15 F): mean age 10.1±4.8 yrs, mean weight 41.9±16.1 kg. DSC-PWI: 14 Pts @4 mL/s with 20-ga catheter (9arms, 5hands), 11 Pts @3 mL/s with 22-ga (4arms, 2feet, 5hands). Sedation in 13 pts (≤8 yrs). Arterial bolus quality resulted excellent in 22 Pts (88%, n=14@4 ml/s and n=8@3 ml/s) and good in 3 Pts (12%, n=3@3 mL/s). Qualitative assessment of CBV maps always revealed excellent white to gray matter differentiation. PSD resulted 40-45%, FWHM ranged from 6s to 7s, without significant differences between 3 ml/s and 4 ml/s flow rate.
Conclusion: In paediatric population, a standard dose of gadolinium allows obtaining high quality DSC-PWI, even using lower flow rates, smaller catheters and different venous accesses.

B-0165 10:46

Paediatric CNS T1 shortening after gadolinium: influence of radiation and chemotherapy

S. Kinner, T.B. Schubert, S. Rebsamen, R. Bruce, S. Reeder, H. Rowley; *Madison, WI/US (SKinner@uwhealth.org)*

Purpose: Intrinsic T1 hyperintense signal has been noted on MRI in deep brain nuclei of adults after multiple doses of gadolinium-based contrast agents. The aim of this retrospective study was to investigate if similar signal changes are observed in children.
Methods and Materials: In this IRB-approved single-centre retrospective study, we reviewed the medical charts and images in 76 children (range 0-18 years; mean 9.3 years) who underwent at least 4 contrast-enhanced MRIs (range 4-20; mean 8) between 2009 and 2015, all using gadobenate. Sixteen patients had posterior fossa tumours (PFT) treated with radiation and/or chemotherapy (RCTX) and 60 were unconfounded by such treatment. T1 signal intensity and signal intensity ratios for dentate-to-pons (DNP) and globus pallidus-to-thalamus (GPT) were calculated, and correlated with number of contrast injections as well as time interval.
Results: 12 of the 16 patients with PFT and RCTX (n=10-20 injections) had deep grey hypterintensities whilst only 2/60 patients (n=20 and n=16 injections) without confounders were positive. Chart review revealed no obvious pattern of clinical deficits (e.g. movement disorders) in the children with hyperintensity. Statistical analysis showed a statistical significant change in signal ratio change for number of scans ($p < 0.001$), but not for the time interval (p=0.353). There was a significance difference in average change in ratio over time between those with CRTX and those without ($p < 0.001$).
Conclusion: There is a correlation between number of ce-MRIs and apparently asymptomatic T1 signal hyperintensity of deep brain nuclei in children, and radiation and/or chemotherapy for posterior fossa tumours accelerates this appearance.

B-0166 10:54

Subarachnoid/subdural hyper-intensity on diffusion-weighted MRI predicts severe brain parenchymal injury in children with meningitis?

Z. Qiao; *Shanghai/CN (qiaozhwei@163.com)*

Purpose: To explore the significance of subarachnoid/subdural hyperintensity (SAHI) on DW-MRI in predicating the brain damage of children with meningitis.
Methods and Materials: Sixty-nine children with clinically diagnosed meningitis were enrolled in this study, including 46 boys and 23 girls (age range:10 days to 12 years old). All of them had MRI examinations during hospitalized. The sign of SAHI was identified on each patient's DW images, and the patients were divided into SAHI positive group (Group A, n=36) or SAHI negative group (Group B, n=33). The brain parenchymal lesions including infarct/hypoxia, abscess, and encephalomalacia were identified on T1W, T2W, Tirm and DW images. Brain patterns with the differences of ADC values between Group A and Group B were analysed by using a Matlab script with the Mann-Whitney U test and False Discovery Rate (FDR) methods.
Results: Twenty-eight of 69 patients (22 in Group A, 6 in Group B) demonstrated macroscopic brain lesions including brain infarction/hypoxia (n=10), abscess (n=6) and encephalomalacia (n=7). There was a significantly higher frequency of macroscopic brain damage in patients in Group A compared to Group B ($p < 0.01$). The areas with significant differences of ADC values between Group A and Group B were localized to the cerebral posterior regions - the Group A patients showed significantly lower ADC values compared to the Group B ones in occipital lobes.
Conclusion: The SAHI on DW-MRI in children with meningitis may predict much more severe brain parenchymal damage and the reduced water diffusion in the posterior regions of cerebral parenchyma.

B-0167 11:02

Safety of gadoteric acid in over 1,600 children included in a prospective observational study

M. Hackenbroch, D. Chang, D. Maintz; *Cologne/DE (Matthias.Hackenbroch@uk-koeln.de)*

Purpose: To assess the safety profile of gadoteric acid in routine practice.
Methods and Materials: More than 35,000 unselected patients scheduled for gadoteric acid (Dotarem®)-enhanced magnetic resonance imaging (MRI) were prospectively enrolled worldwide in the study SECURE. Risk factors, MR indications, adverse events were systematically recorded. The analysed population involved a paediatric subset of 1,631 children of all ages including 106 children (6.5%) aged 0-2 years. Patients with moderate to severe renal impairment (n=515, including 3 children) had to be followed-up for at least 3 months for detection of any Nephrogenic Systemic Fibrosis (NSF) suspicion.
Results: In children (53.5% male, mean age 10.2 years), Central Nervous System (CNS) explorations (78.1%) was the most frequent MRI indication and main risk factors were CNS disorders (16.4%), impaired renal function (9.8%, estimated creatinine clearance or eGFR range 28 - 89 mL/min (/1.73m²)) and allergies (5.2%). Only one adverse event (mild non-serious vomiting) that was deemed doubtfully related to gadoteric acid was described in a 2-year-old child (< 0.1%) with brain tumour. Follow-up data could be retrieved for 477 patients (92.6%) with impaired renal function, including the 3 children, without reports of NSF suspicion.
Conclusion: The very good safety profile of gadoteric acid was confirmed in a broad paediatric population.
Author Disclosures:
M. Hackenbroch: Grant Recipient; Travel Grant. Research/Grant Support; Research Grant.

B-0168 11:10

Isolated and syndromic corpus callosum dysgenesis (CCD): diagnostic value of foetal MRI

S. Bernardo, V. Vinci, M. Saldari, E. Marchionni, A. Antonelli, A. Pizzuti, C. Catalano, L. Manganaro; *Rome/IT (silviabernardo@live.it)*

Purpose: The purpose of this study is to define the role of foetal magnetic resonance imaging (MRI) in the differential diagnosis of isolated and syndromic CCD, in particular associated with parenchymal dysplasia.
Methods and Materials: We retrospectively included 103 pregnancies with an ultrasonographic diagnosis of CCD. At MRI, the mean gestational age was 26 GW (range 18-38 GW). MRI was able to distinguish between isolated or syndromic CC anomalies and added data about the entity of the dysgenesis.
Results: In all of our cases, T2-W imaging demonstrated a well-defined cerebral anatomy. We divided the sample of isolated and syndromic CCD in: complete CC agenesis, partial CC agenesis and CC hypoplasia. We found 77 syndromic and 26 isolated CCD with an high accuracy (92%), even in the early stage of pregnancy (< 24 gw). The outstanding result of our study is the correlation between CCD and parenchymal abnormalities such as cortical dysplasias, gyration's defects (polymicrogyria, oligo-lissencephaly, schizencephaly), subependymal heterotopies and migration abnormalities, with

a 7 more times risk of association in foetuses with complete CC agenesis (p value 0.01). All data were compared to those obtained with post-natal MRI or pathology, depending on the mothers' decision to continue or interrupt the pregnancy.
Conclusion: Foetal MRI is an additional imaging modality in the diagnosis of corpus callosum malformation and is useful in providing further information on the extension of the parenchymal anomalies and associated abnormalities, thus improving clinical and genetic counselling, even for the subsequent pregnancies.

B-0169 11:18

Application of 3D cranial ultrasonography for follow-up of neonates: can it replace follow-up 2D cranial ultrasonography?

Y. Kim, Y. Choi, J.-E. Cheon, H. Choi, T. Kim, H. Cho, J.-E. Park, W. Kim, I.-O. Kim; *Seoul/KR (youkio97@naver.com)*

Purpose: To assess the usefulness of 3D cranial ultrasonography (3DUS) acquired by an inexperienced operator and then reviewed by a paediatric radiologist in comparison with the conventional ultrasonography (2DUS).
Methods and Materials: From May 2015 through June, a total of 21 consecutive neonates (9 boys and 12 girls, median age of 33.8 days) who underwent a follow-up 2DUS and 3DUS on the same day were enrolled. In our routine practice, an experienced paediatric radiologist performs the 2DUS scan and generates a formal radiology report. Additionally, an additional coronal 3DUS scan was performed by an inexperienced operator and was retrospectively reviewed by a paediatric radiologist regarding the following findings: the presence of germinal matrix hemorrhage (GMH), intraventricular hemorrhage (IVH), ventriculomegaly (VM), abnormality of periventricular echogenicity (PVE), and focal parenchymal lesion (FL). Thereafter, the findings on 3DUS were compared with the formal radiology reports. The concordance rates between 2DUS and 3DUS and the acquisition times for each scan were calculated. Overall image quality of each scan was assessed using a 5-point scale.
Results: The concordance rates between 2DUS and 3DUS concerning the five US findings were high (all were more than 90%). The mean acquisition time for 2DUS was 279 seconds (range, 137-673 seconds), while that of 3DUS was about 36 seconds (range, 22-54 seconds). Both scans were scored as acceptable for interpretation (mean image quality score, 4.8 for 2DUS, and 4.4 for 3DUS).
Conclusion: In the case of follow-up cranial ultrasonography, 3DUS could be a good alternative to conventional 2DUS.

B-0170 11:26

Intraoperative navigated neuroultrasound in elective and urgent enfant and paediatric neurosurgery

A. Hambardzumyan, N.H. Dallakyan; *Yerevan/AM (andrias_h@hotmail.com)*

Purpose: Brain anatomical structure do not allow paediatric neurosurgeons during the surgery visualize inner pathologies. Intraoperative direct monitoring can decrease iatrogenic damaging of kid brain structures.
Methods and Materials: Intraoperative navigation neuroultrasound - INUS was performed in a group of 12 patients from 1 months to 12 years. We used sector and linear ultrasound probes in Gray-scale, Colour Doppler, Power Doppler at 5 elective and 7- urgent surgery. Elective surgeries were carried out in 2 children with cerebral abscess removal and for 3 - with abscess drainage. We did INUS after craniotomy, before cortex incision, needle insertion, mass removal and 5, 15, 30 minutes after draining. Urgent surgery was performed in patients with increased intracranial pressure. Ultrasound follow-up was done on the 3, 6, 12, 18 days after surgery.
Results: Elective INUS was performed after craniotomy. INUS allow precisely defining the topic of trepanation, evaluation of the pathological mass, nearby and inner blood vessels, needle insertion, area of dissection of the cerebral cortex, monitoring of abscesses removing or drainage. In all 7 urgent cases performed INUS provide precise puncture and drainage of the brain ventricles.
Conclusion: INUS contribute the accuracy in elective and urgent infants and paediatric neurosurgery in all its steps, with less trauma of normal brain structures. Real-time INUS helps neurosurgeons to avoid blind zones, reduce the operation time and improve infant and paediatric recovery.

B-0171 11:34

Evaluation of parotid glands with real-time ultrasound elastography in children

G. Gungor[1], N. Yurttutan[1], N. Bílal[1], M.S. Menzilcioglu[2], M. Duymus[2], S. Avcu[2], S. Citil[1]; [1]*Kahramanmaras/TR*, [2]*Ankara/TR (mahmutduymush@gmail.com)*

Purpose: The aim of this study was to determine the strain index (SI) of parotid glands in children using ultrasound elastography.
Methods and Materials: In this prospective study, the apparently healthy children were referred from the ear-nose-throat clinic to the radiology clinic for US elastography examination. Conventional and elastographic US examinations of the parotid glands were performed using HI VISION Preirus model US device. 5-12 MHz multi-frequency transducer was used to obtain the images.
Results: A total of 54 children was enrolled in this prospective study. The normal SI values of the parotid glands was 1.24±0.67 (0.29-1.39) regardless of gender. The mean age of girls was 7.42±2.94 years (3-14 years), and boys were 8.50±3.46 years (4-16 years). The SI values of parotid glands for boys was 1.25±0.76, and for girls was 1.22±0.55. There was no statistically significant difference in the SI values, between girls and boys (p=0.986). There was no correlation between SI and age (correlation coefficient was 0.026) - or BMI (correlation coefficient was 0.066).
Conclusion: The present study determined the mean SI values of apparently normal children. Such information can serve as a baseline from which pathological parotid diseases can be examined. US elastography has potential for use in the evaluation of various parotid pathologies in children, and the combination of sonographic and elastographic criteria can be used as part of a routine diagnostic head and neck sonography. In addition, the optimal mean SI of the parotid gland may shed light on other parotid gland abnormalities in children.

B-0172 11:42

Ultrasonographic differentiation between thyroglossal duct cyst and dermoid cyst in children

H. Choi, Y. Choi, J.-E. Cheon, W. Kim, I.-O. Kim, S. Jang; *Seoul/KR (junemiru@gmail.com)*

Purpose: Because the surgical treatment is different between thyroglossal duct cyst (TGDC) and dermoid cyst, correct sonographic diagnosis is important. The purpose of this study was to compare the sonographic features between TGDC and dermoid cyst in children who presented with anterior neck mass.
Methods and Materials: From 2004 to 2015, a total of 66 children with the diagnosis confirmed histologically after surgical resection and who underwent ultrasonography preoperatively (50 with TGDC and 16 with dermoid cyst) were included in this study. Two radiologists blinded to pathologic diagnosis reviewed ultrasound images in consensus. The ultrasonographic features were compared between TGDC and dermoid cyst.
Results: Ultrasonographic features more specific to TGDC were; irregular shape (44.0% vs. 0%), ill-defined margin (24.0% vs. 0%), a thick identifiable wall (30.0% vs. 0%), location deep to the strap muscles (50.0% vs. 12.5%), attachment with the hyoid bone (62.0% vs. 25.0%) and heterogeneous internal echogenicity (36.0% vs. 6.2%). Internal septation (18%) and Dopper signal (16%) were noted only in TGDC, even though they were not statistically significant. The echogenic dots were more frequently seen in dermoid cyst (77.8% vs. 22.2%).
Conclusion: Ultrasonography can help making the differential diagnosis between TGDC and dermoid in children. More complex sonographic features, deep location to the strap muscles and attachment with the hyoid bone were significantly associated with TGDC. On the contrary, dermoid cysts were ovoid in shape, well-defined and tend to show echogenic dots and to be located away from the hyoid bone and in the subcutaneous layer.

B-0173 11:50

Diagnostic reference levels for emergency head CT in paediatric patients

Z. Vawda, W. Groenewald, J.M. Akudugu, R.D. Pitcher; *Cape Town/ZA (zvawda@vodamail.co.za)*

Purpose: To establish local diagnostic reference levels (LDRLs) for emergency paediatric head computed tomography (CT) scans performed at a South African (SA) tertiary-level hospital and to compare these with published data.
Methods and Materials: A retrospective analysis was conducted of volume based CT dose index (CTDIvol) and dose length product (DLP)data from un-contrasted paediatric head CT scans performed in the Trauma and Emergency Unit of a tertiary-level SA hospital from January through June 2013.A random sample of 30 patients in each of three age groups (0-2, 2-5 and 5-10 years) was used. LDRL values were compared with several national DRLs from Europe and Australia.
Results: Mean CTDIvol and DLP values were: 30 mGy and 488 mGy.cm for the 0-2 years age group; 31 mGy and 508 mGy.cmfor the 2-5 years group, and 32 mGy and 563 mGy.cmfor the 5-10years group, respectively. The mean DLP for 0-2 year-olds was the only parameter outside the range of corresponding published reference data. Stratification into narrower age groupings showed an increase in DLP values with age.
Conclusion: An institutional review of the head CT scanning technique for emergency studies performed on children less than 2 years of age is recommended. This study highlights the role of LDRLs in establishing institutional dosimetry baselines, in refining local imaging practice and in enhancing patient safety. Standard age stratification for DRL and LDRL reporting is recommended.

10:30 - 12:00 **Room M 3**

Cardiac

SS 203b

The evolving role of cardiac CT

Moderators:
F. Cademartiri; Rotterdam/NL
G. Feuchtner; Innsbruck/AT

K-01 10:30

Keynote lecture
F. Wolf; Vienna/AT

B-0174 10:39

C.S.I., coronary scene investigation: plaque composition analysis in a STEMI population

S.R. Fuller, D. Caruso, S. Hinen, J.L. Wichmann, C.N. De Cecco, S. Mangold, C. Tesche, A. Varga-Szemes, U.J. Schoepf; *Charleston, SC/US (fullerst@musc.edu)*

Purpose: To retrospectively evaluate pre-STEMI coronary CT for culprit plaque composition in a population with known STEMI using prototype software.
Methods and Materials: From an initial population of 28, we evaluated 13 patients who underwent coronary CT before STEMI, excluding patients with coronary stents or CABG. Culprit lesions were identified in consensus by two readers and prototype software (FRONTIER, Siemens) was used to assess culprit plaque composition (calcified, fibrotic, lipid rich) based on attenuation thresholds. Plaque analysis was performed on a per-segment, per-vessel, and per-culprit plaque basis.
Results: In both the per-segment and per-vessel analysis, vessel reduction was to less than 50% in our STEMI population. The average time from coronary CT to myocardial infarction was 31.2 ± 2.3 months. When analyzing all segments, the most prevalent component of plaques was fibrotic (73%), while the lipid rich component comprised only 21%. When the analysis was restricted to culprit plaques, the lipid rich component increased to 45% ($p < 0.001$).
Conclusion: The lipid rich component of culprit plaques is increased compared to plaques from all segments in a STEMI population.
Author Disclosures:
U.J. Schoepf: Research/Grant Support; Bayer, Bracco, GE Healthcare, Medrad, Siemens.

B-0175 10:47

Diagnostic accuracy of coronary CT angiography with 3rd generation dual-source CT and automated tube voltage selection: clinical application in a non-obese and obese patient population

S. Mangold[1], J. Wichmann[1], C.N. De Cecco[1], A. Varga-Szemes[1], D. Caruso[1], Z. Poole[1], S. Fuller[1], K. Nikolaou[2], U.J. Schoepf[1]; [1]*Charleston, SC/US*, [2]*Tübingen/DE (Steffi_Mangold@live.de)*

Purpose: To investigate diagnostic accuracy of dual-source CT (DSCT) coronary angiography in non-obese and obese patients using a 3rd generation DSCT system.
Methods and Materials: We evaluated 76 patients (31 female; mean age 63.6±10.0 years) who underwent coronary CT angiography (CCTA) with a 3rd generation DSCT and invasive coronary digital subtraction angiography (DSA) within a time period of 15 days to the CCTA study. Prospectively ECG-triggered spiral acquisition was performed with automated tube voltage and tube current selection and advanced iterative reconstruction. Bodymass index (BMI) was recorded and patients were classified in group 1 (n=37, BMI< 30 kg/m2) and group 2 (n=39, BMI ≥30 kg/m2). On CCTA and DSA coronary arteries were assessed for significant stenoses (≥50% luminal narrowing) using a 16-segment model. Accuracy of lesion detection was calculated using invasive DSA as the standard of reference.
Results: A total of 1079 coronary artery segments were evaluated. Sensitivity, specificity, positive predictive value, negative predictive value, and accuracy were 90.6%, 81.8%, 80.4%, 92.3% and 85.5% per patient, 86.0%, 94.1%, 81.8%, 96.5% and 92.5% per vessel and 82.5%, 96.9%, 81.5%, 98.3% and 96.1% per segment. Between the groups no significant differences were found for sensitivity (p=0.8187, 0.5745 and 0.9043) and specificity (p=0.6959, 0.9174 and 0.5149). Mean tube voltage and effective dose were significantly lower in group 1 compared to group 2 (97.0±17.3 vs 108.9±14.5 kV, p=0.0015 and 3.7±3.5 vs 7.9±6.0mSv, p=0.0011).
Conclusion: Our results demonstrate that CCTA using a 3rd generation DSCT system and automated tube voltage selection provides high diagnostic accuracy in non-obese and obese patients.
Author Disclosures:
U.J. Schoepf: Research/Grant Support; Bayer, Bracco, GE Healthcare, Medrad, Siemens Healthcare.

B-0176 10:55

Contrast media reduction in CT-angiography of coronary artery bypass grafts

K. Higashigaito, A. Plass, D. Husarik, F. Maisano, H. Alkadhi; *Zurich/CH (Kai.Higashigaito@usz.ch)*

Purpose: To evaluate the potential of contrast media (CM) reduction in high pitch CT-angiography (CTA) of coronary artery bypass grafts with automated attenuation-based tube voltage selection (ATVS).
Methods and Materials: 60 patients (mean age 71±14.5years) with a total of 176 bypass grafts underwent prospectively ECG-gated high-pitch CTA with ATVS (ref.kVp=100;ref.mAs=200) with third generation 192-slice dual-source CT which allows for tube energy settings from 70-150 kVp at 10 kVp steps. CM volume was adapted according to selected tube voltage using iodine attenuation-curves derived from a phantom study. In-vivo, CM volume and injection rate ranged from 80 ml and 7 ml/s at 120 kVp to 48 ml and 4.2 ml/s at 80 kVp. Two independent, blinded readers evaluated image quality of anastomoses, graft body, and postanastomotic coronary arteries on a three-point Likert-scale. Objective image quality (attenuation of graft and CNR) was determined. CTDIvol and DLP were noted. Cohen's kappa was calculated to evaluate inter-reader agreements. Linear regression analysis was used to assess relationships between selected tube voltage and vascular attenuation/CNR.
Results: Agreements between readers were good (κ=0.678). Five patients were imaged at 80 kVp, 22 at 90 kVp, 11 at 100 kVp, 10 at 110 kVp, and 12 at 120 kVp. Diagnostic image quality was achieved in 98.7% bypass segments. Regression analysis revealed no significant relationship between selected tube voltages and vascular attenuation (p=0.315) and CNR (p=0.168). Mean CTDIvol was 4.0± 0.9 mGy; mean DLP was 135±29.6 mGy*cm.
Conclusion: CM reduction is possible for high pitch CTA of coronary artery bypass grafts when adapting volumes and flow rates to automatically selected kVp-levels, maintaining diagnostic image quality.

B-0177 11:03

Preliminary study on high-pitch dual-source CT coronary angiography with low contrast volume injection protocols at ultra low tube voltage (70 kV)

Y. Yi, Y.-N. Wang, J.-M. Liu, J. Cao, Y. Wang, Z.-Y. Jin; *Beijing/CN (xy_yiyan@sina.com)*

Purpose: To investigate the feasibility and diagnostic value of high-pitch coronary artery CT angiography (CCTA)at 70 kV with low iodine concentration contrast, contrast volume and injection flow rate protocols in combination with sinogram affrmed iterative reconstruction (SAFIRE),in comparison with filtered back projection (FBP).
Methods and Materials: 126 patients (84 with BMI< 25, 42 with 25<BMI≤28; HR≤80/min)with suspected or known coronary artery disease were recruited. The former 84 patients were randomly divided into Group A (n=22), B1 (n=20), C (n=22) and D1 (n=20). The latter 42 patients were randomly divided into Group B2 (n=21) and D2 (n=21). The injection flow rate+volume protocols of contrast for each group were: 2.5 ml/s+25 ml (300 mgI/ml) for Group A; 4.0 ml/s+40 ml (300 mgI/ml) for Group B; 2.5 ml/s+25 ml (350 mgI/ml) for Group C; 4.0 ml/s+40 ml (350 mgI/ml) for Group D. All the patients were scanned with prospective high-pitch CCTA on DSCT at 70kv.The raw data were reconstructed with SAFIRE and FBP. The age, BMI, heart rate, thickness of prethoracic adipose, estimated heart volume, Size Specified Dose Estimates of CT Dose Index (SSDE-CTDIvol) and effective radiation dose (ED) based on patient and background noise, signal-to-noise ratio (SNR), contrast to noise ratio (CNR), Image quality based on segment were evaluated and compared.
Results: There were no significant difference in baseline characteristics among the 4 groups (all P> 0.05) and the mean ED was about 0.20mSv. With SAFIRE, there were no significant difference in the noise, SNR, CNR of each segment in each coronary artery (P> 0.05) for subgroup B1 and D1, B2 and D2 or groupC and subgroup D1; and the SNR, CNR of each segment in each coronary artery in subgroup B1 or group C were significantly higher than that in group A (both $P < 0.05$). The percentage of assessable segments in all groups were more than 98%.
Conclusion: Under 70 kV high-pitch scan with SAFIRE in DSCT equipped IC detector, for patients with 25<BMI≤28, the injection flow rate and volume protocol of 4.0 ml/s+40 ml (300 mgI/ml) is feasible; for patients with BMI≤25, the protocol of 2.5 ml/s+25 ml (350 mgI/ml) is feasible.

B-0179 11:11

The impact of different fat compartments on the presence of coronary artery disease

Z.D. Drobni, M. Kolossvary, D. Horcsik, J. Karady, A. Jermendy, A.D. Tarnoki, G. Jermendy, B. Merkely, P. Maurovich-Horvat; *Budapest/HU (zsofi.drobni@gmail.com)*

Purpose: Previous studies suggested a pathophysiological link between ectopic adipose tissue depots and coronary artery disease (CAD). We sought to assess the relationship between epicardial fat volume (EFV), subcutaneous adipose tissue area (SAT), visceral adipose tissue area (VAT) and the presence of CAD as assessed by coronary CTA.
Methods and Materials: We included subjects from the BUDAPEST (Burden of Atherosclerotic Plaques Study in Twins) study and from the Hungarian Twin Registry. Readers assessed every coronary artery segment for the presence of atherosclerotic plaque. We classified the patients into CAD and no CAD groups, and calculated the segment involvement score (SIS: total number of segments with any plaque). In addition, we measured the EFV on the coronary CTA dataset and the SAT, VAT on a single CT slice acquired at the L3/L4 level.
Results: In total, we included 195 asymptomatic subjects with no history of CAD (mean age: 56.1±9.4, female 64.1%). 106 participants had any plaque with a median SIS of 3.0 (IQR: 1.0-5.0). We used robust maximum likelihood-estimated clustered standard errors correcting for family clustering. Logistic regression was performed to assess the independent predictors of the presence of CAD. The EFV (odds ratio [OR]:1.32; p=0.001), age ([OR]:1.1; $p < 0.001$), male ([OR]:10.0; $p < 0.001$), and hypertension ([OR]:3.3; $p < 0.05$) are independent predictors of CAD.
Conclusion: Independent of the traditional risk factors EFV is associated with the presence of CAD. This finding supports the hypothesis that EFV promotes coronary atherosclerosis development.

B-0180 11:19

Coronary computed tomographic angiography at 80 kVp and knowledge-based iterative model reconstruction is non-inferior to that at 100 kVp with iterative reconstruction

J. Lee, C. Park, T. Kim; *Seoul/KR (anathajh@yuhs.ac)*

Purpose: The objectives were to compare image noise and quality of coronary computed tomographic angiography (CCTA) at 80 kVp with a knowledge-based iterative model reconstruction (IMR) to those of CCTA at 100 kVp with iterative reconstruction (IR), and to evaluate the feasibility of a low radiation dose protocol with IMR in non-obese subjects.
Methods and Materials: Thirty subjects who underwent prospective electrocardiogram-gating CCTA with 80 kVp, 150 mAs, and IMR (Group A), and 30 subjects with 100 kVp, 150 mAs, and IR (Group B) were retrospectively enrolled. A BMI less than 25 kg/m^2 was required for inclusion. The attenuation value and image noise of CCTA were measured, and the SNR and CNR were calculated at the pRCA and LM. The image noise was analysed using a non-inferiority test. The CCTA images were qualitatively evaluated using a four-point scale.
Results: The radiation dose was significantly lower in Group A than in B (0.69±0.08 mSv vs. 1.39±0.15 mSv, $p < 0.001$). The attenuation values were higher in Group A than in B ($p < 0.001$). The SNR and CNR in Group A were higher than those of Group B. The upper limit of the two-sided 95% confidence interval (CI) of the mean image noise difference was greater than the pre-defined non-inferiority margin of 5.0 (95% CI: -3.56-2.41) supporting the non-inferiority of image noise in Group A.
Conclusion: A low radiation dose protocol and IMR could reduce the dose of CCTA whilst maintaining image quality.

B-0181 11:27

Coronary CT angiography: patient-related factors determining image quality using a volumetric CT scanner

O. Ghekiere[1], A. Nchimi[1], J. Djekic[1], M. El Hachemi[1], M. Isabelle[1], D. Hansen[2], P. Vanhoenacker[3], A. De Roos[4], P. Dendale[2]; [1]*Liège/BE*, [2]*Hasselt/BE*, [3]*Aalst/BE*, [4]*Leiden/NL (olivierghekiere@gmail.com)*

Purpose: To investigate the effect of patient-related factors on Coronary Computed Tomography Angiography (CCTA) image quality using a last-generation volumetric scanner.
Methods and Materials: 200 consecutive patients (mean age 60 ± 12 years; 108 men) underwent CCTA. Two readers scored motion-related image quality using a 4-point scale, as diagnostic (excellent (grade 1) and good (grade 2)) and non-diagnostic (moderate (grade 3) and poor image quality (grade 4)). The effect of patient-related factors on image quality were investigated by multinomial logistic regression including gender, age, body mass index (BMI), heart rate (HR), coronary artery calcium score and diameter.
Results: The mean BMI was 27.1±4.9 kg/m²; the mean HR was 61.4±11.9 beats per minute (bpm), including 31 patients with HR> 70 bpm. The mean coronary calcium score and segment's diameter were 300±523 and 2.85±0.86 mm respectively. 2500/2505 (99.8%) coronary segments had diagnostic image quality; interobserver agreement was good (κ=0.61). Increasing coronary diameter was a more important factor improving image quality (odds ratio (OR), 1.86; $p < 0.001$), then lower HR (OR, 1.00; $p < 0.05$) and calcium score (OR, 1.00; p0.05).
Conclusion: The coronary diameter is the most important patient-related factor impacting CCTA image quality using a last-generation volumetric scanner. HR and calcium score have lower impact, whereas gender, age and BMI have none.

B-0182 11:35

A vulnerability marker for coronary artery plaque using ECG-gated CT histographic analysis: comparison with intravascular ultrasound (IVUS)

C. Lim[1], J. Park[1], J. Lee[1], E.-J. Kang[2]; [1]*Taegu/KR*, [2]*Busan/KR (chungun100@gmail.com)*

Purpose: To develop and validate a new vulnerability marker (V-marker) for coronary artery plaque, based on histographic distribution and stratified HU acquired during CT coronary angiography (CTCA).
Methods and Materials: Forty-one plaques from 30 patients examined by CTCA and IVUS were included in this study. Using a freeware (ImageJ), 2-dimensional plaque segmentations were manually performed to include whole plaque volume. Per plaque level, a pixel count-HU scatter plot was acquired. HU axis was stratified to three zones: -40 HU - 40 HU, 41 HU - 120 HU, and 121 HU - 1500 HU. Pixel count axis was divided to three same-sized zones. To enhance fat-equivalent density, 9 zones by pixel count - HU matrix were multiplied by weighting factors from 1 to 9. The V-marker was validated using ANOVA test based on IVUS plaque classifications: lipid-rich, fibrous, and calcified plaques.
Results: From IVUS data, 5 lipid-rich, 7 fibrous, and 29 calcified plaques were depicted. The V-markers showed significantly different mean values among the three groups (5.68±0.67, 4.11±0.75, and 2.27±0.36, respectively, $p < 0.0001$). Although mean HUs showed significant differences (67±37 HU, 131±59 HU, and 691±267 HU, respectively, $p < 0.0001$), less overlaps of 95% confidence interval were noted in the V-marker than mean HU method.
Conclusion: A new vulnerability marker for coronary artery plaque was developed and validated to be feasible. The V-marker could reliably predict IVUS-diagnosed lipid-rich plaques during CTCA.

B-0183 11:43

Differences in aortic valve area estimation due to left ventricular outflow tract area discrepancy measured by transthoracic echocardiography and CT planimetry

J. Fijalkowska, D. Galaska, J. Pienkowska, B. Regent, K. Dziadziuszko, R. Galaska, E. Szurowska, M. Fijalkowski; *Gdansk/PL (jagfijal@gmail.com)*

Purpose: Aortic valve area (AVA) is estimated by echocardiography (TTE). Patients qualified for transcatheter aortic valve implantation (TAVI) routinely undergo computed tomography (CTA). The purpose of this study was to compare estimation of AVA calculating by use of LVOT area obtained with TTE and CTA.
Methods and Materials: 20 patients (81±5 years,15 women) who underwent CTA (SOMATOM Siemens) and TTE (Vivid E9, GE) within a one-week period before TAVI were selected. AVA was measured by TTE including the anterior-posterior LVOT diameter. LVOT area was planimetry calculated on CTA. To ascertain the effect of LVOT measurements on the continuity equation, AVA was recomputed with substitution of the LVOT area measured on CTA images.
Results: The mean AVA obtained by TEE was 0.66±0.16 cm2 and recalculated by CT LVOT area was significantly greater 0.80± 0.20 cm2 (p=0.039). The correlation between those two methods of AVA was not satisfactory, r=0.7. All patients on TEE group had significant stenosis (< 1.0 cm2), after recalculation three of them were shift to moderate aortic stenosis category. There was significant difference between TTE and CTA measurements of LVOT area and greater on CTA (3.07±0.44 cm2 vs. 3.84±0> 56 cm2 respectively, p=0.0002).
Conclusion: Differences in AVA estimation are determined by differences related to underestimation of the LVOT area measured by echocardiography. There is TEE assumption that the LVOT circuit is circular in fact in most cases is an oval. When data from CTA are available, it should be included whilst estimating AVA.

10:30 - 12:00 **Room M 4**

Oncologic Imaging

SS 216b

Advanced imaging methods (2)

Moderators:
C. Ayuso; Barcelona/ES
O.V. Kucheruk; Moscow/RU

B-0184 10:30

Impact of preoperative sarcopenia and visceral obesity, assessed through CT-scan imaging, on postoperative outcome in pancreatic cancer patients undergoing pancreaticoduodenectomy

A. Damascelli, G. Cristel, N. Pecorelli, G. Carrara, M. Braga, A. Del Maschio, F. De Cobelli; *Milan/IT (damascelli.anna@hsr.it)*

Purpose: To evaluate how preoperative body composition parameters, including sarcopenia and visceral obesity, assessed using computed tomography (CT) images, may impact on postoperative outcome in pancreatic cancer Patients treated with pancreaticoduodenectomy (PD).
Methods and Materials: Among 284 pancreatic cancer patients, treated with PD between 2010 and 2014, 202 underwent preoperative staging CT-scan imaging within 30-days before surgery and were included in this study. Total abdominal muscle area (TAMA), visceral fat area (VFA) and subcutaneous fat area (SFA) were assessed using Slice-O-Matic 5.0 software (Tomovision, Montreal, Canada); TAMA and VFA were evaluated on two contiguous slices at the third lumbar vertebra, using predefined Hounsfield unit threshold (skeletal muscle: -29 to -150; visceral adipose tissue: -150 to -50; subcutaneous /intermuscular fat: -190 to -30). Perioperative variables and postoperative outcomes were prospectively collected. Sarcopenia was defined using predetermined sex-specific cutoff values. Multivariate analysis was performed to identify independent predictors of 60-day mortality and PF.
Results: 132 (65.4%) patients were classified as sarcopenic. Postoperative mortality occurred in 12 patients (5.9%), major complications in 40 (19.8%) and pancreatic fistula in 48 patients (23.8%). At multivariate analysis, VFA/TAMA and ASA score = 3 were the strongest predictors of mortality ($p < 0.001$). Among patients who developed major complications, survivors had significantly lower VFA/TAMA ratio than non-survivors (p=0.017). VFA was an independent predictor of PF ($p < 0.001$).
Conclusion: preoperative CT assessment of sarcopenia and visceral obesity, using CT images, improve risk stratification in patients undergoing PD for cancer, predicting mortality and pancreatic fistula occurrence.

B-0185 10:38

Interval increase in lesion enhancement on hepatocellular phase gadoxetic acid enhanced MRI is associated with complete response to chemotherapy in colorectal liver metastases

S. Islam, R. Yinn, A. Riddell, H. Tam, D.-M. Koh; *London/UK (shahriar_islam@hotmail.com)*

Purpose: The aim was to determine whether the degree of enhancement on hepatocellular phase gadoxetic enhanced MRI and ADC before and after chemotherapy could identify pathologic complete responders in colorectal liver metastases (CRLM).
Methods and Materials: Retrospectively, 22 patients with CRLM treated with chemotherapy prior to resection were evaluated with gadoxetic acid enhanced MRI before and after chemotherapy. T1W and DWI were performed. Regions of interest were drawn encompassing metastases on T1W images and ADC map by an to record their average signal intensities (SI) and the average ADC value. We compared the median ADC value; pre-contrast and hepatocellular phase SI and their percentage change in pathologic complete and pathologic non complete responders before and after chemotherapy using Mann-Whitney test. Receiver operating curve characteristics (ROC) of these parameters were determined. A p-value of < 0.05 was deemed statistically significant.
Results: All patients received FOLFOX/FOLFIRI based-chemotherapy, while 8 received in addition bevacizumab. There were 37 CRLM at histology, of which 10 showed complete pathological response. There was a significant difference in the median percentage increase in the hepatocellular phase SI of CRLM after chemotherapy between pathologic complete responders (18%) and pathologic non complete responders (2.5%) ($p = 0.04$). By ROC analysis, an increase in the median hepatocellular phase SI of 6% after chemotherapy has a sensitivity of 85% (95%CI:55-98%) and specificity of 70% (35-93%) for identifying pathologic complete responders (p=0.03).
Conclusion: An interval increase in the hepatocellular phase normalized SI of CRLM is associated with pathologic complete response following neoadjuvant chemotherapy.

B-0186 10:46

Evaluation of primary and secondary liver lesions: dual energy CT (DECT) vs. MRI

T.J. Vogl, N. Ring, R. Bauer, M. Kerl; *Frankfurt a. Main/DE (t.vogl@em.uni-frankfurt.de)*

Purpose: To compare dual energy CT (DECT) with MRI in the diagnostic evaluation of primary and secondary liver lesions.
Methods and Materials: In 53 patients DECT was performed due to known or suspected primary and secondary liver lesions. In all patients signal-to-noise (SNR) and contrast-to-noise (CNR) was calculated for low kV-, high kV- and mixed-image series. An MRI was performed with a maximum of 4 weeks post DECT and no intervention in-between. Two radiologists evaluated the DECT and MRI by counting the detectable lesions in a color-coded iodine map, high kV- and low kV- and mixed-image series ranking them from 1 (best-image) to 4 (worst-image) and then comparing them by a Friedman-and-Conover-test.
Results: A statistically significant difference ($p < 0.001$) was found in SNR and CNR between mixed-image series, low kV and high kV-image. The mixed image series had the highest SNR (median:6.95) and CNR (median:3.77). A statistically significant difference (p=0.003) was shown for the amount of lesions detected in DECT and MRI with a higher maximum in MRI (9.00) vs. DECT (6.75). Statistically significant differences ($p < 0.001$) were seen for the ranking and comparison of image quality with the best results for the mixed-image series (median rank=1; median quality=2).
Conclusion: Regarding the amount of detected lesions MRI was superior to DECT. DECT showed best results for mixed-image series with a 120 kV image. Therefore it is important to reconstruct a mixed-image series in order to have optimum conditions regarding detection, classification and reevaluation of liver lesions.

B-0187 10:54

Hyperintensity on delayed-phase, gadobutrol-enhanced MRI is a significant predictor of survival in a nonsurgical population with colorectal liver metastases

H.M. Cheung, J. Kim, J.M. Hudson, L. Milot; *Toronto, ON/CA (hmc.cheung@mail.utoronto.ca)*

Purpose: To determine if delayed enhancement on gadobutrol-enhanced MRI can predict survival in a nonsurgical patient population with colorectal liver metastases (CRLM).
Methods and Materials: We performed an institutional-REB approved, retrospective study of all patients with CRLM, who received a gadobutrol-enhanced MRI between 2006-2014. Up to two target liver lesions (as defined by RECIST 1.1) were identified on 10-minute delayed phase and the mean lesion-liver contrast-to-noise ratios (CNRs) of the target lesion (s) were measured for each patient. Patients were dichotomized into those with strong MRI enhancement (mean CNR > 10) and weak MRI enhancement (mean CNR < 10). Kaplan-Meyer and Cox-Regression statistics were used to determine if MRI enhancement could predict survival after adjusting for potential confounders (age, sex, chemotherapy prior to MRI, location of primary, previous surgery, CEA level, and lesion size). Variables that did not contribute to the model were eliminated if they did not change the effect of MRI enhancement by more than 10%.
Results: There were a total of 135 patients with 43 deaths. Using Kaplan-Meyer statistics, patients with strong MRI enhancement had significantly improved survival (72% vs. 53% survival at 24 months) (p=0.019). Among 91 patients where data were available for multivariable analysis, weak MRI enhancement was significantly associated with death with an adjusted hazard ratio of 4.1 (95% CI: 1.7-10.4) (p=0.003), after adjusting for surgery prior to MRI (p=0.058), CEA (p=0.201), and chemotherapy prior to MRI (p=0.130).
Conclusion: Delayed-phase, gadobutrol-enhanced MRI can predict overall survival in a nonsurgical patient population with CRLM.

B-0188 11:02

Contrast-enhanced diffusion-weighted MRI vs contrast-enhanced CT for detecting liver metastases for potentially resectable pancreatic ductal adenocarcinoma

J.J. Hermans, D. Riviere, E. van Geenen, M. van Zanten, S. Radema, K. van Laarhoven; *Nijmegen/NL (jjhermans@gmail.com)*

Purpose: To explore the value of contrast-enhanced diffusion-weighted MRI (CE-DW-MRI) versus contrast-enhanced CT (CECT) for detection of liver metastases for potentially resectable pancreatic ductal adenocarcinoma (PDAC).
Methods and Materials: Retrospective analysis of 46 patients (29 men, 17 women; mean age 64y, range 36-82y) with on CECT a potentially resectable PDAC who also underwent a CE-DW-MRI (3 Tesla). Liver metastases on CECT were evaluated in the portal venous phase and pancreas parenchymal phase (if available), and on MRI on an axial HASTE with fat suppression, T1-VIBE pre- and post contrast with fat suppression (intravenous gadoterate

meglumine) and DWI (respiratory triggered single shot echo-planar DWI with three b-values (0 or 50, 500, 800 s/mm2)). A single observer re-evaluated MRI and CT on a per-lesion and a per-patient basis and was blinded to imaging, pathology and surgery reports whether metastases were present.
Results: In 14 patients (30%) liver metastases were finally present. In retrospect, metastases were visible on CECT in 3/14 patients. CE-DW-MRI showed metastases in 13/14 patients. In one patient CECT nor CE-DW-MRI detected liver metastasis. Confirmation of liver metastases was obtained by histopathology (n=6), 18 FDG-PET (n=6) or MR imaging characteristics only (n=2). Sensitivity of CE-DW-MRI and CECT was 93% (95%CI 66-99%) and 21% (95%CI 14-51%) respectively. Moreover, CE-DW-MRI showed a significantly greater number of small metastases (< 5 mm) than CECT ($p < 0.05$).
Conclusion: CE-DW-MRI is superior to CECT in the detection of liver metastases in potentially resectable PDAC. It is especially promising in the detection of small metastases.

B-0189 11:10

Change of liver metastases under therapy: do target lesions represent the changes in the hepatic tumour burden?

F.O. Hofmann, V. Heinemann, J. Holch, A. Baumann, N. Hesse, M. D'Anastasi, W.H. Sommer; *Munich/DE (felix.hofmann@med.uni-muenchen.de)*

Purpose: Tumour response is usually assessed by measuring target lesions (TL). We analysed if changes in TL are representative of changes in the volume of all liver metastases (absolute tumour burden, aTB).
Methods and Materials: 27 patients with metastatic colorectal cancer were randomly selected from a phase-III clinical trial. Two radiologists defined up to two hepatic metastases as TL in consensus. Extensions and volumes of all liver metastases (n=1312) were measured in 128 CT examinations. Double reviews were averaged and the aTB calculated. Changes of TL and aTB were compared with respect to the number of metastases, time since baseline, increase in tumour volume, aTB and TLs' volume (median split).
Results: Changes in aTB correlated strongly with volume changes of two TL (Spearman, r=0.92 [95%-CI: 0.86-0.96, $p < 0.0001$). The correlation with changes in their RECIST-diameter (r=0.79 [0.68-0.88], $p < 0.0001$) was significantly worse (delta (r)=0.17 [0.08-0.21]). Volume changes correlated significantly better in patients with less than 12 metastases in baseline (r=0.96 [0.92-0.99] vs. r=0.87 [0.72-0.95], $p < 0.0001$; delta (r)=0.09 [0.03-0.18]). No significant differences were found between examinations at beginning and end of the analysed time period (delta (r)=0.05 [-0.02-0.14]), patients with and without increase in tumour volume over time (delta (r)=0.13 [-0.05-0.54]), with low and high aTB (delta (r)=0.00 [-0.07-0.07]) or with small and large TL at baseline (delta (r)=-0.02 [-0.10-0.04]); ($p < 0.0001$).
Conclusion: Volumetric measurements of TL reflect changes of hepatic aTB more accurately than diameter-based measurements. In patients with < 12 metastases, two TL showed a good approximation of aTB change. For patients with more metastases, additional TLs might be beneficial for response assessment.

B-0190 11:18

Chemical shift MRI at 3 T to differentiate hepatocellular carcinoma and non-hepatocellular malignant tumours of the liver

K. Ozturk, E. Soylu, G. Savci; *Bursa/TR (keremov54@hotmail.com)*

Purpose: To evaluate the diagnostic performance of chemical shift MRI in distinguishing hepatocellular cancers (HCCs) from non-hepatocellular malignant tumours (non-HCCs) of the liver.
Methods and Materials: In this retrospective study, the patients with diagnosis of malignant liver tumours studied with 3.0-T magnet included to the study. Thirty-seven HCCs and sixty non-HCCs who were studied with chemical shift MRI between January 2012 to October 2015 retrieved from the radiology database and evaluated. Technical parameters used for chemical shift imaging were TEs of 1.15 msec (opposed-phase) and 2.3 msec (in-phase). The percentage of signal intensity (SI) ratios were calculated using the following formula for HCCs, non-HCCs and adjacent normal looking liver parenchyma; [(tumor or parenchyma SI in phase/spleen SI in phase) - (tumor or parenchyma SI opposed phase/spleen SI opposed phase)] x 100 / (tumor or parenchyma SI in phase/spleen SI in phase x 2). The subtraction scores were calculated by subtracting fat percentage ratios of liver parenchyma from relevant tumours. The sensitivity, specificity, positive predictive values (PPVs) and negative predictive values (NPVs) of the subtraction scores in distinguishing HCCs from non-HCCs were calculated.
Results: Fat percentage subtraction scores of HCCs were ≥0 in 34 of 37 and non HCCs < 0 in 53 of 60. The sensitivity, specificity, PPVs, NPVs were found to be 91.9%, 88.3%, 82.9% and 94.6%, respectively.
Conclusion: Chemical shift MR imaging can help to detect minimal intracytoplasmic lipid molecules within HCCs which can help differentiate HCCs from other malignant liver tumours with reliable statistical results obviating unnecessary biopsy.

Author Disclosures:
K. Ozturk: Author; Kerem Ozturk. CEO; Kerem Ozturk. Founder; Kerem Ozturk. Investigator; Kerem Ozturk. Owner; Kerem Ozturk. Patent Holder; Kerem Ozturk. Research/Grant Support; Kerem Ozturk. Speaker; Kerem Ozturk. **E. Soylu:** CEO; Esra Soylu. Consultant; Esra Soylu. Employee; Esra Soylu. Investigator; Esra Soylu. Research/Grant Support; Esra Soylu. Shareholder; Esra Soylu. **G. Savci:** Advisory Board; Gursel Savci. Author; Gursel Savci. Board Member; Gursel Savci. CEO; Gursel Savci. Consultant; Gursel Savci. Equipment Support Recipient; Gursel Savci. Research/Grant Support; Gursel Savci.

B-0191 11:26

Whole liver CT texture analysis to predict the development of colorectal liver metastases: a multicentre study

R.C.J. Beckers[1], D.M. Lambregts[1], R.S. Schnerr[1], S.-X. Rao[2], A.G.H. Kessels[1], M. Maas[1], G.L. Beets[3], C. Verhoef[4], R.G.H. Beets-Tan[3]; [1]*Maastricht/NL*, [2]*Shanghai/CN*, [3]*Amsterdam/NL*, [4]*Rotterdam/NL (rianne.beckers@mumc.nl)*

Purpose: Previous research showed promise for whole-liver CT-texture analysis to discriminate between colorectal cancer (CRC) patients with/without synchronous hepatic metastases. Aim of this multicenterstudy was to validate these findings and investigate whether CT-texture can also predict the development of metachronous metastases before they become visible on CT.
Methods and Materials: 165 patients were included and three subgroups were assessed: patients [A] without metastases for > 2 years (n=57), [B] with synchronous metastases (n=54) and [C] who developed metachronous metastases within 24 months (n=54). Whole-liver texture-analysis was performed on primary staging portal-phase CT by manual delineation of the apparently non-diseased liver. Mean grey-level intensity (M), entropy (E) and uniformity (U) were derived with different filter values (unfiltered=0.0, fine=0.5, medium=1.5, coarse=2.5). Multilevel mixed-effects logistic regression analysis was performed on group A vs B to identify potentially predictive parameters, which were then tested to differentiate between group A and C. Subanalysis were performed for patients with metachronous metastases within six months (n=11).
Results: To differentiate between group A/B, E0.5, U0.5, E2.5 and U2.5 showed potential predictive value. Of these, E0.5 and U0.5 also had value to predict patients from group C who will develop metachronous metastases within six months (p 0.031-0.037) with an AUC of 0.722 for E0.5 and 0.732 for U0.5. For the whole group (A vs. C), however, results were not significant.
Conclusion: Whole-liver CT texture analysis can differentiate between patients with/without metastatic disease and may also have potential to predict upfront which patients are at risk to develop metachronous disease within six months.

B-0192 11:34

Whole volume vs segmental CT texture analysis of the liver: can we predict which areas are at risk to develop metachronous colorectal liver metastases?

R.C.J. Beckers[1], D.M. Lambregts[1], R.S. Schnerr[1], A.G.H. Kessels[1], M. Maas[1], S.R. Pruijssers[1], L.A. da Costa Andrade[2], G.L. Beets[3], R.G.H. Beets-Tan[3]; [1]*Maastricht/NL*, [2]*Coimbra/PT*, [3]*Amsterdam/NL (rianne.beckers@mumc.nl)*

Purpose: Previous studies have shown that whole liver CT texture analysis has potential to predict the presence and development of colorectal liver metastases. The aim was to see if there is any benefit in performing a segmental analysis (using Couinaud segments) to identify specific areas within the liver at risk to develop metachronous metastases, based on the hypothesis that occult disease might already be present in specific segments at primary staging.
Methods and Materials: 45 patients were included: 27 patients without metastases (for > 2 years) and 18 patients who developed metachronous metastases within 24 months. One reader delineated each separate liver segment (Couinaud segments) on the primary staging portal-phase CT. Mean grey-level intensity (M), entropy (E) and uniformity (U) were derived with different filter values (unfiltered=0.0, fine=0.5, medium=1.5, coarse=2.5). Multilevel mixed-effects logistic regression analysis was performed to differentiate between segments with/without metachronous metastases within 12 and 24 months.
Results: In contrast to previous studies, where whole liver texture measurements (mainly E0.5 and U0.5) were significant predictors to differentiate between patients without metastases and patients who at later stage developed metachronous metastases, none of the texture parameters in this study were significantly different between the segments with/without metachronous metastatic disease within 24 months (p=0.201-0.782) or within 12 months (p=0.355-0.970).
Conclusion: Segmental CT texture analysis of the liver appears to have no additional benefit over whole liver texture analysis, which may imply that early changes in the texture of the liver are caused by diffuse changes in the liver parenchyma rather than localised occult disease.

B-0193 11:42

Quantitative functional MRI in a clinical orthotopic model of pancreatic cancer in immunocompetent Lewis rats

L. Zheng, Z. Zhang, W. Li, A.C. Gordon, A.C. Larson; *Chicago, IL/US*

Purpose: To demonstrate feasibility of quantitative MRI measurements in an immuno-competent rat model of pancreatic cancer by comparing in vivo anatomic and quantitative imaging measurements to histologic assays at necropsy.
Methods and Materials: DSL-6 A/C1 tumour fragments were implanted within rat pancreas during minilaparotomy.T1, T2, diffusion-weighted and dynamic contrast-enhanced (DCE) MRI were performed on 7.0T Scanner. Primary tumour size and dissemination score were measured. Primary tumour and metastases were harvested, fixed and stained for H&E, Masson's trichrome (for fibrotic tissue areas measurement), and rat anti-CD34 staining [for microvessel density (MVD) measurements].
Results: Primary tumours, local invasion, and distant metastases were confirmed for all rats. Spleen, liver, diaphragm, peritoneum, and abdominal wall metastases were observed on MRI but smaller lung, mediastinum, omen, and mesentery metastases were only observed at necropsy. Contrast uptake observed during DCE measurements was significantly greater in both primary and metastatic tumour tissues compared to skeletal muscle and normal liver tissues. Both primary and metastatic tumours were hyper-intense in T2-weighted images and hypo-intense in T1-weighted images, but no differences were found between quantitative T2 measurements in primary tumours and that in metastases. Similarly, quantitative ADC measurements were similar for both primary tumour and liver metastases (1.13± 0.3 ×10-3 and 1.24 ±0.4 ×10-3 mm2/s, respectively). Histologic fibrosis and MVD measurements were similar in primary tumours and metastases.
Conclusion: Anatomic and quantitative functional MRI measurements are feasible in orthotropic rat model and permit non-invasive monitoring of tumour responses during longitudinal studies.

B-0194 11:50

Multimodality imaging to assess immediate response following irreversible electroporation in patients with malignant hepatic tumours

K. Sugimoto, K. Saito, Y. Kobayashi, F. Moriyasu; *Tokyo/JP (sugimoto@tokyo-med.ac.jp)*

Purpose: To assess the diagnostic accuracy in identifying residual tumour of contrast-enhanced ultrasound (CEUS), contrast-enhanced multiphase CT (CECT), and gadoxetic acid-enhanced MRI (EOB-MRI) in the subacute follow-up of patients with malignant hepatic tumours treated by irreversible electroporation (IRE).
Methods and Materials: From February 2014 to August 2015, we enrolled 13 patients with 18 hepatic lesions (primary/secondary hepatic tumours, 14/4; tumour size range, 9-36 mm; mean tumour size, 19.5 mm) treated by IRE and examined by CEUS, CECT, and EOB-MRI at 1, 1, and 7 days after IRE, respectively. Follow-up examinations by EOB-MRI or CECT and CEUS were performed at 3-month intervals. Two experienced radiologists independently reviewed the images and assessed the probability of residual tumour using a five-point scale with receiver operating characteristic (ROC) curve analysis. The sensitivity and specificity were also evaluated. Verifiable local recurrence was also assessed using follow-up imaging as the reference standard.
Results: The mean area under the ROC curve was significantly higher for CEUS (0.979) than for CECT (0.719: P=0.001) and EOB-MRI (0.781: P=0.002), as were the sensitivity and specificity (mean 83.3% and 83.3% for CEUS, respectively, vs 58.3% and 45.8% for CECT and 75.0% and 62.5% for EOB-MRI). The interobserver agreement rate for CEUS (0.742) was higher than for CECT (0.658) and EOB-MRI (0.591).
Conclusion: CEUS was found to be superior to CECT and EOB-MRI for the diagnosis of residual tumour in the subacute phase following IRE.

10:30 - 12:00 **Room M 5**

Neuro

SS 211b

Gadolinium deposition and trauma

Moderators:
H. Hanelore; Cluj-Napoca/RO
N.N.

B-0195 10:30

Comparative study of Gd deposits in rat brain after repeated, high doses of linear and macrocyclic contrast agents for magnetic resonance imaging

J. Lohrke; *Berlin/DE (jessica.lohrke@bayer.com)*

Purpose: Recent publications have reported Gd deposits in the dentate nucleus of patients who received four or more contrast-enhanced MRI scans. However, little is known about the differences among gadolinium-based contrast agents (GBCAs). A comparative study in rats was performed, using highly sensitive laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) to image the Gd distribution in brain sections.
Methods and Materials: Healthy Wistar-Han rats were randomly divided into control and four groups (n=10) given: gadodiamide, gadopentetate dimeglumin, gadobutrol and gadoteridol. Each animal received 20 intravenous injections at a dose of 2.5 mmol Gd/kg body weight (500-fold diagnostic dose). After eight treatment free weeks, histopathology, the Gd tissue concentrations in brain homogenates and its distribution in brain kryo-sections were determined using ICP-MS and LA-ICP-MS, respectively.
Results: The detected residual Gd in the brain of all groups was very low (e.g. gadodiamide and gadopentetat dimeglumin: 0.001‰ID/g). The measured Gd-concentrations of linear GBCAs in the brain were higher than those of macrocyclic agents. The LA-ICP-MS images of linear GBCAs showed regions of Gd-signal within the deep cerebellar nuclei including the lateral cerebellar nucleus which is equivalent to the dentate nucleus in humans. There were no histopathological findings in the brain.
Conclusion: In the repeated high dose animal model gadolinium accumulated in cerebellar nuclei. The gadolinium brain concentrations were higher for the linear than for the macrocyclic GBCAs which reflects the known differences in thermodynamic and kinetic complex stabilities of the GBCA-classes. Despite this observation no histopathological findings were present in the brain.
Author Disclosures:
J. Lohrke: Employee; Bayer AG.

B-0196 10:38

Accumulation of gadolinium-based contrast media in the dentate nucleus and globus pallidus: a 18-year longitudinal study of a multiple sclerosis cohort

Y. Forslin, F. Hashim, S. Shams, G. Bergendal, J. Martola,
M. Kristoffersen-Wiberg, S. Fredrikson, P. Aspelin, T. Granberg; *Stockholm/SE (farouk.hashim@karolinska.se)*

Purpose: Gadolinium-based contrast medium (GBCM) is important in MRI diagnostics, especially in multiple sclerosis (MS) to detect disease activity. Recent studies have shown cross-sectional correlations between GBCM injections and signal intensity index (SII) in the dentate nucleus (DN) and globus pallidus (GP) on T1-weighted images. Histopathological studies have further shown gadolinium accumulation in the brain. We aimed to longitudinally investigate the association of multiple GBCM injections with the SII in the DN and GP in MS patients.
Methods and Materials: 23 MS patients, 18-year follow-up, and 24 age-/gender-matched controls, single time-point, underwent MRI scans. SII was calculated with ROIs in DN and GP, using pons and thalamus as references, respectively. All participants were evaluated with comprehensive neuropsychological testing.
Results: SII was higher amongst MS patients than controls in the DN (1.05 vs. 0.99, $P < 0.001$). Multivariate linear regression with corrections for MRI sequence and scanner showed a remaining association with higher SII in the dentate nucleus in MS (B=0.05, $P < 0.001$). More GBCM injections were associated with increased SII in the DN (B=0.008, $P < 0.001$). No significant associations between SII and GP were seen. MS disease duration was not associated with the SII in the DN or GP. Increased SII in the DN was associated with decreased performance in cognitive tests (-0.008, P=0.02).
Conclusion: Higher SII in the DN is associated with increased number of GBCM injections, and a decline in cognitive performance. Considering large inter-individual differences in SII, some patients might be of higher risk of gadolinium accumulation.

Author Disclosures:
S. Fredrikson: Other; eceived honoraria for lectures, educational activities or consultancy from Allergan, Bayer, Biogen Idec, Genzyme, Merck Serono, Novartis, Sanofi and Teva.

B-0197 10:46

Does gadolinium remain in our heads? A comparison trial of T1 signal intensity after repeated administration of gadoterate meglumine

B.-N. Marincu, M. Forsting, L. Umutlu; *Essen/DE (bogdan-nicolae.marincu@uk-essen.de)*

Purpose: Aim of this study was to investigate whether repeated administration of gadoterate meglumine (Dotarem©, Guerbet) leads to cerebral or cerebellar accumulation.
Methods and Materials: Examinations were performed on the same MRI scanner (Magnetom Aera or Magnetom Skyra, both are Siemens' Healthcares) and under application of mere gadoterate meglumine during the investigated time period. 89 patients were subdivided into 5 groups based on the number of contrast agent applications (1-6). For quantitative analysis, the following signal intensity ratios were assessed bilaterally: (1) dentate nucleus (DN)/pons, (2) DN/cerebrospinal fluid, (3) DN/cerebellum, and (4) globus pallidus/thalamus. All signal ratios were compared in a consecutive manner after the 1st administration to the ones after the 2nd, 3rd, 4th, 5th and 6th, respectively.
Results: The statistical analysis revealed no traceable signal increase in any of the four assessed regions for any of the assessed examination time points: (1) DN/pons (after the 2nd: 0.016, 3rd: -0.019, 4th: 0.018, 5th: -0.01, 6th: -0.002; p=0.94), (2) DN/cerebrospinal fluid (after the 2nd: 0.111, 3rd: 0.036, 4th: 0, 5th: -0.098, 6th: -0.066; p=0.93), (3) DN/cerebellum (after the 2nd: 0.001, 3rd: -0.01, 4th: -0.005, 5th: -0.004, 6th: -0.014; p=0.07), (4) globus pallidus/thalamus (after the 2nd: 0.015, 3rd: -0.014, 4th: -0.005, 5th: 0, 6th: -0.001; p=0.84).
Conclusion: These preliminary results confirm that the macrocyclic contrast agent gadoterate meglumine does not lead to any traceable accumulation of gadolinium in cerebral or cerebellar tissue. It may thus be considered safer than its non-macrocyclic predecessors.

B-0198 10:54

High T1 signal intensity in the dentate nucleus after multiple exposures to gadiodiamide: intra-individual comparison between T1- weighted spin echo and 3D MP-RAGE sequences

J. Ramalho, M. Ramalho, M. AlObaidy, R. Hoffmann Nunes, M. Castillo, R.C. Semelka; *Chapel Hill, NC/US (joana-ramalho@netcabo.pt)*

Purpose: Different T1-weighted MR sequences have been interchangeably used for the evaluation of T1 signal intensity in the dentate nucleus (DN) in patients who performed several enhanced MR studies. Our purpose is to determine if there are any differences between the quantitative and qualitative analysis performed with T1-weighted SE and T1-weighted MPRAGE sequences.
Methods and Materials: Our population included 18 patients who underwent at least 2 administrations of gadodiamide and had a baseline and a last MR performed with both T1-weighted SE and 3D MPRAGE sequences. Qualitative and quantitative analysis was independently performed. For quantitative analysis oval regions of interest (ROI) were placed in the DN and middle cerebellar peduncles (MCP) to calculate DN/MCP signal intensity ratios. DN/MCP ratios and the signal changes between the baseline and last examinations were compared using Wilcoxon signed rank test. Correlation between quantitative and qualitative evaluation was assessed using polyserial correlation test.
Results: The differences between the two sequences for both baseline and last examinations DN/MCP ratios were statistically significant (p=0.00769 and p=0.0056, respectively), but the overtime change in ratio's signal intensity was not (p= 0.6397). The correlation between the qualitative and quantitative analysis for MPRAGE was very strong (almost perfect) (r =0.9) but not for SE (r =0.63).
Conclusion: T1-weighted SE and MPRAGE sequences cannot be used interchangeably. Despite similar performance of both sequences in quantitative analysis, baseline and final examinations ratios should be evaluated with the same sequence overtime. Qualitative analysis is superior with MPRAGE.

B-0199 11:02

Changes in brain signal intensity (SI) after repeated injections of gadolinium-based contrast agent (GBCA): a systematic review

G. Di Leo, F. Doniselli, M. Alì, F. Sardanelli; *San Donato Milanese/IT (fabio.doniselli@gmail.com)*

Purpose: We systematically reviewed articles reporting SI increase on brain unenhanced T1-weighted MRI in relation to GBCA injection.
Methods and Materials: On October 10, 2015 we searched on PubMed, EMBASE and congress proceedings. A total of 132 articles were initially retrieved.
Results: After screening Title and Abstract, 13 were evaluated in full text and analysed, for a total of 815 patients. All were retrospective and one was a case report. The number of administrations was not reported in 2 articles, whilst it was highly variable in the remaining 11, from 2 to 60 (mean 15). The investigated areas were mainly dentate nucleus, globus pallidus, thalamus, pons, and middle cerebral peduncle. The evaluation method was subjective/qualitative in 7 articles and quantitative in 6. In 2 articles autopsy data were available. A number of common types of GBCA were retrospective investigated but only one article compared linear versus cyclic-GBCAs, showing that the DN hyperintensity in unenhanced T1-weighted MR images is associated with linear-GBCA administration, whilst the macrocyclic-GBCAs administration showed no such association. Of 13 articles, 9 showed an SI increase of the studied areas, 2 did not. The autopsy studies showed a local Gd deposition. No relation between changes in brain SI and any symptoms was demonstrated.
Conclusion: This review showed an evidence for brain SI increase related to GBCA administrations, confirmed by 2 autopsy studies. However, local accumulation mechanisms and SI changes, differences amongst different GBCAs, and cofactors explaining the variability of this phenomenon are still unclear. Any clinical meaning remains unknown.
Author Disclosures:
G. Di Leo: Other; Congress Sponsorship by Bracco SpA. **F. Sardanelli:** Grant Recipient; Bracco Imaging, Bayer Pharma AG. Speaker; Bracco Imaging. Other; Congress sponsorship Bracco Imaging.

B-0200 11:10

Signal change on unenhanced T1-weighted images in dentate nucleus following gadobenate dimeglumine in patients with and without previous multiple administrations of gadodiamide

J. Ramalho, R.C. Semelka, M. AlObaidy, M. Ramalho, R. Hoffmann Nunes, M. Castillo; *Chapel Hill, NC/US (joana-ramalho@netcabo.pt)*

Purpose: Gadolinium deposition in neural tissue, secondary to multiple administrations of gadolinium-based contrast agents (GBCA), has been histopathologically confirmed. The effect of previous administration of GBCAs in subsequent administration of other GBCAs has not been established yet. Thus, our purpose was to evaluate the impact of previous administrations of gadodiamide in patients who subsequently received gadobenate dimeglumine.
Methods and Materials: Our population included 62 patients who underwent at least 3 administrations of gadobenate dimeglumine, divided in two groups. group 1 included patients who previously received multiple doses of gadodiamide, group 2 included patients without previous exposure to other GBCAs. Quantitative analysis was performed. Dentate nucleus (DN)-to-middle cerebellar peduncle (MCP) signal intensity ratios and the relative change (RC) signal overtime were calculated. Generalized additive model was used.
Results: Group 1 showed a significant increase in baseline DN/MCP and overtime ratios compared to group 2 ($p < 0.0001$). The RC DN/ MCP showed a trend towards an increase in patients who underwent previous gadodiamide (p=0.0735).
Conclusion: There is increased T1 signal change overtime in patients who underwent gadobenate dimeglumine and had received prior gadodiamide, compared to those without known exposure to previous gadodiamide. This suggests a potentiating effect of prior injections of gadodiamide on more recently administered gadobenate dimeglumine may exist.

B-0201 11:18

Imaging and identification of gadolinium deposits in deep cerebellar nuclei of gadodiamide-repeatedly treated rats

L. Valero[1], S. Marco$_2$, N. Fretellier[1], F. Baudimont[3], J.-L. Guerquin-Kern[2], M. Rasschaert[1], P. Robert[1], J.-M. Idee[1], C. Corot[1]; [1]*Roissy/FR*, [2]*Orsay/FR*, [3]*Saint Herblain/FR (ideej@guerbet-group.com)*

Purpose: To detect and characterise gadolinium (Gd) deposits in deep cerebellar nuclei (DCN) of gadodiamide-treated rats after repeated injections, and to investigate the mechanism of Gd accumulation.
Methods and Materials: Healthy rats received 20 intravenous administrations of 0.6 mmol Gd/kg of gadodiamide (Omniscan®), or saline over 5 weeks (4 daily injections/week). MRI was performed at week 5 on a 2.35T Bruker preclinical magnet using a T1w-RARE sequence. Cerebella from 3 gadodiamide-treated rats (randomly selected) were sampled and fixed in Karnovsky's solution. Transmission electron microscopy (TEM) was performed (Z-loss mode, JEOL 2200 FS electron microscope operated at 200 kV). Electron energy loss spectroscopy (omega-filter) was used to characterise the nature of the metal deposits found by TEM. Photonic microscopy was used to confirm the location of cerebellar structure analysed.
Results: An increase in T1 signal intensity (SI) of DCN was observed with gadodiamide (1.068+0.047, n=16) vs. saline (0.099+0.030, n=15) ($p < 0.001$) at completion of the treatment period. No blood-brain barrier abnormalities were detected by ZO-1 occludin immunohistochemistry, regardless of the treatment. The presence of stacked and elongated Gd deposits was characterised in the DCN of 2 out of the 3 tested rats and were located in the

neuropile (either cytosol or cell membranes). No Gd deposits were observed in the DCN of a control, saline-treated rat.
Conclusion: In deep cerebellar nuclei of healthy rats repeatedly treated with gadodiamide, a T1-hypersignal was associated with the presence of stacked and elongated Gd deposits. The exact form of these deposits requires additional studies.
Author Disclosures:
L. Valero: Employee; Guerbet. **S. Marco:** Research/Grant Support; Guerbet. **N. Fretellier:** Employee; Guerbet. **F. Baudimont:** Grant Recipient; Guerbet. **J. Guerquin-Kern:** Research/Grant Support; Guerbet. **M. Rasschaert:** Employee; Guerbet. **P. Robert:** Employee; Guerbet. **J. Idee:** Employee; Guerbet. **C. Corot:** Employee; Guerbet.

B-0202 11:26

Signal intensity evaluation in dentate nuclei, pons, globus pallidus and thalamus in patients with multiple sclerosis: gadolinium retention assessment

C. Tramontini, J.A. Mora, F. Aluja, C. Herazo-Bustos, C. Navas; *Bogota/CO (cherihb4@hotmail.com)*

Purpose: Recently multiple studies have reported gadolinium accumulation in the brain of patients who have undergone multiple gadolinium-contrast administrations. Patients with multiple sclerosis (MS) are submitted to many contrast-enhanced MRI and might become a risk population. Our purpose was to determine if repeated intravenous exposures to gadolinium-based contrast agents are associated with increased intensity in thalamus, dentate nuclei, pons and globus pallidus in patients with MS.
Methods and Materials: We conducted a retrospective study of 60 patients with MS who had undergone multiple enhanced MRI examinations (2-23) from 2007 to 2015. The dentate nuclei-to-pons (DNP), globus pallidus-to-thalamus (GPT), globus pallidus-to-pons (GPP), thalamus-to-pons (TP) and caudate nuclei-to-pons (CNP) ratios were reviewed in axial T1 unenhanced sequences. The relative changes between the first and last MRI were calculated, and plotted against the number of enhanced MRI. The interobserver agreement was evaluated with the intraclass correlation coefficient.
Results: There was no evidence of increase in T1 signal intensities (DNP 0.524, GPT 0.446, GPP 0.684, PT 0.771, CNP 0.352). The Spearman coefficient showed no correlation between the relative changes of the ratios and the number of MRI: DNP 0.202 (P=0.122), GPT: -0.044 (P=0.740), GPP: -0.078 (P=0.552), TP: -0.062 (P=0.638), CNP:-0.181 (P=0.166). The interobserver correlation was almost perfect: 0.982 (CI 95% = 0.968-0.990) for all the structures.
Conclusion: Our study did not find any statistically significant increase in the intensity T1 signal of these structures in patients with multiple sclerosis undergoing multiple MRIs; however, there are factors to consider such as the type of gadolinium.

B-0203 11:34

MRI analysis of diffuse axonal injury: haemorrhagic lesions in the mesencephalon indicate poor long-term outcome

S. Abu Hamdeh, N. Marklund, M. Lannsjö, T. Howells, R. Raininko, J. Wikström, P. Enblad; *Uppsala/SE (Johan.Wikstrom@radiol.uu.se)*

Purpose: Clinical outcome after traumatic diffuse axonal injury (DAI) is difficult to predict. Three MRI techniques were compared in demonstrating acute brain lesions. Relationship of the anatomical distribution of the lesions in combination with clinical prognostic factors to outcome after 6 months was evaluated.
Methods and Materials: Thirty patients, aged 16-60 years (mean 31.2 years) with severe DAI (Glasgow Motor Score = GMS < 6) were examined with MRI at 1.5 T within one week after the injury. A diffusion-weighted (DW) sequence (SE-EPI, b value 1000 s/mm2), a T2*-weighted gradient echo (T2*GRE) sequence and a susceptibility-weighted (SWI) sequence were evaluated by two independent reviewers with short and long neuroradiological experiences. Clinical outcome was assessed with Extended Glasgow Outcome Score (GOSE) after ≥ 6 months.
Results: Interreviewer agreement for DAI classification was very good (κ 0.82 - 0.91) with all three sequences. SWI visualized more lesions than the T2*GRE or DW sequence. In univariate analysis, number of DW lesions in the deep gray matter area including the internal capsules, number of SWI lesions in the mesencephalon, age, and GMS at admission and discharge correlated significantly with poor outcome. Multivariate analysis only revealed an independent relation with poor outcome for age (p = 0.011) and lesions in the mesencephalic region including crura cerebri, substantia nigra and tegmentum on SWI (p = 0.032).
Conclusion: SWI is the most sensitive technique to visualize DAI lesions. Age over 30 years and haemorrhagic mesencephalic lesions anterior to the tectum are indicators of poor long-term outcome in DAI.

B-0204 11:42

High quality MRI data needs visual quality control: a multicenter experience

P. Pullens[1], L. Claes[2], J. Verheyden[2], P.M. Parizel[1], on behalf of CENTER-TBI Participants & Investigators[1]; [1]*Antwerp/BE*, [2]*Leuven/BE (pim.pullens@uantwerpen.be)*

Purpose: quality assessment of MRI data in CENTER-TBI, a European multi-center study focussed on improving care for traumatic brain injury (TBI) patients. MRI scans need to be of sufficient quality for radiological interpretation and for automated analyses.
Methods and Materials: 3D-T2, 3D-T1, 3D-FLAIR, SWI, DTI and rs-fMRI data (3 Tesla) are collected in 13 participating centers in patients with mild to severe TBI. Scanning protocols were harmonized between scanners. Data were visually inspected for artifacts by four raters, after training. Artifact classification for anatomical data is based on 8 artifact types. For DTI and rs-fMRI, an artifact classification scale was developed in-house based on 8 dedicated artifact types. Data were considered unusable if severe ghosting or ringing, striping or blurring is observed.
Results: Data from 265 patients (1855 datasets) were analysed. For T2, 3.4% of scans were classified as unusable, 92.1% interpretable, 4.5% was not acquired. For T1: 1.9/95.8/2.3%, FLAIR: 4.1/92.5/3.4%, SWI: 3.4.92.1.4.5%, DTI (unusable/usable/no data): 29.6/56.6/13.8%, fMRI:13.6/79.2/7.2%. None of the datasets was completely artifact-free. Site performance is variable, minimum performance is 87.5% (of 40 patients in that site) usable anatomical data, 9.1% (of 11) usable DTI data, 0% (of 11) usable fMRI data.
Conclusion: Taking into account the nature of the patient population and diversity of sites, a surprisingly high fraction of anatomical data is of interpretable quality. DTI and fMRI were the most frequently corrupted sequences. Our study shows that visual inspection of incoming data, especially for DTI and fMRI, is of key importance in a multicenter study.
Author Disclosures:
L. Claes: Employee; icometrix NV. **J. Verheyden:** Employee; icometrix NV. **P.M. Parizel:** Consultant; GE Healthcare. Research/Grant Support; Siemens AG. Shareholder; icometrix NV. Speaker; Bracco Group, Mallinckrodt.

B-0205 11:50

Structured reporting of traumatic brain injury CT images by trained neuroscientists for clinical research: an inter-rater reliability study

T. Vande Vyvere[1], L. Claes[2], L. van den Hauwe[1], G. Wilms[2], D. Smeets[2], P.M. Parizel[1]; [1]*Antwerp/BE*, [2]*Leuven/BE (thijs.vandevyvere@icometrix.com)*

Purpose: The aim of this study was to determine accuracy and inter-rater reliability in the interpretation of Traumatic Brain Injury (TBI) features on non-contrast computed tomography (CT) examinations between trained neuroscientists and expert neuroradiologists.
Methods and Materials: Two neuroscientists (NS1;NS2) were trained to interpret CT images of TBI according to the NINDS Common Data Elements (CDE). A total of 50 CTs from 9 different centers were selected from the CENTER-TBI repository. An online CDE structured reporting (SR) system was used to report findings. TBI features and scores on two classification scales (Marshal;Rotterdam) were extracted from the reports and compared to that of expert neuroradiologists (NR1;NR2). Diagnostic performance and kappa coefficients of agreement were calculated.
Results: Accuracy for reporting abnormalities was high (NS1: 94.67%; NS2: 95.00%), as was diagnostic performance (NS1: Sensitivity: 92.81, CI [87.50.96.36], Specificity: 95.46 CI [93.15.97.17]; NS2: Sensitivity: 93.38 CI [87.81.96.93], Specificity: 95.47 CI [93.16.97.18]. Almost perfect overall agreement was found between raters and the gold standard (NS1 and NR1, κ=0.958, NS2 and NR1, κ=0.915, NS1 and NS2, κ=0.958). Agreement for individual TBI features was substantial to almost perfect (range from κ=0.638 to κ=1). Classification scores were also high (Marshall scale: NS1 and NR1, κ= 0.938, NS2 and NR1, κ=0.957; Rotterdam scale: NS1 and NR1, κ=0.949, NS2 to NR1, κ=0.912).
Conclusion: Trained neuroscientists can reliably identify basic CT-scan features of TBI and enter abnormalities into research databases via structured reporting with high accuracy. Our data indicate that they can achieve substantial to almost perfect agreement with expert neuroradiologists.

Author Disclosures:
T. Vande Vyvere: Employee; icometrix NV, Leuven, Belgium. Research/Grant Support; participant in CENTER-TBI, a large collaborative project supported by the 7th Framework program of the European Union (602150). **L. Claes:** Employee; icometrix NV, Leuven, Belgium. Research/Grant Support; participant in CENTER-TBI, a large collaborative project supported by the 7th Framework program of the European Union (602150). **L. van den Hauwe:** Consultant; icometrix NV, Leuven, Belgium. Research/Grant Support; participant in CENTER-TBI, a large collaborative project supported by the 7th Framework program of the European Union (602150). **G. Wilms:** Consultant; icometrix NV, Leuven, Belgium. Research/Grant Support; participant in CENTER-TBI, a large collaborative project supported by the 7th Framework program of the European Union (602150). **D. Smeets:** Employee; icometrix NV, Leuven, Belgium. Research/Grant Support; participant in CENTER-TBI, a large collaborative project supported by the 7th Framework program of the European Union (602150). **P.M. Parizel:** Research/Grant Support; participant in CENTER-TBI, a large collaborative project supported by the 7th Framework program of the European Union (602150).

14:00 - 15:30 **Room B**

Abdominal Viscera

SS 301a

Liver metastases: detection, characterisation and treatment response assessment

Moderators:
E. Kasatkina; Heidelberg/DE
A.M. Riddell; London/UK

K-05 14:00

Keynote lecture
A.M. Riddell; London/UK

B-0206 14:09

Combined gadoxetic acid and gadofosveset enhanced liver MRI for detection and characterisation of liver metastases
P. Bannas[1], C. Bookwalter[2], T. Ziemlewicz[2], U. Motosugi[3], A. Munoz del Rio[2], T. Potretzke[2], G. Adam[1], S. Nagle[2], S.B. Reeder[2]; [1]*Hamburg/DE*, [2]*Madison, WI/US*, [3]*Yamanashi/JP (p.bannas@uke.de)*

Purpose: To compare the performance of gadoxetic acid-alone and combined gadoxetic acid/gadofosveset trisodium enhanced liver-MRI for detection of metastases and differentiation of metastases from hemangiomas.
Methods and Materials: Ninety-one patients underwent gadoxetic acid enhanced liver-MRI before and after additional injection of gadofosveset. Two independent blinded readers retrospectively identified metastases, rated their conspicuity and their confidence in differentiating metastases from hemangiomas. Ratings were compared using alternative-free response receiver-operating-characteristic (AFROC) and conventional ROC-methods. Histology and follow-up imaging served as reference standard.
Results: There were 145 hepatic metastases and 16 hemangiomas. Both readers detected more metastases using combined gadoxetic acid/gadofosveset (Reader1=130; Reader2=124) compared to gadoxetic acid-alone (Reader1=104; Reader 2=103). The sensitivity of combined gadoxetic acid/gadofosveset (Reader1=90%; Reader2=86%) was significantly higher than of gadoxetic acid-alone (Reader1=72%; Reader2=71%, both $P < 0.01$). The AFROC-AUC was significantly higher for the combined technique (0.92 vs. 0.86, $P < 0.001$). The sensitivity for correct differentiation of metastases from hemangiomas was significantly higher for the combined technique (Reader1=98%; Reader2=99% vs. Reader1=86%; Reader2=91%, both $P < 0.01$). The corresponding ROC-AUC was significantly higher for the combined technique (Reader1=1.00; Reader2=1.00 vs. Reader1=0.87; Reader2=0.92, both $P < 0.01$).
Conclusion: Combined gadoxetic acid and gadofosveset enhanced MRI improves detection and characterisation of liver metastases compared to gadoxetic acid alone.

B-0207 14:17

Efficiency of non-contrast-enhanced liver imaging sequences added to initial rectal MRI in rectal cancer patients
S. Kim, K. Kim, S. Hwang, S. Park, H. Kim; *Suwon-si/KR (mizys27@gmail.com)*

Purpose: The purpose was to estimate the value of addition of liver imaging to initial rectal magnetic resonance imaging (MRI) for detection of liver metastasis and evaluate imaging predictors of a high risk of liver metastasis on rectal MRI.
Methods and Materials: We enrolled 144 patients from October 2010 to May 2013 underwent rectal MRI with T2-weighted imaging (T2WI) and diffusion-weighted imaging (DWI) of the liver and abdominopelvic computed tomography (APCT) for the initial staging of rectal cancer. Two reviewers scored the possibility of liver metastasis on different sets of liver images (T2WI, DWI, and combined T2WI and DWI) and APCT and reached a conclusion by consensus for different results. Imaging features from rectal MRI were also analysed. The diagnostic performances of CT and an additional liver scan to detect liver metastasis were compared. Multivariate logistic regression to determine independent predictors of liver metastasis among rectal MRI features and tumour markers was performed.
Results: All sets of liver images were more effective than APCT for detecting liver metastasis, and DWI was the most effective. Perivascular stranding and anal sphincter invasion were statistically significant for liver metastasis ($p = 0.0077$ and $p = 0.0471$), while extramural vascular invasion based on MRI (mrEMVI) was marginally significant ($p = 0.0534$).
Conclusion: The addition of non-contrast-enhanced liver imaging, particularly DWI, to initial rectal MRI in rectal cancer patients could facilitate detection of liver metastasis without APCT. Perivascular stranding, anal sphincter invasion, and mrEMVI detected on rectal MRI were important imaging predictors of liver metastasis.

B-0208 14:25

Can we predict the treatment response of colorectal liver metastasis using hepatobiliary phase (HBP) in Gd-EOB-DTPA-enhanced MR imaging?
H. Lee, C. Lee, Y. Park, J. Lee, J. Choi, K. Kim, C. Park; *Seoul/KR (perfecthj67@naver.com)*

Purpose: To determine the prognostic value of Hepatobiliary phase (HBP) in Gd-EOB-DTPA MRI of colorectal cancer liver metastasis in predicting response to chemotherapy.
Methods and Materials: Forty-four colorectal cancer patients with 85 metastatic nodules in liver were retrospectively reviewed. We evaluate the appearance on HBP and classified them into "target" and "non-target". Signal intensity (SI) was measured and SI ratio of tumour to liver parenchyma was calculated on HBP. Tumour response was assessed by RECIST at 12 weeks after chemotherapy and further classified into "clinical responder" (CR, PR, and SD) and "clinical non-responder" (PD). The relationship of appearance and SI ratio on the HBP with tumour response was analysed.
Results: Eighty-five metastatic lesions were classified into "target" in 22 lesions (25.9%), and "non-target" in 63 lesions (74.1%). Forty lesions (47.1%) were "clinical responder" and 45 lesions (52.9%) were "clinical non-responder". "Target" appearance was more frequent in "non-responder" than "responder" (14/22 [63.6%] vs 8/22 [36.4%]). "Non-target" appearance on HBP tend to be more frequent in "clinical responder" than of "target" appearance in metastasis of colorectal cancer (32/63[50.8%] vs. 8/22[36.4%], p=0.243). The mean SI ratio in 4 response groups was 0.37 in CR, 0.38 in PR, 0.49 in SD, and 0.52 in PD. High SI ratio was associated with poorer response to chemotherapy (p= 0.012).
Conclusion: High SI ratio on HBP of EOB MRI of hepatic metastasis from colorectal cancer were predictive of poorer response, and metastasis showing "Target" appearance tend to respond poorer than those showing "Non-target" appearance.

B-0209 14:33

Presurgical staging of colorectal liver metastases after chemotherapy: evaluation with diffusion-weighted MR imaging and gadoxetic acid-enhanced MRI at 3 T device
P. Boraschi, F. Donati, L. Urbani, M. Castagna, F. Pacciardi, R. Gigoni, F. Falaschi; *Pisa/IT (p.boraschi@gmail.com)*

Purpose: To evaluate the diagnostic performance of diffusion-weighted MR imaging (DW-MRI) and gadoxetic acid-enhanced MRI at 3 T device in the preoperative staging of colorectal liver metastases in patients previously undergone chemotherapy.
Methods and Materials: Fifty patients with colorectal cancer and focal liver lesions underwent MR imaging at 3 T device (GE DISCOVERY MR750;GE Healthcare) after preoperative chemotherapy within 1 month prior to surgery. After the preliminary acquisition of axial T1w (in/out of phase) and T2w (propeller and SS-FSE) images, DW-MRI was performed using an axial spin-

echo echo-planar sequence with multiple b values (150, 500, 1000, 1500 sec/mm²) in all diffusion directions. Gd-EOB-DTPA-enhanced MRI was performed using a 3D breath-hold fat-suppressed T1w LAVA-flex sequence including both dynamic and hepato-biliary phases. All MR images were reviewed by two observers in conference to detect and characterise (benign/malignant) focal liver lesions. The MRI findings were correlated with surgery and histopathology, which was our gold standard. Only clear benign lesions at intraoperative ultrasound remained unresected. Statistical analysis was performed on a per-lesion basis.
Results: A total of 306 hepatic lesions were detected; of these, 220 were metastases (72%), whereas the remaining 86 (28%) were characterised as benign lesions (haemangiomas, cysts and nodular regenerative hyperplasia). The sensitivity, specificity, PPV, NPV and diagnostic accuracy of the reviewers for the detection and characterisation of focal liver lesions were 98%, 93%, 97%, 95% and 97%, respectively.
Conclusion: The combination of DW-MRI with gadoxetic acid-enhanced MRI at 3 T-device is particularly effective in the presurgical staging of colorectal liver metastases treated with chemotherapy.

B-0210 14:41

Effect of duration of scan acquisition on 256 Slice MDCT perfusion values in liver metastates

A.K. Sharma, N. Sharma; *Delhi/IN (shokie10@hotmail.com)*

Purpose: To assess the effects of acquisition duration of 256 MDCT perfusion parameters values in metastases and normal liver tissue.
Methods and Materials: This retrospective study has institutional review board approval with reference to the informed consent. CT perfusion study in 50 patients (median age, 58.5 years, range 47.5-72.7 years) and 30 women (median age, 58.5 years; 47.5-71.8 years), 20 men (median age 55.7 years; range 50.5-72.7 years) with metastases in liver were analysed by means of distributed parametric modelling to determine tissue blood flow, blood volume, mean transit time; permeability, hepatic arterial fraction for tumour and normal liver tissue. Analyses were undertaken with acquisition of 25-50 seconds.
Results: CT perfusion parameter values,varied approaching stable values with increasing acquisition duration. Acquisition greater than 25 seconds was required to obtain moderate confidence in tumour and normal tissue. Blood flow, mean transit time, permeability and hepatic arterial fraction were significantly different between tumour and normal tissue at 50 seconds.
Conclusion: CT perfusion parameters values are affected by acquisition duration and

B-0211 14:49

Respiratory gated PET/CT of the liver: a novel method and its impact on the detection of colorectal liver metastases

A. Schulz, J.C. Godt, J.B. Dormagen, J.E. Holtedahl, T.V. Bogsrud, K.J. Labori, N.-E. Kløw, T. Bach-Gansmo; *Oslo/NO (anselm.schulz@gmail.com)*

Purpose: To evaluate the diagnostic performance of a new method for respiratory gated positron emission tomography (rgPET/CT) for colorectal liver metastases (CRLM), secondly, to assess its additional value to standard PET/CT (PET/CT).
Methods and Materials: Forty-three patients scheduled for resection of suspected CRLM were prospectively included from 2011-2013. None of the patients had previously undergone treatment for their CRLM. All patients underwent PET/CT and rgPET/CT in the same session. For rgPET/CT an in-house developed electronic circuit was used which displayed a color-coded countdown for the patient. The patients held their breath according to the countdown and only the data from the inspiration breath-hold period was used for image reconstruction. Two independent and blinded readers evaluated both PET/CT and rgPET/CT separately. The reference standard was histopathological confirmation for 73/131 CRLM and follow-up otherwise.
Results: 131 CRLM, including 25 mucinous CRLM, were identified in 39/43 patients. The overall per-lesion sensitivity for detection of CRLM was 60.0% for PET/CT, 63.1% for rgPET/CT, and 67.7% for standard+rgPET/CT,. Standard+rgPET/CT was overall significantly more sensitive for CRLM compared to PET/CT (p=0.002) and rgPET/CT (p=0.031). The overall positive-predictive-value (PPV) for detection of CRLM was 97.5% for PET/CT, 95.3% for rgPET/CT, and 93.6% for standard+rgPET/CT.
Conclusion: Combination of PET/CT and rgPET/CT improved the sensitivity significantly for CRLM. However, high patient compliance is mandatory to achieve optimal performance and further improvements are needed to overcome these limitations. The diagnostic performance of the evaluated new method for rgPET/CT was comparable to earlier reported technically more complex and expensive methods.

B-0212 14:57

Comparison of PET/CT and geometric accuracy for predicting local tumour progression 24 h post-RF ablation of liver metastases

F. Vandenbroucke, J. Vandemeulebroucke, J. de Mey; *Brussels/BE (spovef@uzbrussel.be)*

Purpose: To assess the predictive value of [18 F]FDG-PET/CT evaluation versus the geometrical accuracy of the procedure using the contrast-enhanced CT images acquired before and within 24 h after ablation.
Methods and Materials: Twenty patients with a total of 43 focal liver metastases underwent RF ablation, based on previous PET/CT imaging findings, and received a contrast-enhanced PET/CT scan within 24 hours post-procedure. For PET/CT evaluation, the images were independently assessed by three experienced abdominal radiologists. For assessment of the geometrical accuracy, pre- and post-ablation CT images were registered using commercial registration software to verify the geometrical accuracy of the RF ablation. Results were correlated to local tumour progression (LTP) as recorded during PET/CT follow-up, performed every 2-3 months after the intervention.
Results: Eleven lesions (24.4%) showed LTP during a mean follow-up of 62 weeks. Based on the registered images, 29 lesions were completely covered by the ablation zone, whilst 10 were not. For 6 lesions, the edge was found to coincide with the edge of the ablation zone. Interestingly, two lesions only showed LTP after 5-6 months, and both belonged to the group were the edges of lesion and ablation zone coincided. The sensitivity, specificity, PPV and NPV for PET/CT and geometric accuracy were 45%, 94%, 71% and 84%; and 100%, 85%, 69% and 100%, respectively.
Conclusion: Verifying the coverage of liver metastases by an ablation zone through registration of pre- and early post-ablation CT images has a better negative predictive power for treatment outcome than PET/CT.

B-0213 15:05

Evaluation of primary and secondary liver lesions: dual energy CT (DECT) vs. MRI

T.J. Vogl, N. Ring, M.J. Kerl, R.W. Bauer; *Frankfurt a. Main/DE (t.vogl@em.uni-frankfurt.de)*

Purpose: To compare dual energy CT (DECT) with MRI in the diagnostic evaluation of primary and secondary liver lesions.
Methods and Materials: In 53 patients DECT was performed due to known or suspected primary and secondary liver lesions. In all patients signal-to-noise (SNR) and contrast-to-noise (CNR) was calculated for low kV-, high kV- and mixed-image series. An MRI was performed with a maximum of 4 weeks post DECT and no intervention in-between. Two radiologists evaluated the DECT and MRI by counting the detectable lesions in a color-coded iodine map, high kV- and low kV- and mixed-image series ranking them from 1 (best-image) to 4 (worst-image) and then comparing them by a Friedman-and-Conover-test.
Results: A statistically significant difference ($p < 0.001$) was found in SNR and CNR between mixed-image series, low kV and high kV-image. The mixed image series had the highest SNR (median:6.95) and CNR (median:3.77). A statistically significant difference (p=0.003) was shown for the amount of lesions detected in DECT and MRI with a higher maximum in MRI (9.00) vs. DECT (6.75). Statistically significant differences ($p < 0.001$) were seen for the ranking and comparison of image quality with the best results for the mixed-image series (median rank=1; median quality=2).
Conclusion: Regarding the amount of detected lesions MRI was superior to DECT. DECT showed best results for mixed-image series with a 120 kV image. Therefore it is important to reconstruct a mixed-image series in order to have optimum conditions regarding detection, classification and reevaluation of liver lesions.

B-0214 15:13

The value of diffusion-weighted MRI for the differentiation of intrahepatic cholangiocellular carcinoma and solitary hypovascular liver metastases

J.D. Kovac, G. Lilic, A. Djuric-Stefanovic, L. Lazic, D. Vasin, T. Nikolic, M. Mitrovic, D. Masulovic, D. Saranovic; *Belgrade/RS (jelenadjokic2003@yahoo.co.uk)*

Purpose: The aim of this study was to determine the value of diffusion-weighted imaging (DWI) for the differentiation of intrahepatic cholangiocellular carcinoma (ICC) and solitary hypovascular liver metastases.
Methods and Materials: Forty patients with pathologically proven solitary hypovascular liver lesions, ICC (n = 18) and hypovascular liver metastases (n = 22), who had undergone preoperative magnetic resonance imaging (MRI) with DWI were included in the study. All the lesions were evaluated qualitatively using following MRI parameters: the shape of the lesions, appearance on DWI images, T2-weighted and T1-weighted signal intensity, type of the enhancement on the arterial and portal venous phase, capsular retraction, and the presence of biliary dilatation. Quantitative analysis was performed in terms of mean ADC values calculated for b=0, and 800 s/mm2.

Results: Univariate analysis revealed that retraction of the liver capsule, the presence of biliary dilatation, and target sign (a central hypointense area with a peripheral hyperintense rim) on DWI were statistically significant predictors for distinguishing ICC from hypovascular metastases. Target sign on DWI was wound in 15 patients (83.3%) with ICC and in 31.8% patients with hypovascular metastases ($p < 0.05$). No significant difference ($p < 0.05$) was found between mean ADC values for patients with ICC (0.102x10-3 mm2/s) and hypovascular metastases (0.976x10-3 mm2/ s).
Conclusion: The conventional MRI appearance of intrahepatic cholangiocelluar carcinoma and solitary hypovascular metastases usually overlap. Visual analysis of DWI images provides an additional information for differential diagnosis of solitary hypovascular liver lesions.

B-0215 15:21

Comparision of contrast-enhanced ultrasound with CT in differential diagnosis of liver abscess from malignant hepatic tumours
Y. Lee, H. Lee, Y. Cha, S. Wee, K. Yoon; *Iksan/KR (yjyh@wonkwang.ac.kr)*

Purpose: To compare the diagnostic performance of contrast-enhanced ultrasound (CEUS) with CT in differential diagnosis of liver abscess from other focal liver lesions.
Methods and Materials: Total 40 focal liver lesions which were initially suspected liver abscess in 38 patients (19 women, 19 men; mean age, 67.4) were evaluated with CEUS (n=40), CT (n=39), and MRI (n=13). CEUS was performed using either Sonazoid (n=14) or SonoVue (n=16). The final diagnosis of focal liver lesions were abscess (n=31), cholangiocarcinoma (n=5), hepatocellular carcinoma (n=1), metastasis (n=1), eosinophilic abscess (n=1), focal fat deposition (n=1). Final diagnosis were made by combination of biopsy (n=10), identification of pus (n=20), typical imaging findings on follow-up study. The diagnostic performance of CEUS was compared with that of CT.
Results: The diagnostic agreement of CEUS and CT with final diagnosis were 0.938 and 0.547 in k-value ($p < 0.05$), respectively. The CEUS findings of abscess were peripheral rim enhancement (80.6%), heterogenous enhancement (16.1%), homogenous enhancement (3.2%) on arterial phase, respectively. All liver abscesses had central unenhanced area and showed hypoechogenicity on delayed phase. Enhancing internal septa were found in 20 (64.5%) abscesses. Distinct margin of the lesions on portal or delayed phases showed more in abscess than cholangiocarcinoma ($p < 0.05$). Abscesses showed more well-defined margin (n=22, 70.9%) than ill-defined margin (n=9, 29%).
Conclusion: Most of liver abscesses showed peripheral rim enhancement on arterial phase, central unenhanced area, enhancing internal septa, and hypoechoenicity on delayed phase. CEUS is effective and comparable imaging modality to CT in diagnosis of liver abscess.

14:00 - 15:30 **Room C**

Breast

SS 302

Breast innovation, biomarkers

Moderators:
C.S. Balleyguier; Villejuif/FR
M.H. Fuchsjäger; Graz/AT

B-0216 14:00

Quantification of microvascular hemodynamics in mice breast cancer using in vivo synchrotron radiation (SR) microangiography
M. Torii[1], T. Fukui[2], M. Inoue[1], S. Kanao[1], T. Inagaki[3], H. Tsuchimochi[3], K. Umetani[4], M. Shirai[3], M. Toi[1]; [1]*Kyoto/JP*, [2]*Tokyo/JP*, [3]*Osaka/JP*, [4]*Hyogo/JP (masaet@kuhp.kyoto-u.ac.jp)*

Purpose: tumour vasculature represents one of the tumour microenvironment characteristics and is related to tumour malignancy and therapeutic targeting. In conventional studies, tumour vasculature has been evaluated mainly by static analysis (i.e. clinicopathologically), but hemodynamic parameters are difficult to examine in vivo. Therefore, we performed quantitative imaging of microvascular morphology and hemodynamics in mice breast cancer in vivo utilizing synchrotron radiation microangiography.
Methods and Materials: Human breast cancer cell lines were transplanted into mouse mammary fat pads. The catheter was cannulated in the carotid artery and an iodinated contrast agent was injected. Tumour microvessels were visualized using SR microangiography. The vessel diameter (width; μm), slope gradient (SG;⊿intensity / ⊿slice), and mean transition time (MTT;second) were calculated from time intensity curves of the images.
Results: We are able to quantify the microvascular morphology and hemodynamics at high resolution (about 10μm, which generally isn't obtained in other modalities) not only on the tumour surface but down to a 1 cm depth. The branch numbers, width and MTT of microvessels were larger in tumour than in normal breast tissue, whereas SG was similar. Normal vs. tumour: Branch number; 4 vs. 7 Width; A1 (40.1vs.54.9) A2 (29.0vs.38.0) MTT; A1 (3.46vs.5.13) A2 (2.94vs.4.80) SG; A1 (21.9vs.25.6) A2 (13.3vs.20.5) Width and MTT increased with enlarged tumour volume.
Conclusion: This study suggested that the microvascular hemodynamics in tumours is different from that in normal tissue. These preclinical findings may be useful for analysis of vessel function in vivo and provide more information for clinical image interpretation.

B-0217 14:08

Opto-acoustic breast imaging: downclassification and upclassification of suspicious breast masses
R.M. Pijnappel[1], C. Meeuwis[2], B. Bisschops[3], J. Veltman[4], P.T. Lavin[5], R.M. Mann[6]; [1]*Utrecht/NL,* [2]*Arnhem/NL,* [3]*Dordrecht/NL,* [4]*Hengelo/NL,* [5]*Framingham, MA/US,* [6]*Nijmegen/NL*

Purpose: Imagio® is an investigational diagnostic opto-acoustic (OA) imaging device that may improve distinction between benign and malignant masses. We report the 75-subject interim analysis from the post-market surveillance MAESTRO study (planned enrollment-200 subjects) who had breast masses classified as BI-RADS 4a and 4b by conventional diagnostic ultrasound (CDU) to assess OA's sensitivity and specificity and its ability to downgrade benign masses and upgrade malignant masses in percentage chance of malignancy (POM) and BI-RADS category.
Methods and Materials: 75 subjects with 78 masses (44 B, 34 M) from 5 Dutch sites were evaluated with OA prior to biopsy. For each mass, the radiologist scored 5 OA features and assigned POM and BI-RADS categories. OA sensitivity, specificity, and BI-RADS downgrade and upgrade percentages were assessed with and without assist from a previously derived nomogram.
Results: The mean POM difference between malignant and benign masses was better for OA (37%) than for CDU (27%) and MRI (20%). OA specificity was 43% without the nomogram and 68% with the nomogram. OA sensitivity was 97% with and without the nomogram. With OA 43% of benign masses could be downgraded and 47% of malignant masses could be upgraded in BI-RADS category.
Conclusion: These OA results appear to confirm previously reported ability of OA to better distinguish between benign and malignant masses than does CDU, to potentially decrease negative biopsies by downgrading, and to upgrade BI-RADS category in malignant masses. The PIONEER pivotal study (n=2,095) and the MAESTRO study (n=200) may further confirm these results.
Author Disclosures:
P.T. Lavin: Consultant; Seno Medical Instruments, Inc.. Research/Grant Support; Seno Medical Instruments, Inc. **R.M. Mann:** Research/Grant Support; Bayer, Siemens Healthcare. Speaker; Bayer, Siemens Healthcare. Other; Scientific Advisor: Siemens Healthcare, Screenpoint Medical; Section Editor EJR: Elsevier.

B-0218 14:16

First clinical experiences with a noncontrast cone-beam breast CT for the detection of breast masses
S. Wienbeck, E. von Fintel, J. Lotz, U. Fischer; *Göttingen/DE (susanne.wienbeck@med.uni-goettingen.de)*

Purpose: To evaluate the significance of noncontrast cone-beam breast CT for the detection of breast masses in the diagnostic setting.
Methods and Materials: In a prospective clinical trial, noncontrast breast CT (Koning Corp). was performed in women with a BI-RADS 4 or 5 assessment in FFDM and/ or ultrasound of the breast. Patient age, breast density type, lesions size and histopathological results were recorded. A relative change in the average noncontrast scan between masses and the surrounding glandular tissue in Houndsfield Units (HU) was recorded for all cases. For the surrounding tissue, three measurements of the density were made on different localisations within the same axial slices because of the variation from the nipple area to the chest wall.
Results: In this ongoing study, noncontrast breast CT has be done in 36 patients with 36 masses (21 invasive carcinomas, 15 benign lesions) starting in August 2015 up to October 2015. The detection rate of masses in noncontrast breast CT depends on the density type of the breast. Approximately 30% are visible due to a higher density in comparison to the surrounding glandular tissue; HU differences ranging from 20 to 50 HU. The remaining 70% showed a mild higher density or were equivalent to the glandular tissue.
Conclusion: The first results with breast CT show that the lesion detection is dependent on breast density. It is possible on noncontrast imaging in density types ACR I and II. Within density types III and IV, obviously the administration of contrast seems to be necessary.

B-0219 14:24

Radiological imaging features of breast cancer according to the molecular subtypes

M. Nazli; *Istanbul/TR (mnazli46@yahoo.com)*

Purpose: We aimed to investigate the relationship of molecular subtypes of breast cancer with radiomorphological findings and quantitative findings like Ultrasound (US) Elastography (EG), diffusion-weighted magnetic resonance imaging (DW-MRI) and positron emission tomography (PET)/ computed tomography (CT).
Methods and Materials: Between 2012-2015, 365 patients (mean age; 54.55 ±13.82) with 405 breast malignant tumour were evaluated and classified into three molecular subtypes according to immunohistochemical status. Luminal type breast cancer, HER2-Positive and hormon negative Breast cancer, Triple-Negative Breast Cancer. Radiomorphologic appearence of tumour is evaluated at US, strain ratio (SR) of tumour at US/EG, contrast morphology and dynamic contrast curve at dynamic contrast-enhanced MRI (DCE-MRI), apperent diffusion coefficient (ADC) at DWI-MRI and F-FDG enhancement at PET/CT are all measured quantitatively.
Results: Luminal type cancers (n= 320, %79.4), HER2 type cancers (n=26, %6.9) and triple negative breast cancers (n= 45, %11.2), are all evaluated in terms of differentiating features of radiological findings. There was statistically meaningful difference in radiomorphologic appearance of luminal type cancers ($p=0.013< 0.05$). There was difference in morphologic appearence of triple negative tumours. ($p=0.029< 0.05$). At DCE-MRI, earlier maximum peak phase points was detected for HER2 type tumours ($p=0.0140.05$).
Conclusion: Determining the relationship of molecular subtypes and radiological findings may allow to evaluate the biological behavior of the tumours. This may contribute to determine the choices for personalised and targeted treatment of the patients.

B-0220 14:32

Beyond choline: in vivo proton MR-spectroscopy fingerprinting of breast lesions

P. Clauser[1], M. Bazzocchi[2], M. Marcon[3], M.A. Marino[1], C. Zuiani[2], M. Dietzel[4], P.A.T. Baltzer[1]; [1]*Vienna/AT*, [2]*Udine/IT*, [3]*Zurich/CH*, [4]*Erlangen/DE (clauser.p@hotmail.it)*

Purpose: to investigate the diagnostic performance of multiple metabolite proton magnetic resonance spectroscopy (1H MRS) in breast lesion subtyping.
Methods and Materials: 93 consecutive patients (mean age 56 years, range 23-79) undergoing breast MRI for routine clinical indications on a 1.5 T scanner were eligible for this IRB-approved prospective study. Enhancing lesions ≥ 8 mm underwent 1H-MRS using a single-voxel point-resolved spectroscopy (PRESS, TR 2000 ms, TE 272 ms). One water-suppressed acquisition with 128 measurements and one fully relaxed spectrum with 16 measurements were obtained. Histology showed 69 malignant and 24 benign lesions. Two readers in consensus measured the Signal-to-Noise ratio of choline (SNR Cho), olefinic acids (SNR 5.3) and the water to methylene ratio (W-F ratio, 4.74/1.33 ppm). Diagnostic performance was evaluated using the area under the receiver operating characteristic curve (AUC) for each measurement. Combined diagnostic accuracy was explored using a 10-fold cross-validated Chi-squared automatic interaction detection (CHAID) method. Inter-reader agreement was evaluated in a subset of patients.
Results: AUC for SNR Cho, SNR 5.3 and W-F ratio were 0.733, 0.769 and 0.704, respectively ($P> 0.363$). A classification tree with a depth of three ramifications was obtained. The calculated predicted probability showed a significantly better performance compared to the single measurements (AUC: 0.912, $p < 0.006$). SNR Cho was able to distinguish invasive from in situ ductal carcinoma and invasive lobular carcinoma ($P> 0.981$)
Conclusion: Additional evaluation of lipids to choline increases 1H MRS diagnostic performance and could allow accurate lesion characterisation and subtyping.

B-0221 14:40

The predictive factors associated with the early and late recurrence in breast cancer: predictive factors on radiography and clinical-pathology

B. Kim, E. Choi, S. Choi, G. Jin; *Jeonju-si/KR (e3651@hanmail.net)*

Purpose: To evaluate the radiologic and clinical-pathologic factors influencing recurrence period in the cases of the patients who experienced recurrence after first treatment of breast cancer
Methods and Materials: From January 2007 to July 2011, we retrospectively reviewed 1030 breast cancer patients who had undergone surgery at our hospital. Among them, we analysed 602 recurrent cancer patients. We evaluated the MRI imaging parameters (background parenchymal enhancement (BPE), time-intensity curve images, whole-breast vascularity, quantitative parameters of tumours) and clinical-pathologic variables (age at diagnosis, tumour size, axillary node status, tumour grade, expressional status of multiple hormonal receptor) We had attempted to compare the recurrent patients within 2.5 years after the completion of curative surgery and adjuvant chemotherapy as the early recurrence with those over 2.5 years as the late recurrence. Time dependent univariate and multivariate cox regression analysis were used.
Results: Among 1030 women with breast cancers, 47 (4.5%) had early recurrence and 36 (3.4%) had late recurrence. At time-dependent multivariate Cox regression analysis, ER-negativity (p=0.04) and whole-breast vascularity (p=0.004) is predictive to early recurrence. Nuclear grade III (p=0.01), T stage (p=0.04), over moderate degree of BPE (p=0.04), and rim enhancement (p=0.04) affected late recurrence. The AUC for combined MR imaging parameters plus clinical-pathologic variables was better than for each variable alone.
Conclusion: Prominent increased ipsilateral whole breast vascularity and ER-negativity were the predictor associated with early recurrence. Precise risk estimates of primary tumour characteristics on combined MR imaging and clinical-pathologic finding is needed for prediction of breast cancer recurrence

B-0222 14:48

Visualisation of microcalcifications by cone-beam breast CT in comparison to full field digital mammography

S. Wienbeck, E. von Fintel, J. Lotz, U. Fischer; *Göttingen/DE (susanne.wienbeck@med.uni-goettingen.de)*

Purpose: To evaluate the visualisation of microcalcifications in the breast by a clinically available cone-beam breast CT in comparison to full field digital mammography (FFDM).
Methods and Materials: Mastectomy specimens and specimens of stereotactic VAB were both scanned in a dedicated cone-beam breast CT as well as imaged by FFDM. The visibility of microcalcifications was assessed and the minimal detectable size of microcalcifications were electronically measured for both modalities. In addition the number and visual conspicuity of microcalcifications was assessed by a qualitative score for breast CT and FFDM.
Results: In this ongoing study starting in August 2015, 30 specimens of VAB and 15 total mastectomy specimens with microcalcifications were included up to October 2015. Microcalcifications over 250 micrometer in size were detectable with the cone-beam breast CT. The subjective conspicuity of microcalcifications was found to be better on FFDM compared to cone-beam breast CT. Calcifications in breast CT scans were subject to beam-hardening artifacts.
Conclusion: Cone-beam breast CT allows for the detection of microcalcifications of 250 micrometer size and larger. The subjective conspicuity of microcalcifications is significantly better for the FFDM compared to breast CT.

B-0223 14:56

Second-look US using real-time virtual sonography increases the sonographic detection rate of MRI-detected lesions with non-mass like enhancement on breast MRI

S. Nakano, K. Fujii, J. Kousaka, Y. Mouri, T. Ando, R. Tetsuka, M. Goto, T. Imai, T. Ishiguchi; *Aichi/JP (snakano1@aichi-med-u.ac.jp)*

Purpose: Breast MRI-detected lesions are often further evaluated using second-look US. The second-look sonographic correlation rate of non-mass like enhancement (NMLE) is lower than that of mass or focus. The aim of this study was to verify the utility of second-look US using Real-time Virtual Sonography (RVS), which can localize the enhanced distribution obtained by MRI onto the breast surface using an image fusion technique, for the sonographic detection of MRI-detected lesions with NMLE.
Methods and Materials: 19 consecutive patients (19 lesions) with NMLE on 1.5 T prone MRI were enrolled in this study. For conventional B-mode occult NMLE, second-look US using RVS was performed after additional 1.5 T supine MRI. All RVS examinations were performed on an outpatient basis. Pathological findings were confirmed by sonography-guided biopsy or excision.
Results: Of the 19 NMLE lesions, 12 (63%) were identified with second-look US using conventional B-mode alone. Of the seven conventional B-mode occult NMLE lesions, six (86%) were sonographically detected with second-look US using RVS; all of these sonographic morphology were non-ductal, irregular, hypoechoic masses with architectural distortion and lacked convex outer borders. The six lesions could be evaluated using sonography-guided biopsy, and MRI-guided biopsy was not required. The single lesion that was not sonographically detected required surgical biopsy after body marking using RVS. Overall, four cases were malignant (three DCIS and one IDC) and three were benign.
Conclusion: Our results suggest that second-look US using RVS increases the sonographic detection rate of MRI-detected breast lesions with NMLE.

B-0224 15:04

Hybrid PET-MR for predicting pathologic complete response to neadjuvant chemotherapy in breast cancer - preliminary experiences

B. Goorts, M.L. Smidt, S. Vöö, F.M. Mottaghy, J.E. Wildberger, M.B.I. Lobbes; *Maastricht/NL (marc.lobbes@mumc.nl)*

Purpose: To assess the diagnostic accuracy of hybrid PET-MR for predicting pathologic complete response (pCR) of both primary tumour and nodal metastases to neoadjuvant chemo- and immunotherapy (NAC) in breast cancer patients.
Methods and Materials: This prospective study included primary invasive breast cancer patients with at least cT2 and/or a histopathologically confirmed lymph node metastasis undergoing NAC. Exclusion criteria were distant metastases and contra-indications for undergoing contrast-enhanced FDG PET-MR. All patients underwent hybrid PET-MR before (PET-MR-1), midway (PET-MR-2) and after NAC (PET-MR-3). One dedicated breast radiologist and one dedicated nuclear physician evaluated all scans. For the primary tumour maximum diameter, volume, signal intensity time curves, ADC values, visual FDG uptake intensity (VUI) and standardized uptake values (SUV) were measured. For lymph nodes suspicious for metastases: number, morphology, VUIs and SUVs were assessed. PET-MR parameters of primary tumour and lymph nodes of all scans were compared to definitive histopathology, to evaluate the diagnostic accuracy for predicting pCR.
Results: A total of 27 patients were included in this ongoing study. Thus far, five patients finished NAC and were operated on. Four patients had radiological complete response of which three had pCR (sensitivity 75%) and one had 14 mm cribiform carcinoma according to histopathology. One patient had 38 mm non-mass-like enhancement on PET-MR-3; pathology confirmed minimal residual ductal carcinoma, scattered through 35 mm tumour bed. Interestingly, PET always showed earlier CR than MRI.
Conclusion: Hybrid breast PET-MR imaging shows promising preliminary results for predicting pCR in breast cancer patients.

B-0225 15:12

Diffuse reflectance spectroscopy measured during biopsy procedures for tissue characterisation of breast tissue

L.L. de Boer[1], C.E. Loo[1], G.A. Winter-Warnars[1], J.W. Spliethoff[1], T.M. Bydlon[2], B.H. Hendriks[2], A. Fioole-Bruining[1], M. van Loveren[1], T.J. Ruers[1]; [1]*Amsterdam/NL*, [2]*Eindhoven/NL (c.loo@nki.nl)*

Purpose: In the age of personalised medicine there is an increasing demand on radiologists to obtain high quality biopsy specimens for molecular diagnostics. Low diagnostic yield results in high processing costs and new techniques are required to improve this yield. Diffuse reflectance spectroscopy, an optical technology that measures light-tissue interactions, provides real-time tissue characterisation. The feasibility of this technique to differentiate benign and malignant tissue during US-guided breast biopsy procedures were evaluated.
Methods and Materials: Optical fibres were integrated into a 16G biopsy needle to measure the diffuse reflectance during routine biopsy (n = 35). In 5 patients continuous measurements were obtained along the needle trajectory from normal tissue towards the tumour and were recorded simultaneously with ultrasound. At the last measurement location a biopsy was taken to correlate the measurements with histopathology. The optical spectra were quantified and compared between the normal, border, and tumour.
Results: In the initial 30-patient dataset the optically derived fat content could differentiate normal and tumour tissue with 96% accuracy. The fat content decreased from normal to the border of the tumour (-13.6%) and from the border into the tumour (-52.7%). In continuous mode the optical biopsy needle acquired spectra that followed the same trends as the initial point-measurements. Furthermore, the trends measured continuously correlated with US-imaging and histopathology in 4/5 patients.
Conclusion: This technology discriminates normal from tumour tissue real-time during breast biopsy procedures. Furthermore, the measurements obtained in the continuous setting endorse the feasibility of using diffuse reflectance spectroscopy in the existing workflow.
Author Disclosures:
T.M. Bydlon: Employee; Philips Research. **B.H. Hendriks:** Employee; Philips Research.

B-0226 15:20

A prospective evaluation of a 3D functional infrared imaging for risk assessment in women at high risk for breast cancer

D. Izhaky[1], A. Shalmon[2], A. Rundstein[2], Y. Servadio[2], M. Gotlieb[2], E. Mor[1], M. Sklair-Levy[2]; [1]*Air Port City/IL*, [2]*Ramat Gan/IL (david@realimaging.com)*

Purpose: 3D functional infrared imaging (3DIRI) has been shown before to provide high accuracy risk assessment for the likelihood of breast cancer based on multiparametric evaluation of metabolic imaging biomarkers. In this prospective study, 3DIRI is added twice yearly to a screening program which includes annual breast MRI and breast ultrasound or mammography surveillance. This study evaluates the diagnostic accuracy of 3DIRI's risk assessment.
Methods and Materials: : Following IRB approval, 217 female at high risk for breast cancer due to genetic predisposition, signed informed consent for this study. They underwent one or two rounds of screening during 16 months. Screening included 3DIRI scan (prototype Real Imager 8, Real Imaging, Israel) and MRI or breast ultrasound or mammography. Women with a negative screening mammography or ultrasound, but positive 3DIRI's risk assessment score, were referred to MRI. Diagnostic accuracy values were analysed.
Results: 179 women completed one round and 42 women completed two rounds of screening for a total of 261 valid 3DIRI examinations. In 5 women a total of 5 cancers were detected. 3DIRI's risk assessment was positive in 4 of these women, yielding a sensitivity of 80%. In one woman, cancer was missed by mammography, however, correctly classified as suspicious by 3DIRI and was verified by a subsequent MRI scan.
Conclusion: 3DIRI can provide the likelihood of cancer with high accuracy in a population of women that are at high risk for breast cancer. Additional studies are necessary to evaluate its clinical utilization as adjunct to mammography.
Author Disclosures:
D. Izhaky: Employee; Real Imaging Ltd. **E. Mor:** Employee; Real Imaging Ltd.

14:00 - 15:30 **Room Z**

Computer Applications

SS 305

Developing tools for clinical workflow management

Moderators:
L. Faggioni; Pisa/IT
B. Gibaud; Rennes/FR

B-0227 14:00

What is the utility of three-dimensional surface rendering reconstruction of volumetric CT data in routine CT reporting?

J.S.Z. Lee[1], E.K. Woo[2]; [1]*Oxford/UK*, [2]*Buckinghamshire/UK (eric.woo@buckshealthcare.nhs.uk)*

Purpose: Cutaneous changes are under-reported in CT reports. Use of three-dimensional (3D) surface rendering reconstruction of volumetric CT data is shown to accelerate detection of skull and facial fractures. We hypothesise that this technique could aid diagnosis of patients with volumetric CT scans.
Methods and Materials: 3D surface rendering reconstructions were performed on a cohort of 1878 patients who underwent a volumetric CT scan in the past 15 months. Reconstruction images were reviewed by a consultant radiologist and assessed for their clinical utility. Reconstructed images of patients with cutaneous changes were retrospectively reviewed by a second reader for consensus. Images of suboptimal quality were excluded.
Results: The use of 3D surface rendering reconstruction of CT data led to detection of skin changes in 13 patients (0.7%). These include surgical scars, narrowing differential diagnosis in patients with acute abdomens. This was useful when prior patient history was not available. This technique allowed for quick identification of ileostomies, cutaneous lesions and distended upper thoracic veins in a patient with superior vena cava obstruction. Visualisation of skin abnormalities on reconstructed images increased detection of underlying aetiology, and radiologists' confidence in the diagnosis.
Conclusion: 3D surface rendering reconstruction of CT data can be beneficial in detecting skin changes, providing additional information to narrow differential diagnosis in diagnostic dilemmas and to increase radiologists' confidence in the underlying etiology. It was most effective in identifying surgical scars, cutaneous lesions and distended superficial veins, often in the absence of relevant clinical information at the time of reporting.

B-0228 14:08

Structured reporting: evidence-based?

M. Nobel, S.G.F. Robben; *Maastricht/NL (martijn.nobel@mumc.nl)*

Purpose: The radiological report is the most important product of our work and an important medico-legal document. Surprisingly, despite many innovations, such as speech recognition systems, digitalisation and better PACS systems, the way of radiological reporting is still roughly the same. Currently, an ongoing shift can be observed from standard free text reporting to structured reporting (SR). However, is this shift evidence-based or is it just intuition pushing development of SR trying to reach beneficial goals?
Methods and Materials: PubMed and Cochrane Library have been searched for terms associated with 'structured reporting in radiology', which resulted in

210 articles. Articles not in English, Dutch or German, or that did not discuss aspects of structured radiological reporting were excluded.
Results: SR appears to lack a proper definition and published papers have their own interpretation of SR. Multiple initiatives have been presented as SR, such as BIRADS/PIRADS/LIRADS, templates, drop down menus and checklists. Several low evidence-based studies have been performed, with different study designs as well as different used modalities, leading to all kinds of positive outcomes. SR has a tendency to be beneficial in relatively easy to conduct examinations or straight-forward outcomes. However, most positive outcomes seem to be influenced by design-based bias. The only double-cohort study with a randomised controlled trial design (highest level of evidence in our analysis) did not show any improvements.
Conclusion: Although SR seems to be generally accepted, it is not clear yet whether SR is beneficial in radiological reporting, because proper evidence is currently lacking.

B-0229 14:16

Structured reporting of CT examinations in acute pulmonary embolism
B.O.T. Sabel, J. Plum, N. Kneidinger, G. Leuschner, B. Raziorrouh, L. Koletzko, R. Schinner, M.F. Reiser, F.G. Meinel; *Munich/DE (bastian.sabel@gmail.com)*

Purpose: To evaluate the effect of structured reporting of CT pulmonary angiography (CTPA) studies on the content, clarity and clinical usefulness of the reports in a clinical emergency room setting.
Methods and Materials: Conventional and structured reports were generated for forty-one patients who had undergone CTPA and were found to have acute pulmonary embolism. While conventional reports were freely dictated, structured reports were based on the template recommended by the RSNA Reporting Initiative. A questionnaire that included questions regarding the clinicians' satisfaction with content and clarity of the reports was sent to four clinicians. The clinicians rated their degree of satisfaction on a scale ranging from 1 (very dissatisfied) to 10 (very satisfied). The effectiveness of each report in advancing the patient's position on a clinical spectrum (POCS) was categorized. Based on clinical and radiological information, the clinicians had to hypothetically choose the suitable ward and therapy. Mixed effect models were used to test the differences between the reports.
Results: For satisfaction with content, conventional reports received a mean rating of 8.5 and structured reports of 9.6; the difference was significant with $p < 0.0001$. Mean clarity satisfaction ratings for conventional and structured reports were 7.7 and 9.7 respectively, significantly different with $p < 0.0001$. The POCS grade ratings did not differ between the reports. There was no difference in patient assignment to the wards or the recommended therapy.
Conclusion: Referring clinicians perceive structured reports of CTPA studies as offering better content and clarity than conventional reports. No change in patients' management was observed.

B-0230 14:24

Identifying structural quality deficits by systematic reporting of erroneous action
A. Escher, S. Schindera, A. Streuber; *Basle/CH (alexandra.streuber@usb.ch)*

Purpose: To evaluate if systematic reporting and documentation of erroneous action in a radiology department (RD) can help to detect structural quality deficits.
Methods and Materials: Based on a custom-made web-based quality reporting system, data are collected since 04/2013 (1523 incidents). Each incident can be documented easily by a one-click solution in the radiology information system. It also can be categorised in problem categories (e.g. image quality, workflow, reconstruction, misidentification) and classified in positive, neutral or positive impact. Relevant parameters such as modality, workplace and time are documented automatically. All incidents are stored in a database.
Results: Most incidents were classified as "negative impact" (1407/1523). Vast majority of negative incidents are categorised as "image quality" deficits (938/1407). Most "image quality" deficits in relation to total number of examinations appear in MRI (6.15 incidents per 1,000 examination) followed by CT (4.28‰) and radiography (2.97‰). Against expectations "image quality" is better in emergency workplaces. Incident rate under emergency circumstances is lower for radiography (2.05‰; 2.45‰ for two emergency units compared to an average of 3.55‰ for other XR units), confirmed by results in CT (3.4‰ for emergency; 5.8‰ other). There are also significant differences in the prevalence of incidents for different body regions (e.g. higher for complex coronary examinations 13.86‰).
Conclusion: Analysis of quality incidents is helpful to improve imaging quality. The shortages of a non-documented face-to-face communication of errors can be overcome by a structured reporting of incidents. It enables analysis to increase transparency to establish a meaningful improvement process.

B-0231 14:32

Radiology reporting workflows: the development and testing of a semi-naturalistic observational technique using eyetracking, scene video and screen capture
S.J. Rickaby, M. Colbert; *Kingston upon Thames/UK (S.Rickaby@sgul.kingston.ac.uk)*

Purpose: The process of radiology reporting is often hindered by a range of issues that distract the radiologist from the diagnostic task at hand; such as poor software design, data overload and cognitive fatigue. Unfortunately, these problems have been ineffectively investigated because radiology reporting workflows are rarely amenable to laboratory based observational methodologies. The author describes the development and testing of a semi-naturalistic observational technique for the evaluation of reporting workflows using in-vivo patient data.
Methods and Materials: Design: An iterative process of development and informal testing was used to select the most effective and unobtrusive means of capturing a radiologists workstation interactions.
Testing: Twelve Radiologists from one UK hospital were asked to report a chest worklist for twenty minutes, while their behavior was recorded. A session was deemed successful if the radiologist could be continuously recorded for 20 minutes without interruption or technical support.
Results: Final successful capture setup: Tobii eyetracking glasses with standalone data recorder; Camstudio-Portable screen recorder (recording the information screen only), and a scene video recorder. Videos of the sessions were then combined in Adobe After-Effects.
Of the 12 sessions recorded, 9 successfully captured the full twenty minutes of reporting without error or disruption. 2 failed due to workstation memory overload, and 1 failed due to eye tracking calibration problems.
Conclusion: An effective semi-naturalistic method for recording the reporting workflow was developed that was able to capture the majority of the user's genuine reporting activity, without compromising the fluency and complexity of the radiologists' natural behaviors.

B-0232 14:40

Automatic indication detection for imaging decision support in clinical workflows
E. Pons, L.M.M. Braun, J.A. Kors, M.G.M. Hunink; *Rotterdam/NL (e.pons@erasmusmc.nl)*

Purpose: It has become increasingly difficult for physicians to select appropriate imaging procedures. Selection can be aided by evidence-based guidelines, made available in ESR iGuide and ACR Select. Although these guidelines link to relevant evidence, first imaging has to be actively considered as a strategy, and second, the specific clinical condition needs to be manually selected from an extensive list. Further clinical workflow integration is desired, where patients are automatically identified and guideline advice is presented instantaneously. For such integrated imaging decision support (IDS), we have developed an automatic method for indication detection, using natural language processing (NLP). We applied the method to select patients with minor or mild acute closed head injury (GCS ≥13).
Methods and Materials: Because detection should occur from referring clinician documentation at the time of input, we extracted 9068 neurology clinical notes from the emergency department, where head traumas mostly present. We developed NLP-algorithms for automatic processing of unstructured information contained within the notes. A machine learning algorithm for detection of indication was trained on 500 labeled notes, while a pattern based approach was developed for GCS.
Results: Validation yielded 95.2% sensitivity and 97.9% specificity for detecting traumatic head indications and selection of GCS ≥13 was 97% accurate. Simulation on all data linked 2529 patients that visited the emergency department automatically to the appropriate guideline.
Conclusion: Automatic indication detection for IDS performed adequately in one clinical workflow. We will expand our method with additional patient characteristics and risk factors to cover more guidelines.
Author Disclosures:
M.G.M. Hunink: Advisory Board; Member of Scientific Advisory Board of European Institute for Biomedical Imaging Research, including Travel reimbursement. Author; Royalties for textbook: Decision Making in Health and Medicine: Integrating evidence and values. Research/Grant Support; Travel reimbursement, grant for work on Appropriateness Criteria for Imaging from European Society of Radiology (ESR).

B-0233 14:48

CARDS: the decision support tool for radiologists examining head CT images

P. Martynov, N. Mitropolskii, K. Kukkola, L. Mutanen, J. Reponen, A. Makynen; *Oulu/FI (petr.martynov@oulu.fi)*

Purpose: Main purpose of the project is to assist radiologists in the interpretation of difficult cases by providing an easy to use search functionality for retrieving similar diagnostic findings from hospital databases (PACS and RIS) by image or text queries.
Methods and Materials: For the project implementation, we created a testing environment, which includes an open-source PACS and an integrated HL7 messaging system for RIS emulation. For image data indexing, we used Bag of Visual Words (BoVW) technique and tested several algorithm combinations for image keypoint detection and description. We evaluated the stability and efficiency of our algorithms and software solutions with test cases, which contain 663 anonymised DICOM studies (296,488 head CT images with and without contrast), supported by radiologists' reports and anamnesis data. End-user requirements were charted by interviewing over 30 radiologists in individual and group interviews in radiological departments in university and county hospitals (Finland).
Results: Developed pilot software contains a client-side web-based DICOM Viewer application with search functionalities, and a server-side application for background image and text indexing and retrieving. Current average searching time is less than 3 seconds with whole results page loading time about 5 seconds. Quantitative evaluation of algorithm combinations for quality of search results and efficiency is still in progress.
Conclusion: Searches for similar findings based on visual interest area selection of medical images seem to be natural for radiologists. Search by image part works fast and finds visually similar cases, whose medical relevance should be evaluated additionally.

B-0234 14:56

Big Data in optimising radiology management: from passive storage to real-time response

O. Pianykh; *Boston, MA/US (opiany@gmail.com)*

Purpose: Radiology workflow presents a complex mixture of planned events and unforeseen deviations. The old management approach was to set certain expectations and hope that they would be met. Instead, we propose to actively monitor all workflow events in real time, using only the data already available to us.
Methods and Materials: To optimise radiology workflow at Mass General Hospital, we developed an event-tracking system, entirely based on RIS and PACS data. The system was implemented as a real-time process, querying PACS and RIS databases for the most recent 48 hours of workflow events (some 6000 records per query), and identifying each patient and study location in the current processing chain. For each event (such as patient wait or image transmission time), we numerically determined the thresholds which should trigger alerts to the responsible managers. The entire workflow was also made visible online, providing real-time display of the outliers requiring immediate attention.
Results: Our active workflow management tool was launched in February 2015, and immediately proved to be indispensable. It helped us to (a) detect workflow inefficiencies: delayed patients, incorrectly transmitted images, etc. and (b) pinpoint the sources of inaccurate, mismatched processes. As a result, this provided us with a much more honest picture of the current events, and the ability to respond in real time.
Conclusion: PACS and RIS data, passively accumulated by radiology departments, need to be used proactively. Our experience demonstrates that this can be done in real-time, greatly improving the efficiency of radiology workflow at no additional data-collecting cost.

B-0235 15:04

Is explorative data analysis one milestone on the way to value based radiology?

A. Escher, J. Truong, A. Streuber; *Basle/CH (achim.escher@usb.ch)*

Purpose: To evaluate if explorative data analysis can identify workflow patterns in a radiology department (RD) effecting the length of stay (LOS) of inpatients. The ability to prevent prolonged LOS is essential to improve clinical care and efficiency.
Methods and Materials: Data are collected from inpatients treated in a RD (01/2013-12/2014). Analysis focuses on the largest three major diagnostic categories (MDC) (nervous system, circulatory system, musculoskeletal) in RD (N=15'750; 56% from all cases in the RD). An individual developed tool is used to analyse data.
Results: Analysis shows several correlations between radiology patterns and LOS e.g: Weekday of intervention has no effect for nervous system cases. But in the two other MDCs significant ($P < 0.05$) higher LOS is detected for cases, with first scan on Friday compared to other days.Waiting two days instead of one day for the first scan will increase the LOS significantly ($P < 0.05$).In circulatory system the most frequent DRG is bypass-operation. 48% of the cases have a standard process. First scan takes places on admission day and the second scan on the third day. These cases have significant ($P < 0.05$) shorter LOS compared to the cases, which also have the first scan on admission day but missing second scan on third day (27%).
Conclusion: The analysis shows correlations between radiology treatments and length of stay. These results demonstrate potential for optimisation in the treatment process of circulatory system and musculoskeletal patients. The patters need further analysis with medical background and additional information.

B-0236 15:12

Estimating prevalence of rare diseases using a large radiology report database

C.E. Kahn; *Philadelphia, PA/US (charles.kahn@uphs.upenn.edu)*

Purpose: Rare diseases are defined by the European Commission on Public Health as those affecting fewer than 1 in 2000 people. About 6800 rare diseases are known today. This study sought to estimate the prevalence of a set of rare diseases using of large collection of radiology reports.
Methods and Materials: A database of 12,279,330 radiology reports on 7,739,623 patients from a U.S. academic health system served as the source of information. Of 6794 rare diseases in the Orphanet Rare Disease Ontology (www.orpha.net), we limited our search to 2287 diseases mapped to terms in the Radiology Gamuts Ontology (www.gamuts.net). Both ontologies provide synonyms for the disease names to facilitate text-based searching. An information retrieval system (Montage Healthcare Solutions, Inc., Philadelphia, PA) was used to query the report database.
Results: Automated queries were completed for a sample of 481 of the 2287 rare diseases. Of these, 138 diseases (29%) had no detected occurrences. The most frequently observed disorders were tuberculosis (34,118 patients), sarcoidosis (14,811 patients), meningioma (14,153 patients), and hepatocellular carcinoma (12,106 patients). The median number of patients per disease was 6, corresponding to a prevalence of 0.8 per million persons. Estimates showed strong correlation with known prevalence values.
Conclusion: Automated search of a large radiology report database can be used to estimate prevalence of rare diseases. Such information is useful to augment knowledge models for differential diagnosis such as the Radiology Gamuts Ontology.

B-0237 15:20

Identification of rare Imaging Findings: application of natural language processing

E. Pons, J.J. Visser, M.G.M. Hunink; *Rotterdam/NL (e.pons@erasmusmc.nl)*

Purpose: Management of rare or incidental imaging findings poses serious challenges due to limited evidence and lack of consensus regarding their work-up. Manual review to identify sufficient cases for retrospective analysis, prospective decision support, or quality-assurance is often infeasible. We propose a stepwise natural language processing (NLP)-method for case identification, and apply the method to adrenal incidentalomas.
Methods and Materials: Reports are filtered by sequential steps:I. Procedural codes matching all clinical scenarios of occurrence are selected (e.g., CT abdomen and thorax codes).II. Reports that contain key sentences are selected; key sentences mention the essential anatomical descriptor for the finding (e.g. "adrenal").III. Non-relevant anatomical descriptors are removed from key sentences, frequent negative patterns are subsequently filtered (e.g., "normal appearance of [location], adrenals and [location]").IV. A random sample of remaining key sentences are labeled by radiologists via consensus (e.g. "potential incidentaloma").V. A machine learning selection algorithm is trained on these examples and applied as final filter.
Results: 528,127 Dutch radiology reports were extracted, yielding 32,298 reports for five relevant procedural codes. While screening 100 reports only showed a prevalence of 3%, frequent pattern filtering increased data prevalence to 50%. Machine learning selection, trained on 500 examples, identified 3,516 cases with 97% prevalence of potential incidentalomas. The performance for all selection steps combined was 96.7% sensitivity and 99.5% specificity.
Conclusion: Our NLP approach automatically increased finding prevalence from 3% to 97%, with negligible missing cases. Notably, our method does not rely on pre-existing lexicons and is generalizable to other clinical scenarios and languages.
Author Disclosures:
M.G.M. Hunink: Advisory Board; Member of Scientific Advisory Board of European Institute for Biomedical Imaging Research, including Travel reimbursement. Author; Royalties for textbook: Decision Making in Health and Medicine: Integrating evidence and values. Research/Grant Support; Travel reimbursement, grant for work on Appropriateness Criteria for Imaging from European Society of Radiology (ESR).

14:00 - 15:30 **Room O**

GI Tract

SS 301b

Colon

Moderators:
R. Maksimović; Belgrade/RS
T. Mang; Vienna/AT

K-06 14:00

Keynote lecture
M. Hellström; *Gothenburg/SE*

B-0238 14:09

Diagnostic value of CAD-assisted CT colonography in the assessment of nonpolypoid colorectal lesions (NPLs) using CT colonography: a single-centre experience
M. Santoni, M. Ciolina, A. Pichi, P. Baldassari, M. Iannitti, C. Cavallini, D. Diacinti, F. Iafrate; *Rome/IT (mariangela.santoni@libero.it)*

Purpose: To evaluate the capability of CT colonography (CTC) in the assessment of nonpolypoid lesions (NPLs) when carried out by four readers with different levels of experience with and without applying computer-assisted diagnosis (CAD) software.
Methods and Materials: We performed a retrospective analysis of 94 patients affected by NPLs (108 lesions); comparison was made with a historical cohort of 100 patients negative at both CTC and colonoscopy. All patients were blindly analysed with CTC 2D-3D as first reader by four radiologists with different level of experience: an expert ([E]> 5000 exams), intermediate ([I]> 300 ones) and two novice radiologists ([N1-2]> 50); all the exams have been reviewed after one month using CAD as a second reader. All positive patients underwent optical colonoscopy and biopsy. Statistical analysis has been performed to calculate inter-reader agreement and positive predictive value.
Results: Readers' detection rate for CTC 2D- and 3D review was 74% ([E]n=79/108), 65% ([I]n=70/108), 51% ([N1]n=55/108), 57% ([N2]n=61.5%) for CTC+CAD was 84% ([E]n=91/108), 75% ([I]n=81/108), 51% ([N1]n=55/108), 72% ([N2]n= 78/108). Inter-reader agreement pre- and post-CAD was 0.807-0.817 [E] vs [I], 0.552-0.596 [E] vs [N1], 0.645-0.654 [E] vs [N2], 0.721-0.762 [I] vs [N1], 0.827-0.827 [I] vs [N2]. 2D-3D CTC vs CAD second reader reviewing times were 6 minutes [E], 8 minutes [I], 9 minutes [N1] and 10 minutes [N2] and 8±1.5 minutes [E], 11±1.3 minutes [I], 12±2 minutes [N1], 13±2 minutes [N2], respectively (P> 0.05).
Conclusion: A second reader CAD yielded a small increase in reporting time, significantly improving the detection capability of the intermediate- to low-experienced radiologists.

B-0239 14:17

Standard and ultra low-dose CT colonography: comparison of performance of filtered back projection, hybrid iterative reconstruction technique and iterative model reconstruction
L. Lambert[1], P. Ourednicek[2], W. Giepmans[3], J. Jahoda[1], L. Hruska[1], A. Lambertova[1], J. Danes[1]; [1]*Prague/CZ*, [2]*Brno/CZ*, [3]*Best/NL (lambert.lukas@gmail.com)*

Purpose: To compare performance of filtered back projection (FBP), hybrid iterative reconstruction technique (HIR) and iterative model reconstruction (IMR) in standard (SD) and ultra low-dose (ULD) CT colonography.
Methods and Materials: CT colonography in 66 matched patients (33 with colonic findings) was reconstructed with FBP, HIR, and IMR. Image noise was measured in six colonic segments and the left psoas muscle. Image quality of the colon and the left adrenal gland was rated on a five-point Likert scale, and colonic and extracolonic findings were reported.
Results: The mean radiation dose was 4.1±1.4 mSv for SD and 0.86±0.17 mSv for ULD, and per-patient sensitivity, specificity for detection of colonic findings were 0.82, 0.93 for ULD-FBP; 0.97, 0.97 for ULD-HIR; 0.97, 1.0 for ULD-IMR. Per-polyp sensitivity and positive predictive value were 0.84, 0.86 for ULD-FBP; 0.98, 0.96 for ULD-HIR; 0.98, 0.98 for ULD-IMR. Significantly less extraintestinal findings were detected in ULD-FBP and ULD-HIR, but in the E4 category, the detection was similar.
Conclusion: Both HIR and IMR are suitable for submilisievert ultra low-dose CT colonography without sacrificing diagnostic performance of the study.
Author Disclosures:
P. Ourednicek: Employee; Philips Healthcare. **W. Giepmans:** Employee; Philips Healthcare.

B-0240 14:25

Initial study on radiation dose and image quality of ultra-low current and voltage CT colonography with iterative model reconstruction
Y. Lian[1], W. Cao[2], J. Dong[1], H. Wang[1], Y. Jiang[1], J. Gao[1]; [1]*Zhengzhou/CN*, [2]*Guangzhou/CN (lybang0507@126.com)*

Purpose: To assess radiation dose and image quality of CT colonography (CTC) with iterative model reconstruction algorithm (IMR) compared with filtered back projection (FBP).
Methods and Materials: Five segments of pig colon phantoms with 73 polyps (ranging from 1 mm to 15 mm) were collected. Image data were acquired with two tube peak voltage (100 and 120) KVp and five current dose (10 mAs to 50 mAs). Images were reconstructed using FBP and IMR. Two radiologists independently evaluated image quality. Qualitative image quality was assessed with a five-score scale. Image noise, signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), and effective radiation dose were recorded and calculated. Qualitative and quatitative values were analysed by using Wilcoxon signed rank test and the paired t test, respectively.
Results: For 10 mAs with IMR at 100 KVp (A group)and 50 mAs with FBP at 120 KVp (B group), there is no statistically significant difference in qualitative image quality scores (p=0.059). However, image noise, SNRs and CNRs were significantly superior of 10 mAs with IMR ([24.05±2.11] HU vs. [50.04±3.45] HU, 2.40±0.68 vs. 0.62±0.20, and 42.56±6.11 vs. 20.48±1.46, respectively; p=0.001). Compared with B group, radiation dose of A group decreased significantly (0.26±0.03 mSv vs. 2.21±0.23mSv; p=0.000), but per-polyp sensitivity has no statistically significant difference (68 /73 vs. 73/73, p=0.07).
Conclusion: Image quality of CTC using 10 mAs at 100 KVp with IMR could be comparable to 50 mAs at 12oKVp with FBP, and radiation dose of the former was only 0.26 mSv, which was reduced by about 88.2%.

B-0241 14:33

Follow-up of acute complicated diverticulitis: role of CT colonography
M. Bassi, E. Raimondi, Z. Ferrante, B. Malta, C. Montalto, R. Rizzati, M. Giganti, G. Benea; *Ferrara/IT (mattedoc@gmail.com)*

Purpose: To evaluate the role of CT colonography (CTC) in patients recovered from an episode of acute complicated diverticulitis (ACD), in order to set the correct therapeutic approach.
Methods and Materials: From April 2009 to June 2015, 88 patients underwent CTC follow-up (38 males, 50 females, aged 35-91 yo) 6-8 weeks after and episode of ACD, conservatively treated. All patients underwent onset enhanced-CT (CECT) and were stratified using different stages of modified Hinchey classification. CTC examination evaluate both colonic/extracolonic findings, staging and assessing short-term course of diverticular disease.
Results: No CTC complications occurred. CTC quality was good in 79/88 patients (90%); in 9 cases we obtained suboptimal distension due to diverticular disease or colonic stenosis. At baseline CECT we found: Hinchey I (n=40, 45%), II (n=28, 32%); III (n=20, 23%); IV (n=0, 0%) stages. CTC follow-up findings allowed to keep conservative treatment in all cases of Hinchey I (100%), in 16/28 cases of Hinchey II (57%) and in 11/20 cases of Hinchey III (55%). The rest patients not understaged (8/28 Hinchey II, 43%, and 9/20 Hinchey III, 45%) underwent laparoscopic/open surgery. CTC allowed to detect 9 unknown polyps greater than 6 mm that changed treatment strategy.
Conclusion: CTC proved to be a safe and robust imaging technique to evaluate severity and staging in short-term follow-up of ACD, mapping colonic/extracolonic findings and planning the correct therapeutic approach.

B-0243 14:41

Visceral fat volume as a predictor of acute complicated diverticulitis
V.S. Martín, C.A. León, M.N. Hinestroza, L.O. Robador, F.D. Formoso, L.S. Toledo, M.T. Mohamad, M.A. Armas, M.S. Rodriguez; *Las Palmas de Gran Canaria/ES (vdsmmd@gmail.com)*

Purpose: To study the influence of visceral fat measured by CT as a predictor of perforation in patients with acute diverticulitis.
Methods and Materials: A retrospective, single-center study of 151 consecutive patients diagnosed with a first episode of acute diverticulitis was performed. Patients with any history of malignancy were excluded. CT images were reviewed by two abdominal radiologists. Each patient was assigned a modified Hinchey score based upon CT criteria or, when present, surgical findings. A validated software (Image J, v1.48, National Institutes of Health) was employed to obtain Total Fat, Visceral Fat and Subcutaneous Fat volume estimations. SPSS (v.15, Inc., Chicago, IL, USA) was used for statistical analysis. Age, gender, need of admission, length of stay and need of percutaneous or surgical procedures were recorded.
Results: Normal distribution of variables were verified by Shapiro-Wilk test. Patients were grouped based upon modified Hinchey score in relation to non surgical (Hinchey I-II, n=119) and surgical (Hinchey III-IV, n=32) management. A statistically significant difference in Visceral Fat Volume between the

Hinchey III-IV group and the Hinchey I-II group was found (277.48 cm2 vs 192.33 cm2, $p < 0.0001$), independent of age and gender. For Subcutaneous Fat Volume there was no difference between groups (287.06 cm2 vs 252.89 cm2, p=0.16).
Conclusion: These results suggest that, in patients with a first episode of acute diverticulitis, visceral fat may play a role as a risk factor for complicated diverticulitis and, therefore, need of surgical management.

B-0244 14:49

MR imaging in preoperative staging of primary colon cancer patients: a feasibility study

E. Nerad[1], M. Lahaye[2], D.M. Lambregts[3], E. Kersten[1], H. van den Bosch[1], F. Bakers[3], G. Beets[2], H. Grabsch[3], R.G.H. Beets-Tan[2]; [1]*Eindhoven/NL*, [2]*Amsterdam/NL*, [3]*Maastricht/NL (erik.kersten@cze.nl)*

Purpose: CT is currently widely used for staging of colon cancer, little is known about MRI as staging tool for colon cancer. Some practical difficulties arise such as quality of MR abdomen due to artefacts (i.e. bowel movement artefacts). The objective of this study was to evaluate the image quality of MR images in staging colon cancer.
Methods and Materials: 25 colon cancer patients underwent MRI (1.5 T) with T2TSE (axial and coronal) and DWI (b0, b50 and b1000) of the abdomen and were retrospectively analysed by two blinded, independent readers. Each scored the quality of the images, T2TSE and DWI separately, on a scale of 0 to 4 with 0 being very poor quality (no staging possible) and 4 being superb quality. This scale reflects the confidence level of the readers to be able to stage colon tumours as well as malignant lymph nodes. Total scan time of the T2-weighted and DWI sequences was 15 min 38 sec.
Results: All colon tumours could be identified with MRI. The quality score for T2TSE and DWI for reader 1 was 3.32 (SD 0.71, range 2-4), 3.52 (SD 0.70, range 3-4) and for reader 2: 3.28 (SD 0.88, range 3-4), 3.32 (SD 0.77, range 3-4), respectively.
Conclusion: Our results indicate that it is feasible to identify all colon tumours with good MR image quality for both T2-weighted images as DWI. Therefore, MRI could become an alternative to CT to identify colon cancer within clinically feasible acquisition times.

B-0245 14:57

Diagnostic performance of MR imaging in preoperative staging of primary colon cancer patients

E. Nerad[1], M. Lahaye[2], D.M. Lambregts[3], E. Kersten[1], H.C.M. van den Bosch[1], G. Beets[2], F. Bakers[3], H. Grabsch[3], R.G.H. Beets-Tan[2]; [1]*Eindhoven/NL*, [2]*Amsterdam/NL*, [3]*Maastricht/NL (nerad19@hotmail.com)*

Purpose: Currently the FOXTROT trial is investigating whether high-risk colon cancer patients benefit from neoadjuvant treatment. Imaging plays a crucial role in selecting these patients. CT is used for staging of colon cancer with a questionable performance. Although MRI is standard in rectal cancer staging, only one small study is published concerning colon cancer staging with MRI. Therefore the aim of this study was to evaluate the diagnostic performance of MRI for staging of colon cancer.
Methods and Materials: 55 colon cancer patients underwent MRI (1.5 T; T2TSE/DWI) of the abdomen and were retrospectively analysed by two blinded, independent readers. Histopathology after resection was the reference standard. Both readers evaluated tumour characteristics being; invasion through bowel wall (T3/T4 tumours), invasion beyond bowel wall of ≥5 mm and/or invasion of surrounding organs (T3cd/T4), serosal involvement, extramural vascular invasion (EMVI) and malignant lymph nodes (N+). Inter-observer agreement was compared using Kappa (κ) statistics.
Results: The sensitivity/specificity detecting T3/T4 tumours (35/55), T3cd/T4 tumours (15/55), fascia involvement (8/55), EMVI (17/55) and nodal involvement (19/55) for reader 1 were; 91%/84%, 40%/88%, 88%/74%, 100%/62% and 47%/86% and for reader 2: 72%/89%, 60%/75%, 75%/72% 88%/70% and 68%/64% respectively. Interobserver agreement between both readers were good to moderate: 0.72, 0.55, 0.62, 0.60 and 0.60 respectively.
Conclusion: MRI seems to be able to select high-risk colon cancer patients with a good sensitivity for tumour invasion through the bowel wall, EMVI and serosal involvement. Together with its well-known superiority in detecting/characterizing liver lesions, MRI might become the most optimal primary staging modality for colon cancer.

B-0247 15:05

Management of active colonic bleeding detected by angio- MDCT: interventional radiology versus surgery

M. Pannatier, P. Bize, D. Hahnloser, R. Meuli, S. Schmidt; *Lausanne/CH (sabine.schmidt@chuv.ch)*

Purpose: To determine radiological or clinical criteria permitting to guide emergency treatment of active colon bleeding detected by angio-MDCT.
Methods and Materials: We retrospectively included 39 patients, admitted in emergency between August 2003 and July 2014 for active colonic bleeding proven by angio-MDCT. They were divided into two groups based upon the chosen emergency treatment: interventional radiology (n= 21) versus surgery (n= 18). In consensus, two observers reviewed the MDCT-images (location and density of bleeding), the delay between imaging and treatment, patients' hemodynamic parameters (shock index, lactate, and haemoglobin level), clinical data and final outcome in order to detect any differences between the two groups (Fischer, chi-square test).
Results: No significant statistical differences were observed between the two groups, neither radiologically, hemodynamically, clinically nor biologically. Only two tendencies were shown: The group treated by interventional radiology more often showed clinical symptoms, that is hematochezia or melena (p=0.0775), and a decrease of the hemoglobin level (p= 0.0893). Interventional radiology was the preferred treatment option, when the bleeding source was located in the proximal colon (p=0.0866).
Conclusion: In emergency patients with active colonic bleeding revealed by angio-MDCT, interventional radiology should be the first treatment choice, being faster, less invasive and associated with fewer complications than surgery. In case of impossible embolisation or relapse of bleeding, surgery becomes the best treatment option.

14:00 - 15:30 **Room N**

Cardiac

SS 303a

Cardiomyopathies (2)

Moderators:
J. Broncano; Cordoba/ES
A. de Roos; Leiden/NL

B-0248 14:00

The role of cardiac magnetic resonance (CMR) imaging in the differentiation of arrhythmogenic right ventricular cardiomyopathy (ARVC) and athlete's heart

H. Vago, C. Czimbalmos, I. Csecs, A. Toth, F.I. Suhai, O. Kiss, N. Sydo, D. Becker, B. Merkely; *Budapest/HU (vagoha@gmail.com)*

Purpose: The diagnosis of ARVC is based on the Task Force Criteria. However, the elevated RVEDVi can be a result of sport adaption as well, the Criteria doesn't includes no special criteria for professional athletes. Our purpose was to determine the CMR parameters which can help to differentiate between ARVC and athlete's heart.
Methods and Materials: Between 2010-2015 CMR examination was performed on 559 patients (including 15 athletes) because of the suspicion of ARVC. In 43 patients (42±12y; 27male) the CMR proved Task Force Criteria. Additionally 75 healthy professional athletes (23±12y; 16male) were examined. Left (LV) and right ventricular (RV) end-diastolic (ED), end-systolic volumes (ES), ejection fractions (EF) were compared and derived parameters (LVEDV/RVEDV, LVEF/RVEF) were calculated.
Results: The RVEF were lower, RVESVi was higher in ARVC patients, however RVEDVi of male athletes showed no significant difference (133.5 vs 135.9 ml/m2) compared to the athletes. The derived CMR parameters showed significant difference between the athletes and ARVC patients in both males (LVEF/RVEF:1.04 vs 1.2; LV/RVEDV:0.95 vs 0.88) and females (LVEF/RVEF:1.02 vs 1.53; LV/RVEDV:0.97 vs 0.77). In 6 athletes (30y±7y; 5 male) ARVC was diagnosed according to RV wall motion abnormality, late enhancement, RVEF and derived parameters. RVEF and/or LVEDV/RVEDV of athletes with ARVC were below the 5th percentile, whereas the LVEF/RVEF was above the 95th percentile of healthy athletes.
Conclusion: Consequently, RVEDVi shows no difference between ARVC patients and athletes, in healthy athletes RVEDVi was in the range of the proposed Task Force Criteria. RVEF, LVEDV/RVEDV and LVEF/RVEF can support the differentiation of ARVC and athlete's heart.

B-0249 14:08

Role of T1 mapping in cardiac amyloidosis

M. Dal Corso, E. Gavazzi, D. Farina, R. Maroldi; *Brescia/IT (emagavazzi@alice.it)*

Purpose: the aim of our study is to evaluate the potential role of T1 mapping (MOLLI sequences) in diagnosis and follow-up of cardiac amyloidosis.
Methods and Materials: 20 patients with amyloidosis disease (5 ApoA1, 12 AL and 3 TTR) underwent CRM (1.5 T) with T1 mapping pre and post-contrast (if possible). Sequences MOLLI were performed in short axis and four-chamber view. We evaluated blood and myocardium T1 before and after contrast. Blood and myocardium ΔR (delta R) and the value of λ (Lambda) were calculated. We also considered 27 healthy patients and 9 patients with hypertrophic cardiomyopathy as control.

Results: 10 patients (50%) showed myocardium thickening and typical late enhancement pattern of heart involvement in amyloidosis (cardiac amyloidosis, CA); the remaining 50% did not (not cardiac amyloidosis, NCA); in 60% of these latter patients contrast medium wasn't administered due to kidney failure. Mean pre-contrast T1 in CA and NCA was higher compared with healthy patients ($p < 0.0005$, p=0.001). Myocardium ΔR and λ in CA vs healthy were higher (p=0.005 and < 0.0005), vs hypertrophic higher (p=0.027 and < 0.0005), vs NCA higher (p=0.036 and < 0.0005). ΔR blood in CA vs hypertrophic was lower (p=0.041).
Conclusion: pre-contrast T1 mapping can discriminate healthy patients both in CA and in NCA. It could be a potential noninvasive index of cardiac involvement in early diagnosis and disease monitoring. Myocardium ΔR and λ can discriminate patients with CA in all groups.

B-0250 14:16

Left-ventricular geometry associated with outflow obstruction in patients with hypertrophic cardiomyopathy: 3D CT analysis
Y. Song, D. Yang; *Seoul/KR (songsongggg@gmail.com)*

Purpose: Left-ventricular outflow tract obstruction (LVOTO) is regarded as a major determinant of clinical outcome in patients with hypertrophic cardiomyopathy (HCM). Establishing geometric predictors of the obstruction will help manage patients and understand disease course.
Methods and Materials: From Jan 2011 to Aug 2014, 147 consecutive patients with HCM who underwent cardiac CT in a single institution were retrospectively enrolled. The pattern of LV hypertrophy was analysed using 17-segment model, and parameters regarding the geometry of papillary muscles (PMs) and mitral valves were also obtained. All the measurements were done using a commercial software. Multivariate logistic regression analysis and sensitivity analysis were performed to find determinants of LVOTO.
Results: LVOTO was observed in 41 (27.9 %) patients. The patients with LVOTO showed higher prevalence of spiral pattern of hypertrophy (51 vs. 16 %, $p < 0.001$), longer distance from lateral PM base to LV apex (26.8 vs. 21.8 mm, $p < 0.001$), larger maximum LV wall thickness (24.7 vs. 22.5 mm, p=0.014), and elongated anterior mitral leaflet (18.0 vs. 15.7 mm, p=0.001) as compared to non-LVOTO group. The distance from lateral PM base to LV apex was the only variable which remained significant after adjustment for other significant covariates and sensitivity analysis (95% CI, 1.12, 1.01 to 1.24).
Conclusion: The distance between lateral PM base and LV apex was an independent determinant of LVOTO in patients with HCM. This result may be helpful not only to understand the mechanism of LVOTO, but also to establish management plans for relieving LVOTO.

B-0251 14:24

Cardiac MR or delayed enhanced CT in patients with sudden occurrence of ventricular arrhythmias and normal coronary arteries: comparison with endomyocardial biopsy
A. Palmisano, A. Esposito, C. Colantoni, M. Cava, S. Sala, F. De Cobelli, A. Del Maschio; *Milan/IT (palmisano.anna@hsr.it)*

Purpose: Symptoms related to the sudden occurrence of ventricular arrhythmias (VA) remain frequently a diagnostic and therapeutic challenge, after exclusion of coronary artery disease. Aim was to evaluate the role of cardiacMR (CMR) and Delayed Enhanced Computed Tomography (DECT) in the identification of myocardial disease responsible of VA onset, comparing imaging findings to histological essays.
Methods and Materials: 16 patients (pts) (XX/XY: 2/14, mean FE: 50%±5%) with sudden occurrence of palpitation/lipothymia-hypotension related to the onset of previously unknown VA were enrolled. 13 patients underwent CMR including oedema-sensitive T2w-STIR and delayed post-gadolinium IR T1w sequences. The remaining 3 patients with contraindication to CMR, underwent DECT including a delayed low-energy (80 kV) scan for scars identification. Blinded, endomyocardial biopsy (EMB) was performed, and results compared to imaging findings.
Results: In 13/16 patients, imaging features were suggestive for inflammatory cardiomyopathy (5/16 acute myocarditis, 7/16 prior myocarditis, 1/16 cardiac sarcoid). In the remaining three cases, cardiac imaging showed cardiac amyloidosis, left ventricle non-compaction and initial idiopathic dilated cardiomyopathy. EMB confirmed the imaging diagnosis in 13 out of 16 patients; 1 patients with evidence of focal myocarditis at CMR had a negative EMB, whilst 2 patients diagnosed as acute myocarditis at CMR had EMB findings suggestive for chronic myocarditis.
Conclusion: Inflammatory cardiomyopathy is the most frequent diagnosis in patients with this arrhythmic presentation. CMR, or DECT when CMR is contraindicated, may help in the management of these patients, indicating the correct diagnosis and avoiding the need of further investigation with EMB.

B-0252 14:32

Late gadolinium enhancement and systolic function in non-ischemic dilated cardiomyopathy
M. Scarabello, P.M. Cannaò, M. Petrini, F. Riva, F. Secchi, F. Sardanelli; *Milan/IT (marco.scarabello@gmail.com)*

Purpose: The presence of late gadolinium enhancement (LGE), correlated with myocardial fibrosis, is common in patients with non-ischaemic dilated cardiomyopathy (NIDCM). The aim is to quantify LGE and its correlation with left ventricle (LV) and right ventricle (RV) functional parameters in these patients.
Methods and Materials: We retrospectively evaluated 104 NIDCM adult patients, who underwent a 1.5 T cardiac magnetic resonance from July 2014 to March 2015. For each patient, both LV and RV functional evaluation was performed. Delayed contrast-enhanced images were acquired 10 minutes after 0.15 mmol/kg of gadobutrol intravenous administration and the amount of LGE (reported in grams) was assessed using 6 standard-deviation thresholding (6SD) with Medis software (Qmass MR version 7.6).
Results: LV functional parameters were: end-diastolic volume (EDVi) 117.2±40.7 ml/m2 (mean±standard deviation); end-systolic volume (ESVi) 79.5±37.4 ml/m2; LV stroke volume (SV) 69.9±25.4 ml; and ejection fraction (EF) 34.3±11.6 %. RV functional parameters were: 67.5±20.9 ml/m2, 33.1±16.7 ml/m2, 62.6±23 ml and EF 52.07±13.28%, respectively. The mean LGE was 9.82±9.8 g. We found a positive significant correlation between LGE and LVEDVi (r=0.206, p=0.036) and between LGE and LVESVi (r=0.265, p=0.007); while there was a negative significant correlation between LGE and LVEF (r=-0.272, p=0.005). No significant correlation between LGE and LVSV (r=-0.02, p=0.771) or LV absolute mass (r=0.11, p =0.259) was found.
Conclusion: The amount of fibrosis expressed through LGE is positively correlated with LV volumes and negatively correlated with LV systolic function.

B-0253 14:40

T1mapping: diagnostic value in hypertrophic cardiomyopathy with no apparent fibrosis in late gadolinium enhancement
R. Ouyang, L. Wu, J. Xu; *Shanghai/CN (oyrzhen@163.com)*

Purpose: To explore the value of T1mapping in hypertrophic cardiomyopathy with no apparent fibrosis in late gadolinium enhancement.
Methods and Materials: Myocardial T1 value of pre-contrast and post-contrast were measured and T1mapping was generated in twenty volunteers and thirty cases of hypertrophic cardiomyopathy with no apparent fibrosis in late gadolinium enhancement. The T1mapping images were acquired by Modified Look-Locker Inversion Recovery (MOLLI) sequence.
Results: The myocardial native T1 value of volunteers and hypertrophic cardiomyopathy patients is 1296.50±34.34 and 1311.33±72.18 respectively (p=0.422), post-contrast T1 value of volunteers and hypertrophic cardiomyopathy is 599.74±41.71 and 566.06±60.28 respectively (p=0.032). Post-contrast T1 value could differentiate between healthy and diseased myocardium with sensitivity of 76.6%, specificity of 80.2%.
Conclusion: This study demonstrates that post-contrast T1 values provide indexes with high diagnostic accuracy for the discrimination of normal and hypertrophic cardiomyopathy with no apparent fibrosis in late gadolinium enhancement.

B-0254 14:48

Role of cardiac magnetic resonance in the diagnosis of ARVC/D and phenocopies
A.M. Amadu[1], J.C.L. Rodrigues[2], A. Ghosh Dastidar[2], A. Baritussio[2], C.B. Lawton[2], G. Venuti[2], G.B. Meloni[1], M. Conti[1], C. Bucciarelli-Ducci[2]; [1]*Sassari/IT*, [2]*Bristol/UK (antoniomatteoamadu@gmail.com)*

Purpose: The aim of our study is to assess the prevalence of ARVC/D and the prevalence and nature of ARVC/D mimics of patients referred to CMR for suspected ARVC/D.
Methods and Materials: We analysed 2481 CMR scans done during 2014 in a large UK tertiary centre and identified consecutive patients referred for CMR with suspected ARVC/D, on the basis of symptoms and clinical presentation, family history of ARVC/D or sudden cardiac death, abnormal ECG or abnormal transthoracic echocardiography. A comprehensive CMR protocol (including cine and late gadolinium enhancement sequences) was performed in all patients.
Results: We identified 124 patients with suspected ARVC/D, which constituted 5% of the total CMR referrals. CMR identified the underlying diagnosis in 17 out of the 124 patients (14%), where other conventional techniques (including ECG and echo) were inconclusive. Four patients (3%) met the CMR imaging criteria for ARVC/D, eleven patients (9%) had conditions considered "ARVC/D mimics" and two patients (2%) had previous myocardial infarction. Amongst the ARVC/D mimics, we identified: congenital absence of pericardium (n=1), idiopathic dilated cardiomyopathy (n=1), left ventricular non-compaction cardiomyopathy (n=1), left ventricular non-compaction cardiomyopathy plus

myocardial infarct (n=1), arrhythmogenic left ventricular cardiomyopathy (ALVC, variant of ARVC/D) (n=1), anomalous venous return (n=1), atrial septal defect (n=1), asymmetric pectus excavatum (n=1), athletic heart (n=2) and sarcoidosis (n=1).
Conclusion: Although CMR represents just a component of the ARVC/D diagnostic task force criteria, our study demonstrates that CMR is not only important in diagnosing ARVC/D, but also to identify ARVC mimics.

B-0255 14:56

Early cardiac involvement in asymptomatic patients with systemic sclerosis (Ssc) established using cardiac magnetic resonance (CMR)
V. Vellucci, A. Di Sibio, A. Gennarelli, V. Felli, C. Marsecano, G. Michelini, R. Masi, E. Di Cesare, C. Masciocchi; *L'Aquila/IT (valentinavel@gmail.com)*

Purpose: To establish the presence of myocardial perfusion defects and fibrotic lesions in patients with early SSc (systemic sclerosis) using cardiac magnetic resonance (CMR).
Methods and Materials: Forty-five SSc patients (all female; mean age 45.23 years; 20 with diffuse cutaneous SSc and 25 with limited cutaneous SSc) underwent CE-CMR (contrast-enhanced cardiac magnetic resonance) on a 1.5-T MRI scanner. Any patient presented symptoms or sign of cardiac involvement. In all patients, first-pass CMR perfusion images were acquired both at rest and during pharmacological stress (using adenosine triphosphate). Hypoenhanced areas on first-pass images meant perfusion defects. LGE (late gadolinium enhanced) were acquired to detect myocardial fibrotic areas and to define their pattern. We assessed also anatomical distribution of perfusion defects and how they are related to pattern and percentage of LGE.
Results: 16 out of 45 patients (35.5%) exhibited stress perfusion defects whilst 11 patients (24.4%) showed LGE. All LGE-positive patients presented perfusion defects.
Conclusion: Results of our study draw the conclusion that also asymptomatic patients often show perfusion defects and myocardial fibrotic areas. An early diagnosis may help to improve SSc patients' outcome. Also, CE-CMR can help to further elucidate the pathophysiology of myocardial involvement in Ssc patients.

B-0256 15:04

Cardiac magnetic resonance (CMR) findings in patients with new onset of ventricular arrhythmias
M. Cava, A. Esposito, G. Benedetti, D. Vignale, A. Palmisano, A. Del Maschio, F. De Cobelli; *Milan/IT (cava.mariangela@hsr.it)*

Purpose: New onset of ventricular arrhythmias (VA) represents a diagnostic challenge. The aim was to assess CMR role in patients without known structural cardiomyopathies.
Methods and Materials: 59 patients (45±18 years old, 41 male, 18 female) underwent CMR, between January 2014 and September 2015, for VA of unknown origin. CMR protocol included biventricular (LV-RV) function, myocardial oedema (T2-STIR), early and late gadolinium enhancement (LGE).
Results: Indication to CMR was: ventricular tachycardia (VT) in 58% of patients; ventricular ectopic beats (EB) in 29% and ventricular fibrillation or aborted sudden cardiac death (SCD) in 14%. Amongst patients with EB, CMR results were acute myocarditis in 12% and LGE suggestive for chronic non-ischaemic cardiac disease (NICD) in 18%; one case presented morpho-functional anomalies of hypokinetic dilated cardiomyopathy (DCM). In the group with VT, CMR results were 32% of cases chronic NICD signs, as LGE, whilst 0.06% showed signs of acute myocarditis. 15 % of cases presented morpho-functional anomalies of DCM; in one case, CMR found signs of recent myocardial infarction without coronary artery disease. SCD was related to recent myocardial infarction without coronary artery disease at CMR in 25% cases and sustained by non-ischaemic cardiac disease in 25 % cases. Amongst patients with negative CMR findings, 80% had also negative electrophysiology study (EP) report (17% SCD, 38% VT, 46% EB) whilst 20% had positive EP (they all presented with VT).
Conclusion: CMR is a useful tool to support the diagnostic process through identification of morpho-functional and structural cardiac anomalies with arrhythmogenic potential.

B-0257 15:12

Dobutamine stress-induced impairment of cardiac and myocardial performance in a preclinical model of HFpEF: a cardiac magnetic resonance imaging study
U. Reiter[1], G. Reiter[1], G. Adelsmayr[1], M. Manninger[1], A. Alogna[2], A.F. Stalder[3], D. Scherr[1], H. Post[2], M.H. Fuchsjäger[1]; [1]*Graz/AT*, [2]*Berlin/DE*, [3]*Erlangen/DE (ursula.reiter@medunigraz.at)*

Purpose: To investigate dobutamine stress-induced impairment of cardiac and myocardial performance in a preclinical model of early-stage heart failure with preserved ejection fraction (HFpEF).
Methods and Materials: Five anaesthetised deoxycorticosterone-acetate (DOCA) salt-induced early-stage HFpEF pigs and seven weight-matched controls underwent cardiac magnetic resonance imaging at rest and during dobutamine stress (target heart rate increase: 25%). Indices of left ventricular (LV) function were evaluated from cine short-axes images. Early-diastolic tissue velocity (E'), transmitral velocity (E), and coronary sinus net-forward blood volume (CSV) were acquired from 4D phase-contrast measurements, and evaluated by prototype software (4D-Flow). Global myocardial perfusion (GMP) and perfusion reserve (MPR) were estimated from rest/stress CSV and LV mass. Rest, stress, and rest-to-stress differences (in %) of parameters in DOCA- and control animals were compared by t test.
Results: Adequate increase in ejection-fraction and decrease in end-systolic volume accounted for normal contractility reserves in both groups ($p > 0.05$). E' was lower in DOCA at rest (p=0.019) and during stress (p=0.025), transposing to higher E/E' at rest (p=0.013) and stress (p=0.026). Stress-induced changes in LV function were comparable in DOCA and controls, except of cardiac index (DOCA, +37%±12%; controls, +63%±23%; p=0.040) and end-diastolic volume index (DOCA, -20±11%; controls, -5±11%; p=0.042). GMP did not differ between groups at rest (p=0.538), but less increased in DOCA pigs during stress, resulting in reduced MPR (DOCA, 1.5±0.2; controls, 2.1±0.4; p=0.031).
Conclusion: In a preclinical model of early-stage HFpEF, stress induces impaired increase of cardiac index and myocardial perfusion reserve. These parameters might be potential non-invasive markers of early-stage HFpEF.
Author Disclosures:
A.F. Stalder: Employee; Siemens Healthcare GmBH.

B-0258 15:20

CT vs MRI: comparison of right atrium volumetry
S. Rheinheimer, C. Reh, J. Figiel, A.H. Mahnken; *Marburg/DE (rheinhei@med.uni-marburg.de)*

Purpose: Right atrial volume (RAV) is a prognostic factor of the right heart function. This study evaluates the comparability of CT and MRI for right atrial volumetry with different methods.
Methods and Materials: 29 patients (18 male, 47 ± 12 years) received CT and 1.5 Tesla MRI within 17 ± 20 days. RAV was measured using biplane and ellipsoid method (MRI and CT) and Simpson's method (CT). For interobserver comparison measurements were carried out by two observers. Pearson's correlation, Lin's concordance coefficient, and Bland-Altman statistics were calculated.
Results: There is a correlation of RAV between CT and MRI, r [ellipsoid] = 0.65; r [biplane] = 0.64. MRI volumes were significantly lower than CT volumes, [mean ± SD] 43 ± 19 ml versus 27 ± 9 ml, ($p < 0.002$). There was a close interobserver correlation (CT: r = 0.83, MRI: r = 0.73) but a relatively wide range in Bland-Altman analysis.
Conclusion: Compared to left atrial volumes, a higher variability was found for RAV values both in interobserver statistics and in inter-modality comparison. Artefacts due to contrast material (CT) and complex shape of the right atrium might cause these clinically relevant variations.

14:00 - 15:30 **Room L8**

Vascular

SS 315

Peripheral arteries: imaging and therapy

Moderators:
M. de Bucourt; Berlin/DE
J.T. Ortiz-Pérez; Barcelona/ES

B-0259 14:00

The angiosome concept evaluated on the base of micro-perfusion - an O2C guided study
U. Rother, W. Lang, R.E. Horch, A. Meyer; *Erlangen/DE (ulrich.rother@uk-erlangen.de)*

Purpose: Aim of this clinical study was to obtain a wider comprehension of the microcirculation of the foot and to evaluate the relevance of the angiosome concept by means of light guided spectrophotometry (O2C).
Methods and Materials: For this purpose, 28 patients who underwent leg revascularisation due to peripheral arterial disease were examined prospectively. The measurements of the macro-perfusion were performed by using generally acknowledged methods like the ankle-brachial index. The micro-perfusion was assessed by a lightguided spectrophotometry (O2C), evaluating the microvascular blood flow and the haemoglobin oxygenation. The measuring points were located according to the angiosome concept into direct and indirect revascularised areas of the foot. Investigations were performed pre- and post-interventionally and after 4 and 12 weeks in baseline-position as well as in an elevated 45 degree-position of the leg.
Results: Microcirculation parameters (oxygen saturation, blood flow, velocity) of the revascularised leg showed a significant increase in elevation and

baseline position compared to the preoperative values in most analyses. No significant differences between the direct and indirect revascularised angiosome were apparent.
Conclusion: The O2C showed feasible for measuring changes in microcirculation after leg revascularisation. Concerning the micro-perfusion the "angiosome concept" could not be verified. Further studies are required to evaluate its relevance on the base of microcirculation of the foot.

B-0260 14:08

Tack optimised balloon angioplasty below the knee (TOBA-BTK): six months results

M. Brodmann[1], C. Wissgott[2], A. Holden[3], R. Staffa[4], T. Zeller[5], T. Vasudevan[6], P. Schneider[7]; [1]*Graz/AT*, [2]*Heide/DE*, [3]*Grafton Auckland/NZ*, [4]*Brno/CZ*, [5]*Bad Krozingen/DE*, [6]*Hamilton/NZ*, [7]*Honolulu, HI/US*
(marianne.brodmann@medunigraz.at)

Purpose: Post percutaneous transluminal angioplasty (PTA) dissections are a significant clinical problem. Currently, dissections are managed with stents, which are often followed by sub-optimal outcomes including in-stent restenosis and occasionally stent fracture. We evaluated a novel minimal metal Tack implant system for dissection treatment.
Methods and Materials: Patients with critical limb ischemia with angiographic evidence dissection (s) following below-the-knee PTA were enrolled. Post-PTA dissections were treated with Tacks. Endpoints were safety, the absence of peri-procedural death and major adverse limb events (MALE) as well as amputation-free survival, device success (successful delivery and deployment of Tacks), procedure success (core laboratory reported vessel patency in the absence of MALE), freedom from target lesion revascularisation (TLR), and changes in Rutherford category (RC). Data through six months of follow-up are presented.
Results: The study enrolled 35 patients, all RC 4 or 5. The mean lesion length was 51.7±27.7 mm. Post-PTA dissections were graded as A (21.2%), B (60.6%) and C (18.2%). Device success was achieved in 32 (91.4%). Procedure success was 31/32 (96.9%) with one patient requiring re-intervention of a non-target vessel. At six-months post-procedure, amputation free survival was 93.8% and freedom from clinically driven TLR at 6 months was 93.5%. There was significant ($p < 0.0001$) improvement in RC with 56.7% showing 4 or 5 step improvement.
Conclusion: Tack treatment of post-PTA dissection was safe and resulted in low rates of TLR. Tack treatment represents a new, minimal metal paradigm for dissection repair that can safely improve the clinical results associated with PTA
Author Disclosures:
T. Zeller: Consultant; Abbott Vascular, Bard Peripheral Vascular, Boston Scientific, Cook Medical, Gore & Associates, Medtronic, Spectranetics, ReCor. **P. Schneider:** Founder; Intact Vascular. Other; Chief Medical Officer, Intact Vascular.

B-0261 14:16

Subclavian artery stent fractures: prevalence and predisposing factors

A. Hüttl, A. Hüttl, E.M. Végh, H. Sarkadi, B. Nemes, K. Hüttl, E. Dósa;
Budapest/HU (huttlartur@gmail.com)

Purpose: To determine the prevalence of subclavian artery (SA) stent fractures, identify predisposing factors, and analyse their impact on restenosis development.
Methods and Materials: 120 patients (71 women; mean age: 59.4±9.0 years) with symptomatic significant SA stenosis who underwent stenting between 2000 and 2012 at our Department have been included in the study. In 2014, patients were asked to return for a fluoroscopic examination of the implanted stents. Color duplex scan has been used to monitor stent patency. In case of continuous variables t or Mann-Whitney U test, while in case of categorical variables chi-square or Fisher exact test were performed.
Results: 122 stents have been deployed (balloon-expandable, n = 94; self-expandable, n = 28). The median follow-up time was 81.4 (41.1-113.7) months. 43 (35.2%) stent fractures were detected (type I-II, n = 28; type III-V, n=15). The difference between the fractured (n = 43) and non-fractured groups (n = 79) was non-significant regarding the atherosclerotic risk factors, underlying pathology, lesion location, and stenosis grade. Calcifications, long lesions (> 20 mm), and long balloon-expandable stents (> 20 mm) were more common in the fractured than in the non-fractured group ($P < 0.001$; $P < 0.001$; $P = 0.036$, respectively). The restenosis and reintervention rates were significantly higher in patients with type III-V fractures compared to those with type I-II fractures ($P < 0.001$; $P < 0.001$, respectively).
Conclusion: Fractures frequently occur. Lesion and stent characteristics have an influence on fracture rate. Complex fractures increase the risk of restenosis.

B-0262 14:24

Below-the-knee angioplasty in dialysis patients with critical limb ischemia- outcomes with respect to pedal arch involvement

A. Meyer, A. Schmid, W. Lang, U. Rother; *Erlangen/DE*
(alexander.meyer@uk-erlangen.de)

Purpose: To analyse the outcomes of infrapopliteal angioplasty in the setting of renal failure (ESRD) and to evaluate the influence of the pedal arch patency on clinical success.
Methods and Materials: Prospective follow-up of 32 ERSD patients with consecutive infrapopliteal angioplasty over a 5-year period 2010-2014 was performed. Mean follow-up was 10 months (range: 0-51 months). Statistical endpoints were defined for amputation free survival, overall survival and wound healing. The pedal arch was classified in 4 categories according to patency on completion angiography and the influence of the pedal arch Quality on endpoints was assessed.
Results: 45 vessels in 32 ischemic legs were treated. The one year amputation free survival rate was 56% and 34% at two years. Two Major amputations were required. Subsequent revascularisation procedures were necessary in 11 patients (10 redo-angioplasty, one pedal bypass graft). The pedal arch was classified as category 1 in one patient (3%), category 2a in 12 (38%), 2b in 3 (9%) and 3 in 16 patients (50%). No significant differences in terms of survival or wound healing rate were observed between those groups.
Conclusion: Clinical success remains poor. The quality of the pedal arch was not found to have any impact on wound healing or survival.

B-0263 14:32

Impact of a noise-optimized virtual monoenergetic reconstruction algorithm on stent visualisation and detection of in-stent restenosis in lower extremity run-off CT angiography

S. Mangold[1], J. Wichmann[1], C.N. De Cecco[1], A. Varga-Szemes[1], D. Caruso[1], A. Stubenrauch[1], S. Fuller[1], K. Nikolaou[2], U.J. Schoepf[1]; [1]*Charleston, SC/US*, [2]*Tübingen/DE (Steffi_Mangold@live.de)*

Purpose: To evaluate the impact of noise-optimized virtual monochromatic imaging (VMI+) on stent visualisation and diagnostic accuracy for the detection of in-stent re-stenosis at dual-energy CT angiography (DE-CTA) of the lower extremity run-off.
Methods and Materials: We retrospectively evaluated DE-CTA studies of the lower extremities performed on a 3rd generation dual-source CT system in 31 patients with prior stent placement (mean diameter 6.5±1.5 mm). Images were reconstructed with standard linear blending (F_0.5) and VMI+ at 40-150keV in 10-keV increments. In-stent luminal diameter was measured to determine lumen visibility. Contrast-to-noise ratio (CNR) of segments with and without stents was calculated. A five-point scale was used to determine diagnostic confidence. In the 21 patients with additional invasive digital subtraction angiography (DSA), diagnostic accuracy for significant re-stenosis (≥50% lumen narrowing) was assessed at F_0.5 and 80-keV VMI+.
Results: At CTA, a total of 45 stents were present. DSA datasets were available for 28 stents, whereas 12 stents showed significant in-stent re-stenosis. CNR was significantly higher with VMI+ at ≤80keV (17.9±6.4 to 33.7±12.3) compared to F_0.5 (16.9±4.8; all $p < 0.0463$); luminal stent diameters were increased at ≥70keV (5.41±1.8 to 5.92±1.7 vs. 5.27±1.8, all $p < 0.001$). Diagnostic confidence was highest at 70 and 80-keV VMI+ (4.90±0.48 and 4.88±0.63 vs 4.60±0.66, p=0.001 and 0.0042). Sensitivity, negative predictive value, and diagnostic accuracy were higher with 80-keV VMI+ (100%, 100%, and 96.4%) compared to F_0.5 (90.9%, 94.1%, and 89.3%).
Conclusion: VMI+ images at 80-keV improve image quality, diagnostic confidence, and accuracy for stent evaluation at DE-CTA of the lower extremity run-off.
Author Disclosures:
U.J. Schoepf: Research/Grant Support; Bayer, Bracco, GE Healthcare, Medrad, Siemens Healthcare.

B-0264 14:40

Noise-optimised virtual monochromatic imaging improves image quality in 3rd-generation dual-source dual-energy CT angiography of the lower extremity run-off

J.L. Wichmann[1], C.N. De Cecco$_2$, A. Varga-Szemes[2], S. Mangold[2], T.J. Vogl[1], U.J. Schoepf[2]; [1]*Frankfurt a. Main/DE*, [2]*Charleston, SC/US*
(docwichmann@gmail.com)

Purpose: To evaluate a noise-optimised virtual monochromatic imaging algorithm (VMI+) regarding image quality at 3rd-generation dual-source dual-energy CT angiography (DE-CTA) of the lower extremity run-off.
Methods and Materials: We evaluated DE-CTA studies of the lower extremity run-off in 48 patients performed with 3rd-generation dual-source CT. Images were reconstructed with standard linear blending (F_0.5) representing 120-kVp polychromatic acquisition, VMI+ and traditional monochromatic (VMI)

algorithms at 40- to 120-keV energy levels in 10-keV increments. Vascular attenuation and image noise in 18 run-off artery segments were measured; signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) were calculated. Two observers subjectively evaluated vascular attenuation and image noise using five-point Likert scales.
Results: Objective image quality metrics peaked in the 40 and 50 keV VMI+ series (SNR: 20.2±10.7 and 19.0±9.5, respectively; CNR: 18.5±10.3 and 16.8±9.1, respectively) and were significantly (all $P < 0.0001$) higher compared to the corresponding 40 and 50 keV VMI series (SNR: 8.7±4.1 and 10.8±5.0; CNR: 8.0±4.0 and 9.6±4.9) and the standard linearly blended F_0.5 datasets (SNR: 10.7±4.4; CNR: 8.3±4.1). Subjective assessment of attenuation was highest for the 40 and 50 keV VMI and VMI+ image series (range, 4.84-4.91), both superior to F_0.5 (4.07; $P < 0.0001$). Corresponding subjective noise assessment was superior for 50 keV VMI+ (4.71; all $P < 0.0001$) compared to corresponding VMI (2.60) and F_0.5 (4.11).
Conclusion: VMI+ at low (40-50) keV levels improves objective and subjective image quality compared to traditional VMI and standard image reconstructions at DE-CTA of the lower extremity run-off.
Author Disclosures:
U.J. Schoepf: Research/Grant Support; Astellas, Bayer, Bracco, GE Healthcare, Medrad, and Siemens.

B-0265 14:48

Nonenhanced MR angiography of the foot with flow spoiled-fresh blood imaging (FS-FBI): feasibility study and comparison of different parameters

Y. Zhang[1], D. Cao[1], S. Yu[2]; [1]*Fuzhou/CN*, [2]*Nanyang/CN (fjmu_young@sina.com)*

Purpose: To evaluate the feasibility of the foot arteries with flow-spoiled fresh blood imaging (FS-FBI) in healthy volunteers, and to compare the visibility of foot artery with different parameters.
Methods and Materials: Forty-six young healthy volunteers aged 21-48 were enrolled in this study, and were examined by routine flow-spoiled fresh blood imaging (flip angle=90, time of echo=80 ms) in 1.5 T MR scanner. Additional FBI examine with different FA (60° or 120°) and TE (40 ms or 120 ms) were performed in 36 volunteers of all. Two blinded readers separately analysed and graded the venous pollution and image quality of foot artery, demonstration rate of every artery and classification number of dorsalis pedis artery. The image quality of two segments with different FA and TE were compared by using Friedman M test respectively.
Results: The demonstration rate of distal anterior tibial artery, distal posterior tibial artery, common plantar artery and 1ateral plantar artery deep perforating artery were 100%. Average image quality score of all arteries were at least 3 points except medial plantar artery, lateral plantar artery, arcuate artery and proper plantar digital artery; venous pollution grade of all images were not less than 2 minutes. There were significant differences in image quality of distal stump arteries with different FA and TE ($P > 0.05$).
Conclusion: Non-contrast enhanced foot artery angiography with flow-spoiled fresh blood imaging yields reliable visualisation of normal foot arteries.To decrease FA when TE=80 ms, or to increase TE when FA=90°both provide better visibility of distal arteries of foot.

B-0266 14:56

2D-Perfusion angiography of the foot: technical considerations and initial analysis

T. Rodt[1], T. Murray[2], M. McCavert[2], M. Given[2], F. McGrath[2], M. Lee[2]; [1]*Hannover/DE*, [2]*Dublin/IE (rodt.thomas@mh-hannover.de)*

Purpose: To report on technique, feasibility and initial results of 2D-Perfusion angiography of the foot, an evolving technique with potential implications for treatment-planning and technical outcome-analysis of endovascular procedures.
Methods and Materials: In this single-centre study pre- and post-interventional 2D-Perfusion angiography was performed in 28 patients. A standardized contrast administration protocol (15 ml iodixanol 320 mg I/ml, 3 ml/s, 5/6 F antegrade sheath) was applied for digital subtraction angiography using a 2D-Perfusion enabled image intensifier. Representative hindfoot and forefoot regions of interest were agreed by two radiologists and time to peak (TTP), peak density value (PDV) and area under the curve (AUC) calculated to assess for foot perfusion before and after angioplasty.
Results: 2D-Perfusion angiography allowed quantitative assessment of foot perfusion. Following angioplasty the AUC increased by 29.4% (p=0.032) while no significant change in TTP and PDV was detected here. Time-density curves demonstrated foot movement to be the major potential impairing factor for quantitative measurements. No statistical difference in perfusion values were appreciable between above and below-the-knee angioplasty.
Conclusion: 2D-Perfusion angiography of the foot allows quantitative perfusion analysis by means of TTP, PDV and AUC with the potential to be used to stratify interventional treatments and objectify technical outcome. The main methodical restriction regards movement of the foot during the angiographic acquisition, which has to be prevented to ensure valid measurements.

B-0267 15:04

Outcomes of infrapopliteal angioplasty for limb salvage in critical limb ischaemia

M. Sheehan, H. Kok, P. Thanaratnam, E. Ryan, H. Asadi, R. Bajwa, K. Pennycooke, M. Given, M. Lee; *Dublin/IE (marksheehan@rcsi.ie)*

Purpose: Angioplasty of the infrapopliteal arteries is a growing technique for limb salvage in the setting of critical limb ischaemia (CLI).
Methods and Materials: A retrospective analysis of infrapopliteal revascularisation was performed in a tertiary referral centre over a four year period (July 2010-June 2014). Patient demographics, indications, cardiovascular risk factors, procedural details and clinical follow-up were analysed. Freedom from major amputation, defined as below or above knee amputation, was analysed using the Kaplan-Meier method.
Results: One hundred and eighteen patients underwent infrapopliteal angioplasty for CLI of varying severity. The mean age was 75.1 (range 47-96) years with 75.8% male. 49.2% were diabetic and 68.5% had pre intervention CT or MR angiography. Technical success, defined as restoration of at least single in-line flow to the foot, was achieved in 84.5% with partial success in 2.9% and failure in 12.6%. 63.5% had revascularisation performed on one artery, 31.3% on two arteries and 5.2% on three arteries. The anterior tibial artery was the most commonly treated vessel (n=71) followed by the peroneal (n=42), posterior tibial (n=32) and the tibioperoneal trunk (n=17). The mean follow-up period was 282±360 days with cumulative freedom from major amputation of 71.1% at 1 year and 58.7% at 3 years (Figure 1).
Conclusion: Infrapopliteal angioplasty is an effective treatment for CLI with good short and intermediate-term limb salvage rates.

B-0268 15:12

Radiation dose and contrast medium volume reduction in lower extremity CT angiography with iterative model reconstruction (IMR) algorithm

W.-L. Qian[1], D.-J. Zhou[1], C. Feng[1], H. Wang[1], Y. Jiang[2], J.-M. Xu[1]; [1]*Suzhou/CN*, [2]*Shanghai/CN (Lynn.Jiang@philips.com)*

Purpose: To investigate the image quality of lower extremity CTA with low radiation dose and low contrast medium volume using iterative model reconstruction (IMR) algorithm compared to routine dose CTA.
Methods and Materials: Lower extremity CTA scans were acquired for 38 patients: 19 patients were scanned with routine dose (RD) protocol (120 kVp, 120 ml contrast medium at 4 ml/s), and 19 patients were scanned with low-dose (LD) protocol (80 kVp, 80 ml contrast medium, first 40 ml at 4 ml/s then 40 ml at 3 ml/s). Automatic tube current modulation (ATCM, DoseRight, Philips Healthcare) was used in both protocols with a reference quality index of 12 for RD group and 1 for LD group. Images from RD group and LD group were reconstructed with filtered back projection (FBP) and IMR algorithms, respectively. CT attenuation, image noise, SNR and CNR of 5 positions including aortic bifurcation, iliac bifurcation, proximal femoral artery, middle femoral artery, proximal popliteal artery were calculated. Subjective image quality of lower extremity arteries, plantar arterial enhancement and venous contamination were assessed.
Results: Higher mean intravascular attenuation was obtained in LD group as well as SNR, CNR compared to RD group. No difference in image noise and subjective image quality of lower extremity was found between groups. Better score of plantar arterial enhancement and venous contamination was obtained in LD group compared to RD group. Radiation dose was reduced 71.1% in LD group compared to RD group (0.48 mSv±0.07, 1.66 mSv±0.23, p=0.00).
Conclusion: Using of IMR, low-extremity CTA with both radiation dose and contrast medium volume reduction allows better image quality compared to routine-dose CTA.

B-0269 15:20

Extreme low radiation dose CT angiography of low-dose extremity using iterative model reconstruction algorithm

W.-L. Qian[1], D.-J. Zhou[1], C. Feng[1], H. Wang[1], Y. Jiang[2], J.-M. Xu[1]; [1]*Suzhou/CN*, [2]*Shanghai/CN (Lynn.Jiang@philips.com)*

Purpose: To investigate the image quality of lower extremity CT angiography with extreme low radiation dose using iterative model reconstruction (IMR) algorithm compared to routine-dose CT angiography.
Methods and Materials: Lower extremity CT angiography scans were acquired using a 256-slice MSCT for 36 patients: 19 patients were scanned with routine-dose (RD) protocol, 120 kVp, automatic tube current modulation (AC^{TM}) with image quality index of 12 (DoseRight, Philips Healthcare), and 17 patients were scanned with low-dose (LD) protocol, 80 kVp, 20 mAs. All patients received 120 ml iodine contrast medium at injection rate of 4 ml/s. Images from RD group and LD group were reconstructed with filtered back

projection (FBP) and IMR algorithms, respectively. CT attenuation, image noise, SNR and CNR of 5 positions including aortic bifurcation, iliac bifurcation, proximal femoral artery, middle femoral artery, proximal popliteal artery were calculated. Subjective image quality of lower extremity arteries, plantar arterial enhancement and venous contamination were assessed by two radiologists using a 3-point scale blindly.
Results: Radiation dose was reduced 91.0% in LD group compared to RD group (0.15 mSv±0.02, 1.66 mSv±0.23, p=0.00). Higher mean intravascular attenuation was obtained in LD group as well as SNR, CNR compared to RD group. No difference in image noise and subjective image quality of lower extremity, plantar arterial enhancement and venous contamination was found between groups.
Conclusion: Using of IMR, lower extremity CTA allows for a radiation dose reduction up to 91.0% meanwhile without compromising image quality.
Author Disclosures:
Y. Jiang: Employee; Philips.

14:00 - 15:30 **Room E1**

Musculoskeletal

SS 310
Ultrasound

Moderators:
P. Peetrons; Brussels/BE
L.M. Sconfienza; San Donato Milanese/IT

B-0270 14:00
Ultrasonography-guided injection for quadriceps fat pad edema: a 6-month clinical and radiological follow-up
Z. Maras Ozdemir[1], U. Aydingoz[2], M.F. Korkmaz[1], V. Tunay Bayrakcı[2], F.B. Ergen[2], O.A. Atay[2], O. Baysal[1]; [1]*Malatya/TR*, [2]*Ankara/TR (zynpmaras@yahoo.com)*

Purpose: To investigate efficacy and safety of ultrasonography-guided local corticosteroid and anesthetic injection followed by physical therapy for the management of quadriceps fat pad (QFP) edema.
Methods and Materials: We prospectively evaluated 1671 knee MRI examinations in 1542 patients for QFP edema with mass effect, which was present in 109 (6.5%) knees (of these, 20 patients agreed to participate). Participants were assigned into injection and control groups (both received the same physical therapy program). Injection group was first treated with ultrasonography-guided QFP injection of 1 mL corticosteroid and 1 mL local anesthetic agent. Patients were evaluated at baseline and 1-, 2-, 6-month follow-up for pain using static and dynamic visual analogue scale (VAS), suprapatellar tenderness, and QFP edema on MRI.
Results: Final sample size consisted of 19 knees (injection group, 10; control group, 9) in 17 patients. An overall improvement was detected in both groups between baseline and final assessments. Injection group fared better than control group in static VAS scores, while there was no such difference for dynamic VAS. Incidence of suprapatellar tenderness decreased in both groups, statistically significantly in injection group. Pain reduction was greater in injection group at the first month, whereas there was no such superiority at the sixth month. No severe adverse events were identified.
Conclusion: Ultrasonography-guided local injection followed by physical therapy is effective and safe in the management of QFP edema, more effective in pain reduction in the near-term. However, it is not superior to stand-alone physical therapy program in the longer run.

B-0271 14:08
MR - US fusion imaging to guide lumbar facet joint injections
A. Corazza, R. Sartoris, P. Caruso, G. Turtulici, A. Arcidiacono, S. Perugin Bernardi, D. Orlandi, E. Silvestri; *Genoa/IT (angelcoraz@libero.it)*

Purpose: The aim of our work was to evaluate the reliability, accuracy and efficacy of lumbar facet joint injections under a GPS-mediated fusion imaging technique.
Methods and Materials: Forty-six patients (17 males; 62 ± 5.5, mean age ± SD) with low back pain and MR evidence of lumbar zygapophyseal joints degenerative disease were included in our study. They underwent ultrasound-guided facet joint injection of 2 ml lidocaine 2% and corticosteroid (2 ml depomedrol 40 mg/ml) using a high-resolution ultrasound machine (Logiq E9, GE Healthcare, USA) with a GPS-mediated fusion imaging technology which couples real-time B-mode images with those of the previous diagnostic MR examination. A low-dose CT scan was consequently conducted to assess the correct positioning of the needle tip with respect to the zygapophyseal articular space (Z). Further, the infiltrative procedure was repeated at 1, 2, 4, 6 weeks and patients evaluated in terms of low back pain by means of a VAS scale.
Results: All fusion imaging-guided injections were performed successfully (range: 0 - 14 mm; accuracy= 95.6%). The VAS scale demonstrated a significant reduction of low back pain from 7.3 ± 1.7 (mean ± SD), at the baseline, to 2 ± 1.2 (mean ± SD) at 6 weeks ($P < 0.01$). No significant correlation was found between needle tip distance from Z and pain reduction (r=0.56, $p < 0.001$).
Conclusion: Facet joint injection under MR-US fusion imaging technology resulted as a safe, reliable and accurate procedure. It combines the advantages of the real-time ultrasound guidance to those of MR evaluation to perform lumbar percutaneous treatments.

B-0272 14:16
MR T2 mapping to evaluate the effect of ultrasound (US)-guided intra-articular injection of hyaluronic acid (HA) on articular cartilage
G. Ferrero[1], E. Fabbro[1], F. Fiz[2], D. Dettore[2], G. Serafini[1]; [1]*Pietra Ligure/IT*, [2]*Genoa/IT (giulio.ferrero@gmail.com)*

Purpose: To define if T2 relaxation times, measured at the level of the articular cartilage of patients with tibio-femoral or femoral-acetabular chondropathy, can provide information about the effects of a single treatment cycle with ultrasound-guided intra-articular injection of intermediate molecular weight HA.
Methods and Materials: 72 patients with tibio-femoral/femoral-acetabular chondropathy (38 knees, 34 hips, age 18-65 years, Outerbridge I-III) were evaluated with quantitative MRI mapping, based on T2 multiecho images of cartilage tissue; then they were subjected to a single cycle of US-guided viscosupplementation (3 infiltrations, once every two weeks, 4 ml every infiltration) and finally evaluated with MRI at one month after treatment. 30 patients with untreated chondropathy (15 hips,15 knees) were the control and 10 healthy volunteers the reference (5 hips, 5 knees). Statistical tests were processed with SPSS 21.0, the differences between the two groups calculated with the Wilcoxon test ($P < 0.05$) and Chi square ($P < 0.001$), and the data obtained reported as mean±SD. The clinical results were interpreted with VAS.
Results: The T2 values of the volunteers were 33 ±5.2 ms for hips and 35±4.6 ms for knees. In the group of patients, these values were increased (40.7±4.6 and 40.5±4.1, respectively, $P < 0.05$ vs healthy). After the treatment, such values were further increased (46±4.8 and 46.4±4.9, $P < 0.05$ vs baseline). The VAS increased from 7.1± 1.3 to 2.9±1.2 and 6.8±1.2 to 2.5±1.2 for hips and knees, respectively ($P < 0.001$).
Conclusion: The MRI T2 mapping has proved to be a reliable method to provide quantitative information about the short-term ultrastructural changes that occur in the cartilage tissue. The possibility to assess ultrastructural cartilaginous changes on a selected series of patients on baseline and after therapy could define in a more accurate way the clinical and quantitative findings.
Author Disclosures:
G. Ferrero: Grant Recipient; Young Researchers Grant 2014 (European Society of Musculoskeletal Radiology).

B-0273 14:24
New approach for B-mode ultrasound (US) measurements of the plantar aponeurosis in healthy volunteers
M.M.H. Abd Ellah, C. Kornreif, C. Kremser, W.R. Jaschke, A. Klauser; *Innsbruck/AT (dr_m_hamdy2006@hotmail.com)*

Purpose: To evaluate coronal plane measurements of plantar aponeurosis in healthy volunteers using B-mode US.
Methods and Materials: Seventy-nine plantar aponeuroses in 40 healthy volunteers (age range 18 - 74 years, mean 34 years) were examined using 5-18 MHz (HI Vision Preirus, Hitachi Aloka Medical, Ltd, Tokyo) by two musculoskeletal radiologists (2 and 15 years experience). Examination was done in coronal plane with maximum thickness measurement at medial and lateral sides. Patients were classified into groups according to gender (female and male) and age (younger and older). All measurements were compared and interobserver agreement was calculated.
Results: Plantar aponeurosis was significantly thicker medially than laterally (mean ± std 3.1 ± 0.7 mm versus 2.5 ± 0.5 mm respectively, $p < 0.001$). A significant difference was found between male and female groups [3.3 ± 0.7 mm versus 2.9 ± 0.6 mm medially and 2.7 ± 0.6 mm versus 2.3 ± 0.4 mm laterally respectively, ($p < 0.05$)]. A highly significant difference was found between old and young age groups [3.8 ± 0.6 mm versus 2.8 ± 0.4 mm medially and 3.1 ± 0.4 mm versus 2.3 ± 0.4 mm laterally respectively, ($p < 0.001$)]. Good inter observer agreement was noted (0.74)
Conclusion: B-mode US measurement of plantar aponeurosis in coronal plane showed significant differences between medial and lateral sides with significant differences based on gender and age groups. This may represent a new approach for plantar aponeurosis thickness evaluation.

B-0274 14:32

Shear wave ultrasound elastography is a reliable and repeatable method to measure elastic modulus of patellar and achilles tendons

S. Tas, M. Onur, A. Soylu, S. Yilmaz, F. Korkusuz; *Ankara/TR (ruhionur@yahoo.com)*

Purpose: To investigate the reliability of shear wave ultrasound elastography in measuring elastic modulus of patellar and achilles tendons.
Methods and Materials: Five healthy 30.9 ± 4.9-year-old (Average Body Mass Index: 25.0±7.4) males volunteered for this study. After ethical board approval, two examiners, using a 9-MHz transducer with ultrasound equipment (ACUSON S3000, Siemens), measured mean shear wave velocity values (MSWVV) of patellar and achilles tendons of both extremities. The elasticity images acquired using virtual touch tissue imaging quantification (VTIQ) technique in two sessions with intervals of 20 minutes for intra-observer intra-class correlation coefficient (ICC) measurements. Elasticity measurements of tendons were repeated after a week to investigate the inter-day correlation coefficient of examiners. After calculation of PT and AT MSWVV from VTIQ images using Matlab (Mathworks, USA), inter-observer intra-observer and inter-day reliability parameters were investigated based on a two-way random model.
Results: Intra-observer, inter-day and inter-observer correlation coefficients for the MSWVV of patellar and achilles tendons were 0.79-0.95, 0.67-0.89, and 0.54-0.83; and 0.72-0.99, 0.87-0.96, and 0.73-0.97, respectively.
Conclusion: Shear wave ultrasound elastography using the VTIQ technique is a reliable and repeatable technique for measuring stiffness of patellar and achilles tendons according to intra-observer, inter-day and inter-observer correlation coefficient values.

B-0275 14:40

Ultrasound evaluation of meniscal implant extrusion, after meniscus reconstruction and impact of the extrusion on patients quality of life

T. Pobozy[1], K. Slynarski[1], K. Sklinda[1], M. Frel[2]; [1] *Warsaw/PL*, [2]*Otwock/PL (tomasz.pobozy@onet.pl)*

Purpose: The main purpose of the study was to evaluate the use of the ultrasound examination (US) in assessing meniscal implant remodeling and the impact of meniscal extrusion on patients' quality of life (QOL).
Methods and Materials: A total of 35 patients (13 women and 22 men, aged between 18 to 66 years - average 41.6) after arthroscopic meniscal reconstruction with Actifit® implants were included in the study. The average time from surgery was 2.8 years. In two cases two menisci were operated. Implant remodeling and extrusion was assessed ultrasonographically. Extrusion measurement took place quantitatively in millimeters and meniscal extrusion was compared to that in the contralateral knee (which was considered as healthy). These comparisons were done in the supine position with full knee extension, 90 flexion, and in the standing position with full weight-bearing. Postoperative QOL was resumed with the KSS and KOOS questionnaires.
Results: Ultrasonography is a non-invasive and cost-effective method of evaluating the menisci. In the majority of patients good or complete remodeling was observed (28 of 37 menisci which represents 75.6%). We found that post-reconstruction meniscal extrusion has no effect on patients-assessed QOL.
Conclusion: Ultrasonography allows for the evaluation of operator-assessed meniscal remodeling (echogenicity and shape), as well as meniscal extrusion in various knee positions. It is quick, safe and widely available method. Notably, ultrasonography allows for the assessment under load-bearing conditions, which is hardly available in other imaging modalities. Keywords: meniscus, meniscal reconstruction, meniscal extrusion, meniscal implants, ultrasound

B-0276 14:48

Ulnar neuropathy at the elbow: visualisation of cause of ulnar entrapment with high-resolution ultrasound is predictive of outcome after transposition

M. Schertz, J. Silvera, C. Mutschler, C. Bernard, E. Masmejean; *Paris/FR (schertzmathieu@hotmail.fr)*

Purpose: Ulnar neuropathy at the elbow (UNE) is mostly caused by mechanical compression and irritation of the ulnar nerve. Treatment may be conservative or surgical, but optimal management remains controversial. There is a need for finding subgroup of UNE patients responding to specific treatment. The objective was to evaluate prognostic value of ultrasound findings in UNE on post-surgical outcome.
Methods and Materials: Retrospective analysis of patients consecutively operated by transposition of the ulnar nerve (UN). Results of ultrasound findings were compared with subjective recovery (complete remission of symptoms or improvement versus stability of symptom or progression).
Results: Thirty five patients were included in the analysis. Morphological and/or dynamic abnormalities supposed to be causative for a conflict on the UN were seen in 75% of patients (27/35). These causes were: UN dislocation (11), thickened epitrochleo-olecranon ligament (4), presence of epitrochleo-anconeus muscle (3), hypertrophy of the accessory head of the triceps (2) and presence of osteophytes (2). Improved postoperative outcomes was observed in 93% (25/27) of these patients and 44% (4/9) of the patient for whom it was not found any ultrasound abnormality (p = 0.0001). Nerve enlargement at sonography was not associated with outcome.
Conclusion: Visualisation of the cause of the conflict on the UN with high-resolution ultrasound is strongly predictive of recovery after ulnar nerve transposition. High-resolution ultrasound is essential in the preoperative assessment of the UNE.

B-0277 14:56

Therapeutic implications of nerve ultrasound in leprosy

Y. Aswani, S. Saifi; *Mumbai/IN (yashant_aswani@rediffmail.com)*

Purpose: Leprosy and lepra reactions have the same treatment regimen except steroids in the latter. Lepra reactions may be identified on clinical and histopathological grounds. However, they may be clinically silent as well. Neuritis as a result of lepra reactions may cause permanent disability in as less as 24 hours of its onset. The aim of this study is to determine ultrasonographic criteria to distinguish between the two.
Methods and Materials: A prospective analysis of all new leprosy cases between May 2015 to August 2015 at a tertiary care institute was performed. Both leprosy and lepra reactions were diagnosed based on clinical and histopathological criteria. Nerve ultrasound was performed for ulnar, median, lateral popliteal and posterior tibial nerves on both sides using linear trasnducer of 6.6- 8.4 MHz (Xario, Toshiba). Nerve involvement was tabulated as thickening, internal echotexture and vascularity. Pearson's chi square test was applied.
Results: Out of 21 patients, 17 were males and 4 were females. The age range was 16 to 53 years. Ulnar nerve was the most common nerve to be involved. Both leprotic nerves and nerves involved by lepra reactions were thickened and had hypoehoic internal architecture. The sensitivity, specificity, positive and negative predictive value of ultrasonography in diagnosing neuritis caused by lepra reactions by detecting the presence of intraneural Doppler signals was 92.3%, 50%, 75% and 80%, respectively ($p < 0.019$).
Conclusion: Intraneural Doppler signals suggest neuritis due to lepra reactions. Nerve ultrasound is an excellent screening modality to differentiate between leprosy and lepra reactions.

B-0278 15:04

Visualisation of the deep branch of the ulnar nerve using high-resolution ultrasound

G. Riegler, D. Lieba-Samal, H. Platzgummer, C. Pivec, S. Jengojan, P. Brugger, M. Vierhapper, G. Bodner; *Vienna/AT (georg.riegler@meduniwien.ac.at)*

Purpose: The deep-branch of the ulnar-nerve (DBUN) is a pure motor branch innervating the muscles that play an important role in grip and pinch strength. The actual value of imaging for lesions on the nerve over its entire course has not been clarified. Therefore, this study aimed to evaluate the possibility of visualisation of the DBUN from its origin to the most distal point and developing an ultrasound protocol for routine clinical practice.
Methods and Materials: To assess the feasibility of visualisation, we performed HRUS with high-frequency probes (18-22MhZ), HRUS-guided ink marking and consecutive dissection in eight fresh cadaver hands. Measurements of the mean cross-sectional diameter (MCSD), in both hands of ten healthy volunteers (n=20), were obtained at two different locations: directly after separation from the ulnar nerve (R1); and atop the fourth metacarpal bone (R2). A Student´s t-test was used for statistical analysis. Metric data (nerve diameter) are presented as mean ± standard deviation and range (minimum to maximum).
Results: The DBUN was clearly visible in all anatomical specimens and healthy volunteers. Dissection confirmed HRUS findings in all anatomical specimens. The MCSD in volunteers was 0.16 cm ± 0.03 (range, 0.09-0.20) at R1, and 0.15 cm ± 0.02 (range, 0.11-0.18) at R2. There were no statistically significant differences between R1 and R2 (p=0.28).
Conclusion: This study confirms the ability to reliably visualise the DBUN over its entire course with HRUS, in anatomical specimens and in healthy volunteers. We, therefore, encourage the use of HRUS particularly in patients with suspected DBUN lesions.

B-0279 15:12

Visualisation of the recurrent motor branch of the median nerve using high-resolution ultrasound

G. Riegler, D. Lieba-Samal, C. Pivec, H. Platzgummer, S. Jengojan, P. Brugger, M. Vierhapper, G. Bodner; *Vienna/AT (georg.riegler@meduniwien.ac.at)*

Purpose: The terminal-recurrent-motor-branch (RMB) supplies innervation to muscles that contribute to the important abduction/opposition of the thumb. The evaluation of the variable course of the nerve has thus far been restricted to electrophysiological exploration and clinical testing. Therefore, this study aimed to evaluate the possibility of the visualisation and diagnostic assessment of the RMB with high-resolution ultrasound (HRUS).
Methods and Materials: HRUS with high-frequency probes (18-22MhZ) was used to locate the RMB in eight fresh cadaver hands. To verify correct identification, ink-marking and consecutive dissection was performed. Measurement of the mean cross-sectional diameter (MCSD), evaluation of the origin from the median nerve course in relation to the transverse carpal ligament, and possible accessory branches in both hands of ten healthy volunteers (n=20) was performed. Descriptive statistic were used for analysis.
Results: The RMB was clearly visible in all anatomical specimens and in healthy volunteers. Dissection confirmed HRUS findings in all anatomical specimens. The MCSD in volunteers was 0.7 mm $\pm$ 0.1 (range, 0.6-1). The RMB originated from the radial aspect in 11 (55%), the central aspect in eight (40%), and the ulnar aspect in one volunteer (5%). Nineteen (95%) extraligamentous courses, one (5%) subligamentous course, and one accessory branch were detected.
Conclusion: This study confirms the ability to reliably visualize the RMB and its variations with HRUS, in anatomical specimens and in healthy volunteers. We, therefore, encourage the use of HRUS not exclusively, but especially for the preoperative evaluation for carpal tunnel release or when thenar muscle weakening is present.

B-0280 15:20

Do we need image guidance for subacromial subdeltoid injections?

G.M. Allen, M. DeDea, D.J. Wilson; *Oxford/UK (gina_m_allen@btinternet.com)*

Purpose: Subacromial-subdeltoid (SASD) bursal injections are commonly used to treat patients with symptoms of impingement. There is a considerable debate whether these injections should be performed using image guidance or landmark guidance with contradictory evidence in the literature. There is a debate regarding the type of drug that should be injected. We have reviewed the literature and present an overview.
Methods and Materials: We have reviewed and collated over 200 current publications regarding SASD injection paying particular attention to different guidance techniques and outcome measures.
Results: There are contradictory findings and messages. Some have found that landmark guided injections are as effective as those using ultrasound guidance. Others have found the exact opposite. The evidence presented in a recent Cochrane review is confusing; there is some debate regarding the analysis of this data and criticism of the conclusions made. There is evidence that ultrasound-guided injections are less painful than those performed using landmark guidance. There is a suggestion that the exact location of the bursa is important. The majority consider that steroids are the best therapeutic agents.
Conclusion: There is a substantial difference in the way SASD injections are managed in the different centres. The contradictory evidence is insufficient to offer a firm conclusion at present. There is a pressing need for prospective randomised studies with adequate controls. These investigations would require substantial numbers of cases and it is likely that multicentre research will be necessary. Currently there are convincing arguments for both landmark and ultrasound-guided techniques.

14:00 - 15:30 **Room E2**

Neuro

SS 311a

Cerebral tumours (1)

Moderators:
A. Falini; Milan/IT
F.P. Kuhn; Zurich/CH

K-07 14:00

Keynote lecture

P. Due-Tonnessen; *Oslo/NO*

B-0281 14:09

Intraoperative MR imaging of cerebral oxygen metabolism in patients with brain tumours

A. Stadlbauer, A. Merkel, B. Sommer, S. Brandner, M. Zimmermann, M. Buchfelder, K. Rössler; *Erlangen/DE (andi@nmr.at)*

Purpose: Tissue oxygen tension is an important parameter for brain tissue viability and its non-invasive intraoperative monitoring in the whole brain is of highly clinical relevance. Here, we introduce a multiparametric quantitative blood oxygenation dependent (qBOLD) MRI approach which enables the intraoperative examination of oxygen metabolism during the resection of brain tumours.
Methods and Materials: Ten patients suffering from brain tumours were intraoperatively examined twice (before craniotomy and after gross-total resection) using the qBOLD technique and a 1.5 Tesla MR scanner, which is installed in an operating room. The MR protocol included T2*- and T2-mapping, and dynamic susceptibility-weighted (DSC) perfusion. qBOLD data analysis was performed using a custom-made in-house MatLab software for calculation of maps of oxygen extraction fraction (OEF) and cerebral metabolic rate of oxygen (CMRO2) as well as of cerebral blood volume (CBV) and flow (CBF).
Results: Peritumoural oedema showed an increase in both perfusion (CBV +21%, CBF +10%) and oxygen metabolism (OEF +32%, CMRO2 +13%) after resection of the lesion. However, in peritumoural non-oedematous structures only oxygen metabolism (OEF +19%, CMRO2 +10%) was increased, but not perfusion. No changes were found in contralateral normal brain. Fortunately, no neurovascular adverse events were observed.
Conclusion: This approach for intraoperative examination of oxygen metabolism in the whole brain is a new application of intraoperative MRI additionally to resection control (residual tumour detection) and updating of neuronavigation (brain shift detection). It may help to detect and treat neurovascular adverse events early during neurosurgical operations and to improve postoperative outcome.

B-0282 14:17

Assessment of tumour oxygenation and its impact on treatment response in bevacizumab treated recurrent glioblastoma

D. Bonekamp[1], K. Mouridsen[2], A. Radbruch[1], A. Wick[1], H.-P. Schlemmer[1], W. Wick[1], M. Bendszus[1], L. Østergaard[2], P. Kickingereder[1]; [1]*Heidelberg/DE*, [2]*Aarhus/DK (d.bonekamp@dkfz-heidelberg.de)*

Purpose: The effects of antiangiogenic agents on tumour oxygenation in recurrent glioblastoma (rGB) remain controversial. We used a novel dynamic susceptibility contrast MRI (DSC-MRI) based method to examine whether bevacizumab alters tumour oxygenation in patients with rGB and whether such changes predict treatment response.
Methods and Materials: 71 patients diagnosed with rGB underwent anatomic and DSC-perfusion MRI at baseline and first follow-up after bevacizumab initiation. We generated maps of tumour metabolic rate of oxygen (TMRO2), oxygen extraction fraction (OEF) and capillary transit time heterogeneity (CTH). Parametric response maps (PRMs) were used to quantify parametric changes in response to BEV (i.e. proportion of voxels with a significant increase [%PRM (+)] or decrease [%PRM (-)]). Correlation with progression-free survival (PFS) and overall survival (OS) was examined using Cox-proportional-hazard models.
Results: TMRO2 and CTH showed significant reductions BEV response ($p < 0.01$, respectively) whereas OEF remained unchanged. The hazard ratios (HR) for progression and death significantly increased with (I) higher baseline TMRO2 (HR=2.36,$p < 0.01$;HR=2.12,$p < 0.01$, respectively) and with (II) higher %PRM (-) of TMRO2 (HR=1.11,$p < 0.01$;HR=1.05,p=0.02), but showed no association with (III) baseline values of CTH or OEF or their changes in response to BEV. The magnitude of %PRM (-) for TMRO2, CTH and OEF was a function of the baseline value of these parameters.

Conclusion: Higher pretreatment TMRO2 characterises more aggressive rGB and is a strong negative predictor of BEV-response. Larger BEV-induced TMRO2 reduction may reflect prognostically unfavorable tumour hypoxia, while the remaining relative elevation of TMRO2 under BEV therapy compared to less aggressive rGB may indicate antiangiogenic evasion.

B-0283 14:25

Magnetic resonance imaging biomarkers for assessment of vascular pathologies in glioma

A. Stadlbauer[1], M. Zimmermann[1], K. Rössler[1], S. Oberndorfer[2], M. Buchfelder[1], A. Dörfler[1], G. Heinz[2]; [1]*Erlangen/DE*, [2]*St. Pölten/AT (andi@nmr.at)*

Purpose: Knowledge of the topological and structural heterogeneity of tumour microvasculature is important for monitoring of disease progression and treatment response. Here, we introduce new MRI biomarkers for assessment of vascular pathologies in glioma using vascular architecture mapping (VAM).
Methods and Materials: Twenty patients with known or suspected brain tumours were examined at 3 Tesla using the VAM technique. We used a dual contrast agent injections approach to obtain spin echo (SE) and gradient echo (GE) EPI DSC perfusion MRI data. Custom-made in-house MatLab software was used for calculation of ΔR2,GE versus ΔR2,SE^3/2 diagrams, which we named vascular hysteresis loops (VHLs), for each brain voxel. VHLs were evaluated with the known parameters microvessel size (VSI) and density (MVD) as well as with new biomarkers: signed hysteresis area (sHA), vascular induced peak shift (VIPS, time shift between peak signals of SE- and GE-EPI perfusion), and curvature of the VHLs.
Results: sHA allowed differentiation between the supplying arterial and draining venous microvasculature within high-grade glioma and VIPS provided complementary information about the blood volume within these structures (VIPS↑ = CBV↓). The changes in sHA and VIPS in combination were beyond the contrast-enhancing tumour area. Interestingly, curvature was decreased in tumour but increased in peritumoural oedema, which might be related to microvascular changes due to compression. VSI and MVD provided complementary and inversely correlated information.
Conclusion: These new MRI biomarkers give insights into the complexity and heterogeneity of vascular changes in glioma, which might be useful for therapy monitoring. However, histological validation is required.

B-0284 14:33

Multiparametric MR imaging of oxygen metabolism and angiogenesis in glioma patients

A. Stadlbauer[1], M. Zimmermann[1], K. Rössler[1], S. Oberndorfer[2], M. Buchfelder[1], A. Dörfler[1], G. Heinz[2]; [1]*Erlangen/DE*, [2]*St. Pölten/AT (andi@nmr.at)*

Purpose: Both energy metabolism and angiogenesis are part of the 10 hallmarks of cancer and help rationalizing the complexity of neoplastic disease. Their noninvasive in-vivo assessment, however, is still challenging. Here, we introduce a multiparametric MRI approach which enables the combined exanimation of oxygen metabolism and angiogenesis in gliomas.
Methods and Materials: Twenty patients with untreated or recurrent glioma, and one during the first two cycles of antiangiogenic therapy (Avastin), were examined at 3 Tesla using vascular architecture mapping (VAM) and quantitative BOLD (qBOLD). For VAM we performed spin echo (SE) EPI and gradient echo (GE) EPI DSC perfusion. For qBOLD we additionally performed T2*- and T2-mapping. In-house MatLab software was used for calculation of maps of microvessel size (VSI) and density (MVD) as well as of oxygen extraction fraction (OEF) and cerebral metabolic rate of oxygen (CMRO2).
Results: Low-grade glioma (LGGs) showed increased OEF but no sign for microvascular changes within the lesion and its vicinity. High-grade glioma (HGGs) showed decreased OEF and areas with increased CMRO2, which were congruent with the highest MVD values in the lesion, i.e. excessive blood and oxygen supply was induced by angiogenesis. MVD and VSI were regionally complementary (MVD↑=VSI↓). OEF was increased in non-oedematous structures outside the contrast-enhancing area of HGGs. Antiangiogenic therapy was associated with massive changes in oxygen metabolism and microvasculature towards normalization even after the first cycle.
Conclusion: Combined exanimation of oxygen metabolism and angiogenesis may be useful for therapy monitoring of gliomas. However, histological validation is required.

B-0285 14:41

Comparison of ferumoxytol and gadolinium enhancement changes in response to Avastin in high grade glioma patients

A. Horváth[1], C. Várallyay[2], D. Schwartz[2], P. Ambady[2], P. Bogner[1], E. Neuwelt[2]; [1]*Pécs/HU*, [2]*Portland, OR/US (andrhorvath@gmail.com)*

Purpose: To test the diagnostic performance of ferumoxytol by comparing gadolinium and ferumoxytol enhancement in glioma patients treated with Avastin.
Methods and Materials: 20 high grade glioma patients (13 males, 7 females, mean age ± SD : 53.6 ± 10.3 years) with post-gadolinium and 24 hour post-ferumoxytol T1-weighted MR scans before and after Avastin treatment were enrolled in this study. Enhancement volumes and enhancement signal intensities normalised to white matter signal intensity were measured with histogram analysis on all scans. Enhancement volumes and signal intensities were compared between contrast agents and between pre- and post-Avastin scans with repeated measure two-way ANOVA analysis.
Results: Enhancement volume did not differ between contrast agents (P = 0.5246). On the other hand, gadolinium showed higher normalised enhancement signal intensities than ferumoxytol (P = 0.0002). Both enhancement volume and signal intensity decreased in response to Avastin treatment (P = 0.0002 and P = 0.0004, respectively). Changes in enhancement volumes and in signal intensities in response to Avastin were not different between contrast agents (P = 0.8081 and P = 0.6305, respectively).
Conclusion: The similarities in enhancement changes between gadolinium and ferumoxytol suggest that ferumoxytol performs well in the diagnosis and follow-up of treated glioma patients and it shows high potential as an alternative contrast agent.

B-0286 14:49

Prognostic value of preoperative dynamic contrast-enhanced MRI perfusion parameters for high-grade glioma patients

A. Ulyte[1], M. Skardelly[2], J. Schittenhelm[2], C. Braun[2], B. Bender[2], S. Bisdas[3]; [1]*Vilnius/LT*, [2]*Tübingen/DE*, [3]*London/UK (agne.ulyte1@gmail.com)*

Purpose: The prognostic value of dynamic contrast-enhanced (DCE) MRI perfusion parameters histogram analysis is not well established for high-grade glioma (HGG) patients. The aim of this prospective study was to investigate DCE perfusion transfer coeficient (Ktrans), vascular plasma volume fraction (vp), extracellular volume fraction (ve), reverse transfer constant (kep) and initial area under gadolinium concentration time curve (IAUGC) as predictors of progression free (PFS) and overall survival (OS) for HGG patients. Glioma grade differentiation with DCE parameters was also assessed.
Methods and Materials: Sixty-nine patients with suspected HGG underwent preoperative DCE-MRI scans. DCE perfusion whole tumour histogram parameters, relevant clinical details, PFS and OS data were obtained. Univariate, multivariate and Kaplan-Meier survival analyses were conducted. Receiver operating characteristic (ROC) curve analysis was employed to identify perfusion parameters with the best differentiation performance.
Results: On univariate analysis, ve and the skewness of vp had significant negative impacts, while kep had a significant positive impact on OS ($P < 0.05$). ve was also a negative predictor of PFS ($P < 0.05$). Patients with lower ve and lower IAUGC had longer median PFS and OS on Kaplan-Meier analysis ($P < 0.05$). Ktrans and ve could differentiate grade III and IV gliomas the best (area under the curve 0.819 and 0.791 respectively).
Conclusion: High ve is a predictor of worse PFS and OS in HGG patients. vp skewness and kep are also predictive for OS. Ktrans and ve achieve the best performance for differentiating grade III from grade IV gliomas.

B-0287 14:57

Prognosis prediction of non-enhancing T2 high signal intensity lesion after standard treatment in glioblastoma: application of dynamic contrast-enhanced MR imaging

R. Kim, S. Choi; *Seoul/KR (rihyeon.kim@gmail.com)*

Purpose: To assess the prognostic value of non-enhancing T2 high signal intensity lesion using pharmacokinetic parameters from dynamic contrast-enhanced (DCE) MR imaging in glioblastoma multiforme (GBM) patients receiving standard concomitant chemoradiotherapy and adjuvant temozolomide medication.
Methods and Materials: A total of 49 GBM patients were included who had underwent pre-operative DCE MR imaging and received standard treatment including near total removal of the contrast-enhancing portions. According to the Response Assessment in Neuro Oncology criteria, patients were classified into disease progression (n=21) or non-progression (n=28) group. We analysed the histogram parameters of Ktrans, Ve and Vp within the entire non-enhancing T2 high signal intensity lesion of each patient. The parameters with the best percentile from cumulative histograms were identified by analysis of the area under the curve (AUC) of the receiver operating characteristic analysis and were compared by using multivariable stepwise logistic regression analysis.
Results: For the differentiation of progression and non-progression groups, the highest AUC values were found at the 99th percentile of the Ktrans (AUC, 0.954), the 97th percentile of Ve (AUC, 0.815) and the 94th percentile of Vp (AUC, 0.786) (for all, $p < .05$). The 99th percentile Ktrans was the only variable that could independently distinguish progression from non-progression group in multivariable stepwise logistic regression ($p = .002$).

Conclusion: We found that the Ktrans value of non-enhancing T2 high signal intensity lesion could be used for the prognosis prediction after standard treatment for GBM, wherein a high 99th percentile Ktrans value suggests a poor prognosis.

B-0288 15:05

Intravoxel incoherent motion diffusion-weighted MR imaging in differentiation of meningiomas: initial study

Y. Lu[1], K. Shek[2], B. Yin[1], D. Geng[1]; [1]*Shanghai/CN*, [2]*Honkong/CN (06307070008@fudan.edu.cn)*

Purpose: To prospectively evaluate traditional Diffusion-weighted Imaging parameter (Apparent Diffusion Coefficient, ADC) and the intravoxel incoherent motion (IVIM) parameters (D; f and D*) in differentiation among meningiomas.
Methods and Materials: 67 (86%) patients with WHO I and 11 (14%) patients with WHO II meningiomas underwent traditional DW imaging and IVIM DW imaging. Traditional DW imaging and IVIM DW imaging were performed by using 2 b values (0, 1000s/mm2) and 12 b values (0-3500 s/mm2) respectively. ADC and IVIM parameters of the meningiomas were measured by 2 radiologists, and significance between the tumour types were assessed by using unpaired t-test and one-way ANOVA.
Results: The mean ADC value of WHO II meningiomas and benign meningiomas were 0.908±0.267×10-3 mm2/s and 0.905±0.194×10-3 mm2/s respectively, p=0.619. D value exhibited a tendency to be lower in WHO II meningiomas than WHO I meningiomas (0.459±0.030×10-3 mm2/s vs 0.522±0.072×10-3 mm2/s, p=0.054). In ROC curve, the cut-off value of D value that separated atypical meningiomas from WHO I meningiomas was 0.479×10-3 mm2/s with sensitivity of 90.9% and specificity of 76.7%. Secretory and angiomatous meningiomas had higher ADC value, ADC ratio, D ratio and f than other subgroups. D* was significantly lower in fibrous meningiomas than others (2.783±1.179×10-3 mm2/s vs 5.125±1.918×10-3 mm2/s), but the reliability of D* was suspicious.
Conclusion: IVIM is a more reliable technique in distinguishing different grades of meningiomas than traditional DWI MRI and 0.479×10-3 mm2/s is the cut-off value of D for WHO I and WHO II meningiomas. D ratio, f and f ratio are potentially useful in differentiating certain subgroup of meningiomas.

B-0289 15:13

Quantitatively evaluate the efficacy of diffusion kurtosis imaging in grading gliomas: a preliminary study

J. Chu[1], Y. Wang[1], J. Zhao[1], X. Yan[2], X. Li[1]; [1]*Guangzhou/CN*, [2]*Shanghai/CN (truechu@hotmail.com)*

Purpose: To evaluate the diagnostic efficacy of diffusion kurtosis imaging (DKI) in grading gliomas and to assess the correlation of diffusion parameters with cell proliferation biomarker (Ki 67).
Methods and Materials: Eighteen patients (M:11, F:5, median age:49y) with pathologically proved gliomas [10 high-grade gliomas (HGG), 8 low-grade gliomas (LGG)] were included in our study. All patients underwent routine MRI and DKI scan. Ten ROIs were manually drawn on the tumour parenchyma and the value of mean kurtosis (MK), axial kurtosis (Ka), radial kurtosis (Kr), mean diffusivity (MD), fractional anisotropy (FA) were calculated. Mann-Whitney-Wilcoxon test, ROC analysis and Spearman correlation were performed.
Results: All diffusion parameters can significantly differentiate HGG and LGG ($p < 0.000$). MK, Ka, Kr, FA were significantly higher in HGG while MD was significantly lower in HGG ($p < 0.000$). ROC analysis showed that MK had the highest diagnostic value while MD demonstrated the lowest diagnostic value. The AUC of MK, Ka, Kr, FA and MD were 0.742, 0.732, 0.661, 0.657, 0.232, respectively and the specificity and cut-off value of MK were 86.3% and 0.715. The most sensitive diffusion parameters was FA (86%, cut-off value: 0.107) and Ka (91%, cut-off value: 0.764) had the highest specificity. Further, mean MK and Kr values were positively correlated with Ki 67 values ($p < 0.033$).
Conclusion: Diffusion kurtosis imaging may help in gliomas grading. MK and Ka better than Kr, FA and MD which demonstrated relatively higher diagnostic value, Ka showed the highest specificity. Further, higher MK and Kr value may predict active tumour cell proliferation.

B-0290 15:21

Diagnostic accuracy of MR imaging techniques for treatment response assessment in patients with high grade glioma: a systematic review and meta-analysis

B.R.J. van Dijken, P.J. van Laar, G.A. Holtman, A. van der Hoorn; *Groningen/NL (b.r.j.van.dijken@student.rug.nl)*

Purpose: Patients with high-grade glioma require frequent treatment response assessment as recurrence is inevitable. As anatomical MRI is not able to differentiate tumour progression from treatment-induced changes, novel molecular MRI techniques have been studied. However, the accuracy of these techniques is not well known. Therefore, we performed a systematic meta-analysis to assess the diagnostic accuracy of treatment response evaluation of anatomical and molecular MRI.
Methods and Materials: PubMed, EMBASE and Web of Science were independently searched by two authors for diagnostic accuracy studies of MRI techniques for treatment response assessment in patients with high-grade glioma confirmed by histology or follow-up. Meta-analysis was performed using bivariate random effect models when ≥5 studies were included. Study quality assessment was performed with QUADAS-2.
Results: Out of 1816 originally identified studies, 36 studies were included. Anatomical MRI (6 studies, 205 patients) showed a pooled sensitivity and specificity of 77% (95%CI 57-90) and 72% (45-89), respectively. Pooled ADC (7 studies, 204 patients) sensitivity 71% (60-80) and specificity 87% (77-93). DSC (18 studies, 708 patients) 87% (82-91) and 86% (77-91). DCE (5 studies, 207 patients) 92% (73-98) and 85% (76-92). ASL (2 studies, 102 patients) showed a sensitivity range of 52-79% and specificity range of 64-82%. MRS (9 studies, 207 patients) sensitivity was 92% (79-97) and specificity 95% (65-99).
Conclusion: MRS showed the highest diagnostic accuracy and all molecular techniques showed higher accuracy than anatomical MRI. This supports the incorporation of standard molecular MRI in treatment response assessment in high-grade gliomas.

14:00 - 15:30 **Room F1**

Oncologic Imaging

SS 316

Dealing with metastatic disease

Moderators:
D.M. Lambregts; Amsterdam/NL
A. Sohaib; London/UK

B-0291 14:00

The application of DW-MRI in the staging of oesophageal cancer: prospective comparison with EUS and MDCT

F. Giganti, P.G. Arcidiacono, R. Nicoletti, A. Ambrosi, E. Orsenigo, E. Mazza, A. Del Maschio, F. De Cobelli; *Milan/IT (giganti.fra@gmail.com)*

Purpose: To prospectively compare the diagnostic performance of diffusion-weighted magnetic resonance (DW-MR), multidetector computed tomography (MDCT) and endoscopic ultrasound (EUS) in the preoperative loco-regional staging of oesophageal cancer.
Methods and Materials: Eighteen patients with biopsy-proved oesophageal tumour (9 directly treated with surgery and 9 addressed to chemo/radiotherapy before) underwent 1.5 T DW-MRI, 64-channels MDCT and EUS before and after neoadjuvant treatment. All images were analysed blindly by dedicated operators and two radiologists calculated independently the ADC from the first scan. Results were then compared with surgical findings. Spearman and intraclass correlation coefficients, Mann-Whitney and ROC curves analysis were performed. The population was divided into T1-2 vs T3-4 and N0 vs N+. Sensitivity, specificity, accuracy, positive and negative predictive value were calculated and compared for each technique.
Results: For T staging, EUS showed the best sensitivity (100%) while MR showed the highest specificity (92%) and accuracy (83%). For N staging, MR and EUS showed the highest sensitivity (100%) but none of the three techniques showed adequate results for specificity. Overall, MR showed the highest accuracy (66%) for N stage. Mean ADC was different between surgery-only and chemo/radiotherapy groups (1.90 vs 1.30 x 10-3 mm2/s, respectively; p= 0.005), with an optimal cut off for local invasion of 1.33 x 10-3 mm2/s (p=0.05).
Conclusion: DW-MR could improve the current preoperative staging workup for oesophageal cancer, showing characteristic advantages for both staging and initial treatment decision-making.

B-0292 14:08

One-step one-phase vs. multi-step multi-phase whole-body staging CT - comparison of radiation dose and diagnostic confidence

D. Zinsser, R. Marcus, E. Körner, A. Othman, F. Bamberg, K. Nikolaou, M. Notohamiprodjo; *Tübingen/DE (dominik.zinsser@med.uni-tuebingen.de)*

Purpose: To compare a one-step protocol to a multi-step protocol whole-body CT (neck, chest, abdomen, pelvis) regarding radiation dose and diagnostic confidence.
Methods and Materials: 106 retrospectively identified examination pairs of patients with breast cancer or malignant melanoma were included. Multi-step (separate scans for chest (arterial phase), abdomen (portal venous phase) and neck (second bolus)) and one-step protocols (whole-body portal venous phase) were acquired on the same MDCT-scanner (128-slice-dual-source (DSCT) or 64-slice-single-source (SSCT)). Two readers assessed the visibility of subpectoral, mediastinal and cervical lymph nodes on a five point

Likert scale (1=very poor, 5=excellent). Dose-length-product and frequency of supraorbital tumour involvement, pulmonary embolism and arterialized liver lesions were registered.
Results: Using the one-step protocol there was a significant dose reduction on both scanners compared to the multi-step protocol due to reduced overlap (average DLP 920 vs. 1218 (DSCT) and 1058 vs. 1663 (SSCT) mgy*cm, p≤0.001). There was a significant difference regarding the visibility of the subpectoral (3.98 vs. 1.26 and 3.77 vs. 1.25, p≤0.001) and mediastinal (4.53 vs. 3.51 and 4.44 vs. 3.56, p≤0.001) lymph nodes due to contrast medium related beam hardening artefacts. Using the multi-phase protocol, the cervical lymph nodes were judged significantly better (4.81 vs. 4.28 and 4.94 vs. 4.6, p≤0.001), and enhancement of pulmonary vessels was higher (227 vs. 149 (p≤0.001) and 227 vs. 160 (p=0.078) HU).
Conclusion: A one-step whole-body CT protocol provides a comparable diagnostic confidence combined with a significantly lower radiation dose compared to a multi-step protocol in patients with breast cancer or malignant melanoma.

B-0293 14:16

Sentinel lymph node (SLN) melanoma micrometastasis managed conservatively: sonography (US) patterns of recurrence

O. Catalano[1], C. Caracò[1], A. Nunziata[2], F. Sandomenico[1], A. Petrillo[1];
[1]*Naples/IT*, [2]*Ercolano/IT (tonikus@libero.it)*

Purpose: Patients treated conservatively for lymph-node melanoma micrometastasis are at risk of recurrence and require a close follow-up. We have employed US to prospectively monitor melanoma patients having not undergone completion lymphadenectomy after a SLN biopsy (SLNB) diagnosis of micrometastasis. We now report on the timing, location, and features of recurrence.
Methods and Materials: As a part of an ongoing multicenter study (MSLT-2), we managed conservatively, without completion lymphadenectomy, 40 melanoma patients with a SLNB diagnosis of micrometastasis. These subjects were evaluated three-monthly with physical examination, LDH sampling, chest x-ray, and US with color Doppler of the pericicatricial area, superficial lymphatic stations, and liver. PET was obtained six-monthly. Lymph-nodes were regarded as suspicious in the following circumstances: L/T diameter< 1.5 and hypoechoic internal echotexture; L/T diameter< 1.5 and non-hilar vascularisation; hypoechoic internal echotexture and non-hilar vascularisation; diffuse cortical thickening and non-hilar vascularisation; asymmetrical cortical thickening; focal cortical nodule. In-transit metastasis was defined as hypoechoic cutaneous/subcutaneous nodules with flow signals.
Results: US detected tumour recurrence in 15 patients (4 now alive with disease and 11 dead of disease). Mean time for recurrence was 14 months (range 4-30 mo). US detected melanoma recurrence as in-transit metastasis in 7/15 cases, regional lymphadenopathy in 6/15 cases, and liver metastasis in 3/15 (one patient had two recurrence sites). There was no nodal relapse in non-regional stations.
Conclusion: Melanoma recurrence after micrometastasis diagnosis at SLNB and treated conservatively is frequent, developing as in-transit metastasis, lymph-node metastasis, or deep metastasis. US proves effective in the detection of locoregional recurrence.

B-0294 14:24

Can unenhanced multiparametric MRI substitute gadolinium-enhanced MRI in the characterisation of vertebral marrow infiltrative lesions?

D.Z. Zidan, H. El Ghazaly; *Cairo/EG (dalia.zidan@yahoo.com)*

Purpose: To assess the diagnostic effectiveness of unenhanced-multiparametric magnetic resonance imaging (mp MRI) as an alternative to gadolinium (Gad)-enhanced MRI in the characterisation of vertebral marrow infiltrative lesions.
Methods and Materials: A prospective evaluation of fifty-six patients with suspected or untreated vertebral metastases undergoing MRI of the spine at 1.5 T was carried out. Two groups of sequences were assigned and compared for the characterisation of marrow infiltrative lesions: group [A]unenhanced-mp MRI (including T1-weighted, T2-weighted, short time inversion recovery (STIR),diffusion weighted imaging (DWI) and in/opposed phase sequences) and group[B]gadolinium-enhanced MRI (including T1-weighted, T2-weighted, STIR and T1-weighted fat-suppressed gadolinium-enhanced sequence). Qualitative and quantitative image analysis was performed and compared. The sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and accuracy for both imaging techniques were calculated.
Results: There was no statistical significant difference between unenhanced-multiparametric MRI and gadolinium-enhanced MRI as regards their diagnostic performance in differentiating benign from malignant vertebral marrow infiltrative lesions ($p > 0.05$) with calculated sensitivity (94% vs. 97%), specificity (92% vs. 88%), positive predictive value (94% vs. 91%), negative predictive value (92% vs. 95%) and (93% vs. 93%) accuracy.
Conclusion: Unenhanced-multiparametric MRI is compatible with gadolinium-enhanced MRI in reliable characterisation of marrow infiltrative lesions. The routine MRI protocol of cancer patients should be altered to accommodate the evolving MRI technology and cost effectively substitute the need for a gadolinium enhanced scan.

B-0295 14:32

Association of quality and quantity of bone metastases as well as volumetric bone mineral density with the prevalence of vertebral fractures in breast cancer patients

V. Neuhaus, N. Abdullayev, M. Hellmich, S. Krämer, D. Maintz, B. Krug, J. Borggrefe; *Cologne/DE (victor-frederic.neuhaus@uk-koeln.de)*

Purpose: To investigate the prevalence of osteoporotic and pathologic vertebral fractures in breast cancer patients and the association with bone mineral density and vertebral bone metastases.
Methods and Materials: Retrospective analysis of CTs conducted on 184 breast cancer patients. Bone mineral density was measured in lumbal vertebrae and t-scores were calculated by the Intellispace-Density-Software (Philips, Netherlands). The largest planimetric ratio between metastatic lesion and vertebral Body, number of vertebrae carrying metastases and quality of metastases (osteolytic, osteoblastic or mixed) were determined. The prevalence of osteoporotic and pathologic vertebral fractures was investigated according to the Genant criteria. Statistical analysis was conducted using multivariate logistic regression with ROC-analysis.
Results: 42 patients (23%) showed vertebral fractures, of these 20 were found to be osteoporotic (11%) and 22 pathologic (12%). 50 % of the patients showed a T-score below -2.5. Vertebral fractures showed a stronger association with the prevalence of metastases than with the size of metastases (sOR: 9.8 (4.3-22.3), AUC:0.84, $p < 0.0001$ vs. sOR:2.5 (1.8-3.8), AUC:0.88, $p < 0.0001$). Bone mineral density and size of metastases combined showed no improved association with vertebral fractures. The T-Score showed the strongest association with osteoporotic fractures (sOR: 2.9 (1.4-6.0), AUC=0.89, $p < 0.01$).
Conclusion: In breast cancer patients the prevalence of osteolytic metastases is strongly associated with vertebral fractures. The additional detection of the size of vertebral bone lesions did not improve association with vertebral fractures. Bone Mineral density shows a strong association with osteoporotic fractures in breast cancer patients and should be considered for screening the fracture risk in breast cancer patients.

B-0296 14:40

Primary tumour detection in CUP of neuroendocrine origin: additional value of ^{68}Ga-DOTA-TATE-PET/CT compared to contrast-enhanced CT

P. Kazmierczak, A. Rominger, V. Wenter, C. Spitzweg, C. Auernhammer, M. Angele, C. Rist, M.F. Reiser, C.C. Cyran;
Munich/DE (Philipp.Kazmierczak@med.uni-muenchen.de)

Purpose: To investigate the diagnostic accuracy of ^{68}Ga-DOTA-TATE-PET/CT compared to contrast-enhanced CT and to quantify the additional diagnostic value of ^{68}Ga-DOTA-TATE-PET for primary tumour detection in neuroendocrine cancer of unknown primary (CUP-NET).
Methods and Materials: Thirty-eight consecutive patients (male n=27, female n=11, mean age 62 years) with histologically proven CUP-NET who underwent a contrast-enhanced ^{68}Ga-DOTA-TATE-PET/CT (Biograph 64 TruePoint, Siemens Healthcare, Erlangen, Germany) for primary tumour detection and staging between 2010 and 2014 were included in this IRB-approved retrospective study. Two blinded readers independently analysed the contrast-enhanced CT and ^{68}Ga-DOTA-TATE-PET/CT data sets separately and noted from which modality they suspected a primary tumour. A consensus was reached in case of divergent results. Postoperative histopathology (n=24) and follow-up ^{68}Ga-DOTA-TATE-PET/CT imaging (n=14) served as reference standard and statistical measures of diagnostic accuracy were calculated accordingly.
Results: The majority of confirmed primary tumours were located in the abdomen (ileum n=19, pancreas n=12, lung n=2, small pelvis n=1; reading **Results:** PET/CT: true positive n=30, true negative n=3, false positive n=3, false negative n=2; CT: true positive n=20, true negative n=6, false positive n=0, false negative n=12). High interobserver agreement was noted regarding the suspected primary tumour site (Cohen's κ 0.90, $p < 0.001$). ^{68}Ga-DOTA-TATE-PET/CT demonstrated a significantly higher sensitivity (94 % vs. 63 %, p=0.0047) and a significantly higher accuracy (87 % vs. 68 %, p=0.0033) for primary site detection than contrast-enhanced CT alone.
Conclusion: ^{68}Ga-DOTA-TATE-PET augments the sensitivity and accuracy of contrast-enhanced CT for primary tumour detection in CUP-NET by 50 % and 30 %, respectively.

B-0297 14:48

Patterns of metastatic spread and its implications on follow-up strategies in uveal melanoma

C. Kloth, A. Othman, G. Bier, R. Syha, T. Eigentler, C. Garbe, K. Nikolaou, B. Klumpp; *Tübingen/DE (C.Kloth@gmx.de)*

Purpose: Uveal melanoma is associated with metachrone hepatic metastases. The aim of this study was to analyse the way of metastatic spread in uveal melanoma, especially in regard of the extent and temporal occurrence of hepatic metastases.
Methods and Materials: 81 patients with hepatic metastases from uveal melanoma were included in this retrospective study (female 43; median age 65y). All patients received contrast enhanced CT and 53 patients (65.4%) received additional MRI of the liver. The temporal occurrence and the pattern of metastatic spread were analysed. Patients were assigned to three groups: 1. ≤3 metastases potentially suitable for resection or RFA, ≤5 metastases potentially suitable for TACE, > 5 metastases potentially suitable for SIRT or chemosaturation or systemic therapy.
Results: Metastases of uveal melanoma occurred 4.62±5.38y after primary diagnosis.38 patients died (5.9±5.84y after diagnosis/1.02±0.81y after metastasis). 450 liver segments were assessed, 165/450 were affected by metastases in CT (mean target size 43.97±37.11 mm) vs. 310/450 in MRI (mean target size 46.68±37.35 mm); (liver segments p=0.000;mean sizep=0.03). Patient group assignment by CT /MRI was as follows: group 1 29/9, p=0.002, group 2 11/9, p=0.124, group 3 10/32, p=0.09 of 50 patients with CT and MRI. Compared both methods 32 patients received a different therapy groups (always higher staging category).
Conclusion: Based on the temporal occurrence of metastases a follow-up period of 10.27 years (90 % percentile) might be suitable in patients with uveal melanoma. Due to primarily hepatic metastases frequent MRI of the liver seems to be a valuable tool for early detection.

B-0298 14:56

Contrast-enhanced PET/CT for oncologic indications: reproducibility and comparison to the two-step procedure, including PET/CT and contrast-enhanced CT from radiology (COMBITEP study)

A.L. Cazeau, S. Ferron, M. Pulido, C. Bellera, S. Mathoulin Pelissier, J. Palussiere, A. Dutertre, Y. Godbert, E. Descat; *Bordeaux/FR (a.cazeau@bordeaux.unicancer.fr)*

Purpose: To enhance PET/CT (PETceCT) could allow completion of a single global examination reducing medical cost, transport and patients time. In this prospective study (ClinicalTrials.gov Identifier: NCT01881620), we evaluated the interpretation reproducibility between PETceCT and a two-step procedure combining spontaneous PET/CT and ceCT from the radiology (RceCT).
Methods and Materials: Between March 2010 and May 2012, we enrolled prospectively 109 patients with standard oncologic PETCT indications and RceCT within four weeks. Immediately after PETCT completion, Xenetix 125 ml were infused (80sec-2 cc/ml) and full-dose CT was acquired performing PETceCT. Blinded readings of 95 anatomic areas with binary final statuses (B for benign and probably benign and M for malignant or probably malignant) amongst 3 main groups were evaluated (B, M, and indeterminate including PB and PM). Endpoints were cePETCT inter-observer agreement (1) by two duos of radiologist-nuclear physician (1a and 1b) and (2) by a nuclear physician alone and (3) the two-step procedure compared to (1a). Also, (4) intra-observer radiologist interpretation agreement of RceCT and the ceCT part of PETceCT (PceCT) was evaluated. The inter-rater agreement was evaluated based on weighted Kappa (Kw).
Results: During this period, 105 patients were eligible and assessable. Numbers of involved areas (M) depicted were respectively (1a) 358, (1b) 376, (2) 374, (3) 353, (4) 237 for RceCT and 229 for PceCT. The agreement was good respectively with Kw[CI95]: (1) 0.65[0.52-0.78], 2) 0.79[0.66-0.92], 3) 0.77[0.65-0.90] and (4) excellent 0.80[0.67-0.93].
Conclusion: PETceCT is equivalent for the reproducibility to the usual two-step procedures and could be proposed as a "one-stop-shop" exam in cancer care.

B-0299 15:04

Diagnostic value of whole-body ultra low dose CT (WBULDCT) in comparison with spinal magnetic resonance imaging (SMRI) in the assessment of disease in patients with multiple myeloma (MM)

S. Spiga, D. Ippolito, C. Talei Franzesi, V. Besostri, E. Orsini, S. Sironi; *Monza/IT (saraspiga84@gmail.com)*

Purpose: To compare the diagnostic value of whole-body ultra low-dose CT (WBULDCT) with spinal magnetic resonance imaging (SMRI) in the identification of spinal bone marrow involvement of Multiple Myeloma (MM) patients.
Methods and Materials: Thirty patients (17 males; 52-83 years), with histologically proven MM, underwent WBULDCT and dedicated SMRI (9/30 for staging, 21/30 during follow-up), and were evaluated. Unenhanced WBULDCT was performed on a 256-slice scanner (iCT,Philips), with following parameters: tube voltage 120 kV, tube current 40 mAs, collimation128x0.65. Spine MRI was performed on a 1.5 Tmagnet (Achieva, Philips), with following protocol: T1 TSE and T2 STIR acquired on sagittal plane. WBULDCT was compared to spine MRI in terms of lesion detection, pattern and bone marrow involvement.
Results: In 21/30 patients (70%), WBULDCT and SMRI were concordant, detecting (14/21) or excluding (7/21) involvement of the axial skeleton, while in 9/30 patients (30%) WBULDCT and SMRI were discordant in terms of axial skeleton involvement: in 2/9 patients SMRI was positive and WBLDCT was negative, while in 7/9 patients only WBULDCT was positive. Corresponding sensitivity for lesion detection in the spine was 73% for WBULDCT and 53% for SMRI, respectively. Only one patient with negative WBULDCT scan showed multifocal lesions on SMRI. Moreover, in 22/30 of cases (73%) WBULDCT detected additional osteolytic lesions in other extra-assial districts (skull, sternum, ribs, pelvis, upper and lower limbs).
Conclusion: WBULDCT represent an useful diagnostic tool in detection of spinal involvement of MM patients, offering also detailed information about extra-assial involvement, which could be potentially missed with dedicated SMRI alone, reserving SMRI in case of negative results in symptomatic patients.

B-0300 15:12

[18 F]-FDG-PET/MR for staging and restaging of lymphoma patients: is the use of DWI justified?

C. Giraudo, D. Senn, G. Karanikas, M. Weber, M. Raderer, M. Mayerhoefer; *Vienna/AT (chiara.giraudo@meduniwien.ac.at)*

Purpose: To compare the diagnostic performances of [18]F-FDG-PET/MR with and without DWI for staging and restaging Hodgkin (HL) and Non-Hodgkin lymphomas (NHL).
Methods and Materials: Patients with histologically proven lymphoma underwent [18 F]-FDG-PET/MR on a fully-integrated system, for staging and restaging. Fourteen nodal and 12 extranodal regions were evaluated. Kappa coefficients (k) were used to assess agreement between [18 F]-FDG-PET/MR with and without DWI before (k_s;Ann Arbor classification) and after therapy (k_r;Lugano classification). FDG-avid lymphomas were also separately analysed.
Results: Twenty-nine patients, 8 with HL and 14 with NHL (7 MALT, 6 mantle cell, 5 diffuse large B-cell, 2 follicular, 1 marginal zone lymphoma) met the inclusion criteria. An average of 104 days occurred between staging and restaging. At staging, [18]F-FDG-PET/MR without DWI classified 2 patients as grade 0, 4 as grade I, 7 as grade II, 4 as grade III and 12 as grade IV; at restaging, 21 patients showed complete remission, 4 partial remission, 3 stable disease, and one progression. [18 F]-FDG-PET/MR without and with DWI demonstrated very high agreement (k_s=.856;k_r=.858). Discrepancies were only observed in MALT lymphoma: [18 F]-FDG-PET/MR with DWI correctly upstaged 3 patients (two stage I instead of 0; one stage II instead of I); for restaging, two patients were rated as partial remission and stable disease, instead of complete remission, due to the information provided by DWI. Both k_s and k_r were1.00 for FDG-avid lymphomas.
Conclusion: The application of DWI in a [18 F]-FDG-PET/MR protocol for staging and restaging of lymphoma guarantees a correct rating especially in indolent lymphomas.
Author Disclosures:
C. Giraudo: Research/Grant Support; Austrian Science Fund (FWF), project KLIF 382

B-0301 15:20

The quantitative CEUS features of clinically suspicious non-Hodgkin lymphoma involved superficial lymph nodes: a preliminary study

J. Shi; *Shanghai/CN (shijun.ni@163.com)*

Purpose: To explore the potential differences between different lymphoma subtypes by retrospectively CEUS quantitative analysis.
Methods and Materials: 109 consecutive patients meeting standards were examined with conventional US and CEUS. The longitudinal, transverse dimensions, ratio of the longitudinal and transverse dimensions, hilum and internal echo were evaluated under B-mode. Software named QontraXt made quantitative CEUS offline analysis possible. The peak, time to peak, sharpness, and AUC were automatically calculated by the offline software. The final pathological specimens were obtained by core needle biopsy.
Results: Six patients were excluded from this study. In 103 superficial lymph nodes, 82 nodes were verified lymphoma invasion. 3 nodes were Hodgkin lymphoma involved and rest of them was Non-Hodgkin lymphoma. In the five evaluated US parameters, our data show that two of them including internal echo and the status of hilum were statistically significant between benign and lymphoma lymph nodes. Unfortunately, peak, TP, sharpness and AUC were proved to be no statistically significant in distinguishing between benign and lymphoma lymph nodes. While, compared to benign and BCNHL lymph nodes, peak was higher in TCNHL lymph nodes. The ROC curve for peak

demonstrated that, with a threshold of 44.6, the sensitivity, specificity, PPV and NPV of CEUS were 61.9%, 74.7%, 39.4% and 88.1%, respectively. In addition, TCNHL lymph nodes showed a higher peak than DLBCL lymph nodes did.
Conclusion: According to the results from our existing data, CEUS could be helpful in distinguishing TCNHL from non-TCNHL for their higher PEAK in the examination.

14:00 - 15:30 **Room F2**

Physics in Radiology

SS 313
Radiation risk assessment and awareness

Moderators:
N. Buls; Brussels/BE
O. Ciraj-Bjelac; Belgrade/RS

K-10 14:00
Keynote lecture
V. Tsapaki; *Athens/GR*

B-0302 14:09
The transatlantic race of CT radiation dose: Europe vs United States
A. Euler, A. Parakh, S. Schindera; *Basle/CH (andre.euler@usb.ch)*

Purpose: To compare institutional diagnostic reference levels (DRLs) for CT from recently published dose-data from the US with data from a local CT dose registry in Europe.
Methods and Materials: For the local European CT dose registry, the dose-data was obtained from eight scanners in six different institutions. Data from all CT scans, performed between January 2014 until September 2015 at these institutions were analysed using a dose-tracking software (Radimetrics, Bayer Healthcare). The 75th percentile of CTDIvol and DLP for routine CT of the head, thorax and abdomen-pelvis obtained from the local registry was then compared with the dose-data from five University of California Medical Centers (published in Radiology, October 2015).
Results: The radiation dose parameters in the US institutions were higher as compared to the European institution. The largest difference was noted for CT of the chest, where the 75th percentile of the CTDIvol and DLP measured in the US institutions were 17 mGy and 610 mGycm, respectively as compared to 6 mGy and 239 mGycm in the European institution. The smallest difference was detected for the abdomen-pelvis with 21% difference in CTDIvol (17 vs 14 mGy) and 9% difference in DLP (860 vs 790 mGycm). For CT head, the CTDIvol and DLP in the US versus European institutions measured 62 mGy and 1120 mGycm versus 43 mGy and 826 mGycm, respectively.
Conclusion: The lower dose-metric data values demonstrated in European institutions reflect their adoption of dose-optimisation techniques in clinical routine with best results seen for chest CT.
Author Disclosures:
S. Schindera: Advisory Board; Bayer Healthcare. Research/Grant Support; Siemens, Bayer Healthcare, ulrich medical.

B-0303 14:17
Patient organ dose with computed tomography - a review of present methodology and DICOM information: executive summary of the joint report of AAPM task group 246 and EFOMP
J.S. Andersson[1], W. Pavlicek[2]; [1]*Umeå/SE*, [2]*Scottsdale, AZ/US (jonas.andersson@radfys.umu.se)*

Purpose: The justification and optimisation of medical imaging employing ionizing radiation have been intensely discussed in recent years, particularly for computed tomography (CT). A key point in this discussion is the estimation of patient dose, which commonly employs radiation output metrics developed for quality assurance and no patient specific information. Such patient dose estimates are of limited value, and more refined methods needs to be promoted and provided to the community.
Methods and Materials: AAPM Task Group 246 was formed in 2013, and in a joint venture with EFOMP charged with summarizing present methodology and DICOM information available for estimating patient dose with computed tomography.
Results: The Joint Report of AAPM Task Group 246 and EFOMP is a comprehensive resource for the clinical medical physicist. The possibilities of patient specific dosimetry from the Computed Tomography Dose Index (CTDIvol), to the Size-Specific Dose Estimates (SSDE) and advanced Monte Carlo methods are discussed together with available DICOM information, as well as practical examples on how patient dose estimates can be achieved. The report also summarizes important factors contributing to the uncertainty in patient dose estimates and gives examples of achievable confidence intervals.
Conclusion: The SSDE and Monte Carlo methods can together with detailed scanner, examination and patient specific DICOM information offer refined estimates of patient dose for justification and optimisation of CT examinations. Given the present robustness of available methods AAPM Task Group 246 and EFOMP recommend that all reports of patient dose should be accompanied by estimates of the associated uncertainty.

B-0304 14:25
Are the existing national diagnostic reference levels for CT outdated?
A. Euler, A. Parakh, S. Schindera; *Basle/CH (andre.euler@usb.ch)*

Purpose: To compare institutional diagnostic reference levels (DRLs) for CT of an European academic center with various published national DRLs.
Methods and Materials: The institutional DRLs (defined as 75th percentile) for routine CT of the head, thorax and abdomen which were performed in an academic center were analysed using a dose-tracking software (Radimetrics, Bayer Healthcare). Additionally, analysis of the DRLs for two dedicated low-dose protocols indicated for detection of pulmonary embolism and urolithiasis were also done. All CT scans performed with the above-mentioned protocols which were conducted between January 2014 and September 2015, were included in the study. DLP served as the dose parameter. The national DRLs of Switzerland, Germany, France, United Kingdom, Australia and Japan were used for comparison.
Results: The institutional DRLs for the standard CT of head (10,185 exams) was 750 mGycm (range of national DRLs: 760 - 1120 mGycm), thorax (3,518 exams) was 102 mGycm (range: 400 - 580 mGycm), abdomen (2,409 exams) was 657 mGycm (range: 510 - 1030 mGycm), low-dose pulmonary angiogram (2,042 exams) was 113 mGycm (one national DRL: 450 mGycm) and low-dose renal-colic protocol (1,296 exams) was 218 mGycm (no known published national DRL).
Conclusion: The published national DRLs for the thorax are outdated. The currently available dose reduction CT techniques appear to be optimal for chest CT. The published national DRLs for standard abdomen are still up-to-date. National DRLs for well-accepted indication-specific low-dose protocols should also be published (e.g. to rule out pulmonary embolism and urolithiasis).
Author Disclosures:
S. Schindera: Advisory Board; Bayer Healthcare. Research/Grant Support; Siemens, Bayer Healthcare, ulrich medical.

B-0305 14:33
Awareness and knowledge of ionising radiation hazard among medical students and residents in Kabul, Afghanistan
S. Maroof, T. Alam; *Kabul/AF (maroofsahar1@gmail.com)*

Purpose: The aims of this study were to assess the awareness of medical student and residents towards ionizing radiation hazards.
Methods and Materials: A cross sectional survey was conducted among fourth, fifth and final year medical students of two different medical colleges and residents doctors working at French Medical Institute for children.
Results: Overall Knowledge and awareness on radiation hazards was inadequate.Only 61 (46.9%) of the students and 19 (14.6%) of residents knew that what does ALARP principal refers to.A small number of medical students and residents (20.4% of the students and 18.29 % of residents) knew that thyroid gland should be protected.24 (17.5%) of students and 1 (0.7 %) of residents were not aware that CT-SCAN uses x-ray.21.7% students and 4.35% of residents didn't know that CT-SCAN involves the highest radiation exposure for the patient.Only 30.38 % of the students and 22.9 % of residents knew that chest CT scan is associated with greater dose of radiation.A very limited number of participants demonstrated knowledge of specific estimated radiation dose.Strong evidence of association was found between awareness on radiation hazards, having exposed to previous course on radiation hazards, knowledge on radiology and medical physics.
Conclusion: Results indicate that awareness of medical students and residents on ionizing radiation is inadequate.Based on the results we highly recommend a formal course on radiation hazards and radiation protection in medical school curricula.

B-0306 14:41
Improving radiation awareness and feeling of personal security of non-radiological medical staff in computed tomography scanning room by implementing a traffic light system
C. Heilmaier, A. Mayor, N. Zuber, P. Fodor, D. Weishaupt; *Zurich/CH (christina.heilmaier@triemli.zuerich.ch)*

Purpose: Non-radiological medical professionals often need to remain in the scanning room during computed tomography (CT) examinations to supervise patients in critical condition. At this, their position relative to the x-ray beam significantly influences the radiation dose they receive, which often causes uncertainty. The purpose of this study was to assess if a traffic light system

improves non-radiological medical staff's radiation awareness and feeling of personal security.
Methods and Materials: Phantom measurements were done to define areas of different dose rates within the CT room. Thereafter, coloured stickers were mounted to the floor according to a traffic light system: green=lowest, orange=intermediate, and red=highest radiation exposure. Non-radiological medical professionals with different years of working experience evaluated the system using a structured questionnaire. Kruskal-Wallis and Spearman's correlation test were applied.
Results: Overall, rating of the system by the 56 participants (30 physicians, 26 nursing staff) was very good, and almost all professionals tried to stand in the green stickers during the scan. The system significantly increased their radiation awareness and feeling of personal protection, particularly in staff with ≤5 years of working experience ($p < 0.05$). Majority of non-radiological medical professionals stated that staying in the green stickers and patient care would be compatible. Knowledge on radiation protection was poor in all groups, especially in professionals with few working experience ($p < 0.05$).
Conclusion: A traffic light system in the CT scanning room indicating areas with lowest, intermediate and highest radiation exposure is much appreciated. It increases radiation awareness, and improves feeling of personal radiation protection.

B-0307 14:49

Radiation risk from screening mammography
R.M.K. M.Ali, A. England, A. Tootell, P. Hogg; *Manchester/UK (P.Hogg@salford.ac.uk)*

Purpose: To present comparative effective lifetime risk data for different screening programmes worldwide.
Methods and Materials: Thermoluminescent dosimeters accommodated inside an adult dosimetry ATOM phantom were used to measure radiation organ doses. The examined breast was simulated by using PMMA-Polyethylene phantom. Sixteen FFDM machines were used to expose the breast phantom in standard four-view screening mammography (craniocaudal and mediolateral oblique projections for each breast). Effective risk, the number of cancer cases produced by the exposure to X-radiation, was calculated for each machine and across 28 different screening programmes.
Results: Large differences in total lifetime effective risk exist between different screening programmes throughout the world. The highest radiation risk results from the annual early onset US programme for 'high breast cancer risk' women, commencing at 25 years old. For this programme, the calculated total life time effective risk ranges from 911.3 to 1531.8 cases/1000000 women across the sixteen studied machines. The lowest total lifetime effective risk was 56.1- 94.4 case/1000000 women resulting from biennial screening mammography for women aged 50-64 years. Minor differences in effective risk were found amongst the different machines, but these differences were not significant statistically.
Conclusion: Significant differences in total lifetime effective risk have been found between screening programmes throughout the world. These differences are mainly attributed to the onset age of screening mammography. Another less important factor is the time interval between the successive screens, since the tissues' radiosensitivity reduces with age.

B-0308 14:57

A successful dose management quality improvement project (QIP): data-driven multi-disciplinary approach to managing patient radiation in computed tomography (CT)
L. Laurent; *Park Ridge, IL/US (Lisa.Laurent@advocatehealth.com)*

Purpose: Advocate Health Care (Illinois' largest integrated delivery network), has taken proactive measures by evaluating and deploying advanced technologies for managing radiation dose throughout the enterprise to enhance patient safety and quality. Initiating this innovative dose management program was Advocate Lutheran General Hospital, a 638-bed level I trauma center performing 40,000 CTs/year.
Methods and Materials: Utilizing retrospective analysis, dose values were compared to Diagnostic Reference Levels established by the American College of Radiology and the American Association of Physicists in Medicine. A web-based dose monitoring analytics software tool, GE DoseWatch™, was implemented enabling the quantitative/qualitative analyses of patients imaged with computed tomography (CT). Additionally, a reliable comprehensive electronic archiving system to track protocol modifications was established in order to provide accurate documentation for auditing, while streamlining work flow.
Results: Depending on the CT exam, radiation dose delivered to patients decreased up to 20% (with decreases in delivered dose variability). This decrease is sustained. Our approach has increased stakeholder engagement locally and across the enterprise serving as a model for a system-wide dose management program.
Conclusion: With the establishment of a dose management QIP, the complexity of factors related to a meaningful radiation dose reduction environment can be easily addressed. Through this process, we have learned the importance of building a committed multi-disciplinary team early, allocating resources for technologist education and engaging stakeholders. By creating a dose management QIP, Advocate Lutheran General Hospital has improved patient care delivery based on scientific data-driven evidence through dose assessment/protocol optimisation, education and transformational change.
Author Disclosures:
L. Laurent: Consultant; Dr. Laurent has served as a consultant in the past for GE Health Care. Investigator; Dr. Laurent has served as a Principle Investigator for a Bayer Healthcare sponsored research project that has absolutely no connection or association with this abstract or the material presented. Speaker; Dr. Laurent has given lectures on behalf of GE Healthcare. There has been no financial support whatsoever in the preparation of this abstract. Other; No commercial or vendor support - financial or otherwise - has been provided for this abstract.

B-0309 15:05

Utilising a server based simulation to compare effective organ dose of 70 kV dynamic CT examinations to diagnostic standard triphasic abdominal CT
J.F.M. Gawlitza; *Mannheim/DE (joshua_gawlitza@yahoo.de)*

Purpose: To utilise a Monte Carlo simulation for the comparison of organ-specific-dose of a dose-optimized abdominal perfusion CT protocol (pCT) with a standard triphasic CT (sCT) protocol in patients with suspected rectal cancer or hepatocellular carcinoma (HCC).
Methods and Materials: 50 patients with suspected HCC and 25 patients with suspected rectal cancer that underwent pCT examinations on a 3rd generation dual-source CT (Somatom Force, Siemens) with a dose optimized tube voltage of 70 kV were exported to an analysis platform (Radimetrics, Bayer). The pCT studies were matched with a reference group of sCT examinations on a clinical scanner (Somation Emotion 16, Siemens) using the calculated water-equivalent-diameter of the patients. The analysis platform was used for the calculation of the organ-specific effective dose (ED) as well as global radiation-dose parameters (ICRP103).
Results: The ED of the pCT-liver-protocol was lower compared to the sCT in 14 of 21, and non-inferior in a total of 18 of 21 metrics (all $p < 0.05$). The ED of the pCT-rectal-protocol was lower than the sCT in 15 of 21, and non-inferior in 18 of 21 metrics (all $p < 0.05$). The EDs of the pCT examinations were especially in the dose sensitive organs such as the red marrow (17.3mSv vs 24.6mSv, $p=< 0.0001$) and the liver (33.3mSv vs 46.9mSv, $p=0.0003$) lower than the sCT.
Conclusion: Our results suggest that pCT compares favorably to standard CT with regard to effective organ dose, especially in dose sensitive organs, while providing additional dynamic information that could potentially lead to changes in patient management.

B-0310 15:13

Introducing a dose monitoring software in conventional x-ray imaging: initial experiences
C. Heilmaier, N. Zuber, D. Weishaupt; *Zurich/CH (christina.heilmaier@triemli.zuerich.ch)*

Purpose: Dose management is nowadays an important part of quality assurance of radiological departments and can be accomplished by dose monitoring software. The purpose of the present study was to assess whether implementation of dose monitoring software is feasible in conventional X-ray imaging.
Methods and Materials: Dose data of 13 types of radiographies and 14 complete examinations was registered with a dose monitoring software with focus on dose-area-product (DAP;mGycm2) and entrance surface dose (ESD;mGy). Study was split in 2 periods of 5 months each; after period 1 acquisition parameters of the X-ray systems were reviewed and radiographers underwent refresher training concentrating on radiation protection. Dose data of both periods was compared applying student t-tests.
Results: Dose data transfer was successfully accomplished with the dose monitoring software in total of 13,955 radiographies and 8,466 complete examinations in period 1 and 16,090 radiographies and 10,389 complete examinations in period 2. There was decline in dose for all types of radiographies and complete examinations in period 2 (mean DAP period 1: radiographies/complete examinations, 528/662 mGycm2; mean DAP period 2: 386/602 mGycm2) with differences being statistically significant in 8 of 13 types of radiographies and 6 of 14 complete examinations. Similar results were seen regarding ESD (mean radiographies/complete examinations period 1: 0.953/1.25 mGy; period 2: 0.744/1.17 mGy), in which dose significantly declined in period 2 in 6 of 13 radiographies and 5 of 14 complete examinations.
Conclusion: Introduction of dose monitoring software in conventional X-ray imaging is feasible and allows for comfortable dose data aggregation and dose optimisation.

B-0311 15:21

Conventional x-ray dose analysis in emergency rooms in different hospitals using a centralised electronic platform

E. Fraile Moreno, C. Benito, J. Azpeitia, J. Albillos, E. Dominguez, P. Fraga, J. Galobardes, T. Villarejo; *Madrid/ES (eduardo.fraile@salud.madrid.org)*

Purpose: Analyse variability on the dose in general hospitals in conventional x ray and determinate root causes to fix them using a centralised electronic platform.
Methods and Materials: The analysis for conventional x rays has been done in 6 hospitals connected in the same network. The studies have been performed in emergency rooms with the same manufacturer and model of digital X ray equipments and same configuration. Data are storage on real time from modalities to a central server used to analyse them. Data from patient studies were collected over a period of six month. For each protocol, an alert threshold was calculated based on the usual clinical practice (2 times the percentile median).The root causes were classified (bad patient positioning, bad collimation on patient, study protocol incorrect selected, bad protocol selected depending on morphology) and measured.
Results: From April to September 2015, 128,022 studies were performed and 22,523 (17, 6 %) were detected as alert. Patient under 20 years old were 1,072 (4, 76 %). X ray Thorax and abdominal simple were the most common studies. Our analysis demonstrates that 15.28% of the extra dose applied to population is caused directly by misunderstanding or lack of knowledge of how to handle patients. Most of these mistakes can be fixed by dose education.
Conclusion: Dose monitoring electronic solution allow us reducing the variability on the dose in conventional x ray and determinate root causes to fix them.

14:00 - 15:30 **Room D1**

Chest

SS 304

Lung MRI

Moderators:
P. Ciet; Rotterdam/NL
N.N.

B-0312 14:00

Free-breathing 3D T1-weighted fat-saturated contrast-enhanced gradient-echo sequence with radial data sampling in thoracic and cardiovascular MRI

C. Ruff[1], R. Grimm[2], A. Hornung[1], M. Kündel[1], J. Weiß[1], F. Bamberg[1], K. Nikolaou[1], M. Notohamiprodjo[1]; [1]*Tübingen/DE*, [2]*Erlangen/DE (christer.ruff@med.uni-tuebingen.de)*

Purpose: To evaluate free-breathing (FB) radially sampled fat-saturated T1-weighted gradient-echo acquisitions (radial volumetric interpolated breath-hold examination, Radial VIBE) with and without self-gating as well as breath-hold (BH) Cartesian sampled VIBE acquisitions for post-contrast imaging of the thorax and cardiovascular system.
Methods and Materials: This IRB-approved study was performed according to the declaration of Helsinki. 20 patients referred for myocardial infarction, myocarditis and cardiomyopathy were imaged at 1.5 T (MAGNETOM Aera, Siemens Healthcare). Gadobutrol (Bayer Healthcare)-enhanced Cartesian-sampled isotropic (voxel-size 1.4x1.4x1.4 mm3) VIBE sequences acquired during BH (18s) were compared to prototype FB radially sampled sequences (approx. 4 min) featuring respiratory self-gating. Multiplanar reformations were performed with syngo.via (Siemens). All image data sets (Cartesian, radial, radial with self-gating) were evaluated by two independent readers (5-point Likert scale): overall image quality, large-vessel depiction, small-vessel depiction, heart depiction, thoracic wall/diaphragm sharpness and streaking artefacts. Statistical analysis was performed with paired t tests.
Results: Respiratory self-gating of the radially sampled VIBE led to significantly improved depiction of large (4.4±0.5 vs 3.9±0.7, $p < 0.05$) and small vessels (4.7±0.5 vs 3.4±0.8, $p < 0.05$) as well as thoracic wall/diaphragm sharpness (4.9±0.4 vs 3.6±0.5, $p < 0.05$), whereas overall image quality (4.1±0.4 vs 4±0.6, p=0.36) was not impaired by the significantly increased streaking artefacts (3.6±0.5 vs 4.7±0.5, $p < 0.05$). Compared to standard BH Cartesian VIBE, radially sampled VIBE with self-gating showed improved large and small vessels (4.4±0.5 vs 3.3±0.6, p=0.05;4.7±0.5 vs 3.3±0.6, $p < 0.05$), thoracic wall/diaphragm (4.9±0.4 vs 3.3±0.6, $p < 0.05$) and overall image quality (4±0.6 vs 3.3±0.6, p=0.17).
Conclusion: Respiratory self-gated radially sampled VIBE acquired during free-breathing yields better vessel depiction and image sharpness for thoracic and vascular imaging, particularly of the thoracic wall and large and small vessels compared to radially sampled VIBE without self-gating and breath-hold Cartesian-sampled VIBE.

Author Disclosures:
R. Grimm: Employee; Siemens Healthcare GmbH, Erlangen, Germany.

B-0313 14:08

Automated 3D segmentation of pulmonary magnetic resonance angiography in patients with pulmonary arterial hypertension: correlation with pulmonary arterial systolic pressure

C. Melzig[1], S. Wörz[1], S. Ley[2], C. Fink[3], S. Partovi[4], K. Rohr[1], H.-U. Kauczor[1], E. Grünig[1], F. Rengier[1]; [1]*Heidelberg/DE*, [2]*Munich/DE*, [3]*Celle/DE*, [4]*Cleveland, OH/US (claudius1.melzig@med.uni-heidelberg.de)*

Purpose: To demonstrate feasibility of automated 3D segmentation of pulmonary arteries based on magnetic resonance angiography (MRA), to assess pulmonary artery geometry characteristics in patients with pulmonary arterial hypertension (PAH) compared to healthy volunteers and to correlate them to echocardiographic pulmonary arterial systolic pressure (PASP).
Methods and Materials: 20 patients with PAH confirmed by right-heart catheterisation and 21 healthy controls underwent MRA of the pulmonary arteries at 1.5 T. Patients also received echocardiographic PASP measurement. Automated 3D model-based segmentation of the main, right and left pulmonary arteries (mPA, rPA and lPA) was performed. The respective minimum and maximum diameters perpendicular to each vessel were computed and corrected for body surface area (BSA). For comparison, vessel diameters were also measured manually on axial reconstructions and corrected for BSA.
Results: Mean PASP of patients was 60.2±18.8 mmHg. 3D segmentation-based minimum and maximum diameters in patients/controls were 18.1/14.8 and 21.1/16.4 for mPA, 14.9/10.0 and 16.9/12.1 for rPA and 14.0/10.0 and 15.9/12.6 for lPA (mm/m² BSA). All measurements differed significantly between patients and controls ($p < 0.001$). The minimum lPA diameter showed the strongest correlation with PASP ($r=0.75$, $p < 0.001$). For manual axial measurements, lPA diameter showed the strongest correlation with PASP (r=0.62, p=0.008).
Conclusion: MRA-based 3D segmentation of pulmonary arteries is feasible and revealed significantly increased diameters along the entire vessel course for mPA, rPA and lPA in patients with PAH compared to healthy controls. Estimation of PASP was improved by 3D segmentation compared to 2D measurements on axial slices.

B-0314 14:16

Pulmonary perfusion phase imaging using self-gated Fourier decomposition MRI reveals perfusion inhomogeneities in patients with cystic fibrosis

S. Veldhoen, D. Stäb, A.M. Weng, A.S. Kunz, A. Fischer, C. Wirth, H. Hebestreit, T.A. Bley, H. Köstler; *Würzburg/DE*

Purpose: Fourier Decomposition (FD) MRI provides site-resolved functional lung imaging without application of contrast media. Perfusion and ventilation-weighted images can be reconstructed by means of FD. The present work demonstrates that perfusion-weighted data also contains information regarding the pulmonary perfusion phase.
Methods and Materials: Lung perfusion measurements were performed using SENCEFUL, an advancement of the FD technique, obtaining morphologic image series by cardiac and respiratory self-navigation of data sampled in quasi-random fashion. Signal variations over the cardiac cycle allow for determining perfusion-weighted images and the perfusion phase, which indicates the phase shift in the lungs in relation to a reference voxel in a central vessel (e.g. pulmonary trunk). Pulmonary perfusion and phase measurements on 10 volunteers and 10 cystic fibrosis patients were performed on a 1.5 T system.
Results: Perfusion amplitude maps of the healthy subjects revealed homogeneous lung perfusion. In the perfusion phase maps, the perfusion-induced signal changes exhibited similar behaviour in all lung parts. In contrast, maps of the cystic fibrosis patients showed significantly higher phase dispersion and areas with reduced perfusion possibly due to regional impairment by hypoxic vasoconstriction within the Euler-Liljestrand mechanism.
Conclusion: First measurements revealed that perfusion phase maps of cystic fibrosis patients differ from those of healthy subjects. While a balanced perfusion phase in healthy volunteers indicates a homogeneous pulse wave velocity throughout the lungs, results in patients with cystic fibrosis show regionally varying delays. Detailed examination of the diagnostic capabilities of FD based perfusion phase MRI is subject to future work.
Author Disclosures:
S. Veldhoen: Grant Recipient; Research grant IZKF Würzburg. **A. Fischer:** Employee; GE Healthcare. **T.A. Bley:** Consultant; MSD. Grant Recipient; Research Grant IZKF Würzburg; Research Grant DFG. Research/Grant Support; Research agreement Siemens. **H. Köstler:** Patent Holder; Siemens. Research/Grant Support; Research agreement Siemens.

B-0315 14:24

Semi-quantitative visual scoring of fibrosing lung disease using T2-weighted BLADE sequences and comparison with multidetector computed tomography

M.T.A. Buzan[1], J. Dinkel[2], M. Eichinger[3], D. Colombi[4], M. Kreuter[3], F. Herth[3], H.-U. Kauczor[3], C. Pop[1], C. Heussel[3]; [1]*Cluj-Napoca/RO*, [2]*Munich/DE*, [3]*Heidelberg/DE*, [4]*Parma/IT (teobuzan@yahoo.com)*

Purpose: Several scoring systems have been proposed to quantify lung fibrosis at high-resolution computed tomography. The aim of our study was to assess the performance of an adjusted score using T2-weighted BLADE sequences, as compared to multidetector computed tomography (MDCT).
Methods and Materials: 24 patients (mean age: 71 years, interquartile: 53-81 years) with different stages of fibrosing lung disease underwent MDCT and MRI of the lung, with a median scanning interval of 1 day, interquartile: 0-2 days. An adjusted semi-quantitative visual scoring, assessed at six different lung levels, was applied on T2-weighted fat-saturated BLADE sequences and compared to MDCT. The overall and per lung percentages of impairment, together with pattern extension at each level, including ground-glass opacities, reticulation, honeycombing, consolidation and presence of bronchiectasis, as well as distribution of abnormalities were evaluated. Spearman rank correlation was used to test the relationship between the two methods.
Results: The overall and per lung percentages of impairment showed very strong correlation between T2 BLADE and MDCT, $r=0.88$, $p < 0.05$. Regarding patterns extension, we found a very good correlation between the two methods concerning reticulation and consolidation ($r=0.82$ and $r=0.92$, $p < 0.05$), but only moderate for ground-glass opacities and honeycombing ($r=0.51$ and $r=0.59$, $p < 0.05$). The visual score for each level showed a strong correlation, $r=0.65$. There was excellent agreement regarding the distribution of abnormalities, $p < 0.05$.
Conclusion: A semi-quantitative visual score may be applied on T2-weighted BLADE sequences to assess the overall extent of abnormalities, but further technological refinements are needed to increase resolution for pattern recognition.

B-0316 14:32

Pulmonary thin-section MR imaging with ultra-short TE: comparison of capability for lung nodule detection and nodule type classification with low- and standard-dose thin-section CTs

Y. Ohno[1], Y. Kishida[1], S. Seki[1], H. Koyama[1], T. Yoshikawa[1], M. Yui[2], A. Lu[3], M. Miyazaki[3], K. Sugimura[1]; [1]*Kobe/JP*, [2]*Otawara/JP*, [3]*Vernon Hills, IL/US (yosirad@kobe-u.ac.jp)*

Purpose: To determine the capability of pulmonary MR imaging with ultra-short echo time (UTE) for lung nodule detection and nodule type evaluation as compared with thin-section low- and standard-dose CTs.
Methods and Materials: 170 consecutive patients (96 males and 74 females; mean age 70 years) with suspected pulmonary nodules at near-by hospital were examined with standard- and low-dose CTs (270 mA [SDCT] and 50 mA [LDCT]) and pulmonary MR imaging with UTE. According to standard-dose CT findings, all nodules were divided into solid, part-solid and ground glass nodules. In each patient, probability of presence at each pulmonary nodule was assessed on all three methods by means of 5-point visual scoring system. Then, FROC analyses were performed to compare detection capability among all methods. Finally, sensitivity was compared each other by means of McNemar's test. For nodule type evaluation, inter-method agreements among all methods by kappa statistics with $\chi 2$ test.
Results: Figure of merits (FOMs) of all methods (SDCT: FOM=0.97, LDCT: FOM=0.96, MRI: FOM=0.96) had no significant differences ($p > 0.05$). In addition, sensitivities of all three methods (SDCT: 92.0%, LDCT: 91.5%, and MRI: 91.5%) had also no significant difference ($p > 0.05$). On nodule type assessment, inter-method agreements among all methods were also determined as almost perfect ($0.81 < \kappa < 0.89$, $p < 0.0001$).
Conclusion: Pulmonary MR imaging with UTE is considered at least as valuable as low- and standard-dose CTs for lung nodule detection and nodule type evaluation.
Author Disclosures:
Y. Ohno: Research/Grant Support; Toshiba Medical Systems Corporation. **T. Yoshikawa:** Research/Grant Support; Toshiba Medical Systems Corporation. **M. Yui:** Employee; Toshiba Medical Systems Corporation. **A. Lu:** Employee; Toshiba Medical Research Institute USA, Inc. **M. Miyazaki:** Employee; Toshiba Medical Research Institute USA, Inc. **K. Sugimura:** Research/Grant Support; Toshiba Medical Systems Corporation.

B-0317 14:40

Dynamic contrast-enhanced MRI of malignant pleural mesothelioma: a comparative study of pharmacokinetic models and correlation with mRECIST criteria

M. Vivoda Tomšič[1], K. Šurlan Popovič[1], S. Bisdas[2], V. Kovač[1], I. Šerša[1]; [1]*Ljubljana/SI*, [2]*London/UK (mvivoda@gmail.com)*

Purpose: To compare two tracer kinetic models, the extended Tofts (ET) and the adiabatic approximation tissue homogeneity model (AATH) for analysis of dynamic contrast enhanced (DCE) MRI and examine the value of the DCE parameters to predict response to chemotherapy in patients with malignant pleural mesothelioma (MPM).
Methods and Materials: Eighteen patient underwent DCE MRI studies at three time points: prior to therapy, during, and after cisplatin-based chemotherapy. The images were analysed using ET and AATH models. In short-term follow-up, the patients were classified as having disease control or progressive disease according to modified RECIST criteria in solid tumours. ROC analysis was used to examine specificity and sensibility of DCE parameters for predicting response to therapy. Bland-Altman, comparison and correlation tests were used to analyse whether derived parameters are interchangeable or correlated between the two models or in the same model, respectively.
Results: The results indicate that the derived parameters are not interchangeable between the models. Significant correlation with response to therapy was found for AATH-calculated pre-treatment plasma volume (vp) showing sensitivity of 67% and specificity of 92% (AUC 0.8) and intra-treatment ET-calculated vp showing sensitivity of 100% and specificity of 64% (AUC 0.8).
Conclusion: Our results suggest that both ET and AATH models have potential in predicting response to therapy in MPM and may serve as potential biomarkers, though they are not interchangeable.

B-0318 14:48

A role of diffusion-weighted MRI in prediction of mediastinal lymph node metastasis in patients with NSCLC: comparison to PET results

E.U.A.K. Yilmaz; *Izmir/TR (erkan.yilmaz@sifa.edu.tr)*

Purpose: To compare the diagnostic efficacies of diffusion-weighted magnetic resonance imaging (DWI) and fluorine 18 fluorodeoxyglucose (18 F_FDG) positron emission tomography (PET) findings for the preoperative prediction of mediastinal nodal metastasis in patients with non-small cell lung cancer (NSCLC).
Methods and Materials: The study included total 126 mediastinal lyph nodes (LNs) of 57 patients (35 men and 22 women; mean age, 63.4 years) with NSCLC underwent both DWI (using a diffusion factor of 0-600 s/mm² at 1.5 T) and PET examinations. A LN was considered as metastasis at DWI, when it showed apparent diffusion coefficent (ADC) value more than 0.95 s/mm². In PET, a LN was regarded as positive for malignancy when it showed value of ≥3 in SUV.
Results: LNs were positive for malignancy in 76 (60%) of 126 nodes and 25 (44%) of 57 patients. The sensitivity, specificity, positive predictive value, negative predictive value, and accuracy of DWI were 81.5% (62 of 76 nodes), 82% (41 of 50), 87.3% (62 of 71), 74.5% (41 of 55) and 81.7% (103 of 126) respectively; whereas those of PET were 86.8% (66 of 76), 74% (37 of 50), 83.5% (66 of 79), 78.7% (37 of 47) and 83.3% (105 of 126). There were 9 false-positive interpretations at DWI, compared with 13 false-positive on PET scans.
Conclusion: DWI allows reliable differentiation between benign and malign mediastinal LNs in patients with NSCLC. Therefore DWI may have a potent alternative imaging method for the preoperative diagnosis of mediastinal LN metastasis in patients with NSCLC.

B-0319 14:56

Chemical exchange saturation transfer (CEST) imaging vs FDG-PET/CT: capability for differentiation of malignant from benign pulmonary lesions

Y. Ohno[1], M. Yui[2], M. Miyazaki[3], Y. Kishida[1], S. Seki[1], H. Koyama[1], T. Yoshikawa[1], K. Sugimura[1]; [1]*Kobe/JP*, [2]*Otawara/JP*, [3]*Vernon Hills, IL/US (yosirad@kobe-u.ac.jp)*

Purpose: To directly and prospectively compare the capability of chemical exchange saturation transfer (CEST) imaging for differentiation of malignant from benign pulmonary lesions with FDG-PET/CT.
Methods and Materials: Thirty-six consecutive patients (26 men and 10 women; mean age 67 years) with pulmonary nodules and/ or masses underwent CEST imaging, FDG-PET/CT and pathological and/or follow-up examinations. According to final diagnoses, all lesions were divided into malignant (n=26) and benign (n=10) groups. Then, magnetization transfer ratio asymmetry (MTRasym) was calculated from z-spectra at 3.5 ppm in each pixel, and MTRasym map was computationally generated. To evaluate the capability for differentiation between two groups at each lesion, MTRasym and SUVmax

were assessed by ROI measurements. To compare each index between two groups, Student's t-test was performed. Then, ROC-based positive test was performed to determine each feasible threshold value for differentiation of two groups. Finally, sensitivity, specificity and accuracy were compared each other by McNemar's test.
Results: Mean MTRasym (0.1±5.5%) and SUVmax (3.0±0.8) of malignant group were significantly higher than those of benign group (MTRasym: -4.2±4.4%, p=0.03; SUVmax: 2.5±0.5, p=0.04). When applied each feasible threshold value, sensitivity (SE: 80.8 [21/26] %), specificity (SP: 70.0 [7/10] %) and accuracy (AC: 77.8 [28/36] %) of MTRasym had no significant difference with those of SUVmax (SE: 69.2 [18/26] %, p=0.25; SP: 60.0 [6/10] %, p=1.0; AC: 66.7 [24/36] %, p=0.13).
Conclusion: CEST imaging is considered at least as valuable as FDG-PET/CT for differentiation of malignant from benign pulmonary lesions.
Author Disclosures:
Y. Ohno: Research/Grant Support; Toshiba Medical Systems Corporation. **M. Yui:** Employee; Toshiba Medical Systems Corporation. **M. Miyazaki:** Employee; Toshiba Medical Research Institute USA. **T. Yoshikawa:** Research/Grant Support; Toshiba Medical Systems Corporation. **K. Sugimura:** Research/Grant Support; Toshiba Medical Systems Corporation.

B-0320 15:04

Diaphragmatic dynamic magnetic resonance imaging (MRI): preliminary results and perspectives
R. Lotte, S. Boussouar, F. Le Pimpec-Barthes, A. Charpentier, K. Dang Tran, C. Rivera, B. Lambert, P. Halimi, A.-C. Hernigou; *Paris/FR (raissalotte@hotmail.com)*

Purpose: The aim of this study was to assess the benefit of diaphragmatic dynamic MRI in the diagnosis of diaphragmatic dysfunction and to propose a dynamic MRI diaphragmatic protocol.
Methods and Materials: Between 2011 and March 2015, we have selected 45 patients with hemidiaphragm elevation referred for surgery and 6 patients outgoing lung transplantation. Those 51 patients have been explored with 1.5-T or 3-T MRI. MRI protocol included morphological FIESTA sequences in free breathing, inspiration and forced expiration, and dynamics sequences during at least one complete respiratory cycle.
Results: Morphological acquisitions showed hemidiaphragm disruption in 12 of 51 patients (23%). Average difference of elevation of the hemidiaphragm was 53 mm. With dynamic sequences, excursion of the elevated hemidiaphragm (maximum hemidiaphragmatic displacement) was reduced by 60%. Loss of anterior-posterior gradient was observed in 52% of the patients, paradoxical motion in 27% and localised dysfunction in 13%.
Conclusion: MRI is a simple, non-invasive method to evaluate diaphragmatic motion. In addition to clinical and physiological investigations, diaphragmatic MRI explores the diaphragmatic function with a standardised, simple and reproducible protocol. The 20 min MRI duration remains tolerable even in patients with severe dysfunction. A simple reading grid allows the quantification of diaphragmatic function helping to refine the treatment.

B-0321 15:12

3 Tesla MRI evaluation of pectus carinatum with breath-hold imaging
R. Lee, G. Lo Goh, H. Ai, K. Chan, C. Yuen, W. Chung, M. Hung; *Hong Kong/CN (chuntayuencty@hotmail.com)*

Purpose: Pectus carinatum (PC), constitutes approximately 5% of chest wall deformities. Current study studied T1 and T2 breath-hold MR sequences and the efficacy of MRI measurements in the evaluation of PC.
Methods and Materials: Eighteen patients diagnosed of pectus carinatum (mean age: 15.3 years) and 9 controls (mean age: 19 years) underwent an end-inspiratory with 3 Tesla MRI scan (Siemens Magnetom Skyra) using Axial T2-weighted HASTE and T1-weighted VIBE sequences. Images were reviewed by 2 experienced radiologists. Evaluation of the overall image quality of the T1 and T2 sequences for bones, cartilage and soft tissue were graded using a four-point Likert scale. The following MR measurements were calculated: Haller's index, asymmetric index and sternal rotation angle. Student's t test was used to compare the differences between control and PC group.
Results: There were significant differences in terms of image quality between the T1 VIBE and T2 Haste sequence. The T2 HASTE sequence showed significantly ($p < 0.01$) higher quality (mean quality score 3.4 vs 2.4) than the T1 VIBE sequence. Mean sternal rotation angle in PC group was significantly ($p < 0.001$) higher than the control group (8.82 vs 0.88). Mean asymmetric index was also significantly ($p < 0.01$) higher than the control group (1.08 vs 1.02). However, there were no significant differences in mean Haller's index (2.31 vs 2.58) between groups.
Conclusion: Results showed Axial T2 Haste sequence has better image quality than T1 VIBE sequence to evaluate PC. Sternal rotation angle and asymmetric index may be the significant markers to evaluate pectus carinatum.

B-0322 15:20

Pulmonary embolism detection with 3D ultrashort echo time MRI: experimental study in canines
P. Bannas[1], L.C. Bell[2], K.M. Johnson[2], M.L. Schiebler[2], C.J. Francois[2], U. Motosugi[2], D. Consigny[2], S.B. Reeder[2], S.K. Nagle[2]; [1]*Hamburg/DE*, [2]*Madison, WI/US (p.bannas@uke.de)*

Purpose: We aimed to demonstrate the feasibility of free-breathing 3D-radial ultrashort-echo-time (UTE) MRI for simultaneous detection of pulmonary embolism (PE) and high quality evaluation of lung parenchyma.
Methods and Materials: Twelve beagles underwent MRI and CT before and after induction of PE with autologous clots. Breath-hold 3D (MRA) and free-breathing 3D-radial UTE were performed at 3 T. Two blinded radiologists independently marked and graded all pulmonary emboli on a 4-point-scale (1=low confidence, 4=absolutely certain) on MRA and UTE images. Image quality of pulmonary arteries and lung parenchyma was scored on a 4-point-scale (1=poor, 4=excellent). Locations and ratings of emboli were compared with reference standard CT using alternative free-response receiver operating curve (AFROC) methodology. Areas under the curve (AUC) and image quality ratings were compared using F-test and Wilcoxon Signed-Rank test.
Results: 48 emboli were detected using CT. Both readers demonstrated higher sensitivity for PE detection with UTE (83%/79%) than with MRA (75%/71%). The AFROC-AUC was significantly higher for UTE than for MRA (0.95 vs. 0.89, P=.0180). UTE image quality exceeded MRA for subsegmental arteries (3.5±0.7 vs. 2.9±0.5; P=.0017) and for lung parenchyma (3.8±0.5 vs. 2.2±0.2; P <.0001). The apparent SNR of pulmonary arteries and lung parenchyma was significantly higher for UTE than for MRA (41.0±5.2 vs. 24.5±6.2, P <.0001 and 10.2±1.8 vs. 3.5±0.8, P <.0001, respectively).
Conclusion: Free-breathing 3D-radial UTE performs better than breath-hold 3D-MRA for detection of PE and produces better image quality for visualizing small vessels and lung parenchyma.

14:00 - 15:30 **Room D2**

Interventional Radiology

SS 309
Musculoskeletal

Moderators:
A. Diamantopoulos; London/UK
S. Marcia; Cagliari/IT

B-0323 14:00

Retrospective analysis in 20 consecutive patients undergoing percutaneous MR-guided cryoablation of Morton's neuroma: clinical results and insight on a new emerging treatment
R. Cazzato[1], J. Garnon[1], G. Tsoumakidou[1], G. Koch[1], J. Caudrelier[1], X. Buy[2], P. Rao[1], M.-A. Thenint[1], A. Gangi[1]; [1]*Strasbourg/FR*, [2]*Bordeaux/FR (gigicazzato@hotmail.it)*

Purpose: To retrospectively review our experience with percutaneous MR-guided cryoablation (CA) of painful interdigital Morton's neuromas.
Methods and Materials: The following data were collected: patients' sex and age; lesion size and location; procedural outcome (technical success and complications); clinical outcome according to patients' satisfaction ("completely satisfied" vs "satisfied with minor reservations" vs "satisfied with major reservations" vs "dissatisfied") at the last follow-up available. Local pain experienced at last follow-up was also recorded on a 0-10 VAS.
Results: Twenty patients (15 female, 5 male; mean age 50.3 years) were included; 24 neuromas (mean size 11.9 mm) were treated. Twelve neuromas were located in the right foot (50%) and 12 (50%) in the left one. The third web-space was the most common location (91.6%). All procedures were carried out under local anaesthesia in an outpatient basis. Technical success was 100%. Only one minor (grade B) complication was reported in 1/24 (4.2%) case. Complete follow-up (mean 19.7 months) was available for 18/24 (75.0%) neuromas. Patients' satisfaction on a per lesion basis was "complete" in 77.7% cases, "complete with minor reservations" in 16.6% cases, and "complete with major reservations" in 5.7% cases. Mean local pain post-CA was 3.7. Following CA, no patients required additional treatments due to "stump neuroma" syndrome.
Conclusion: MR-guided CA of Morton's neuroma is a new emerging treatment, yielding several advantages such as, low risk of post-CA "stump neuroma" syndrome and the possibility to carry out the procedure under local anaesthesia in an outpatient basis.

B-0324 14:08

Treatment of supraspinatus tendinopathy: dry needling as a stand-alone procedure vs dry needling and platelet-rich plasma (prp)

F. Bruno, A. La Marra, S. Mariani, F. Arrigoni, L. Zugaro, A. Barile, C. Masciocchi; *L'Aquila/IT (federico.bruno.1988@gmail.com)*

Purpose: To evaluate whether ultrasound (US)-guided platelet-rich plasma (PRP) injection offers any therapeutic advantage over dry needling as a stand-alone procedure in the treatment of tendinosis of the supraspinatus tendon.
Methods and Materials: 60 patients (30 men, 30 women, mean age 49.1 years) with refractory supraspinatus tendinopathy who underwent either dry needling (n=30, Group 1) or dry needling combined with PRP injection (n=30, Group 2). Pre-treatment evaluation included ultrasound and MRI scan, analysis of visual analogue pain scores (VAS) and Constant scale for functionality. Clinical (VAS and Constant score) and instrumental (US and MRI) follow-up was performed 6 months after the treatment.
Results: In Group 1, we noted recovery of tendon echogenicity and MRI signal intensity in 10 patients, 14 patients showed no improvement and 6 patients showed worsening of the tendinopathy. 65% of the patients showed improvement in VAS and 55% in Constant values. Group 2 showed recovery of tendon echogenicity and MRI signal intensity in 20 patients, 6 patients showed no improvement and 4 patients showed worsening of the tendinopathy. 24 patients (80%) reported mild to moderate pain reduction (mean VAS score 3, range 0-5), 6 patients had no improvement. The mean Constant value improvement was 65%.
Conclusion: Both PRP and needling are effective and minimally invasive. There is a trend to greater clinical improvement for patients treated with additional PRP, as well as evidence of better morphological recovery.

B-0325 14:16

Percutaneous long bone cementoplasty for palliation of malignant lesions of the limbs in 196 patients

E. Lanza[1], R. Cazzato[2], R. Grasso[3], X. Buy[4], J. Palussiere[4], V. Pedicini[1], L. Balzarini[1], D. Poretti[1]; [1]*Rozzano/IT*, [2]*Strasbourg/FR*, [3]*Rome/IT*, [4]*Bordeaux/FR (eziolanza@gmail.com)*

Purpose: Percutaneous cementoplasty (PC) is rarely applied to long bone tumours since cement is not considered to be sufficiently resistant to torsional forces. We reviewed the literature to understand the effects of percutaneous long bone cementoplasty (PLBC) in terms of analgesia, limb function and complications.
Methods and Materials: This study followed the Cochrane's guidelines for Systematic Reviews of Interventions. Inclusion criteria were as follows: (1) prospective/retrospective studies concerning PC; (2) cohort including at least 10 patients; (3) at least 1 patient in the cohort undergoing PLBC; (5) published in English; (6) results not published by the same author more than once.
Results: A total of 1598 articles were screened, and 13 matched the inclusion criteria covering 196 PLBC patients. Pain improvement was high in 68.2% patients (σ = 0.2) and mild in 27.4% (σ = 0.2). Functional improvement was high in 71.9% patients (σ = 0.1) and mild in 6% (σ = 0.1). Use of PLBC correlated with pain reduction ($P < 0.001$). Secondary fractures occurred in 16 cases (8%, σ= 2.5); other complications occurred in 2% of cases. Percutaneous stabilisation (PS) was coupled with PLBC in 17% of cases without any subsequent fracture. PS was not associated with the absence of secondary fracture ($P = 0.08$).
Conclusion: PLBC is safe, offering good pain relief and impaired limb function recovery. Secondary fractures are uncommon, and PS may reduce their occurrence. However, no evidence is currently available to support PS plus PLBC as compared to PLBC alone.

B-0326 14:24

Usefulness of O2-O3 intradiscal versus steroid intraforaminal injection in back pain control: a prospective double-blind trial in patients with different discovertebral pathologies

M. Perri[1], T. Popolizio[1], C. Marsecano[2], M. Varrassi[2], A. Splendiani[2], M. Carlo[2]; [1]*San Giovanni Rotondo/IT*, [2]*L'Aquila/IT (marco-perri@tiscali.it)*

Purpose: The aim of this study was to prospectively evaluate the clinical efficacy of perigangliar steroid and local anaesthetic with intradiscal O2-O3 injection versus steroid and local anaesthetic intraforaminal injection in different types of herniation and grade of disc degeneration.
Methods and Materials: A total of 517 patients were randomly assigned to two groups. Control group (159 men, 101 women; age range 25-89 years) underwent steroid and local anaesthetic intraforaminal injection. Study Group (163 men, 94 women; age range 22-92 years) underwent the same treatment with addiction of O2-O3 intradiscal injection. Procedures were performed under computed tomographic guidance. Visual Analogue Scale Questionnaire was administered before treatment and at intervals, the last at 6-month follow-up. Results were compared with Kruskal-Wallis and t test.
Results: After 6 months, O2-O3 discolysis was successful in 106 (41.24%). Study Group patients with extrusions compared with 9 Control Group patients (3.5%) ($P < 0.001$). In 89 (34.6%) Study Group patients with protrusions, success rate was statistically significant compared with 5 Control Group patients (1.9%). Significant difference was detected in the presence of Grade I, II, III of degenerated disc in 185 of Study Group patients (68.4%) compared with 4 Control Group patients (1.5%).
Conclusion: The addition of O2-O3 discolysis is more effective at 6 months than perigangliar steroid and local anaesthetic injection, especially in cases of herniated or protruded discs and with a Grade of disc degeneration from mild to moderate range.

B-0327 14:32

Effectiveness of percutaneous vertebroplasty in cases of multiple myeloma with vertebral pain

M. Inecikli[1], Ö. Nas[2], B. Hakyemez[2]; [1]*Rize/TR*, [2]*Bursa/TR (drinecikli@yahoo.com)*

Purpose: Assessing the effectiveness, benefits and reliability of percutaneous vertebroplasty (PV) in cases of patients diagnosed with Multiple Myeloma (MM) with vertebral involvement.
Methods and Materials: PV procedures performed on 166 vertebras of 41 patients with MM were retrospectively evaluated. Affected vertebral levels, loss of vertebral body height, approaches used for entering vertebrae, polymethylmethacrylate (PMMA) cement amount applied to the vertebrae corpus during PV, PMMA cement leaks and pain before and after PV in visual analogue scale (VAS) in these MM patients' cases were evaluated.
Results: Median VAS scores of patients decreased from 9 one day before PV to 6 within one day after the procedure, to 3 one week after the procedure and eventually to 1 three months after the procedure ($p < .001$). During PV procedure, cement leak was observed on 68 vertebral levels (41%). Loss of vertebral height in correlation with complication rate of the procedure was determined as 50% on grade 1, 48.9% on grade 2 and 35.1% on grade 3. There was no any meaningful statistical difference observed between them ($p=0.487$). Median value of PMMA in terms of mL was determined to be 6 ml.
Conclusion: PV is a procedure which has low complication rates and is easy to perform and minimally invasive. For these reasons we believe that PV should be preferred for MM patients with serious back pains.

B-0328 14:40

Cementoplasty for arthrodesis screw loosening: a technique to prolong the useful life of an implant

S. Perez Aguilera, M. Zauner Jakubik; *Sabadell/ES*

Purpose: Vertebroplasty is a recognised technique that is efficacious for pain relief and stabilisation of osteoporotic fractures. Likewise, using hollow transpedicular screws with cement is an efficacious technique for increasing the hold of arthrodeses in osteoporotic vertebrae. The problem arises when one end of an arthrodesis loosens due to unrecognised osteoporosis or other reasons. What to do in these cases?
Methods and Materials: In March 2013, to prolong the life of arthrodeses and to avoid having to replace or lengthening them, we started to cement screws that had become loosened. We have treated 11 patients (2 men and 9 women) with clinical and radiologic signs of arthrodesis loosening by percutaneous cementation of the loosened screws, most (7) on S1. We describe the technique and the follow-up.
Results: All patients report significant relief of pain due to the mechanical instability of the arthrodesis, and all arthrodeses continue to hold without signs of greater loosening or need for extension. The complication we've had in 5 patients was cement leakage, only one was significant case with clinical radiculalgia (requiring medical treatment) and in the remaining patients (4) the leak was to posterior soft tissue and had no impact clinic.
Conclusion: Although not simple, vertebroplasty to cement loose screws is efficacious and useful to prevent or at least delay prosthesis replacement or arthrodesis extension.

B-0329 14:48

Radiological percutaneous osteosynthesis and cementoplasty for impending malignant pathological fracture of the proximal femur

E. Mavrovi, H. Beji, A.-C. Kalenderian, G. Vaz, C. Mastier, P. Thiesse, B. Richioud; *Lyon/FR (ertimavrovi@gmail.com)*

Purpose: To retrospectively evaluate the technique and outcomes of Radiological Percutaneous Osteosynthesis and Cementoplasty (RPOC) on impending malignant pathological fracture of the proximal femur.
Methods and Materials: Between February 2014 and June 2015 RPOC was performed in 12 patients (3 women, 9 men) with metastases of proximal femur and a high fracture risk (Mirels' score ≥ 8). After institutional review board the patients were not candidates for surgical stabilization. We retrospectively analysed occurrence of post-procedural fractures, technical feasibility, duration

in the operating room, early complications, reduction in pain and duration of hospitalisation.
Results: No fracture occurred after a median follow-up of 180 days (range, 11-540). The technical success was 100%. The average Mirels' score was 9.8 ± 1.1 (range, 8-12). RPOC was performed under general (n = 10) or loco regional (n = 2) anesthesia. The average duration of the procedure was 95 minutes ± 17 (range, 73-121). All patients got up and walked on the day after the surgery. The average duration of hospital stay was 4 days ± 3 (range 2-10). No major complication occurred. One patient presented with a hypoesthesia in the lateral thigh. For symptomatic patients (n = 7), visual analog scale (VAS) decreased from 6.8 ± 1.2 (range, 5-9) before treatment, to 2.3 ± 1.1 (range, 1-4) one month later.
Conclusion: Preventive RPOC for pathological fracture of the proximal femur is a reliable alternative for cancer patients who are not candidates for surgical stabilization. Studies with larger populations are needed to confirm our experience.

B-0330 14:56

Percutaneous intra-articular neurolysis with pulsed radiofrequency in knee osteoarthritis

D. Filippiadis, S. Grigoriadis, A. Mazioti, S. Spiliopoulos, E. Brountzos, N. Kelekis, A. Kelekis; *Athens/GR (grigoriadis_stavros@hotmail.com)*

Purpose: To investigate the effectiveness of percutaneous imaging-guided intra-articular pulsed radiofrequency neurolysis (PRF) in patients with knee osteoarthritis suffering from chronic pain refractory to conservative therapies.
Methods and Materials: During the last 12 months, PRF was performed on 15 cases of knee osteoarthritis. A 20G/10 cm cannula was percutaneously inserted in the antero-lateral region of the knee joint under fluoroscopy. Coaxially, an RF electrode (10-mm "active tip") was introduced and neurolysis session was performed with PRF (1,200 pulses at 45 V with 20-ms duration followed by a 480-ms silent phase). Following, intra-articular injection of hyaluronate was performed. Pain prior, one week/one month after and at the last follow-up (average follow-up 6 months) were compared by means of a numeric visual scale (NVS) questionnaire.
Results: Comparing the pain scores of questionnaires prior (mean value 8.2± 0.8 NVS units) and 1 week after (mean value 3.0 ± 1.0 NVS units) treatment, there was a mean decrease of 5.2 NVS units in terms of pain reduction and life quality. At 1 month post-therapy mean value of self-reported pain was 1.8± 0.8 NVS units with a mean decrease of 6.4 NVS units in terms of pain reduction and life quality. Overall mobility improved in 15/15 (100%) patients. No complication was observed.
Conclusion: PRF seems to be an effective and safe technique for palliative management of chronic pain in patients with knee osteoarthritis. Results seem to be reproducible and lasting longer than intra-articular injection of hyaluronate solely performed.

B-0331 15:04

Role of CT-guided percutaneuos cryoablation combined with cementoplasty for bone lesion in weight-bearing areas

S. Quarchioni, F. Arrigoni, S. Mariani, A. La Marra, L. Zugaro, A. Barile, C. Masciocchi; *L'Aquila/IT (di.gao@hotmail.it)*

Purpose: To evaluate effectiveness of percutaneous cryoablation combined with cementoplasty in the treatment of bone lesion subjected to weight-bearing.
Methods and Materials: From April 2009 to February 2015, we treated 32 patients (mean age 58 years) with one potentially instable bone lesion in weight-bearing areas (27 vertebral body, 3 femoral head and 2 acetabulum). We treated bone metastasis (22 patients, 7 with extracompartmental component) and multiple myeloma lesion (10 patients). We used slight sedation for all patients. Lesion was reached through 11G needle used as guide for cryoprobe (17G). Two freezing cycles separated by warming cycle were performed; then, after about 15 min of waiting to allow the defreezing of the lesion, cement was delivered through the same 11G needle. All the procedures were performed under Fluoro-CT guidance. Follow-up was performed at 3, 6 and 12 months.
Results: Patients had rapid pain relief for a period from 3 to 18 months (mean 9.2 months) with an improvement in quality of life in all patients. Technical success was 100%. The mean VAS improved approximately of 75% from 8.9 to 1.1 (mean 7.2). In only 2 cases occurred majors complications: a bleeding (successfully embolised) and a slight leakage of cement. No fractures occurred in the sites of cementoplasty.
Conclusion: Cryoablation in combination with cementoplasty is a safe treatment that can lead to a significant good and fast local tumour control, with an improvement of pain and quality of life in patients with potentially instable bone lesion due to its critical localisation.

B-0332 15:12

Efficacy of ultrasound-guided needle tenotomy for the treatment of chronic tendinopathies

F. Bruno, A. La Marra, S. Mariani, F. Arrigoni, L. Zugaro, A. Barile, C. Masciocchi; *L'Aquila/IT (federico.bruno.1988@gmail.com)*

Purpose: To determine the effectiveness of ultrasound-guided percutaneous needle tenotomy in terms of clinical improvement and morphological recovery in patients with chronic tendinopathies.
Methods and Materials: 20 tendons (3 patellar, 6 Achilles, 7 supraspinatus, 4 common extensor elbow) in 12 patients (10 men, 10 women, mean age 32.5 years, range 20-45). The patients underwent MRI and ultrasound examination following referral with clinical diagnosis of tendinosis (mean symptom duration 6 months) that had failed conservative treatment. Pre- and post-procedure (at 3- and 6-month follow-up) VAS scores were collected to assess patient clinical response. All patients were treated with sonographically guided percutaneous tenotomy. The procedure was performed twice, 3 weeks apart. All complications were recorded. Follow-up ultrasound and MRI examination was performed 6 months and 1 year after the treatment to evaluate tendon morphology.
Results: VAS score was significantly lower at 6th month (2.2± 0.7) follow-up compared with the baseline (5.8 ± 0.6) with an overall success rate of 75%. After 1 year, 60 % of the patients reported stable improvement in VAS. The imaging follow-up with sonographic assessment showed a reduction in overall tendon thickness and in the size of the area of tendinosis in 15 tendons (75%). MRI findings confirmed improvement of the tendon morphology and signal intensity in the same cases. 3 tendons showed no improvement (15%); in 2 tendons (10%) degenerative changes evolved.
Conclusion: US-guided dry needling guidance shows promises as a cheap, safe and effective treatment for patients with degenerative tendon disease.

B-0333 15:20

Combined microwave ablation and percutaneous screws fixation plus cementoplasty in the treatment of painful bone metastases

C. Pusceddu, N. Ballicu, B. Sotgia, R. Fele, L. Melis; *Cagliari/IT (clapusceddu@gmail.com)*

Purpose: To evaluate the feasibility and effectiveness of TC-guided microwave ablation (MWA) and percutaneous screw fixation plus cementoplasty (PSFPC) in patients with painful bone metastases with fractures or to prevent pathological fracture.
Methods and Materials: Fourteen patients (6 men and 8 women, median age 59 years) with 18 metastatic bone lesions underwent CT-guided MWA followed by PSFPC in the same session. All patients were not more susceptible for chemotherapy or radiotherapy and were considered unfit for surgery. Vertebrae (12 cases), femurs (4 cases) and pelvis (2 cases) were the intervention sites and the primary end point was pain relief. Pain severity was estimated by using a visual analogue scale (VAS) before treatment and 6 months post-treatment. Functional outcome was assessed by improved patient walking ability.
Results: All sessions were completed and all procedures were well tolerated. There were no complications related to ablation or to incorrect positioning of the screws or leakage of cement. All patients were able to walk already within 6 hours after procedure and the average length of hospital stay was 2 days. VAS score decreased from 7.4 (range, 4-9) before treatment to 1.5 (range, 0-4) 6 months after and improvement patients' walking ability at 6 months was 100%. No new bone fracture occurred during a median follow-up of 8 months.
Conclusion: MWA followed by PSFPC is a safe and effective procedure which allows us to reduce the tumoural tissue, stabilize the fracture and prevent pathological fractures with significant pain relief and good recovery of walking ability.

14:00 - 15:30 **Room K**

Genitourinary

SS 307

Prostate cancer: targeted biopsy and beyond

Moderators:
M. Meissnitzer; Salzburg/AT
N.N.

B-0334 14:00

Prospective randomised evaluation of MR-guided in-bore versus MRI/ultrasound fusion plus TRUS-guided prostate biopsy in patients with prior negative biopsies

F. Dietzel, L. Schimmöller, M. Quentin, D. Blondin, C. Arsov, R. Rabenalt, G. Antoch, H.E. Gabbert, P. Albers; *Düsseldorf/DE (frederic.dietzel@med.uni-duesseldorf.de)*

Purpose: To prospectively evaluate PCa detection rate of MR-guided in-bore biopsy (IB-GB) alone versus MRI/ultrasound fusion-guided biopsy combined with a systematic TRUS-GB (FUS+TRUS-GB) in patients with prior negative TRUS-GB and elevated PSA levels.
Methods and Materials: Two hundred and ten patients with suspicious multiparametric 3 T MRI (T2WI, DWI, DCE-MRI) of the prostate were prospectively randomised to IB-GB or FUS+TRUS-GB. Analysis of PCa detection rates (significant PCa = Gleason score ≥7), number of biopsy cores to detect one (significant) PCa, and tumour involvement per biopsy core were performed.
Results: One hundred and six patients received IB-GB (age 65±7.1 years; median PSA 10 ng/ml) and 104 patients FUS+TRUS-GB (age 67±6.8 years; median PSA 11 ng/ml). Mean number of cores was for IB-GB 6±0.8 and FUS+TRUS-GB 18±1 ($p < 0.001$). PCa detection rate for IB-GB was 37% and for FUS+TRUS-GB 39% (p=0.8). For significant PCa it was 29% vs. 32% (p=0.8). IB-GB needed 15 biopsy cores to detect one PCa and 19 for one significant PCa, whereas FUS+TRUS-GB needed 44 and 55 biopsy cores.
Conclusion: Targeted IB-GB alone achieved equal PCa detection rates compared to a combined biopsy approach of FUS and TRUS-GB. Furthermore IB-GB required significantly less biopsy cores.

B-0335 14:08

Are single shot biopsies sufficient for targeted MR-guided prostate cancer detection?

T. Ullrich, L. Schimmöller, M. Quentin, F. Dietzel, C. Arsov, R. Rabenalt, D. Blondin, P. Albers, G. Antoch; *Düsseldorf/DE (Tim.Ullrich@med.uni-duesseldorf.de)*

Purpose: To evaluate a single shot biopsy strategy (one biopsy core per MRI lesion) in targeted MR-guided in-bore prostate biopsy for reduction of unnecessary biopsy cores.
Methods and Materials: One thousand five hundred forty-five targeted MR-guided in-bore biopsy cores (two cores per MRI lesion) in 290 patients (66±7.8 years; median PSA 8 ng/ml) were evaluated regarding PCa detection rate of the first (FBC) compared to the second biopsy core (SBC). Gleason score Distribution and Gleason upgrading were analysed.
Results: Two hundred thirty-nine (31%) FBC and 252 (33%) SBC were prostate cancer (PCa) positive (p=0.4). Patient PCa detection rate based on the FBC and SBC were 46% vs. 48% (p=0.6). For clinically significant PCa with a Gleason score ≥4+3=7 the detection rate was 18% for both, FBC and SBC (p=0.9). 89% of the SBC showed no histologic difference to the FBC. 7.5% of the SBC detected PCA by negative FBC. 2.6% of the SBC showed a Gleason upgrading from a Gleason score 3+3=6 to ≥3+4=7 and 0.5% SBC to a Gleason score ≥4+3=7. 1.8% of the SBC showed a Gleason upgrading from 3+4=7 to ≥4+3=7.
Conclusion: Provided a correct biopsy position was documented a single shot biopsy is feasible when performing a targeted MR-guided in-bore prostate biopsy. The benefit of a second targeted biopsy core per suspicious MRI-lesion is likely minor, especially regarding the PCa detection rate and significant Gleason upgrading.

B-0336 14:16

MRI-targeted prostate biopsy outcomes after previous negative TRUS-guided random biopsy: correlation to risk-based patient selection

A.R. Alberts, M.J. Roobol, L.P. Bokhorst, C.H. Bangma, I.G. Schoots; *Rotterdam/NL (i.schoots@erasmusmc.nl)*

Purpose: Given the limitations of PSA and standard transrectal ultrasound (TRUS)-guided biopsies for detecting prostate cancer (PCa), we evaluated the PCa detection rate of MRI/TRUS-fusion-guided prostate biopsies in men with previous negative biopsies.
Methods and Materials: MRI/TRUS-fusion-guided prostate biopsy (Koelis-Urostation™) was used in 122 consecutive referred patients after previous negative TRUS biopsies, between 2013 and 2015. All underwent 3 T-MRI without endorectal coil. Lesions were classified as PI-RADS 1-5. PI-RADS ≥3 received MRI/TRUS-guided biopsy.
Results: Mean patient age was 65.9 (SD ±6.2) years and mean PSA was 14.6 (SD ±7.7) ng/ml. The overall and high-grade PCa detection rate was 32% (39/122) and 25% (31/122). 54/122 men had on MRI one or more suspicious lesions for PCa; all were biopsied. The PPV of a positive MRI for overall and high-grade PCa detection was 72% (39/54) and 57% (31/54), respectively. PCa detection in PI-RADS 3, 4 and 5 positive MRIs was 50% (5/10), 53% (10/19) and 96% (24/25), respectively. Interestingly, the PCa detection risk for PI-RADS 3, 4 and 5, based on the Rotterdam Prostate Cancer Risk Calculator (RPCRC), was increased in 50% (5/10), 53% (10/19) and 92% (23/25), almost similar distribution to the PCa detection rate.
Conclusion: In men with previous negative TRUS biopsies, the overall and high-grade PCa detection rate following MRI/TRUS fusion biopsy was 32% and 25%. The PPV of a positive MRI for overall and high-grade PCa detection was 72% and 57%. Patient risk stratification based on RCPCRC shows correlation to PI-RADS classification.

B-0337 14:24

Qualification biopsies by elastic fusion registration in active surveillance for localised prostate cancer

D. Portalez, R. Aziza, M. Roumiguie, S. Sanson, B.A. Malavaud; *Toulouse/FR (portalez.daniel@iuct-oncopole.fr)*

Purpose: EAU2015 guidelines offer active surveillance in low-risk prostate cancer (> 10 years' life-expectancy, cT1/2, PSA≤10 ng/mL, biopsy Gleason score ≤6, ≤2 positive biopsies, < 50% cancer per biopsy).
Methods and Materials: 120 patients (5/2013-6/2015) referred for active surveillance after initial sextant biopsies (SB) were imaged (ESUR 2012 recommendations, 1.5 T mpMRI). PI-RADS≥3 targets were sampled by elastic fusion registration technology (EFRT) (Koelis˚, France; 2 cores/target). Systematic cores were obtained in sextants (2 per sextant) not sampled by EFRT. Harnden's criteria (Cancer 2008) ascertained clinical significance (one positive core, ≤3 mm, Gleason score 6).
Results: mpMRI was non-evocative in 18 patients. 102 patients (34 with clinically significant cancers on initial SB, 68 not clinically significant) showed 132 PI-RADS≥3 targets. 396 and 896 EFRT and systematic cores were taken, 40% and 8% respectively showed cancer ($p < 0.0001$). Biopsies of the smallest target (secondary lesion) did not add to those of the largest (index lesion). Cancer was confirmed in 77/102 patients (cumulative length of cancer 12.1 mm, Gleason score 6 in 37 patients, 7 in 40 patients). Concordance with SB positive core locations was 63.3%, 6.6% and 30.0% for index, secondary target and systematic cores, respectively ($p < 0.001$). Qualification biopsies failed to confirm the clinical significance showed by initial SB in 6/34 patients but upgraded 33/68 cancers initially considered non-significant. Upgrading was the result of EFRT cores of the index lesion in 26 patients and of repeat systematic cores in 7 patients.
Conclusion: SB provide an imperfect insight into cancer significance supporting mpMRI and repeat biopsies with EFRT to qualify for AS.

B-0338 14:32

Sepsis and other complications related to TRUS-guided prostate biopsy: 3-year experience at a regional cancer centre

C. Crowley[1], A. Cahill[2], J. Buckley[2], F. O' Brien[2], K. O' Regan[2]; [1]*Dublin/IE*, [2]*Cork/IE (claire.crowley@ucdconnect.ie)*

Purpose: Retrospective study of prospectively collected data to measure the incidence of sepsis and other complications associated with TRUS-guided prostate biopsy in an outpatient setting.
Methods and Materials: All biopsy procedures (12-core) were performed in a regional cancer centre by 2 operators, using standard antibiotic prophylaxis. Complications were recorded over a 3-year period (April 2012-April 2015) including hospital admissions, outpatient clinic visits and all biopsy patients were contacted by a nurse specialist within 2 days following the procedure to enquire about symptoms and/or complications.
Results: There were 635 biopsies performed on 536 patients. There were 43 (6.7%) adverse events. The most common was fever/dysuria which was self-limiting or treated by the patient's family physician (n=17, 2.6%). Blood culture positive sepsis (all E.coli) requiring hospital admission occurred in 0.6% (n=4; mean CRP level 205 mg/L; mean length of hospital stay [LOS] 3.5 days). Clinical sepsis with negative blood cultures requiring hospital admission occurred in 2% (n=13; mean CRP level 140 mg/L; mean LOS 4.4 days). Three patients developed prostatitis/epididymitis/orchitis (0.5%) and 4 developed acute urinary retention (0.6%). One patient developed significant post-biopsy haemorrhage. There was 1 mortality within 10 days although this was not

directly attributable to the biopsy procedure. The most common risk factor for infection requiring hospitalisation was Diabetes mellitus (n=4 of 17).
Conclusion: TRUS-guided prostate biopsy is associated with a significant risk (2.6%) of infection requiring hospital admission despite antibiotic prophylaxis. Patients with Diabetes mellitus may be at higher risk of significant infection.

B-0339 14:40

Should MRI after prostate biopsy be delayed?
J. Choi, S. Jung, M. Choi; *Seoul/KR (comicluv@hotmail.com)*

Purpose: To confirm that delay of MR imaging after prostate biopsy is essential for reduction of hemorrhage that could affect the diagnostic performance of MRI.
Methods and Materials: All MR images were reviewed by a radiologist who was blinded to the pathologic results of both biopsy and prostatectomy. Among twelve regions of peripheral zone, the number of regions with hemorrhage was recorded. The haemorrhagic exclusion sign was counted when a well-defined area of low signal surrounded by an area of high signal was seen on T1-weighted image. Clinically insignificant cancer was defined as a tumour less than 1.3 cm3 with a Gleason score of less than 7 (4+3).
Results: In 71 patients, the median interval between biopsy and MR was 17 days. There was no difference in the number of haemorrhagic areas between two groups divided by an interval of 17 days. There was no difference in the false negative rate for detection of cancer when either the number of haemorrhagic areas was more than six (large amount) or less than or equal to five (small amount). In cases with a small amount of hemorrhage, there was no difference in false negative rate regardless of clinical significance of the cancer. Clinically insignificant cancers were less detected when there was a large amount of hemorrhage. Focal lesion with haemorrhagic exclusion sign was more frequently correlated with true prostate cancer than without haemorrhagic exclusion sign.
Conclusion: Delay of MR after biopsy to avoid masking clinically significant cancers by remaining hemorrhage may not absolutely essential.

B-0340 14:48

Risk-based patient selection for MRI-targeted prostate biopsy after negative transrectal ultrasound-guided random biopsy avoids unnecessary MRI scans
A.R. Alberts, I.G. Schoots, L.P. Bokhorst, G.J.L.H. Leenders, C.H. Bangma, M.J. Roobol; *Rotterdam/NL (i.schoots@erasmusmc.nl)*

Purpose: The multi-parametric MRI is increasingly used after negative transrectal ultrasound (TRUS)-guided random biopsy. Risk-based patient selection could help to avoid unnecessary MRIs. Here, we study the rate of potentially avoided MRIs by risk-based patient selection using the Rotterdam Prostate Cancer Risk Calculator (RPCRC).
Methods and Materials: 122 consecutive men received an MRI and subsequent MRI-TRUS fusion-targeted biopsy in case of suspicious lesion (s) (PI-RADS >= 3) after negative TRUS-guided random biopsy. Men were retrospectively stratified according to the RPCRC biopsy advice to determine the rate of avoided MRIs by risk-based patient selection compared with standard (PSA-driven) patient selection. ROC curve analysis was performed to determine the AUC of the RPCRC for (high-grade) PCa.
Results: The group with a positive biopsy advice following RPCRC risk stratification showed high-grade PCa in 47% (28/60) and low-grade PCa in 10% (6/60) in MRI-TRUS fusion-targeted biopsies. The group with a negative biopsy advice showed 5% (3/62) high-grade PCa and 3% (2/62) low-grade PCa in MRI-TRUS fusion-targeted biopsies. Upfront RPCRC-based patient selection would have avoided 51% (62/122) mpMRIs and 25% (2/8) low-grade PCa diagnoses, missing 10% (3/31) high-grade PCa. The RPCRC AUC for PCa and high-grade PCa were respectively 0.76 (95% CI 0.67 - 0.85) and 0.84 (95% CI 0.76 - 0.93).
Conclusion: Following a negative TRUS-guided random biopsy, a risk-based patient selection with the RPCRC could avoid 51% of MRIs. Adjusting the RPCRC for the MRI-targeted biopsy setting could make further improvement in risk-based patient selection for multi-parametric MRI.

B-0341 14:56

Localisation of primary prostate cancer by simultaneous 68 gallium-HBED-CC-PSMA PET/MRI
M. Eiber, G. Weirich, K. Holzapfel, M. Souvatzoglou, I. Rauscher, B. Haller, M. Schwaiger, T. Maurer; *Munich/DE (matthias.eiber@gmx.de)*

Purpose: Multiparametric MRI (mpMRI) has emerged as promising technique for localizing prostate cancer (PC). Localization of PC might be further improved by combining mpMRI with PET imaging utilizing novel tracers directed against the prostate-specific membrane antigen (PSMA). We compared the diagnostic performance of simultaneous 68Ga-HBED-CC-PSMA PET/MR for localization of PC with mpMRI and PET alone.
Methods and Materials: 66 men with biopsy-proven PC underwent simultaneous 68Gallium-HBED-CC-PSMA PET and mpMR prior to radical prostatectomy (RP) using a dedicated PET/MR system. PET, mpMRI and combined PET/mpMRI datasets were independently evaluated using PI-RADS 1.0 criteria/5-point Lickert scale on a sextant base. Diagnostic performance for localization of PC was calculated based on receiver operating characteristics (ROC) analysis. Standardized uptake values (SUVs) in PET were recorded and image contrast was defined as ratio of malignant/non-malignant prostate tissue.
Results: 53/66 patients were eligible for analysis. 202/318 (63.5%) sextants contained cancer. PET, mpMRI, and PET/mpMRI detected maligancy in 92% (49/53), 66% (35/53) and 98% (52/53) of the patients, respectively. Simultaneous PET/mpMRI statistically outperformed mpMRI (AUC 0.88, $p < 0.001$) and PET-imaging (AUC 0.83, p=0.002) for localization of PC. Sole PET-imaging was statistically significantly superior to mpMR (AUC 0.73, p=0.003). PET provided high imaging contrast between malignant vs. non-malignant tissue (4.48 (range 0.89-15.5)), but no significant correlation was observed between quantitative PET-parameters and Gleason-Score or PSA-value.
Conclusion: Combined 68Gallium-HBED-CC-PSMA PET/MRI improved diagnostic accuracy for localization of PC. Thus, the combination of mpMRI and molecular imaging targeting PSMA constitutes a promising approach highly attractive for targeted biopsies or potential focal therapies.

B-0342 15:04

Magnetic resonance spectroscopy of the prostate: in vitro comparison of the choline-plus-creatine-over-citrate ratio at 1.5 T and 3.0 T
U.G. Mueller-Lisse[1], M. Scherr[2], A. Meister[1], M.F. Reiser[1], U.L. Mueller-Lisse[1]; [1]*Munich/DE*, [2]*Murnau a. Staffelsee/DE*

Purpose: Magnetic resonance spectroscopy (MRS) of the prostate applies the choline-plus-creatine-over-citrate ratio (CC/C) to distinguish between benign prostate tissue and prostate cancer (PCA) at 1.5 T. We compared CC/C at 1.5 T and 3.0 T in a series of different biochemical prostate phantoms in vitro.
Methods and Materials: Eight different prostate phantoms with aqueous solutions of choline (4-16 mmol/l), creatine (5-10 mmol/l) and citrate (4-32 mmol/l) were examined with single-voxel-MRS (SVS) and 3D-MRS (CSI, PRESS-sequence, 8x8x8 voxels) at both 1.5 T ("Aera", Siemens-Medical-Solutions, TR/TE 1000/130 ms) and 3.0 T ("Skyra", Siemens-Medical-Solutions, TR/TE 940/145 ms). CC/C was calculated from respective metabolite concentrations in the phantoms and from respective integral values under the respective MRS spectral peaks of choline, creatine, and citrate at 1.5 T and 3.0 T. Respective distinction of "benign" from "malignant" CC/C was statistically significant at $p < 0.005$ (multiple comparison Bonferroni corrected two-tailed Student's T Test for unpaired samples).
Results: Chemical CC/C ratios in the phantoms were 0.44 (benign), 0.56-0.88 (moderately differentiated PCA), and 1.63-3.25 (poorly differentiated PCA). Respective CC/C in SVS at 1.5 T and 3.0 T was 0.44±0.02 and 0.47±0.18 (benign); 0.81±0.07-1.40±0.03 and 0.60±0.17-1.03±0.04 (moderately differentiated PCA); and 2.61±0.15-6.16±0.47 and 1.73±0.21-3.35±0.36 (poorly differentiated PCA). Distinction of CC/C at CSI was statistically significant for benign from all PCA phantoms and for all moderately differentiated PCA from poorly differentiated PCA phantoms at both 1.5 T and 3.0 T ($p < 0.001$).
Conclusion: Increase of CC/C with loss of biochemical prostate tissue differentiation can be simulated in a phantom model. In vitro CC/C measurements suggest that distinction of benign prostate metabolism, moderately differentiated PCA and poorly differentiated PCA is possible. MRS-CC/C appears to be closer to chemical CC/C at 3.0 T than at 1.5 T.
Author Disclosures:
U.G. Mueller-Lisse: Other; the authors thank Drs. G. Thoermer, P. Kreissler and J. Babl for technical support and valuable advice in the conduction of this study.

B-0343 15:12

ADC in the evaluation of side-specific extracapsular extension of prostate cancer: development and internal validation of a nomogram of clinical utility
F. Giganti, A. Coppola, A. Ambrosi, S. Ravelli, A. Esposito, A. Briganti, F. Montorsi, A. Del Maschio, F. De Cobelli; *Milan/IT (giganti.fra@gmail.com)*

Purpose: To develop a nomogram of clinical utility based on diffusion-weighted imaging to predict side-specific extracapsular extension.
Methods and Materials: Seventy men underwent 1.5 T multiparametric magnetic resonance imaging followed by radical prostatectomy. Apparent diffusion coefficient (ADC) values were assessed for normal and pathological tissue, and their ratio. Univariate and multivariate logistic regression analyses were performed. Logistic regression coefficients were used to develop our nomogram. Receiver operating characteristic curve analysis was performed to determine the optimal ADC cut-off for extracapsular extension.
Results: At univariate analysis, ADC ≤ 0.84 x 10-3 mm2/s and ratio ≤ 0.60 were associated with extracapsular extension ($p < 0.001$) along with suspicious extracapsular extension at imaging ($p = 0.003$) and biopsy Gleason score

($p < 0.001$). At multivariate analysis, ADC ($p = 0.031$), extracapsular extension on T2-weighted images ($p < 0.001$) and biopsy Gleason ($p = 0.001$) maintained their independent predictor status. Our nomogram showed a significant higher sensitivity (96%) than T2-weighted images (54%; $p = 0.001$) and diffusion-weighted imaging alone (79 %; $p = 0.045$).
Conclusion: We developed a nomogram predicting side-specific extracapsular extension in prostate cancer. ADC represents a potential imaging biomarker to predict side-specific extracapsular extension in patients with prostate cancer. The nomogram aims to assist clinicians in confirming extracapsular extension. Our nomogram could improve the current diagnostic pathway and possibly the therapeutic approach for this disease.

B-0344 15:20

Index lesion characterised by 11C-choline PET/CT and 3-Tesla MRI spectroscopy in primary prostate carcinoma: clinical implications in the era of image-guided therapy

M.D. Hernández-Argüello, J. Solorzano, I. Pascual, A. Benito, M. Collantes, C. Padula, M. Cabaleros, J. Pardo, J.A. Richter; *Pamplona/ES (mharguello@unav.es)*

Purpose: Index lesion and deregulated choline metabolism analysis emerge as important steps in primary prostate carcinoma (PPC) evaluation.The aim of this study was to evaluate the cross-correlation between 11C-choline tracer distribution and chemical shift imaging (CSI) maps in patients with PPC.
Methods and Materials: 29 patients were prospectively studied with 3-Tesla MRI (T2WI-sMRI) and high-definition 11C-choline-PET/CT prior to the prostatectomy. T2WI and PET/CT data were co-registered to compare side by side 11C-choline tracer distribution and CSI maps. Index PET was defined as the highest avid 11C-choline foci and Index sMRI defined as the area with the highest choline peak or choline/citrate ratio without the influence of data obtained by T2WI. Index H, defined as the largest sized tumour on biopsy, was used as standard of reference for correlation analysis. Quantitative data (SUVmax, choline/citrate ratio and choline peak) in both tumour and benign control tissue (BCT) were determined. Kappa statistic and Mann-Whitney U tests were performed.
Results: There was no correlation between 11C-choline distribution and CSI maps when using the aforementioned criteria. Index H was correctly classified by Index PET and Index sMRI in 76.9% and 3.8% of the cases, respectively. Combined data from 11C-choline-PET/CT and T2WI presented the highest Index H detection capability (96.2%). Quantitative PET and CSI data differed amongst tumour and BCT ($p < 0.001$).
Conclusion: Using 11C-choline PET/CT in conjunction with T2WI improves Index lesion detection. Choline metabolism data from 11C-choline-PET/CT and CSI probably represent different biological processes and should not be used as equivalents in clinical practice.

14:00 - 15:30 **Room G**

Radiographers

SS 314

CT parameters: juggling or struggling?

Moderators:
E. Agadakos; Athens/GR
E. Sorantin; Graz/AT

K-11 14:00

Keynote lecture

A. Hartvig Sode; *Odense/DK*

B-0345 14:09

Optimisation of chest computed tomography using a phantom: impact of mAs and reconstruction techniques on image quality

C.S. Reis[1], T. Faquir[2], V. Harsaker[3], P. Hogg[2], L. Kristoffersen[3], I.L. van Rein[4], K. Stancombe[2], N.C. Warmerdam[4], C. Wergeland[3]; [1]*Lisbon/PT*, [2]*Salford/UK*, [3]*Oslo/NO*, [4]*Groningen/NL (christinewe@live.no)*

Purpose: To verify if the mAs and reconstruction techniques affect the visualisation of relevant structures in lung Computed Tomography (CT) using a phantom.
Methods and Materials: Images were acquired using varying mAs and reconstruction techniques. Image quality (IQ) was analysed applying two approaches: perceptual, using 5 observers and objective (edge gradient calculation) to verify the sharpness of the structures. Dose was recorded. Wilcoxon Signed Rank test was used to compare the data from the perceptual image analysis. P-values were calculated (Bonferroni-Correction method) to compare reconstruction techniques and mAs. A Kappa Test with linear weighting was performed to calculate the level of agreement between observers.
Results: The Wilcoxon-Signed-Rank-Test showed no significant difference between the reconstruction techniques tested ($p < 0.05$). In addition, the test showed no significant difference between any of the mAs values with a Bonferroni correction ($p = 0.0167$). For 10 mAs the observers scored differently, depending on which structures they were looking at. The overall IQ was acceptable, and the nodules were well defined. The agreement for visualising the range of anatomical regions (Kappa test linear-weighting) suggests that observer 2 and 3 had a poor agreement level (0-0.366) and observer 1, 4 and 5 had moderate agreement (0.5714-0.751).
Conclusion: The visual measures of IQ were largely unaffected by reconstruction techniques or mAs values. However, further work is needed for a better understanding of visual and clinical value of reconstruction techniques at lower doses.

B-0346 14:17

Noise variations across clinically accepted paediatric body CT scans

M. O'Connor, S. Foley; *Dublin/IE (michelle.oconnor@ucd.ie)*

Purpose: This research investigated current noise levels in body CT scans in two paediatric centres.
Methods and Materials: With ethical permission, a random sample of 100 abdomen and thorax CT scans was collected from two paediatric hospitals, both with Philips 64slice Brilliance scanners and using weight based protocols (80-120 kVp, AEC, 64x0.625 mm collimation, pitch 0.891, iDose level 4). Waist circumference (WC) was measured at L3-L4 and chest circumference (CC) at the level of the nipples to depict patient size. Noise was measured by three experienced observers using identical sized regions of interest (ROI) in four homogenous locations; (1)Bladder, (2) subcutaneous adipose tissue, (3)Air 2 cm anterior to skin and (4)in bronchus at level of carina. Linear regression was carried out to assess patient size, age and clinical site as noise predictors.
Results: Inter- and intra-viewer reliability were excellent (ICC> 0.98). Patients ranged in age from 1-16 years (mean: 8) with mean WC 72.3 cm (59-86 cm) and mean CC 57.1 cm (46-71 cm). Mean noise in the chest (central:10.5 HU, peripheral:11.1 HU, range:4-19 HU) was significantly ($p > 0.05$)higher than that in the abdomen (central:9.4 HU, peripheral:10.3 HU, range:4-16 HU). No statistically significant linear dependence was found between mean noise in abdominal ($F(3.96)=0.317$, $p=0.813$) or thoracic CT ($F(3.96)=1.044$, $p=0.377$) on age, patient size or hospital site.
Conclusion: Widespread use of AEC results in consistent noise levels for paediatric body CT between sites and across patient ages and sizes suggesting that further optimisation is possible to ensure image quality is optimized according to clinical indications.

B-0347 14:25

Short and long term effects of clinical audit on compliance with procedures in CT scanning

A. Oliveri[1], N. Howarth[2], H. Salame[1], P. Gevenois[1], D. Tack[1]; [1]*Ath/BE*, [2]*Chenes-Bougeries/CH (aoliveri1991@gmail.com)*

Purpose: To test the hypothesis that quality clinical audit could improve the compliance with procedures in CT scanning.
Methods and Materials: This retrospective study was conducted in two hospitals, based on 6,950 examinations and four procedures, focusing on the acquisition length in lumbar spine CT, the default tube current applied in abdominal unenhanced CT, the tube potential selection for portal phase abdominal CT and the use of a specific "paediatric brain CT" procedure. A first clinical audit reported the compliance with these procedures. After presenting the results to the stakeholders, a second audit was conducted to measure the impact of this information on the compliance and repeated the year after. Comparisons of proportions were performed using the Chi-square Pearson test.
Results: Depending on the procedure, the compliance rate ranged from 27 to 88% during the first audit. After presentation of the audit results to the stakeholders, the compliance rate ranged from 68 to 93% and was significantly improved for all procedures (P ranging from <.001 to.031) in both hospitals and remained unchanged during the third audit (P ranging from.114 to.999).
Conclusion: Quality improvement through repeated audits on the compliance with CT procedures durably improves this compliance.

B-0348 14:33

Analysis of CT exposure parameters, dose values and image noise in order to promote the harmonisation of CT examinations

A. Carriço, F. Palumbo, R. Cristina, G. Paulo, J. Santos; *Coimbra/PT (f_palumbo@hotmail.com)*

Purpose: Analyse and compare the exposure parameters, dose descriptors and image quality of the most frequently Computed Tomography (CT) examinations performed in four different CT scanners in the same institution in order to harmonise the procedures.

Methods and Materials: Exposure parameters and dose values Head CT (HCT), High Resolution Chest (HRCCT) and Abdominal (AbdCT) were directly analysed on Picture Archiving and Communication System (PACS), data were collected from 20 examinations per procedure and a CT scanner. Local and regional Diagnostic Reference Levels (DRL's) were established and CT image quality was analysed based on the standard deviation value of the Hounsfield Units in homogeneous Regions Of Interest.
Results: CT examinations were analysed (n=240). The exposure parameter, dose values and image noise vary per equipment and procedure. The proposed CT DRL's for HCT, HRCCT and AbdCT are 67 mGy/1036 mGy.cm, 11 mGy/383 mGy.cm and 14 mGy/1567 mGy.cm ($CTDI_{VOL}$/DLP), respectively.
Conclusion: Despite the CT scanners technological differences and the majority of the obtain dose values are according to the recommendations, is possible to optimise the procedures in order to harmonise the CT practices and dose values.

B-0349 14:41

Coronary computed tomography angiography: evaluation of the effects of cradle sagging on stair-step artifacts

S. Lee, J. Kang, H. Koo, S. Kim, D. Seo; *Seoul/KR*
(sangwoo1321@gmail.com)

Purpose: Different R-R intervals over cardiac cycles can affect the volume data and stair-step artifacts (SSA) could be developed. However, it could be detected even in CT images obtained using the data from the same R-R intervals. We thus hypothesized cradle sagging during the scan could affect the development of SSA.
Methods and Materials: CT scan of pulsating cardiac phantom with straight artificial vessels was performed using 64 MDCT in retrospective ECG gating. Both the phantom and 10-60 kg standard weights at 10 kg intervals were placed on the cradle. CT images were obtained at the three different points with the movement of the cradle, within the similar locations of the heart at a feet-first protocol. Tilt angles of the cradle were measured using a digital inclinometer and scanned phantom. The presence of SSA was assessed by two independent radiologists using curved multiplanar reconstructed (MPR) images.
Results: Tilt angles at each point showed statistically significant correlation with the increased weights on the cradle (r=0.91, 0.97 and 0.88 at each point, $P < 0.05$). Moreover, SSA were perceived more in the CT images obtained at the cradle with higher tilt angle. In rotated vertically curved MPR images, sagittal images showed more severe SSA than coronal images.
Conclusion: Tilt angle of the cradle showed significant correlation with the weights of phantom, and SSA were noted more when higher tilt angle was detected. To reduce SSA, cradle sagging should be minimized to avoid the tilting of the cradle which might affect the CT volume data.

B-0350 14:49

Optimisation of CT follow-up protocol's in patients with gastrointestinal stromal cancer

R. Pinilla[1], M.I.R. Ortega[1], E.M. Campos[1], M. Monteiro[2]; [1]*Madrid/ES*,
[2]*Coimbra/PT (rosapinillasebastian@gmail.com)*

Purpose: Patients with gastrointestinal stromal cancer (GIST), are often assessed by CT, with the aim of early diagnosis and to assess the response to treatment. We intend to evaluate the CT scans performed in these patients to evaluate the protocols chosen enm to the clinical indication. We want to establish a protocol that without limiting the diagnostic capacity, may still comply with the ALARA principle.
Methods and Materials: We conducted a retrospective observational study in patients with GIS diagnosis. All CT scans were reassessed. Data such as: Kv, mAs, activation AECs, dose received by the patient, extent of range, number of obtained series, use of radiation protections devices, were accessed.
Results: 326 studies (81 patients) met the inclusion criteria and constituted our sample. The average TC performed on these patients is 4.41, receiving an average, effective doses of 19.86 mSv of each CT done. We found four different protocols performed with different dimensions and dose for the same clinical indication.
Conclusion: The CT correct protocol for staging of patients with GIST history without active disease, is performed only in 9.8% cases. Most cases in which the most suitable protocol was not used, there was an increase in patient dose and loss of information. To avoid this loss of information and unnecessary increase in dose we propose to implement the correct protocol in our department.

B-0351 14:57

Assessment of image quality criteria from abdominal CT examinations

A.F.C.L. Abrantes, P. Paias, L.P. Ribeiro, A.M. Ribeiro, R.P.P. Almeida, K.B. Azevedo; *Faro/PT (lpribeiro@ualg.pt)*

Purpose: To assess the image quality criteria from abdominal CT examinations based in quality control charts and to demonstrate the importance of implementing a radiological imaging quality control system.
Methods and Materials: A retrospective study was conducted in a public radiology department using a random sample of 500 selected abdominal CT examinations, grouped in 20 smaller samples, each one with 25 exams. Using a checklist based on the American College of Radiology guidelines and the European Guidelines on Quality Criteria for Computed Tomography, the conformities and non-conformities found were recorded and used to establish three types of quality control: (1) the proportion of conformities and non-conformities (p chart); (2) the total number of non-conformity exams (np chart) and (3) the total number of non-conformities in each sample (c chart), in order to suggest corrective actions for improvement.
Results: Considering all exams, 47.60% were non-conformity exams. 343 non-conformities were identified and the "incorrect positioning" showed the highest number of non-conformities (34.11%), followed by the group "presence of artefacts in the image" (26.53%), the "data relating to examination" (20.99%), and the "absence of good achievement criteria" (18.37%).
Conclusion: This research allowed the identification of different types of non-conformities found in abdominal CT images, which have impact on imaging quality. Therefore, the existence of suitable quality control of the radiographic images is essential to achieve high quality standards in radiology departments. It is recommendable to do training courses regularly improving radiographers performance and strategies to reduce the non-conformities must be implemented.

B-0352 15:05

Carotid plaque PET/CT standardised uptake values measurements as a biomarker for stroke: software reproducibility challenges

N. Giannotti, J. McNulty, S. Foley, P. Kelly; *Dublin/IE (nicola.giannotti@ucd.ie)*

Purpose: Carotid plaque standardised uptake values (SUVs) have been linked to the risk stratification of stroke patients, however, validation of the analysis methods is required to ensure reproducibility. This study investigates whether PET/CT SUVs are consistent between software packages.
Methods and Materials: 143 carotid PET/CT cases were analysed using two different software packages (OsiriX®, TeraRecon iNtuition™). A range of quality assurance checks were performed before manually drawing 10 regions of interest (ROIs) on five standardised anatomical sites: carotid bifurcation right/left, common carotid artery right/left, and internal jugular vein. The Mann-Whitney U test was performed to compare the two software packages while the Wicoxan T test was used to compare SUV measurements for each of the 28 possible ROIs. Intra-reader reliability was also assessed using the Kappa test.
Results: A total of 48,880 measurements were collected between the two software packages. The usability and limitations of processing and analysis approaches for each was considered in order to identify the most appropriate methodologies. An overall statistically significant difference ($p < 0.05$) was identified between the analysis conducted using OsiriX® and that using TeraRecon iNtuition™. Across the 28 possible ROIs, statistically significant differences were found between both software packages in 85.7% of cases.
Conclusion: The analysis performed showed that the PET/CT measurements of this region using the two different software packages were not consistent. Thus further investigation is warranted in order to validate this methodological approach for assessing plaque vulnerability and stroke risk.

B-0353 15:13

Multi-center analysis of incidental findings on low resolution CT attenuation correction (CTAC) images: an extended study

J. Coward[1], R. Lawson[1], T. Kane[2], M. Elias[3], A. Howes[4], J. Birchall[5], P. Hogg[1];
[1]*Manchester/UK*, [2]*Blackpool/UK*, [3] *Wrexham/UK*, [4]*Prestcot/UK*, [5]*Derby/UK*
(j.coward@salford.ac.uk)

Purpose: To review new incidental findings detected on low-resolution CT attenuation correction (CTAC) images acquired during SPECT-CT myocardial perfusion imaging (MPI) as part of an extended study.
Methods and Materials: CTAC images acquired at the time of MPI performed using SPECT at four UK nuclear medicine centres were evaluated as part of a multi-centre study. New incidental findings that were considered to be clinically significant were evaluated further. Positive predictive value (PPV) was determined at the time of definitive diagnosis.
Results: Out of 3485 patients, 962 (28%) had a positive finding on the CTAC image, of which 824 (24%) were new findings. Eighty four (2.4%) patients had findings that were considered clinically significant at the time of the CTAC report and which had not been previously diagnosed. However, only 10 (0.29%) of these had findings that were confirmed as clinically significant, with

the potential to be detrimental to patient outcome, after follow-up and definitive diagnosis.
Conclusion: The overall PPV of 12% across the 4 centres was extremely low. Low-resolution CTAC images from SPECT-CT MPI studies provide limited diagnostic information. Our data do not support the routine reporting of CTAC images, however, statistical power is low due to small numbers. This merits further work which might ultimately change results. Advances in knowledge: This study offers a unique evaluation of new clinically significant incidental findings on low-resolution CT images in an attempt to determine the benefit of reporting the CTAC images.

B-0354 15:21

The visible and the invisible in cone beam CT: the role of radiographer
M. Simoncini[1], M. Biondi[1], L. Amata[1], M. Virgilio[2], L. Giuliani[2], C. Ottonello[1]; [1]*Pomezia/IT*, [2]*Rome/IT (marta.simo@hotmail.it)*

Purpose: To evaluate the potential of cone beam CT (CBCT) - as used in clinical practice - in the study of collateral (extra-dental, including temporo-mandibular joint, and extra-sinusal) findings.
Methods and Materials: We retrospectively studied 30 patients (6 males, 24 females, age 55.8 ± 15.3, mean ± sd) that performed CBCT (Instrumentarium OC 300 MAXIO, Tuusula, Finland-EU), from June to September 2015, by using a simple standard acquisition for dental study (maxilla-mandible, temporomandibular joint) or paranasal sinuses study. After standard reconstructions we performed reconstructions of cervical spine and temporal bone.
Results: We visualised upper cervical spine (C1-C3) in all patients performing maxilla-mandible standard study. Temporal bone, with middle and inner ear structures, was correctly visualised in all patients performing temporo-mandibular joint and sinuses standard study.
Conclusion: With standard CBCT examination upper cervical spine and temporal bone can be well visualised, with low radiation dose compared to multislice-CT and with a single dose administration (simultaneous study of dental and extra-dental structures). Moreover cervical study is performed in a more physiological - but uncomfortable - standing position. Unfortunately, the small field of view does not allow more extensive studies. Moreover, CBCT density values seem to be not unreliable, since they are affected by patient position in CBCT unit machine; this condition could limit or not allow a correct tissue characterisation.

14:00 - 15:30 **Room M 1**

Head and Neck

SS 308

Salivary glands, neck, parathyroid

Moderators:
G. Conte; Milan/IT
C. Czerny; Vienna/AT

B-0355 14:00

MRI: the technique of choice in the study of Warthin tumours
B. Brea Alvarez, L. Esteban, Y. García-Hidalgo, M. Tuñón; *Majadahonda/ES*

Purpose: Salivary glands tumours treatment depends on: • Histology, • Location, • Extension; Ultrasound has not specificity in histological diagnosis nor it defines well the tumour extension. FNA is the most cost effective procedure but it does not avoid the use of imaging techniques that are necessary to stablish tumour location and extension. Warthin Tumours are the second common salivary gland tumour and the surgical resection is the treatment of choice. The purpose of this study is to establish Multiparametric MRI as the technique of choice in the study of Warthin Tumours.
Methods and Materials: We reviewed MRI studies of 174 salivary glands tumours. 55 of them were Warthin tumours. Morphological characteristics (location, morphology and signal intensity pattern) and Biological imaging parameters (CDA value in DWI and morphology of uptake curve in PWI) were analysed. Histological confirmation was performed in all cases.
Results: Warthin tumour was a lesion with: • Well defined edges, • Hypointense signal on T2 (sensibility 62.3%, specificity 73.5%), • Low/moderated enhancement after gadolinium administration (sensibility 94.5%, specificity 64.6%),• Homogeneus ADC value < 1.32 (sensibility 100%, specificity 50.5%), • Homogeneus pattern of early uptake and washing > 30% (sensibility 82.6%, specificity 93.3%).
Conclusion: MRI allows the characterisation of Warthin tumour. • Tumour with well defined edges, hypointense signal on T2 and low/moderated enhancement was Warthin tumour with a sensibility of 65.5% and specificity of 93.3%. • Tumour with ADC value < 1.32 and progressive or early uptake and washing > 30% was Warthin tumour with a sensibility of 84.1% and specificity of 95.2 %.

B-0356 14:08

MRI with diffusion weighted imaging of salivary gland tumours, prediction of the benignancy and malignancy
A. Youssef, D. Abdelhady Mohammed, R. Edward; *Cairo/EG (aydayoussefegypt@gmail.com)*

Purpose: Evolving the Imaging role to correctly predict the benign or malignant nature of a lesion is of the essence, as management plan varies accordingly. In our study we investigate the capacity of preoperative Diffusion weighted imaging (DWI) to predict the benign and malignant salivary gland tumours, using apparent diffusion coefficient (ADC) value in addition to conventional MRI criteria.
Methods and Materials: Our study included 51 patients (27 females and 24 males, with age ranging from 2 to 70 years) with salivary gland tumours; DWI was performed with b values of 0, 800. ADC value was calculated at the solid components and correlated with histopathological findings.
Results: There were 16 benign and 35 malignant lesions detected. There is a statistically significant difference between the mean ADC value of the benign lesions (1.39±0.52 x10-3 mm2/s) and the mean ADC value of the malignant lesions (0.69±0.22 x10-3 mm2/s) ($P < 0.001$). The optimal ADC cutoff value that was deter-mined for discrimination between these lesions is: 1.075 x10-3 mm2/s, with sensitivity of 97.14% and specificity of 75%. Using conventional MRI alone in predicting benign and malignant lesions has the sensitivity of 64.7% and specificity of 43.7% with 70.9% positive predictive value and 36.8% negative predicative value. Combining DWI and conventional MRI has increased accuracy, as the sensitivity and specificity were 100%, 87.5% respectively with 94.4% positive predictive value and 100% negative predicative value.
Conclusion: Using DWI in addition to conventional MRI increases the capability of imaging to differentiate benign and malignant salivary gland lesions.

B-0357 14:16

Assessment of salivary gland tumours using MRI and CT: impact of experience on diagnostic accuracy
T.J. Vogl, T. Stark-Paulsen, M.H. Albrecht, N.-E. Nour-Eldin, H. Ackermann, A. Maataoui; *Frankfurt a. Main/DE (t.vogl@em.uni-frankfurt.de)*

Purpose: To analyse the accuracy of radiological diagnosis in MRI or CT studies of salivary gland tumours, depending on the experience of the radiologist.
Methods and Materials: Three radiologists with > 20, 11 and 7 years of experience diagnosed retrospectively 128 cases (53 females/75 males, mean age:55±17), with suspected salivary gland tumours: benign (n=87) and malignant (n=23) tumours, diseases without neoplasia (n=15), no disease (n=3). The observers rated 116 MR and 12 CT images with regard to malignancy, benignity and classification. The histopathological findings were used as reference standard. Sensitivity, specificity, positive-predictive-value (PPV), negative-predictive-value (NPV) and interrater agreement (assessed by Cohen's kappa) were calculated to compare the radiological performance between the raters.
Results: Diagnostic performance for the diagnosis of malignancy by MRI was (sensitivity/specificity):R1 (100%/100%), R2 (70.00%/90.63%), R3 (70.00%/92.71%) and by CT:R1 (100%/100%), R2 (100%/88.89%), R3 (66.67%/66.67%). For benignity assessment by MRI:R1 (96.34%/97.06%), R2 (82.93%/67.65%), R3 (90.24%/64.71%) and by CT:R1 (100%/100%), R2 (80.00%/85.71%), R3 (80.00%/85.71%). The highest agreement for determination of dignity by CT was between R1-R2 ($\kappa=0.74$;$p < 0.001$) and the lowest between R2-R3 ($\kappa=0.28$;$p < 0.001$). Sensitivity/specificity for classification of pleomorphic adenomas by MRI was: R1 (100%/100%), R2 (76.92%/87.01%), R3 (43.53%/67.53%) and by CT: R1 (100%/100%), R2 (100%/88.89%), R3 (66.67%/88.89%). For Warthin's tumour by MRI: R1 (100%/97.44%), R2 (68.42%/83.33%), R3 (50.00%/67.95%) and by CT: R1 (100%/100%), R2 (50.00%/100%), R3 (100%/100%), for squamous cell carcinomas (SCC) by MRI:R1 (100%/100%), R2 (75.00%/97.12%), R3 (75.00%/99.04%) and by CT: R1 (100%/100%), R2 (66.67%/88.89%), R3 (66.67%/66.67%). The highest agreement was detected between R1-R2 at MRI ($\kappa=0.62$; $p < 0.001$) and the lowest between R1-R3 at MRI ($\kappa=0.28$;$p < 0.001$).
Conclusion: The diagnostic accuracy in the assessment of salivary gland tumours strongly depends on the observer's expertise and increases with greater radiological experience.

B-0358 14:24

Ultrasound-guided salivary gland core needle biopsy: the road to take

M.A. Schuller Arteaga, L. Antón Mendez, M. Udondo González del Tánago, J.L. Del Cura Rodríguez, A. Bilbao González, R.M. Zabala Landa, I. Korta Gómez, A. Viteri Jusue, D. Grande Icarán; *Bilbao/ES (dr.schuller@gmail.com)*

Purpose: Until recently Fine Needle Aspiration (FNA) in conjunction with imaging studies has been the diagnostic technique of choice for salivary gland tumours, however in many circumstances it is not enough to differentiate the mass nature, let alone establish an accurate diagnosis. Recent studies indicate that US-guided core needle biopsy (CNB) provides more useful material, therefore allowing better tumour classification and in many cases a precise diagnosis. With this study we aimed to determine the accuracy and complications rate for US-guided CNB in the diagnosis of salivary gland masses.
Methods and Materials: A retrospective analysis of 305 patients who underwent US-guided CNB of salivary gland masses between March 2006 and December 2014 was performed. Histological findings from biopsy specimens were compared with surgical results or with patient follow-up history. Accuracy, sensitivity, specificity, positive predictive value and negative predictive value were calculated. ROC curves and Simple Kappa Coefficient were obtained.
Results: 171 patients underwent surgical excision (56.07%). The biopsy was concordant with the final diagnosis in 288 patients (94.43%). CNB capability to discriminate benign from malignant masses displayed an AUC = 0.92 (CI 95%: 0.86 - 0.98), with a Kappa Coefficient = 0.88 (0.80-0.96). Sensitivity and specificity were 84.78% and 99.22% respectively. Minor complications were observed in 2 patients (0.66%) in the forms of hematoma and abscess.
Conclusion: US-guided core needle biopsy constitutes a safe and effective method for studying salivary gland masses, allowing categorisation between benign and malignant disease and in most cases establish an accurate and specific diagnosis.

B-0359 14:32

Assessing the influence of MRI scan position on image quality of head and neck MR images for radiotherapy treatment planning

L. Xiao, M. Yuen, Y. Tung, P. Wong, H. Ho; *New Territories/HK (xl430@ha.org.hk)*

Purpose: To investigate how MRI patient position protocols influence image registration accuracy, target delineation and calculated dose in patients with nasopharyngeal carcinoma (NPC) cancer undergoing radiotherapy and the consequences for gross tumour volume (GTV) definition and radiotherapy treatment planning.
Methods and Materials: Two NPC patients received a computed tomography (CT), a routine diagnostic MRI (RD_MRI) and an MRI in the radiotherapy position with a flat base plate and an alpha cradle under patient and an immobilization mask (RT_MRI). Therapist delineated the GTV on the CT registered to RD_MRI (RD_GTV) and on the CT registered to RT_MRI (RT_GTV). Registration quality between the CT and MRI was compared by measuring differences between structures in the two MRI set-ups. Two-tailed paired student t-tests were performed to determine the statistical significance.
Results: There was a decrease in the mean distance from the centre of the delineated structures drawn on the CT and MRI databases (from 11.77 to 2.42 mm, p-value, 0.0001) between CT and RD_MRI versus the RT_MRI.
Conclusion: By registering CT with MRI scans performed in the radiotherapy position, there are significant improvements in the image registration and target definition for NPC patients.

B-0360 14:40

Cervical adipose tissue to airway volume ratio (CAT:AV): a novel anthropometric measure, its anatomic relationship to sleep apnea, cerebrovascular accident and overall mortality

H.S. Maresky[1], P.A. Gottlieb[1], L. Copel[1], D. Ahoubim[2], S. Tal[1]; [1]*Zrifin/IL*, [2]*Miami, FL/US (maresky@gmail.com)*

Purpose: To evaluate volumetric quantification of cervical adiposity and airway volumes by Multi-detector Computed Tomography as a novel anthropometric tool and a potential proxy for sleep apnea, cerebrovascular accidents (CVA) and overall mortality.
Methods and Materials: Cervical adipose tissue and airways of all patients who underwent head and neck CT at our institution within one year (2013) were reconstructed volumetrically. Included scans were all NCCT (non-contrast CT) and all CTA (CT angiography). Three-dimensional reconstruction was performed using a novel semi-automated seed planting algorithm. Information on BMI, hypertension, and smoking was obtained, sleep apnea ("STOPBANG") questionnaires were collected.
Results: A total of 431 necks were analysed, including 72 NCCT and 359 CTA. Subjects were grouped into three categories based upon sleep apnea score risk (0-2, 3-4, 5-8), with 135 considered "low risk," 165 "intermediate risk," and 131 "high risk." A strong correlation between CAT:AV and sleep apnea score was noted ($r=0.78$, $p < 0.001$) and between CAT:AV and CVA ($r=0.55$, $p < 0.001$). Patients were followed for 670 days, and the top quartile of all CAT:AV patients displayed a significant propensity for overall mortality (7.5%, p=0.032).
Conclusion: Patients with high CAT:AV ratios possess a higher likelihood to suffer from sleep apnea, display stroke-like symptoms, and display a higher predeliction for mortality. Further research is warranted to fully explore CAT:AV as an anthropometric tool for quantifying obesity, and in order further understand the anatomic relationship between cervical adiposity and airway volumes, a wide aray of serious comorbidities, and overall mortality.

B-0361 14:48

Accuracy of magnetic resonance imaging for subglottic stenosis grading in patients with granulomatosis with polyangiitis

M. Kupka, P. Bannas, L. Linsenhoff, G. Adam, F. Henes; *Hamburg/DE (m.kupka@uke.de)*

Purpose: To compare magnetic resonance imaging (MRI) and laryngoscopy for assessing the clinical relevance of subglottic stenosis (SGS) in patients with granulomatosis with polyangitis (GPA) using pulmonary function tests (PFT) as the standard of reference.
Methods and Materials: Our retrospective study included 96 examinations in 42 patients (28 females; mean age: 55.1, range: 18-73 years) with GPA and suspected SGS. All patients underwent larnygoscopy, MRI and PFT. Stenosis was graded with both laryngoscopy and MRI using the Meyer-Cotton Score (1: ≤50%; 2: 51-70%; 3: 71-99%; 4: complete obstruction). Using PFT, the peak expiratory flow (PEF), maximum inspiratory flow (MIF) and forced expiratory volume (FEV) were determined.
Results: In MRI, 89 examinations were rated positive for SGS (n=60 grade 1; n=27 grade 2; n=3 grade 3) whereas in laryngoscopy only 81 examinations were rated positive for stenosis (n=57 grade 1; n=18 grade 2; n=6 grade 3). MRI demonstrated higher scores in 26 cases and lower scores in 17 cases compared to laryngoscopy. Mean±SD stenosis scores were 1.3±0.6 for MRI and 1.2±0.8 for laryngoscopy. MRI scores showed a significant correlation with MIF, FEV and PEF (r=-0.336, p=0.001; r=-0.248, p=0.008; r=-0.365, p=0.001). Laryngoscopic scores showed a weaker correlation with FEV and PEF (r=-0.225 p=0.021; r=-0.334 p=0.005) and no significant correlation with MIF (r=-0.09, p=0.356).
Conclusion: Laryngoscopy underestimates subglottic stenosis grades compared to MRI in patients with GPA. PFT showed a stronger correlation of stenosis scores as determined by MRI compared to laryngoscopy, indicating that MRI might be better suited to assess the clinical relevance of subglottic stenosis in patients with GPA.

B-0362 14:56

MRI of neck victims of survived strangulation: evaluation of cases

C. Bruguier, J. Grimm, J.-B. Zerlauth, K. Michaud, P. Mangin, R. Meuli, S. Grabherr; *Lausanne/CH (christine.bruguier@chuv.ch)*

Purpose: For the medico-legal evaluation of victims of survived strangulation, an neck-MRI can be performed. In our institute, neck-MRI examinations were performed for a test period of four years. The aim of this study was to identify clinical indicators for the performance of neck-MRI in living strangulation victims.
Methods and Materials: We retrospectively reviewed the medico-legal reports from all victims examined during the test period. We extracted objective lesions (e.g. petechiae, bruising) and reported clinical symptoms (e.g. vision disorder, dysphasia) from the reports. These findings were compared to findings reported from the neck-MRI.
Results: 112 victims were examined after suspected strangulation.11 victims (9.8%) underwent the neck-MRI examination. 84 of the victims (75%) presented objective lesions during the clinical examination, with 8 victims presenting with petechiae and bruising. Neck-MRI was performed in 4 of these 8 victims (50%), and 2 (50%) showed visible lesions with MRI: mucosal and submucosal superior tracheal and vocal cord hemorrhage. Of 76 victims (68%) with bruising as the only objective finding, 66 victims described clinical symptoms, and 7 were examined by MRI. Two of these 7 (28.6%) demonstrated lesions in MRI: swelling of deep neck muscles and lymph nodes.
Conclusion: If performed, MRI resulted in pathological findings in 36% of the cases. This leads to the suspicion that many more findings could have been detected in the other victims. Our experience leads us to the conclusion that an MRI examination of victims of suspected strangulation is useful, and strict indications for its use should be delineated.

B-0363 15:04

Multi-modality imaging of patients with carotidynia and clinical correlation

A. Lecler, G. Volle, M. Obadia, P. Roux, J. Savatovsky, O. Gout, J.-C. Sadik;
Paris/FR (alecler@fo-rothschild.fr)

Purpose: To report 8 cases of patients with carotidynia imaged with 3 techniques: sonography, CT angiography, and gadolinium-enhanced MR imaging, and with follow-up imaging.
Methods and Materials: During a period of 24 months, eight patients with clinical signs and symptoms consistent with carotidynia were referred for imaging in our service. All patients underwent ultrasonography (US), 6 had computerized tomography angiography (CTA) and 7 had gadolinium-enhanced magnetic resonance (MR) imaging of the neck on a 3 T system.
Results: All patients presented with vascular abnormalities in all 3 imaging modalities. US showed hypoechoic wall thickening of the carotid bulb including distal common carotid artery. There was only a mild lumen narrowing compared with a large outward extension of the vessel wall. Doppler mode did not show any haemodynamic change. CTA showed mildly narrowed lumen, concentrically thickened arterial wall and fat stranding in the carotid space. MR showed abnormally marked enhancement of the wall thickening and of the surrounding tissue. Two patients presented with a crescentic fatty plaque. All 3 modalities excluded differential diagnosis. Follow-up US 3 to 6 weeks later showed significantly fewer pathologic findings and a complete healing in half of the patients. Fatty plaque completely disappeared in the 2 patients.
Conclusion: Our series support the imaging features of carotidynia previously described in the literature and thus the existence of carotidynia as a distinct clinical entity.

B-0364 15:12

Preliminary results of 18 F-Fluorocholine PET/MRI show excellent accuracy in patients with primary hyperparathyroidism and inconclusive conventional imaging

W.P. Kluijfhout[1], T.A. Hope[1], M.R. Vriens[2], J.E. Gosnell[1], W.T. Shen[1], Q.-Y. Duh[1], C.M. Glastonbury[1], I. Suh[1], M.H. Pampaloni[1]; [1]*San Francisco, CA/US*, [2]*Utrecht/NL (wouter.kluijfhout@ucsf.edu)*

Purpose: Conventional imaging fails to localise parathyroid adenomas in a substantial proportion of patients with primary hyperparathyroidism (pHPT). Preliminary data have shown promising results using 18 F-Fluorocholine (FCH) PET/CT. No studies have investigated the performance of FCH PET/MRI.
Methods and Materials: Our prospective study has enrolled patients with biochemical pHPT and inconclusive neck ultrasound and 99TC-sestamibi scan. After administration of 3 MBq/kg FCH, PET imaging followed by MRI (pre- and post-gadolinium) was performed. Intraoperative localisation, histology, and confirmation of biochemical cure were used as the gold standard for determining diagnostic performance.
Results: Ten patients have been scanned thus far, of whom seven have final clinical confirmation. All eight adenomas (including one lipoadenoma and one double adenoma) removed by surgery were correctly localised by FCH PET/MRI without false-positive results (100% sensitivity and positive predictive value). Mean SUV of adenomas was 5.1 versus 2.9 of the thyroid. One patient with a confirmed adenoma also had concomitant multiglandular hyperplasia of the other three glands, which was not detected by the scan. All patients had normalisation of calcium 1 week postoperatively.
Conclusion: This is the first study ever investigating PET/MRI for parathyroid localisation. Preliminary results show that FCH PET/MRI localises adenomas with very high accuracy in the setting of failed conventional imaging. Addition of MRI provides the surgeon with detailed anatomic information without extra radiation. Further study is needed to confirm our initial results on the accuracy of FCH PET/MRI for localising parathyroid adenomas, and also to determine its performance in patients with 4-gland hyperplasia.

B-0365 15:20

One-stop SPECT-CT-guided ultrasound for parathyroid adenoma localisation - a single centre experience

P. Touska[1], A. Elstob[1], N. Rao[2], A. Parthipun[1]; [1]*London/UK*, [2]*Birmingham/UK (p.touska@doctors.org.uk)*

Purpose: To evaluate the utility and sensitivity of SPECT-CT-guided ultrasound to localise parathyroid adenomata (PTA), using a one-stop approach (single patient attendance). In particular, comparing the sensitivity for single versus multi-gland disease, given the management implications. Additionally, evaluating the effect of the presence of thyroid disease on PTA localisation.
Methods and Materials: A retrospective analysis of patient records, covering a period of 5.4 years (10/2009-03/2015) was undertaken. Patients that had undergone SPECT-CT-guided ultrasound for PTA and were subsequently operated upon, by a minimally-invasive or open parathyroidectomy, were identified using local radiology and pathology databases. Gland number and location, thyroid appearance on ultrasound, calcium and parathyroid hormone levels were recorded. The data was analysed for radio-pathological correlation.
Results: A total of 157 patients were identified. Of these, 83%(n=131) had single gland disease, 13%(n=20) had multi-gland disease; 4%(n=7) had negative explorations. Imaging correctly identified the side and site in 84% of cases of single gland disease (sensitivity 87%), but the identification rate and sensitivity were lower for multi-gland disease (40% and 67% respectively). The thyroid was abnormal in 40%(n=64) cases. Concurrent thyroid disease did not hinder localisation rates: 77% (normal thyroid), 81% (multinodular goitre) and 100% (thyroiditis and atrophy).
Conclusion: SPECT-CT-guided ultrasound for parathyroid adenoma localisation represents a useful and sensitive study for the detection of single gland disease, enabling minimally-invasive parathyroidectomy. The one-stop approach offers convenience and improved patient experience. However, the technique is less sensitive in multi-gland disease. The presence of thyroid disease does not appear to reduce localisation rates.

14:00 - 15:30 **Room M 2**

Paediatric

SS 312

Thorax and musculoskeletal

Moderators:
C. Balassy; Vienna/AT
Z. Yazici; Bursa/TR

K-09 14:00

Keynote lecture

A.C. Offiah; *Sheffield/UK*

B-0366 14:09

Juvenile idiopathic arthritis (JIA): whole-body MRI (WBMRI) approach in diagnosis and assessment of therapeutic efficacy

P. Arcuri[1], S. Roccia[2], G. Raiola[1], M. Cirillo[1], A. Pingitore[1], G. Fodero[1]; [1]*Catanzaro/IT*, [2]*Lamezia Terme/IT (arppaolo@alice.it)*

Purpose: WBMRI may play an important role alongside clinical exam and radiography as an objective tool for assessing active disease activity and guiding therapy in JIA. Typical finding on MRI are: edema, synovitis and joint or bursal fluid. The aim of our study was to evaluate the effectiveness of Whole-Body-MRI with DWI in detection of sites of disease not clinically detectable.
Methods and Materials: We retrospectively reviewed 24 paediatric patients (median age 11.7 years).Six children underwent general anesthesia. Scans are performed on a 1.5-T MRI scanner with a dedicated multichannel surface coil system. The MRI protocol included T1 weighted, T2-STIR and DWI sequence. Localizations were considered positive those characterised by bone edema and / or synovitis. We reviewed medical records in order to determine if performing WBMRI added useful information for diagnostic purposes and/or changed clinical management. Mann-Whitney U test was performed to compare the sites of disease clinically detectable and the sites detected with WBMRI.
Results: In 18 cases (75%), WBMRI discovery lesions ignored by clinical examination. In detect bone marrow edema, sensitivity was: T1=79%, T2 STIR=88%, DWI=94%. In synovitis, sensitivity was T1=83%, T2 STIR=91%, DWI=98%(ADC synovium was lower than ADC effusion in the ROI; median, 1.96×10−3 mm2/s vs. 2.41×10−3 mm2/s respectively).
Conclusion: WBMRI with DWI sequence showed to be able to detect lesions ignored by clinical examination. DWI showed positive lesions much better and more than T2WI with STIR. WBMRI can be an important adjunct for monitoring disease and setting therapy in JIA.

B-0367 14:17

Radiological phenotype/ genotype correlations of constitutional bone diseases involving the parathyroid hormone (PTH) and its signaling pathways

M. Lahkim, A. Durand, V. Merzoug, A. Linglart, C. Adamsbaum;
Le Kremlin-Bicêtre Cedex/FR (mohamedlahkim@ymail.com)

Purpose: To define the radiological semiology of constitutional bone diseases caused by genetic defect of the signaling pathways of parathyroid hormone (PTH and PTHrp).
Methods and Materials: Retrospective study including 36 patients under the age of 18 with short stature due to genetic defects PTH / PTHrp: hypoparathyroidism (4), brachydactyly type E (1), pseudohypoparathyroidism (PHP1 A) (15) and 1B (5) pseudopseudohypoparathyroïdism (Pseudo-PHP) (4) acrodysostosis (6) and acroskypho metaphyseal dysplasia (1). Skeletal radiography analysis using a qualitative and semi-quantitative grid with a focus

into the length ratios of metacarpals, metatarsals, phalanges and interpedicular lumbar distance compared to a control series.
Results: Hypoparathyroidisms presented only a bone hyperdensity without modeling abnormalities. The remaining 32 patients had spinal stenosis and bone modeling abnormalities with major brachymetacarpies in all cases of acrodysostosis. The brachyphalangies and brachydactylies predominated in PHP1 A and acrodysostosis. The cone epiphyses were constant in PHP1 A, PseudoPHP and acrodysostosis. Ectopic ossifications and exostoses were present in the Pseudo-PHP and PHP1 A. Coxa valga was present in PHP1 A and brachydactyly type E. It was associated with spread bilateral iliac wings and prognathism only in the metaphyseal acroskyphodysplasia.
Conclusion: The knowledge of radio-genetic phenotypes helps targeting genetic research. Radiographs of hands is a key point for an accurate diagnosis

B-0368 14:25

Serial analysis of aortic haemodynamics in patients with repaired aortic coarctation by 4D flow MRI
J. Geiger[1], J. Romberg[2], D. Hirtler[2], K. Gottfried[2], B. Stiller[2]; [1]*Zurich/CH*, [2]*Freiburg/DE (julia.geiger@kispi.uzh.ch)*

Purpose: 4D flow MRI was performed to analyse the evolution of aortic haemodynamics in patients with repaired aortic coarctation (CoA).
Methods and Materials: Two 4D flow MRI scans of the thoracic aorta (temporal resolution~42 ms, spatial resolution~2.4 mm, venc=200 cm/s) were performed in 28 CoA patients: mean age at first scan (t1) 14.6±7.9 years, at second scan (t2) 19.0±8.3 years. Wall shear stress (WSS), peak velocities and oscillatory shear index (OSI) were calculated at 9 defined levels of the thoracic aorta, and aortic diameters (ascending/descending aorta (AAo/DAo), arch, CoA) were measured. Blood flow visualisation was performed by 3D particle traces. For statistical analysis, patients with bicuspid aortic valve (BAV) were evaluated separately.
Results: Quantitative analysis showed an overall decrease in WSS (mean t1: 0.48±0.18 N/m², t2: 0.33±0.13 N/m²; $p < 0.005$) and an increase in OSI (t1: 7.16±4.05, t2: 9.98±4.76; $p < 0.05$). AAo/DAo ratio decreased in all subgroups (t1: 1.44±0.29, t2: 1.34±0.18; p=0.017). Peak velocities decreased significantly in the AAo (t1: 1.42±0.37m/s, t2: 1.27±0.37m/s; $p < 0.001$). BAV patients showed lower OSI, higher WSS in the AAo and lower peak velocities in the aortic arch, the CoA site and the DAo. The total number of secondary flow patterns decreased except for an increase in additional localised AAo helices.
Conclusion: In patients with repaired CoA, a normalisation of aortic haemodynamics was observed in the follow-up. BAV patients showed specific characteristics in quantitative parameters. 4D flow MRI permits the evaluation of qualitative and quantitative aortic changes in CoA patients over time which are not limited to the CoA site.

B-0369 14:33

Role of dual-source computed tomography in identification of respiratory symptomatic patients affected by true isolated vascular rings
T.P. Santangelo, M. Trezzi, G. Muscogiuri, M. Maurizi Enrici, S. Albanese, A. Carotti, P. Tomà, A. Secinaro; *Rome/IT (teresapia.santangelo@opbg.net)*

Purpose: Role of dual-source computed tomography (DSCT) to establish correlation between percentage of tracheal area reduction (TAR) and respiratory symptoms in patients with vascular rings.
Methods and Materials: 30 paediatric patients (mean age: 4.1±5.0 years; 14 males) with true isolated vascular rings, diagnosed on echocardiography, underwent chest computed tomography angiography using 2nd-generation DSCT. All the CT examinations were not performed under anaesthesia. Patients were divided into two groups according to presence (group A, n=18) or absence of respiratory symptoms (group B, n=12). Tracheal lumen area was calculated, in both groups, contouring manually the lumen of trachea at level of jugular vein level and in the section of minimum diameter. Percentage of TAR was calculated dividing the normal and minimum area. ROC curve analysis showing the trade-off between sensitivity and specificity of respiratory symptoms as a function of percentage TAR was performed. Comparison of the TAR percentages between groups A and B was calculated using t-Student. A p value < 0.05 was considered significant.
Results: A statistic significant difference was observed in percentage (p= 0.013) of TAR between Group A (51±14%) and Group B (37±11%). $>$ 50% of TAR identified symptomatic patients with a sensitivity and specificity respectively of 60% and 92% (AUC=0.77). Surgery was performed in 23 patients, 18 of which were symptomatic.
Conclusion: Percentage of TAR is statistically significantly greater in symptomatic patients than asymptomatic. $>$ 50% of TAR can identify symptomatic patients with a sensitivity and specificity respectively of 60% and 92%. DSCT angiography could assume a key role in management of patients with vascular rings.

B-0370 14:41

Lung perfusion with dual-energy CT: can we achieve a diagnostic image quality in children?
M. Remy-Jardin, T. Santangelo, A. Deschildre, J.-B. Faivre, A. Hutt, J. Rémy; *Lille/FR (martine.remy@chru-lille.fr)*

Purpose: To evaluate the image quality of dual-energy (DE) lung perfused blood volume (PBV) images in children.
Methods and Materials: The study population included 31 children (mean age: 10.55 yr; mean weight: 34.13 kg), referred for a DE chest CT examination indicated in the long-term follow-up of congenital diaphragmatic hernia repaired in the neonatal period. CT angiographic examinations were obtained with a second-generation dual-source CT system (80-140 Sn kV) after injection of a 30-40% contrast agent.
Results: The characteristics of CT angiograms included a mean: (a) z-axis coverage of 26.56 ±4.24 cm (median: 25.60) (range: 20.70-37.90); (b) DLP of 133.0 ± 124 mGy.cm (median: 82) (range: 49-427); (c) noise of 7.58 ± 2.72 HU (range: 3.20 - 14.10); (d) attenuation within the pulmonary trunk of 415.8 ± 132.1 HU (range: 194.3-791.0). Perfusion images were devoid of respiratory motion artifacts in 87% of cases (27/31), showing mild motion artifacts around cardiac cavities in 83% of cases (25/31). Beam-hardening artifacts were found around the superior vena cava (26/31; 84%), the subclavian and inominate veins ipsilateral to the site of injection (19/31; 61%), mainly rated as minimal (23/26 [88%] and 12/19 [39%], respectively). The overall quality of perfusion images was rated as good (12/31; 39%) or excellent (19/31; 61%) with a mean level of attenuation within normal lung of 48.52 ± 18.30 HU and a mean gradient of attenuation between areas of hypo- and normal perfusion of 25.39 ± 9.47 HU.
Conclusion: Perfusion images of diagnostic quality can be generated from DECT in children.

B-0372 14:49

Multi-detector computed tomography of paediatric large airway diseases: comparison between virtual bronchoscopy and fiberoptic bronchoscopy
T.S. Jugpal, A. Garg, J. Kumar, G.R. Sethi; *New Delhi/IN (tejeshwar.jugpal@gmail.com)*

Purpose: The purpose of this study was to detect, localise and characterise various intrinsic and extrinsic lesions of tracheobronchial tree in the paediatric population using multi-detector computed tomography (MDCT) and compare the findings with fiberoptic bronchoscopy.
Methods and Materials: MDCT images were acquired in 35 children (aged 6 months to 16 years) with clinically suspected airway diseases. Computer generated multi-planar reformats (MPRs), minimum intensity projections (MinIPs) and virtual bronchoscopy images were reconstructed. The children subsequently underwent fiberoptic bronchoscopy. The findings were categorised into intraluminal obstruction, extra-luminal compression and dynamic airway compromise.
Results: A total of 29 lesions were detected in 28 children, whereas 7 children had normal airway. MDCT detected 18 intraluminal obstructive and 8 extra-luminal compressive lesions with a sensitivity and specificity of 100%. Additional synechiae was detected on MDCT distal to airway occlusion, which was not visualised on fiberoptic bronchoscopy. Out of the 3 dynamic airway lesions (tracheo-bronchomalacia) only one was detected on MDCT whereas bronchoscopy detected all three cases. The combined sensitivity, specificity, positive and negative predictive value of MDCT in detecting airway diseases were 92.8%, 100%, 100% and 77.8%, respectively.
Conclusion: MDCT including virtual bronchoscopy is a rapid, accurate, non-invasive and reproducible method for evaluation and characterisation of paediatric airway lesions. MDCT also visualize distal lesions of airway, which can be easily missed on fiberoptic bronchoscopy due to a proximal occlusion. However, fiberoptic evaluation of airway is required to accurately detect dynamic airway lesions.

B-0373 14:57

Comparison of organ doses between 70 kVp chest CT and 100 kVp chest CT with a dedicated tin filter for spectral shaping using thermoluminescent dosimeter measurements in a paediatric phantom
C. Hagelstein[1], M. Weis[1], T. Henzler[1], U. Lechel[2], K. Neff[1], G. Brix[2], S.O. Schönberg[1], A. Schegerer[2]; [1]*Mannheim/DE*, [2]*Neuherberg/DE (Claudia.Hagelstein@umm.de)*

Purpose: To compare radiation organ-doses and objective image-quality of a 70 kVp chest-CT protocol and a 100 kVp chest-CT protocol using a dedicated 0.6 mm tin-filter (Sn-filter) for spectral shaping in an anthropomorphic paediatric phantom simulating a 1-year-old child.
Methods and Materials: Organ-doses were measured with 200 thermoluminescent dosimeters (TLDs) placed within the phantom. 70 kVp and 100 kVp-Sn chest-CT were performed on a third generation dual-source CT using automatic tube current modulation with a reference mAs of 50 using a

pitch of 2.0. CTDIvol was recorded and effective radiation dose was calculated according to the ICRP guideline 103. Objective image-quality was evaluated by measuring attenuation and image-noise within the chest.
Results: CTDIvol was lower using the 100 kVp-Sn-protocol compared to the 70 kVp-protocol (CTDIvol: 0.02 mGy vs. 0.06 mGy). Effective radiation dose was reduced by a factor of 2.1 using the 100 kVp-Sn-acquisition (0.064mSv vs. 0.133mSv). All TLD-based measurements were considerably lower using the 100 kVp-Sn-protocol. For example, radiation dose measured from the TLDs placed on the phantom body surface was 3 times lower for the 100 kVp-Sn-acquisition when compared to the 70 kVp-acquisition (0.027 mGy vs. 0.082 mGy) and organ-dose of the thyroid gland was 3.5 times lower (0.083 mGy vs. 0.290 mGy). Attenuation within the chest region of interest remained constant whereas image-noise was elevated by a factor of 1.4 for the 100 kVp-Sn-acquisition.
Conclusion: Paediatric chest-CT performed at 100 kVp with Sn-filter based lower energy photon shielding leads to lower organ-dose levels when compared to an ultra-low kVp chest-CT performed at 70 kVp. Both protocols showed a good image-quality although image-noise was higher for the 100 kVp-Sn-scan.

B-0374 15:05

Feasibility of low dose 18 FDG PET/CT in paediatric oncology
J. Zhang, N. Hall, K. Binzel, M. Natwa, M.V. Knopp; *Columbus, OH/US*
(zhang.538@osu.edu)

Purpose: To demonstrate low-dose FDG PET/CT in paediatric oncology patients based on virtual dose reduction of true clinical scans and clinical demonstration.
Methods and Materials: Clinical care 18 F-FDG (5.9±2.2 MBq/kg) whole-body PET/CT of 33 paediatric patients were acquired on a Gemini TF 64 system at 75±5 min post FDG injection using 3 min/bed. Virtual dose reduction scans were reconstructed from listmode data using 120s, 90s, 60s, 30s, and 15s/bed to simulate lower PET doses at 2/3 Th, 1/2th, 1/3 Th, 1/6th and 1/12th. VOIs were placed on lesions and normal anatomical tissues with quantitative and qualitative assessment performed. Specific phantom experiments were used to validate the methodology of virtual PET simulation. Significant lower FDG dose PET/CT of 5 research adolescents was scanned to validate the proposal.
Results: Although all lesions are visible on the 1/12th dose PET, overall PET image quality appears to be influenced in a multi-factorial way. 30%-60% dose reduction from current SOC FDG is recommended to maintain equivalent quality and PET quantification. An optimized BMI-based FDG administration is recommended (from 40±18 MBq to 177±55 MBq depending on BMIs). A linear "lowest Dose-BMI" relationship is given. Consistent SUVs from 1/12th to full dose PETs were identified (R2 = 1.08, 0.99, 1.01, 1.00 and 0.98). No significant variance of count density, SUV and SNR were found across different frame durations ($p < 0.01$).
Conclusion: Paediatric PET/CT can be performed using current generation time of flight PET/CT systems at substantially lower doses (30-60%) than the SOC in our environment leading to a major dose reduction.
Author Disclosures:
M.V. Knopp: Research/Grant Support; Ohio Third Frontier.

B-0375 15:13

Use of diagnostic computed tomography in paediatric PET-CT: is diagnostic CT essential?
C. Loberg, C. Kuhl, A. Heinzel, F. Mottaghy, F. Verburg; *Aachen/DE*
(cloberg@ukaachen.de)

Purpose: PET/ CT is a well established technique, combining functional information and anatomic imaging in a single study. Paediatric patients are expected to absorb much higher radiation doses than adult patients because of their lower tissue mass compared to adults. The aim was to find out if the diagnostic, contrast enhanced CT-part is essential for diagnosis and follow-up.
Methods and Materials: We reviewed 71 patients who underwent 103 PET-CT examinations between January 2007 and October 2014. 18 F-2-fluoro-2-deoxyglucose (FDG)-PET/CT scans were acquired one hour after injection of weight-adapted median 144 MBq FDG using a Philips Gemini TF 16 PET/CT scanner. Low dose whole body CT was performed without contrast medium for attenuation correction purposes. Subsequently a contrast enhanced diagnostic CT was acquired. Following the CT a PET scan was performed. Images were subsequently read and interpreted by board-certified nuclear medicine physicians and radiologists.
Results: Specificity was significantly higher combining PET and CT compared to stand-alone CT and PET. In assessment of lymph nodes, inflammatory foci and liver lesions diagnostic contrast enhanced CT is essential.
Conclusion: Our study showed that integrated multi-modality imaging with PET/CT leads to an increased specificity compared to stand-alone CT and PET. In addition to published studies our study once more shows that diagnostic contrast-enhanced CT is an essential component of multi-modality imaging for assessment in initial diagnosis and of follow-up and should also be performed in children as the benefits of the radiation exposure are clearly given.

14:00 - 15:30 **Room M 3**

Cardiac

SS 303b
CT perfusion

Moderators:
R. Fischbach; Hamburg/DE
M. Francone; Rome/IT

B-0376 14:00

Quantification of myocardial perfusion defects at third-generation dual-source CT in an ex-vivo porcine heart model
G. Pelgrim[1], S. Van Tuijl[2], K. Slump[3], M. Stijnen[2], M. Oudkerk[1], R. Vliegenthart[1]; [1]*Groningen/NL*, [2]*Eindhoven/NL*, [3]*Enschede/NL*
(gjpelgrim@gmail.com)

Purpose: To differentiate ischemic from normal myocardium using dynamic computed tomography myocardial perfusion imaging (CTMPI) in an ex-vivo porcine heart model.
Methods and Materials: An isolated beating heart model was used to perfuse five porcine hearts (PhysioHeart, LifeTec Group, Eindhoven, The Netherlands) in Langendorff mode. The aortic root was perfused at constant pressure. Blood flow and heart rate were monitored throughout the experiment. Dynamic CTMPI was performed using third-generation dual-source CT (Force, Siemens, Erlangen, Germany), with shuttling mode (70 kV and 350 mAs/rot, 250 ms rotation time), and Z-range of 10.2 cm. A pressure wire was used to monitor induced predefined fractional flow reserve (FFR)-based stenosis grades of 0.90, 0.80, 0.70, 0.60 and 0.50. Dedicated software (VPCT myocardium, Siemens, Germany) was used to determine myocardial blood flow (MBF) (ml/100 ml/min) and myocardial blood volume (MBV) (ml/min) in ischemic and non-ischemic segments, using the 16-segment model.
Results: Heart rate was generally stable (range, 83-115). Model blood flow ranged from 0.8 to 1.2 l/min. Mean MBF for non-ischemic myocardial segments was 75 ml/100 ml/min (range, 34-117 ml/100 ml/min), with a mean MBV of 7.0 ml/100 ml (range, 3.32-12.14). A significant decrease in MBF and MBV was shown for ischemic segments when FFR-based stenosis was < 0.80 (Mann-Whitney U test, $p < 0.05$). For MBV a significant decrease was already found at FFR=0.80.
Conclusion: The Langendorff mode of the PhysioHeart model provides a stable environment to analyse and validate CT perfusion. Quantitative CTMPI can detect FFR-based stenosis < 0.80. Future research will be aimed at determining CTMPI cut-off values to diagnose ischemia.
Author Disclosures:
S. Van Tuijl: Employee; LifeTec Group. **M. Stijnen:** Employee; LifeTec Group.

B-0377 14:08

Computed tomography coronary angiography vs stress cardiac magnetic resonance for the management of symptomatic revascularised patients: a cost effectiveness study
G. Pontone[1], D. Andreini[1], C. Rota[1], M. Guglielmo[1], S. Mushtaq[1], A. Baggiano[1], A. Solbiati[1], A. Guaricci[2], M. Pepi[1]; [1]*Milan/IT*, [2]*Foggia/IT*
(gianluca.pontone@ccfm.it)

Purpose: Computed tomography coronary angiography (CTCA) and stress cardiac magnetic resonance (stress-CMR) are suitable for diagnosing obstructive coronary artery disease (CAD). Aim of this study is comparing the clinical and economic outcomes of using anatomical (CTCA) versus a functional strategy (stress-CMR) in revascularised symptomatic patients for chest pain.
Methods and Materials: 400 revascularised symptomatic patients for chest pain were addressed to CTCA (n:200,mean age 68±10 yo) or stress-CMR (n:200,mean age 66±9yo) and followed-up in terms of downstream non invasive tests, invasive coronary angiography (ICA) and revascularisation procedure, medical costs for CAD management, cumulative effective radiation dose and major adverse cardiac events (MACEs) defined as composite endpoints of non fatal myocardial infarction and cardiac death.
Results: The mean follow-up for CTCA and stress-CMR groups were similar (772±398vs.794±345 days,p:ns). Compared with stress-CMR strategy, CCTA was associated with an increased likelihood of subsequent mean number of

further non-invasive test (1.04 vs. 0.81, $p < 0.01$),cardiac catheterization (40%vs.30%,$p < 0.05$). No differences were found in terms of subsequent percutaneous coronary interventions (PCI) (30%vs.26%, p:0.37) but stress-CMR group was associated with a favorable trend of PCI/ICA rate (86% vs. 75%, p: 0.08) and MACEs (4%vs.8.5%,p:0.06). CTCA strategy showed a higher mean cost per patient (-11%),$p < 0.05$ and a lower mean effective radiation dose (-80%),$p < 0.01$.
Conclusion: Revascularised patients initially evaluated with CTCA after PCI had more downstream non invasive and invasive testing, higher CAD-related spending and effective radiation exposure as compared to patients evaluated with stress-CMR with comparable (MACEs).

B-0378 14:16

Comparison between CT perfusion imaging of the myocardium and intracoronary transluminal attenuation gradient in coronary CT angiography for the assessment of coronary artery stenosis
B.M. Gramer, I. Baur, M. Rasper, M. Rasper, A. Leber; *Munich/DE*

Purpose: To compare the diagnostic accuracy of dynamic first pass CT perfusion (CTP) imaging and the transluminal attenuation gradient (TAG) derived from coronary CT angiography in the assessment of coronary artery stenosis.
Methods and Materials: 34 patients with suspicion of coronary artery disease, who underwent invasive coronary angiography (CA) and assessment of intermediate coronary artery lesions (50-75% diameter reduction) by an invasive pressure wire examination (FFR) were included. All patients underwent a coronary CTA and a dynamic CTP examination under adenosine stress at a 256 slice CT scanner. Myocardial blood flow (MBF) was determined using the dynamic first pass CTP data. TAG was calculated as the linear regression coeffcient between luminal attenuation and the distance of the location in the coronary artery from its origin. MBF and TAG were compared with the results CA and FFR. ROC curves were calculated. Sensitivity and specificity were calculated using Youden´s index.
Results: The area under the ROC curve was 0.92 (0.80 to 0.95) for MBF and 0.64 (0.46 to 0.793) for TAG (p=0.002). The optimal threshold using Youden´s index was 1.51 for TAG and 1.21 for MBF. Sensitivity and specificity for detection of hemodynamically relevant coronary artery lesions were 71.4 (41.9-91.4) and 73.2 (57.1- 85.8) for TAG. Sensitivity and specificity were 90.9 (58.7-98.5) and 84.6 (65.1- 95.5) for MBF.
Conclusion: MBF derived from dynamic CTP imaging of the myocardium is superior compared to the TAG derived from coronary CTA for the assessment of coronary artery stenosis.

B-0379 14:24

Computed tomography angiography and perfusion CT to assess coronary artery stenosis causing perfusion defects
R. Boughrarou; *Algiers/DZ (rafikalinda@hotmail.com)*

Purpose: Multi-detector computed tomography coronary angiography (CTA) is a robust method for the non-invasive diagnosis of coronary artery disease (CAD). However, in its current form; CTA is limited in its prediction of myocardial ischaemia. The purpose of our study was to test whether stress computed tomography myocardial perfusion imaging (CTP), when added to CTA, can predict perfusion abnormalities caused by obstructive atherosclerosis.
Methods and Materials: We conducted a prospective study to evaluate the accuracy of integrated CTA-CTP, using 320 - MDCT.100 patients were included, aged between 23 and 74 years old.The protocol was performed as follows: Rest CT: contrast enhanced scan using prospective triggering.Stress CT: contrast enhanced scan during dipyridamole infusion. CTA was evaluated for stenosis. CTP images were analysed for the transmural differences in perfusion using the transmural perfusion ratio (TPR) and the 17 segments model. The protocol was successfully completed for 100 patients, with an average radiation dose of 14 mSv.
Results: The sensitivity, specificity, positive predictive value and negative predictive value of CTA and CTP to detect obstructive atherosclerosis causing perfusion abnormalities using quantitative angiography and SPECT, as gold standard, was 97%, 57%, 69%, 95% and 94%, 71%, 69%, 95%, respectively.
Conclusion: CTP can identify stress myocardial perfusion defects and provide information on coronary stenosis. The combination of CTA and CTP can detect atherosclerosis causing perfusion abnormalities when compared with quantitative coronary angiography and SPECT.

B-0380 14:32

Optimal timing of static CT iodine distribution scans based on dynamic CT myocardial perfusion imaging data
G. Pelgrim[1], E.R. Nieuwenhuis[1], J.L. Wichmann[2], C.N. De Cecco$_2$, R. Van der Geest[3], K.H. Slump[4], M. Oudkerk[1], J. Schoepf[2], R. Vliegenthart[1]; [1]*Groningen/NL*, [2]*Charleston, SC/US*, [3]*Leiden/NL*, [4]*Enschede/NL (gjpelgrim@gmail.com)*

Purpose: To determine the optimal timing for CT acquisition of myocardial iodine distribution, using dynamic CT myocardial perfusion imaging (CTMPI) as reference.
Methods and Materials: Twenty-five symptomatic patients (59 years (SD±8.4),14 male) were analysed using dynamic stress CTMPI (Definition Flash, Siemens, Germany) at 100 kV and 300 mAs and adenosine perfusion MRI (Magnetom Avanto 1.5 T, Siemens, Germany). Ischemic and non-ischemic segments were determined based on MRI. Hounsfields Units (HU) were monitored over time in myocardial segments. Duration of maximal difference between ischemic versus non-ischemic segments was analysed. Regions-of-interest (ROIs) were drawn in aorta ascendens (AA) and aorta descendens (AD). Interval between predefined threshold of 150 and 250 HU in AA/AD and start of maximal difference in density between (non-)ischemic segments was determined as proxy for scan delay.
Results: Ten patients had an inducible perfusion defect on MRI. A minimal difference of 15 HU between ischemic and non-ischemic segments endured 8.16±0.88s. For AA triggering, scan delay was 3.7 (Interquartile range (IQR)=1.8-5.5) and 2.3s (IQR=0-3.5) for 150 and 250 HU threshold, respectively. For AD triggering only scan delay for 150 HU threshold could be used in bolus tracking with a time delay of 2.32s (IQR=0-3.7). For 250 HU, median AD delay was 0 (IQR=0-0.77).
Conclusion: Perfusion defects in the myocardium can be differentiated best during an interval of 8.16±0.88s. One could either use a test bolus with a delay to peak enhancement in the myocardium or bolus tracking with reference ROI in either the AA or AD.
Author Disclosures:
J. Schoepf: Consultant; Bayer-Schering, Bracco, GE Healthcare, Medrad, Siemens Healthcare. Research/Grant Support; Bayer-Schering, Bracco, GE Healthcare, Medrad, Siemens Healthcare.

B-0381 14:40

Morphological coronary stenosis characteristics by CCTA: comparison with invasive fractional flow reserve
L. Macron, J.-L. Sablayrolles; *Saint Denis/FR (laurentmacron@gmail.com)*

Purpose: The degree of coronary stenosis assessed by CCTA is poorly correlated to its functional significance. The aim of this preliminary study was to identify morphological plaque characteristics by CCTA predictive of functionally significant stenosis defined by an invasive Fractional Flow Reserve < 0.8.
Methods and Materials: Thirty consecutive patients referred for invasive coronary angiography with at least one 30-69% stenosis by QCA indicating FFR measurement and a pre-ICA CCTA were retrospectively included. ICA indication was based on symptoms, CCTA results and/or non-invasive stress test. Degree of stenosis (< or ≥50%), length of stenosis (< or ≥16 mm) and type of plaque (non-calcified, calcified or mixt) were determined by CCTA and correlated to FFR.
Results: No difference between stenosis degree and length measured by CCTA and QCA ($p > 0.78$ and $p > 0.71$, respectively) was found. Moderate stenosis evaluated in CTA and QCA can predict FFR≤0.80 with high sensitivity (1.000; 0.697 - 1.000, 95%, Confidential Interval (CI), $p < .005$), moderate specificity (0.656; 0.545 - 0.656, 95% CI, $p < .005$), 100% accuracy, high Negative Predictive Value (NPV) (1.000; 0.856 - 1.000, 95% CI, $p < .005$), moderate Positive Predictive Value (PPV) (0.476; 0.322 - 0.322, 95% CI, $p < .005$). Moderate stenosis might be clinically severe with FFR≤0.8 if their length ≥16 mm and they are calcified (Probability of contingency, p=0.05, number of cases is insufficient).
Conclusion: Correlation and contingency between clinical severity of moderate stenosis with FFR≤0.80 and length of stenosis ≥16 mm in calcified arteries have to be studied with appropriate number of cases.

B-0382 14:48

Adenosine triphosphate stress dynamic perfusion CT imaging to identify myocardial ischemia: correlation with coronary CTA and invasive coronary angiography
E. Tahir[1], T. Kido[1], Y. Tanabe[1], N. Fukuyama[1], T. Kido[1], J. Yamamura[2], G.K. Lund[2], G. Adam[2], T. Mochizuki[1]; [1]*Toon, Ehime/JP*, [2]*Hamburg/DE (e.tahir@uke.de)*

Purpose: To study the CT attenuation-based ischaemia evaluation of myocardium with normal and stenotic coronaries using whole heart dynamic myocardial perfusion imaging (CTP).

Methods and Materials: 30 patients underwent ATP stress dynamic CTP without table movement using a 256-slice MDCT and both CCTA and invasive coronary angiography (ICA). Dynamic CTP (whole heart datasets with 20 sample times in 40 beats in systole) was acquired with prospective ECG-gating. Obstructive CAD was defined as more than 50% stenosis on CTA or ICA, respectively. Quantitative CTP assessment of myocardium was performed according to the AHA 16 segment model. Myocardial peak CT attenuation value (HU), peak enhancement value (ΔHU), enhancement ratio (peak myocardial enhancement ΔHU / peak aortic enhancement ΔHU) and time to peak (ttp) enhancement were evaluated.
Results: On CCTA 40 segments were classified as normal, 29 had coronary stenosis and 7 were excluded. CAG: 20 normal and 21 stenotic vessels. CCTA defined normal and ischemic myocardium showed mean peak CT attenuation values of 154±24 HU vs. 142±27 HU ($p < 0.05$), enhancement values of 100±23ΔHU vs. 87±25ΔHU ($p < 0.05$), enhancement ratios of 0.21±0.03 vs. 0.18±0.04 ($p < 0.01$) and ttp enhancement of 8.9±2.5s vs. 8.05±1.0s (p=0.49). ICA defined normal and ischemic myocardium showed mean peak CT attenuation values of 149±27 HU vs. 142±34 HU ($p < 0.05$), enhancement values of 95±25ΔHU vs. 87±32ΔHU (p=0.39), enhancement ratios of 0.19±0.03 vs. 0.17±0.05 ($p < 0.05$) and ttp enhancement 8.3±1.5s vs. 8.2±1.0s (p=0.67).
Conclusion: Ischaemic myocardium in the territory of stenotic coronary arteries can be identified using cut-off points for peak CT attenuation, enhancement and ehancement ratio.

B-0383 14:56

Acceptance of combined coronary CT angiography and myocardial CT perfusion versus conventional coronary angiography in patients with coronary stents

S. Feger[1], M. Rief[1], P. Martus[2], M. Laule[1], M. Dewey[1], E. Schönenberger[3]; [1]*Berlin/DE*, [2]*Tübingen/DE*, [3]*Hannover/DE (sarah.feger@charite.de)*

Purpose: To evaluate how well patients with coronary stents accept combined coronary computed tomography angiography (CTA) and myocardial CT perfusion (CTP) compared with conventional coronary angiography (CCA). While combined CTA and CTP may improve diagnostic accuracy compared with CTA alone, patient acceptance of CTA/CTP remains to be defined.
Methods and Materials: A total of 90 patients with coronary stents prospectively underwent CTA/CTP (both with contrast agent, CTP with adenosine) and CCA as part of the CARS-320 study. In this group, an intraindividual comparison of patient acceptance of CTA, CTP, and CCA was performed.
Results: CTP was experienced to be significantly more painful than CTA ($p < 0.001$) and was associated with a higher frequency of dyspnea ($p < 0.001$). Comparison of CTA/CTP with CCA revealed no significant differences in terms of pain (p=0.141) and comfort (p=0.377). Concern before CTA/CTP and CCA and overall satisfaction were likewise not significantly different (p=0.097 and p=0.123, respectively). Nevertheless, about two thirds (n=60, 68%) preferred CTA/CTP to CCA ($p < 0.001$). Moreover, patients felt less helpless during CTA/CTP than during CCA (p=0.026). Lack of invasiveness and absence of pain were the most frequently mentioned advantages of CTA/CTP over CCA in our patient population.
Conclusion: CCA and combined CTA/CTP are equally well accepted by patients; however, more patients prefer CTA/CTP. CTP was associated with more intense pain than CTA and more frequently caused dyspnea than CTA alone.
Author Disclosures:
M. Dewey: Author; Heisenberg Program of the DFG for a professorship (DE 1361/14-1), the FP7 Program of the European Commission for the randomised multicenter DISCHARGE trial (603266-2, HEALTH-2012.2.4.-2), the European Regional Development Fund (20072013 2/05, 20072013 2/48), the German Heart Foundation/German Foundation of Heart Research (F/23/08, F/27/10), the Joint Program from the German Research Foundation (DFG) and the German Federal Ministry of Education and Research (BMBF) for meta-analyses (01KG1013, 01KG1110, 01KG1110), GE Healthcare, Bracco, Guerbet, and Toshiba Medical Systems. Prof. Dewey has received lecture fees from Toshiba Medical Systems, Guerbet, Cardiac MR Academy Berlin, and Bayer (Schering-Berlex). He is a consultant to Guerbet, and one of the principal investigators of multi-center studies (CORE-64 and 320) on coronary CT angiography sponsored by Toshiba Medical Systems. He is also the editor of Coronary CT Angiography, and Cardiac CT, both published by Springer, and offers hands-on workshops on cardiovascular imaging (www.CT-kurs.de). Prof. Dewey is an associate editor of Radiology and European Radiology. Other; Institutional master research agreements exist with Siemens Medical Solutions, Philips Medical Systems, and Toshiba Medical Systems, the terms of these arrangements are managed by the legal department of Charité – Universitätsmedizin Berlin.

B-0384 15:04

Potential usefulness of cardiac output and total peripheral resistance as indicators of adequate vasodilation in myocardial perfusion imaging

N. Nagasawa, K. Kitagawa, A. Yamazaki, H. Sakuma; *Tsu/JP (nagasawa@clin.medic.mie-u.ac.jp)*

Purpose: In myocardial perfusion imaging, adequate vasodilatation is essential for accurate assessment of myocardial ischemia. Heart rate (HR) and systolic blood pressure (SBP) are commonly used to monitor the effect of vasodilator and trigger a tracer injection. However, more reliable indicator of vasodilation is warranted since change of HR and SBP from baseline is relatively small and often fluctuates. The purpose of this study was to investigate the potential usefulness of cardiac output (CO) and total peripheral resistance (TPR) as indicators of adequate vasodilation.
Methods and Materials: Fourteen patients (66.8±13.3 years, 9 males) with suspected coronary artery disease underwent dynamic myocardial perfusion CT with vasodilator infusion using a dual-source CT scanner (Definition Flash; Siemens, Forchheim, Germany). CO and TPR at baseline and during the vasodilator infusion were measured by using noninvasive, continuous whole-body bioimpedance system (NICaS; NI Medical, Hod-Hasharon, Israel). Myocardial blood flow was quantified using the hybrid deconvolution and maximum slope method.
Results: Adequate response to vasodilator infusion was confirmed in all patients by high myocardial blood flow quantified by dynamic stress perfusion CT (125.8±22.8 mL/min/100 g). HR and CO increased significantly during vasodilation by 11.2±7.5 bpm and 1.4±1.0L/min, or 18.0±12.5% and 28.0±17.3%, respectively (p=0.0001 and 0.0002). Significant decrease of TPR by 397±230dn*s/cm5 or 20.0±9.8% was also observed (p=0.00002), while SBP showed no significant change.
Conclusion: Hemodynamic response to vasodilator infusion can be monitored by both CO and TPR. Further research is required to determine the usefulness of these indices for triggering the tracer injection in comparison with HR and SBP.

B-0385 15:12

Optimal scan delay time for quantitative CT myocardial perfusion imaging

N. Nagasawa, K. Kitagawa, A. Yamazaki, H. Sakuma; *Tsu/JP (nagasawa@clin.medic.mie-u.ac.jp)*

Purpose: Quantitative myocardial perfusion imaging (MPI) by computed tomography (CT) was recently introduced to calculate myocardial blood flow (MBF). Timing bolus method is often used to determine the contrast arrival time in each patient because it is essential to acquire baseline CT values for MBF quantification. However, use of timing bolus is associated with additional complexity, radiation and contrast medium. The purpose of this study was to investigate a fixed scan delay time for quantitative CT MPI which can be universally employed.
Methods and Materials: Timing bolus data in 135 consecutive patients who underwent dynamic "shuttle mode" CT MPI using 2nd generation dual-source CT was analysed. Timing bolus was performed by injecting 10 ml of contrast material (Iopamiron 370, Bayer) followed by saline flush (20 ml) at a rate of 5 ml/sec. Contrast arrival time in the ascending aorta from the start of bolus injection was measured using the time-attenuation curve of the timing bolus.
Results: Dose-length product associated with timing bolus method was 20.7±3.6 mGy•cm. Contrast arrival time in the ascending aorta was 12.5±1.9 (9 to 19) seconds. Since it takes max 4.9 seconds (4 heart beats at 61 bpm) to obtain one dynamic image dataset using the shuttle mode, fixed delay of 4 seconds ensures acquisition of at least one baseline perfusion image dataset before arrival of contrast medium.
Conclusion: Use of fixed delay time of 4 seconds can reduce complexity, radiation and contrast medium required for quantitative CT MPI by eliminating the need of timing bolus method.

B-0386 15:20

Relationship of cardiovascular risk factors to myocardial perfusion parameters using dynamic computed tomography myocardial perfusion imaging

G. Pelgrim[1], R. Vliegenthart[1], F.G. Meinel[2], J.L. Wichmann[3], F. Pugliese[4], C.N. De Cecco[3], M. Oudkerk[1], J. Schoepf[3]; [1]*Groningen/NL*, [2]*Munich/DE*, [3]*Charleston, SC/US*, [4]*London/UK (gjpelgrim@gmail.com)*

Purpose: To analyse normal myocardial perfusion values using dynamic computed tomography myocardial perfusion imaging (CTMPI) and relationship with cardiovascular risk factors.
Methods and Materials: In total, 98 patients (74 male; mean age±standard deviation [SD], 59.1±8.8 yrs) were included from a multi-center registry of patients suspected of coronary artery disease. Patients underwent both CT angiography and dynamic stress CTMPI using second-generation dual-source CT (Definition Flash, Siemens, Erlangen, Germany). Scans were visually analysed for stenosis > 50% and perfusion defects, and patients with ischemic

myocardial segments were excluded. Patient demographics were collected from patient records. CTMPI data were analysed for quantitative perfusion parameters like myocardial blood flow (MBF), myocardial blood volume (MBV) and volume transfer constant (Ktrans).
Results: Out of the 98 patients, 15 had a coronary stenosis. Overall, mean MBF was 139.3±31.4 mL/100 mL/min, MBV 19.1±2.7 mL/100 mL, and Ktrans 85.0±17.5 mL/100 mL/min. No significant differences for the different MPI parameters were found by gender. Hypertension and type-2-diabetes showed significantly lower MPI parameters (hypertension vs no hypertension: MBV 18.5±3.0 vs 19.7±2.3 mL/100 mL, $p < 0.05$; and diabetes vs no diabetes: MBF 128.5±31.5 vs 144.0±30.5 mL/100 mL/min). In patients with hyperlipidemia, MBF was significantly higher ($p < 0.05$). Smoking and family history did not show significant CTMPI differences.
Conclusion: CTMPI analysis can potentially identify early perfusion effects in pathological conditions like diabetes and hypertension. No significant differences were found for age, gender, smoking and family history. Standardization of quantitative measurements may help to stratify risks in patients without gross perfusion defects.
Author Disclosures:
J. Schoepf: Consultant; Bayer-Schering, Bracco, GE Healthcare, Medrad, Siemens Healthcare. Research/Grant Support; Bayer-Schering, Bracco, GE Healthcare, Medrad, Siemens Healthcare.

14:00 - 15:30 **Room M 4**

Neuro

SS 311b
Dementia

Moderators:
N. Pyatigorskaya; Paris/FR
M.A. van Buchem; Leiden/NL

B-0387 14:00

The clinical impact of 18 F-fluorodeoxyglucose (FDG) positron emission tomography/computed tomography (PET/CT) in patients with cognitive impairment
H. Motara[1], T. Olusoga[2], G. Russell[3], S. Jamieson[1], S. Ahmed[2], A. Pillai[3], A. Scarsbrook[1], C. Patel[1], F. Chowdhury[1]; [1]*Leeds/UK*, [2]*Harrogate/UK*, [3]*Saltaire/UK (motaraharoon@hotmail.com)*

Purpose: This study evaluated the clinical impact of brain FDG PET/CT performed in a selective manner in patients with cognitive impairment at a tertiary referral centre in the UK. It also assessed the accuracy of FDG brain imaging to correctly establish the diagnosis of Alzheimer's Dementia (AD) in a 'real-world' clinical practice.
Methods and Materials: Using the institutional radiology database, a total of 136 patients were identified for inclusion in the study. FDG scans were performed using a consistent methodology and interpreted by dual-trained radiologists and nuclear medicine physicians. Standardised questionnaires were sent to the referring clinicians to establish the final clinical diagnosis and to obtain information about subsequent management and outcome.
Results: There was a 72% questionnaire return (98/136), with mean patient follow-up of 471 (SD 205) days. FDG PET/CT had an impact on patient management in 81%, adding confidence to the pre-test diagnosis in 43%, changing the pre-test diagnosis in 35%, reducing the need for further investigations in 42%, and resulting in a change in therapy in 32%. There was high correlation between the PET diagnosis and final clinical diagnosis with a correlation coefficient of 0.78 ($p < 0.0001$). The accuracy of FDG imaging in diagnosis of AD was 94%, with a sensitivity of 87% (CI 69.2-95.8) and a specificity of 97% (CI 88.7-99.5).
Conclusion: FDG PET/CT brain imaging has a significant clinical impact when performed selectively in patients with unexplained cognitive impairment and shows high accuracy in the diagnosis of AD in a 'real-world' clinical practice.

B-0388 14:08

Medial temporal lobe atrophy grades in a homogeneous 75-year-old cognitively normal population
V. Velickaite[1], J. Kullberg[1], L. Cavallin[2], L. Lind[1], H. Ahlström[1], L. Kilander[1], E. Westman[2], E.-M.B. Larsson[1]; [1]*Uppsala/SE*, [2]*Stockholm/SE (vilma.velickaite@akademiska.se)*

Purpose: To evaluate medial temporal lobe atrophy (MTA) grade and to establish normal values for visual scoring of MTA in a cognitively normal 75-year-old population.
Methods and Materials: In a prospective population-based study, 370 individuals with MMSE score > 26 were examined with magnetic resonance imaging (MRI) of the brain at the age of 75 years. From a sagittal T1-weighted 3D gradient echo sequence, coronal images, angled along the posterior contour of the brainstem, were reconstructed and used for the evaluation. Visual scoring of MTA was done by 2 neuroradiologists using the Scheltens scale (range from 0-4, where 4 is the most severe atrophy).
Results: Inter-rater reliability was good for the right side and very good for the left side. MTA grade 1 was seen on the worst side in 45% of the individuals, grade 2 in 40%, grade 3 in 13% and grade 4 in 1 %. Different grades of atrophy on the left and right side were found in 40% and the difference was 1 grade.
Conclusion: MTA grade 2 is often seen in cognitively normal individuals at age 75 years. Care should be taken not to diagnose dementia based on MTA grade only, since 54% of the cognitively normal individuals had MTA grade ≥2. We propose that the highest MTA grade for each individual is used in clinical practice.

B-0389 14:16

The role of quantitative MR R2* brain iron deposition in patients with Alzheimer disease and its correlation with cerebral perfusion
R. Esposito, M. Maccarone, S. Salice, G. Caracciolo, S. Delli Pizzi, L. Valentino, P. Chiacchiaretta, A. Ferretti, A. Tartaro; *Chieti/IT (resposito1979@gmail.com)*

Purpose: Cerebral iron deposition plays a key role in Alzheimer Disease (AD) and is elevated in cortical and subcortical regions. Higher iron concentrations in AD may increase free iron catalysing lipid peroxidation leading to cell membrane damage. The study aims to investigate the correlation of brain iron accumulation with the severity of vascular damage and cerebral perfusion.
Methods and Materials: 18 mild AD patients evaluated by means of neuropsychological tests were enrolled in the study and compared with 18 aged matched healthy volunteers. Iron concentration was derived from R2* measurements obtained with multi-echo gradient sequences (slice thickness 4 mm, TR= 68 ms; TE=4.9 ms, delta TE=4.9 ms) from 14 ROI in cortical and subcortical regions. Cerebral blood flow (CBF) was obtained by means of a pseudocontinuous Arterial Spin Labeling (pCASL; T2* EPI; TR/TE = 4000/11 ms). Vascular damage was evaluated on conventional images according to Fazekas scale.
Results: R2* shows a significant correlation with the severity of white matter vascular damage in the right frontal cortex ($p > 0.05$) and with Mini Mental State Examination (MMSE; $p < 0.02$) in the left frontal cortex in AD group. CBF modifications in AD patients shows a significant correlation with vascular damage ($p < 0.05$) in the left lateral orbito-frontal cortex. Moreover a significant decreased CBF was observed in bilateral nucleus caudatus in AD group ($p < 0.05$).
Conclusion: Iron concentration positively correlates with the severity of vascular damage and negatively correlates with CBF in AD patients and it may be used as biomarkers to evaluate AD progression.

B-0390 14:24

Microinfarcts detected on MRI - another important imaging biomarker in cognitive impairment?
S. Shams[1], M. Larvie[2], M. Lev[2], J. Martola[1], A. Charidimou[2], M. Kristoffersen Wiberg[1], L.-O. Wahlund[1]; [1]*Stockholm/SE*, [2]*Boston, MA/US (sara.shams@ki.se)*

Purpose: Microinfarcts have prior been studied histopathologically, and on 7.0T MRI. Recent evidence has however proven that microinfarcts can be detected on routine 3.0 T clinical MRI scans. The prevalence and associations of microinfarcts in cognitive impairment on 3.0 T MRI is however undetermined, and the implications and associations is unknown.
Methods and Materials: Recruited patients (n=370) underwent memory investigation as well as a 3.0 T MRI scan. All MRIs were analysed for cortical microinfarcts (CMI) as well as acute microinfarcts (AMI). CMI were rated according to a new scale for 3.0 T derived from 7.0T MRI and histopathological analysis. Microinfarcts were defined as hypointense on T1-MPRAGE, perpendicular to the cortex and under 5 mm in size, and hyperintense or isointense on FLAIR. AMI were rated and defined as small hyperintense dots on DWI. Associations between CMI and AMI and imaging markers and clinical parameters were determined with generalized linear models.
Results: The prevalence of CMI was 43%, and AMI 5% in the whole cohort. A high number of CMI, but not AMI, was associated with high age (B=0.2, P=0.02), and lower cognitive score (B=-0.05, P=0.002). Similarly, a high number of CMI, but not AMI, showed associations with lower amyloid levels in the cerebrospinal fluid (B=-0.02, P=0.001). No associations were seen with other imaging markers and clinical parameters for both CMI and AMI.
Conclusion: CMI is common in a memory clinic cohort and may prove to be an important imaging marker of neurodegeneration.

B-0391 14:32

Analysis of hippocampal subfield in patients with mild Alzheimer's disease

Y. Liu, H. Yuan, X. Zeng, Z. Wang; *Beijing/CN (lyyulia@163.com)*

Purpose: The aim of this study is to evaluate the atrophy pattern of hippocampal subfield in patients with mild Alzheimer's disease (AD) by using automatic segmentation tool.
Methods and Materials: Patients with AD (n=11, mean age 75.50±7.04 years) were recruited. Mean MMSE scores were (23.40±1.78), mean CASI scores were (82.70±5.32). Health controls (n=10, mean age 69.50±6.91 years) were recruited. Mean MMSE scores were (29.38±0.52), mean CASI scores were (97.6±1.60). MRI examinations were performed, the acquisition parameters: T1 MPRAGE [TR=2530 ms, TE= 3.44 ms, slice thickness=1 mm, voxel size=1.0×1.0×1.0 mm3, scan time= 6 min3sec]. T2WI TSE cor[TR= 4140 ms, TE= 97 ms, slice thickness= 2 mm, voxel size= 0.6×0.5×2.0 mm3, scan time=5 min20sec]. Automatic Segmentation of Hippocampal Subfields (ASHS, http://www.nitrc.org/projects/ashs/) was used to analyse data.
Results: 1. Compared to health controls, we found significant decrease of hippocampal subfield in mild AD patients in bilateral cornu Ammomis 1 (CA1) (L:p=0.025, R:p=0.001), bilateral subculum (SUB)(L:p=0.005, R:p=0.000), bilateral dentate gyrus (DG)(L:p=0.048, R:p=0.004),bilateral perirhinal cortex (L:p=0.022, R:p=0.001),right CA2 (p=0.011), right entorhinal cortex (ERC)(p=0.005). There were no significant differences in intracranial volume (ICV) ($p > 0.05$).
2. There were positive correlation in right CA1 (r=0.505), right SUB (r=0.676), right ERC (r=0.509), right perirhinal cortex (r=0.520) with MMSE scores. There were positive correlation in left SUB (r=0.519), right CA1 (r=0.636), right DG (r=0.506), right SUB (r=0.686), right perirhinal cortex (r=0.537) with CASI scores.
Conclusion: Volumes of hippocampal subfield decreased in mild AD patients and were positive correlation with clinical scores. Substructures of hippocampal might serve as a good index to characterise subtle changes in AD patients.

B-0392 14:40

Brain MR pallidal index do not correlate with clinical functional scale in extrapiramidal syndromic cirrhotic patients

E. Soligo, A. Stecco, M. Carecchio, R. Matheoud, A. Carriero; *Novara/IT (eleonora.soligo@alice.it)*

Purpose: It has long been appreciated that Magnetic Resonance Imaging can reveal T1-weighted hyperintensity in basal ganglia, mostly in the globus pallidus, in patients with chronic liver disease and predominant motor signs, such as Parkinsonism. Our study tries to determine correlations with this change of brain intensity and neurological signs evaluated by UPDRS Score.
Methods and Materials: T1-weighted MR images were acquired from 13 patients, valuated by neurologist and internist. From MRI scans the signal intensity of the globus pallidus were calculated using the pallidal index (PI), the ratio of globus pallidus to subcortical frontal white-matter signal intensity in axial plane multiplied by 100. On a single slice a standardized region of interest (5 mm^2) in the globus pallidus was chosen and in the subcortical frontal white-matter and after was measured mean signal from each region on the console.
Results: In our small group of patients PI did not correlate with UPDRS Score (p=0.7) and PI is affected neither by the time since onset of neurological signs (p=0.4) or since diagnosis of cirrhosis (p=0.9).
Conclusion: In spite of the evidence of brain changes in these group of patients our investigation does not show that PI increases in advanced stage liver disease or in patients with severe motor signs.

B-0393 14:48

Altered brain connectivity in dementia: a correlation study between functional and structural data

V. Onofrj[1], F. Piludu[1], F. Vecchio[1], F. Miraglia[1], G. Granata[1], M. Caulo[2], P. Bramanti[3], P.M. Rossini[1], C. Colosimo[1]; [1]*Rome/IT*, [2]*Chieti/IT*, [3]*Messina/IT (valeriaonofrj@gmail.com)*

Purpose: White matter alterations of limbic and fronto-temporal connection and temporo-parietal cortex thinning have been consistently described in Alzheimer disease (AD) and mild cognitive impairment (MCI). A relatively new approach based on resting state EEG found consistent patterns of cortical functional connectivity abnormalities in AD and MCI. With the present study we compare data of cortical thickness, DTI analysis and functional cortical network of resting EEG. We hypothesize that microstructural changes in white matter structures related to memory function, cortical thickness and functional cortical network of resting EEG could be interrelated in a detectable pattern that may reflect early changes in MCI.
Methods and Materials: A dataset of 32 aMCI patients and 13 age-matched controls underwent Tract-based spatial statistics (TBSS) for global DTI analysis and surface-based cortical thickness analysis. EEG recordings of the 32 patients were analysed and weighted and undirected networks were built by the eLORETA solutions of the cortical sources' activities.
Results: Patients showed reduced FA values compared to controls ($p < 0.02$), suggesting reduced structural connectivity mostly in the left cingulum, precuneus and the callosum. No statistical correlation was found between DTI analysis and cortical thickness analysis. Patterns of significant correlation were found between FA values of limbic structures and EEG bands amplitude values.
Conclusion: Correlation analyses indicated convergence among white matter structural connectivity and functional cortical connectivity detected on EEG. However these findings were not correlated to cortical thickness data. DTI analysis may represent a marker of neurodegenerative dysfunction, possibly preceding atrophy.

B-0394 14:56

Iterative metal artifact reduction in computed tomography following deep-brain-stimulation (DBS) surgery

J. Aissa, J. Boos, C. Schleich, R. Lanzman, P. Kröpil, G. Antoch, C. Thomas; *Düsseldorf/DE (joel.aissa@med.uni-duesseldorf.de)*

Purpose: The purpose of this study was to assess the impact of the novel iterative MAR technique (iMAR) on image quality and diagnostic performance in the follow-up of patients with surgically implanted DBS-electrodes. We hypothesized that artifact burden can be reduced and subjective image quality can be increased using the novel iMAR technique compared to the standard weighted filtered back projection (WFBP).
Methods and Materials: Seventeen patients who had received routine intraoperative CT of the head following implantation of DBS electrodes between March 2015 and June 2015 were retrospectively included. Raw data of all patients was reconstructed with standard filtered back projection and additionally with the iMAR algorithm. For quantitative evaluation, we measured frequencies of density changes to assess artifact reduction. For evaluation of qualitative image quality we scored the visibility of numerous cerebral anatomic landmarks, evaluated the exact intracerebral detectability of electrodes localisation/differentiation and the artifact strength overall and adjacent to the electrodes.
Results: Quantitative artifact reduction revealed that images reconstructed with iMAR contained significantly less metal artifacts compared to the WFBP reconstructed images ($p < 0.05$). Qualitative image analysis showed significantly improved image quality for iMAR compared to WFBP ($p < 0.05$).
Conclusion: Reconstructions of head CT images using the novel iMAR algorithm in patients following DBS-implantation allows an efficient reduction of metal artifacts near DBS electrodes compared to WFBP reconstructions. We demonstrated an improvement of quantitative and qualitative image quality of iMAR compared to WFBP in patients with DBS-electrodes.

B-0395 15:04

Alterations of white matter integrity in HIV-associated neurocognitive disorder: a tract-based spatial statistics study

S. Oh[1], W. Lee[2], N.-Y. Shin[2], S.-K. Lee[2], S. Lim[2]; [1]*Cheonan/KR*, [2]*Seoul/KR (oasis1979@gmail.com)*

Purpose: To investigate the differences in integrity of white matter (WM) between the patients with HIV-associated neurocognitive disorders (HAND) and HIV-infected patients without cognitive impairment.
Methods and Materials: Twenty-two HIV-infected patients (10 with HAND and 12 without HAND) and 11 healthy controls were enrolled in this study. Whole brain analysis of fractional anisotropy (FA), mean diffusivity (MD), radial diffusivity (RD) and axial diffusivity (AD) was performed by Tract-Based Spatial Statistics (TBSS) to localise abnormal WM regions between groups.
Results: Compared with healthy controls, HAND group showed increased MD in the bilateral superior and posterior corona radiate, left cingulum, right superior longitudinal fasciculus, left body and splenium of corpus callosum, bilateral posterior limbs and retrolenticular parts of internal capsules, bilateral posterior thalamic radiations, bilateral cerebral peduncles, bilateral sagittal striata and bilateral cerebellar peduncles and medial lemniscus. HAND group also showed increased RD in the right corona radiata, right superior longitudinal fasciculus, right internal capsule, right posterior thalamic radiation, right sagittal striatum, bilateral superior and middle cerebellar peduncles and left medial lemniscus. Trail Making Test (TMT) A raw score showed negative correlation with MD of WM tracts in the right anterior superior corona radiate, right internal capsule, right cerebral peduncle, left posterior corona radiata and posterior thalamic radiation, bilateral medial lemniscus, bilateral middle cerebellar peduncle, bilateral corticospinal tract.
Conclusion: Widespread WM tract alteration was noted in HIV-infected patients with HAND. The WM tract alterations were suspected to be associated with neurocognitive function in patients with HAND.

B-0396 15:12

Changes of systolic cerebrospinal fluid flow in patients with normal pressure hydrocephalus exceed age-related alterations

S. Stoecklein[1], S. Lause[1], A. Pomschar[1], R. Schniepp[1], S. Lee[2], K. Jahn[1], N. Alperin[2], B. Ertl-Wagner[1]; [1]*Munich/DE*, [2]*Miami, FL/US*
(sophia.stoecklein@med.uni-muenchen.de)

Purpose: Idiopathic normal pressure hydrocephalus (iNPH) is a potentially treatable cause of dementia, and should therefore be diagnosed as soon and precisely as possible. However, the interpretation of radiologic signs of iNPH is often impeded by coinciding age-related alterations such as atrophy and microangiopathy. The purpose of the present work was to identify an MR-based flow measure that can discriminate iNPH patients from age-matched controls.
Methods and Materials: 10 patients with iNPH (mean age=74.4, STD=6.2, 8 female), 18 age-matched healthy control subjects (HCO, mean age=71.1, STD=5.2, 11 female), and 14 young control subjects (HCY, mean age=21.6, STD=1.7, 8 female) were studied using a 3.0 T MR scanner (Siemens Healthcare, Erlangen, Germany). Cine phase-contrast images were acquired to quantify the systolic CSF flow rate (CSFmax) and arterial cerebral blood flow rates (ACBmax).
Results: CSFmax was significantly decreased in iNPH patients as compared to age-matched controls ($p < 0.01$), and significantly decreased in elderly as compared to young healthy controls ($p < 0.01$, Figure 1). Although ACBmax did not differ significantly between any of the three groups ($p < 0.05$ respectively), we defined a CSFmax/ACBmax ratio to account for potential differences in ACBmax. This ratio was also significantly decreased in patients as compared to their age-matched controls, and significantly decreased in elderly as compared to young healthy controls ($p < 0.01$, respectively).
Conclusion: Reduction of CSFmax exceeded age-related changes in iNPH patients, even when accounting for arterial blood flow rates, and might therefore serve as a robust and easily obtainable MR-based measure that may support the diagnosis of iNPH.

B-0397 15:20

Rating scores of medial temporal atrophy from CT and MR images are highly correlated

D. Van Westen[1], M. Johnsson[2], C. Håkansson[1], L. Minthon[3], O. Lindberg[3], S. Palmqvist[3], O. Hansson[3]; [1]*Lund/SE*, [2]*Trelleborg/SE*, [3]*Malmö/SE*
(Mikael.Johnsson@skane.se)

Purpose: Visual assessment of medial temporal lobe atrophy (MTA), a morphological hallmark of Alzheimer´s disease, is commonly performed using the Scheltens rating scale. While the rating scale originally was developed for MR, CT scans are more readily available in the clinic. Here, we compare MTA ratings from CT to MR and relate these to hippocampal volume and cognition.
Methods and Materials: In total 116 individuals (mean 70.9 years, 60 males) with subjective (n=28) and objective (n=88) cognitive decline were included (Swedish BioFINDER study, www.biofinder.se). MR examinations included coronal MPRAGE and CT examinations routine coronal reconstruction. The mean interval between CT and MR was 168 days. The left and right MTA score were assessed independently for CT and MRI and mean MTA was calculated.
Results: MTA from CT was higher than from MR (mean MTA 1.02 and 0.88 respectively, $p < 0.001$), but these correlated well (mean MTA: R=0.888, $p < 0.001$). Both correlated with hippocampal volume (mean MTA from CT -0.512 and from MR -0.489, $p < 0.001$ for both) and with the ADAS-3 cognitive test of delayed recall (0.198 for CT and 0.208 for MR, $p < 0.05$). Intra-rater reliability was high, albeit higher for MR (intraclass correlation coefficient 0.79 for CT and 0.9 for MR).
Conclusion: Our results suggest that MTA rated from CT is comparable to MR, although the CT rating tends to be somewhat higher. This was in most cases due to the choroid fissure being less welldefined on CT and might be rated as widened, although this was not the case on MR.

14:00 - 15:30 **Room M 5**

Neuro

SS 311c

Neurovascular interventions (1)

Moderators:
A. Biondi; Besancon/FR
H.P. Schemuth; Essen/DE

K-08 14:00

Keynote lecture

A. Biondi; Besancon/FR

B-0398 14:09

Results of the acute recanalisation of thrombo-embolic ischaemic stroke with pREset (ARTESp) trial

W. Kurre[1], B. Schwaiger[2], A. Gersing[2], T. Niederstadt[3], W. Reith[4], S. Felber[5], S. Prothmann[2]; [1]*Stuttgart/DE*, [2]*Munich/DE*, [3]*Münster/DE*, [4]*Homburg/DE*, [5]*Koblenz/DE (wiebke.kurre@gmx.de)*

Purpose: ARTESp is a prospective, multicentre, observational trial to evaluate the safety and efficacy of the pREset stent-retriever for the treatment of intracranial embolic vessel occlusion (clinicaltrials.gov identifier: NCT02437409).
Methods and Materials: Patients presenting with an intracranial large vessel occlusion within six hours of symptom onset were consecutively included in four stroke centres. Recanalisation was assessed using the o-TICI score considering ≥2b successful. Device-related adverse events (AE) were recorded and post-treatment imaging was screened for parenchymal haematoma (PH) and subarachnoid haemorrhage (SAH). Any haemorrhage causing a clinical deterioration was classified as symptomatic. The NIHSS was assessed at 24-72 hours and at discharge. Primary outcome measure was the mRS at 90 days considering mRS 0-2 as a favourable outcome.
Results: Overall 100 patients [mean age 68 years (range 24-91), median NIHSS 15 (range 5-29)] with 101 target vessels were included. Target vessels were located in the anterior circulation in 91%. Successful recanalisation with pREset alone was achieved in 88% requiring an average of 1.8 passes. AE consisted of 3 (3%) contrast extravasations, 3 (3%) emboli to a new, and 3 (3%) to the same territory and 3 (3%) vasospasms. Only one embolic event was clinically symptomatic. Post-treatment imaging revealed 7 (7%) SAH, 7 (7%) PH and 1 (1%) remote subdural haematoma. Four (4%) haemorrhages were symptomatic. The median NIHSS decreased to 5 (0-42) at 24-72 hours and 2 (0-27) at discharge. Favourable clinical outcome was seen in 61%, and 7% had died.
Conclusion: Intracranial thrombectomy with the pREset stent-retriever proved to be safe and effective under controlled study conditions.
Author Disclosures:
W. Kurre: Consultant; phenox. **W. Reith:** Consultant; phenox. **S. Felber:** Consultant; phenox. Other; proctor phenox. **S. Prothmann:** Other; proctor phenox.

B-0399 14:17

Impact of patient transfer on clinical outcome after endovascular recanalisation - analysis from the acute recanalisation of thrombo-embolic ischaemic stroke with pREset (ARTESp) trial

W. Kurre[1], B. Schwaiger[2], A. Gersing[2], W. Reith[3], T. Niederstadt[4], S. Felber[5], S. Prothmann[2]; [1]*Stuttgart/DE*, [2]*Munich/DE*, [3]*Homburg/DE*, [4]*Münster/DE*, [5]*Koblenz/DE (wiebke.kurre@gmx.de)*

Purpose: Access to endovascular stroke therapy is limited due to technical and human resource requirements. Eligible patients frequently need secondary transfer. Our aim was to determine the impact of transfer on outcome in the ARTESp trial population.
Methods and Materials: We included 91 patients with pre-stroke mRS ≤1 from the ARTESp trial. Patients were divided into primary (PA) and secondary (SA) admissions. We compared baseline clinical data (age, NIHSS, i.v. thrombolysis, occlusion site), recanalisation results, process time, and outcome categories at 90 days [excellent (mRS=0), good (mRS=0-1), favourable (mRS=0-2), death (mRS=6)] between the two groups. Univariable analysis and forward stepwise logistic regression were used to identify predictors for excellent, good and favourable outcome.
Results: Baseline characteristics and recanalisation success did not differ between SA (n=52) and PA (n=39). The time from symptom onset to reperfusion was significantly longer for SA (290 vs. 188 min, $p < 0.001$) due to longer time from stroke onset to admission in the endovascular centre (185 vs. 62 min, $p < 0.001$). The chance for excellent and good outcome was lower (16% vs. 40%, p=0.015; 49% vs. 71%, p=0.038) and similar for favourable

outcome and death (59% vs. 76%, p=0.093, 6% vs. 3%, p=0.629). Occlusion time was identified as an independent predictor for excellent, good and favourable outcome (OR 0.985, 95%CI 0.976-0.994, p=0.001; OR 0.971, 95%CI 0.947-0.996, p=0.022; OR 0.963, 95% CI 0.931-0.997, p=0.032).
Conclusion: Secondary transfer had a significant negative impact on clinical outcome after endovascular stroke therapy due to delay of revascularisation. Optimisation of infrastructure is urgently required.
Author Disclosures:
W. Kurre: Consultant; phenox. **W. Reith:** Consultant; phenox. **S. Felber:** Consultant; phenox. Other; proctor phenox. **S. Prothmann:** Other; proctor phenox.

B-0400 14:25

Reduction in cerebral embolic lesions during Transcatheter Aortic Valve Replacement (TAVR) with an embolic protection device (MISTRAL-C)
H. Ahmad[1], A. van der Lugt[1], L. van Gils[1], N.M. van Mieghem[1], H.W. van der Werf[2], G. Brueren[3], A.F.M. van den Heuvel[2], P. Koudstaal[1], P.P.T. de Jaegere[1]; [1]*Rotterdam/NL*, [2]*Groningen/NL*, [3]*Eindhoven/NL* *(h.ahmad@erasmusmc.nl)*

Purpose: To compare intracranial DWI lesions in patients undergoing TAVR with and without embolic protection device, and whether this will influence post-procedural neurocognitive performance.
Methods and Materials: 65 patients with aortic stenosis were randomised to TAVR with or without sentinel dual filter system (Claret Medical Inc, CA, USA). Patients underwent a 3 Tesla MRI of the brain before and 5±1 days after TAVR. The MRI-scans were read by two experts blinded to the randomisation arm. The number and volume of new DWI lesions were assessed. The primary endpoint was the total volume of new ischemic lesions. Secondary outcomes consisted of neurocognitive tests.
Results: Twenty-eight patients did not undergo brain MRI follow-up mainly because of patient refusal and new permanent pacemaker implantation after TAVR. In the 37 patients with brain MRI, 22 patients had TAVI with and 15 patients without an embolic protection device. Twenty-seven % of protected patients had no new brain lesions vs. 13% of controls (p=0.312). The total lesion volume (median) in the protected patients was 95 mm³ and in the control group 197 mm³ (p=0.171). The total lesion volume in the anterior circulation in the protected patients was 0 mm³ and in the control group 76 mm³ (p=0.057). MMSE worsening of > 2 points occurred in 4% of the protected patients and in 27% of the controls (p=0.017).
Conclusion: There is a trend towards more DWI lesions in patient undergoing TAVR without an embolic protection device which is accompanied by less neurocognitive decline.
Author Disclosures:
N.M. van Mieghem: Consultant; Abbot Vascular, Edwards Lifesciences. Grant Recipient; St Jude Medical, Claret Medical, Boston Scientific Corporation, Medtronic. Other; Equity: Claret Medical.

B-0401 14:33

Endovascular occlusion of intracranial vessels using nBCA embolisation, controlled by adenosine-induced asystole
F. Thaher, M. Aguilar, C. Harmening, W. Kurre, R. Martinez, P. Kurucz, O. Ganslandt, H. Henkes; *Stuttgart/DE (firas.thaher@gmail.com)*

Purpose: To evaluate the efficacy and safety of adenosine-induced asystole during the intra-arterial injection of nBCA, aiming at controlled endovascular occlusion of intracranial vessels.
Methods and Materials: A retrospective analysis of patient files and procedure documentations was performed. Between August 2010 and July 2014, adenosine-induced asystole was applied in 29 consecutive procedures, performed in 24 patients (12 females). A total of 21 AVMs, 4 dural AV fistulas, three intracranial aneurysms and one arterial vessel injury were treated. The procedures were evaluated according to the following criteria: 1) Was asystole achieved? 2) Was the nBCA injection sufficiently controlled? 3) Was a complication of the adenosine injection encountered? 4) Did the nBCA embolisation cause adverse effects, related to venous passage or arterial displacement?
Results: Asystole was induced in all 29 attempts. The injection and propagation of nBCA were well controlled in all procedures. All patients returned spontaneously to rhythmic cardiac action, without any circulatory issues. No complication related to venous passage or distal arterial migration of nBCA was observed.
Conclusion: Adenosine-induced asystole per se is safe. In high-flow arteriovenous shunts and in rare arterial embolisations (e.g., dissecting aneurysm occlusion), nBCA injection is well controlled if performed under cardiac arrest.

B-0402 14:41

Prediction of long-term functional outcome after subarachnoid hemorrhage using machine learning
C. Rubbert, R. May, D. Martens, B. Turowski, C. Mathys, J. Caspers; *Düsseldorf/DE (christian.rubbert@med.uni-duesseldorf.de)*

Purpose: After aneurysmal subarachnoid hemorrhage (aSAH) patients often suffer from impairments. Only 33% are returning to their original fulltime jobs. Although the pathogenesis is not fully understood, impaired microcirculation appears to be one of the main contributors to reduced functional outcome. Amongst other factors, early changes in cerebral perfusion, indirectly measured by CT perfusion (CTP), might be predictive for the functional outcome. We applied machine learning to predict long-term functional outcome after aSAH.
Methods and Materials: 351 consecutive aSAH patients admitted between 1/2006 and 6/2010 were retrospectively analysed. In total, 186 patients (mean age 53.0±12.2; 63.4% female) underwent CTP imaging < 72 hours after aSAH and were available for a telephone interview (personally or by proxy) to determine modified Rankin Scale (mRS) scores for functional outcome. Mean follow-up time was 22.5 months. The random forest algorithm was used to predict dichotomized mRS (≤2; > 2). Age, gender, WFNS and Fisher scores as well as the following CTP parameters were chosen for modeling: Mean, maximum, maximum deviation and standard deviation of each mean transit time (MTT) and cerebral blood flow (CBF). Training commenced on 141 (≈75%) of the patients. The model was then applied to the remaining 45 (≈25%) patients as a test dataset.
Results: The model predicted a mRS score > 2 with a sensitivity of 80.0% and a specificity of 76.0%.
Conclusion: Machine learning using age, gender, scores on admission and early CTP results can be used to predict functional outcome after aSAH with a high sensitivity and specificity.

B-0403 14:49

Thrombo-embolic complications during intracranial arterial endovascular procedures treated with stent retrievers by mechanical thrombectomy: technical and clinical results
M. Voormolen, T. van der Zijden, T. Menovsky, L. Yperzeele, I. Baar, O. d'Archambeau, F. De Belder, P.M. Parizel; *Edegem/BE (maurits.voormolen@uza.be)*

Purpose: Evaluation of clinical and technical outcome of stent retrievers by mechanical thrombectomy in thrombo-embolic intracranial arterial occlusions.
Methods and Materials: Thrombo-embolic events are the most frequent complications of endovascular intracranial vascular procedures. Until recently, intra-arterial thrombolysis was one of few interventional methods to dissolve thrombo-occlusions of intracranial arteries, but with high haemorrhagic risk. Mechanical thrombectomy devices for stroke treatment became available in our hospital from 2010. We retrospectively evaluated the results of intra-arterial mechanical thrombectomy in per procedural thrombo-occlusive events from October 2010 until September 2015.
Results: Overall, thrombo-embolic occlusions of large intracranial arteries occurred in 20 procedures: 15 cases (75%) during endovascular intracranial aneurysm occlusion (9 acute, 6 elective treatments) out of 404 aneurysm occlusion procedures (3.7%); 7 cases prior to and 8 during/after aneurysm occlusion. Two events during endovascular AVM treatment (out of 80 treatments (2.5%)), one during preoperative meningeoma embolisation and two during cerebral angiography. Multiple types of stent retrievers were used. All procedures showed complete recanalisation (TICI 2b/3) with mean occlusion time of 30 minutes (range 8 - 135; median 15 min) resulting in no neurological deficit in 15 patients (75%). Three patients treated for ruptured aneurysms had persistent neurological deficits (aphasia, hemianopsia, hand paresis) despite recanalisation. Two patients died shortly after treatment due to complications of pre-existing subarachnoid haemorrhage. No thrombectomy procedure related complications occurred.
Conclusion: Thrombo-embolic occlusion of intracranial arteries during endovascular procedures can be a potential invalidating complication. In our series mechanical thrombectomy removes the thrombus safely and with good clinical outcome.

B-0404 14:57

CT angiography/perfusion (CTA-CTP) for early detection of vascular complications after subarachnoid haemorrage (SH) due to aneurysm rupture
E. Puglielli, L. Gregori, V. Di Mizio, R. Lattanzi, A. Bernardini, V. Di Egidio; *Teramo/IT (edopug@hotmail.com)*

Purpose: The aim of this paper is to analyse the possible correlation between CTP/CTA finding and outcome in order to manage systemic Blood-Pressure after SH.

Methods and Materials: 246 consecutive patients with symptomatic SH (mean age 58.7y, April 2009-March 2015), Fisher 2 (76.27% [180/236]), 3 (18.22% [43/236]), 4 (5.5% [13/236]) and CTA evidence of intracranial aneurysm undergoing endovascular coiling, with subsequent permanent exclusion. The PCT (CBV, CBF, MTT, TTP) and penumbra areas correlates with vascular hypoperfusion. Patients' age, sex, Hunt-Hess score at presentation and vasospasm (using TICI), leptomeningeal score (rLMs) were recorded and correlated using a multiple logistic regression analysis ($p < 0.005$).
Results: Reduction of CBV and increase of MTT suggestive for rise of intracranial pressure may represent an indicator of microvascular damage ($p < 0.005$). Large infarct areas on CTP correlate with haemorragic suffusion (33/236) 9.74%. (162/236) 68.64% had a good (17-20), (40/236) 16.94% a medium (11-16), and (34/236) 14.40% a poor (0-10) rLMs. Interrater reliability was high, with an intraclass correlation coefficient of 0.87 (95% CI, 0.77%-0.95%). In multivariable analysis, the rLMs (good versus poor: OR, 15.8; 95% CI, 3.3%-97.4%; medium versus poor: OR, 9.5, 95% CI, 1.7%-50.6%).
Conclusion: Although recent studies support a possible role of CTP/CTA in the early detection of vascular complications after SH more efforts are needed to evaluate the relationships between imaging, systemic or brain pressure for the early detection of ischaemic damage after SH.

B-0405 15:05

Imaging anatomy of dural blood supply from pial arteries: evaluated by 3D rotational angiography in normal subjects and pathologic conditions

S. Tanoue[1], H. Kiyosue[1], H. Mori[1], T. Kubo[1], K. Sugita[1], R. Ishibashi[2], A. Ishii[2]; [1]*Oita/JP*, [2]*Kitakyushu/JP (stanoue@oita-u.ac.jp)*

Purpose: The purpose of this study was to investigate the incidence and imaging anatomy of dural branches arising from pial arteries and its clinical implication in transarterial embolisation for falcotentorial or posterior fossa dural lesions.
Methods and Materials: Multiplanar reconstruction images of rotational vertebral angiography in 98 cases without dural lesions (normal group) and 31 cases with hypervascular dural lesions (pathologic group) including meningioma and dural arteriovenous fistula (DAVF) were retrospectively reviewed. The frequency and imaging anatomy of the dural branches from pial arteries were analysed.
Results: In normal group, 5 sides (2.5%) of pial arteries, including 3 superior cerebellar arteries (SCA) and 2 posterior cerebral arteries (PCA) branched dural arteries. All of the arteries arose from the crural or ambient segment of SCA and PCA, and run along the tentorium cerebelli. In pathologic group, 1 case with falx meningioma and 6 cases (23%) with tentorial DAVFs were fed by dural branches from PCA in 4, SCA in 2, and circumflex artery in 1. All of branches from SCA and PCA arose from ambient or crural segment.
Conclusion: The falcotentorial hypervascular lesions were often fed by dural branches arising from pial arteries. In some cases of normal group, dural branches from PCA or SCA could be identified on 3D rotational angiography. Pial arteries in the posterior fossa potentially have dural branches; therefore, physicians should pay careful attentions on dural supply from pial arteries for the endovascular treatment of falcotentorial lesions.

B-0406 15:13

Safety and efficacy of intravenous tirofiban as antiplatelet premedication for stent-assisted coiling in acutely ruptured intracranial aneurysms

J. Lee, B. Kim, M. Kang, S. Kim, S. Choi; *Busan/KR (genius393@naver.com)*

Purpose: To evaluate the safety and efficacy of intravenous tirofiban administration, instead of oral dual antiplatelet agents, as an antiplatelet premedication, for stent-assisted coiling in patients with acutely ruptured intracranial aneurysms.
Methods and Materials: We conducted a retrospective review of a database containing a consecutive series of patients who underwent stent-assisted coiling for acutely ruptured intracranial aneurysms between March 2010 and January 2015. Intravenous tirofiban was administered to all patients prior to stent-assisted coiling, instead of premedication with loading doses of aspirin or clopidogrel.
Results: A total of 40 patients with 41 aneurysms received intravenous tirofiban and underwent stent-assisted coiling. None of the patients showed a newly developed intracerebral haemorrhage, subarachnoid hemorrhage (SAH) or intraventricular haemorrhage. Intraprocedural aneurysmal rupture occurred in two patients (5%). Cerebral infarction developed in two patients (5%). Ventriculostomy-related haemorrhage was seen in 2 of 10 patients in whom ventriculostomy was performed before or after coiling. Thirty-four (85%) patients had a good outcome (Glasgow Outcome Scale of 4 or 5) at the time of discharge, but one patient died as a result of cardiac arrest. None of the patients developed thrombocytopenia, retroperitoneal, gastrointestinal, or genitourinary bleeding related to tirofiban administration.
Conclusion: In our study, tirofiban showed a low risk of significant haemorrhagic or thromboembolic complications. Tirofiban may offer a safe and effective alternative as antiplatelet premedication during stent-assisted coiling of acutely ruptured intracranial aneurysms.

B-0407 15:21

Association of automatically quantified blood volume after aneurysmal subarachnoid haemorrhage with delayed cerebral ischemia

I.A.J. Zijlstra; *Amsterdam/NL (ij.a.zijlstra@amc.uva.nl)*

Purpose: Earlier studies have shown that semi-quantitative methods (e.g. (modified) Fisher and Hijdra scales) assessing the amount of extravasated blood after aneurysmal subarachnoid haemorrhage (aSAH) are predictors for vasospasm and delayed cerebral ischemia (DCI). These scales give a rough estimation of the aSAH blood volume and are observer dependent, which may add to the moderate prediction rates for DCI. We therefore assessed the association between automatically quantified aSAH blood volume and DCI.
Methods and Materials: We retrospectively studied clinical and radiological data of consecutive aSAH-patients admitted to two academic hospitals in the Netherlands between January 2009 and December 2011. Adjusted Odds ratio's (aOR) with associated 95% confidence intervals (CI) were calculated for the association between aSAH blood volume and DCI (clinical, radiological, or both)and blood location (intraparenchymal haematoma (IPH) and intraventricular haematoma (IVH)) and clinical DCI. A sensitivity analysis was performed in patients who survived more than 3 days.
Results: We included 333 patients for the primary analyses and 286 patients for the sensitivity analysis. The aOR of aSAH blood volume for DCI (clinical, radiological, and both) was 1.02 (95% CI 1.01-1.03) per ml blood. The aOR of IPH for clinical DCI was 0.47 (95% CI 0.24-0.95) and of IVH for clinical DCI 2.66 (95% CI 1.37-5.17). Similar results were found in the sensitivity analysis.
Conclusion: The automatically quantified aSAH blood volume is significantly associated with DCI. These results with our rater-independent methods facilitates future multi-center studies on DCI prevention and treatment.

Thursday, March 3

10:30 - 12:00 **Room B**

Abdominal Viscera

SS 601a

Chronic liver disease and primary liver tumours

Moderators:
P. Rodríguez; Madrid/ES
N.N.

B-0408 10:30

Surveillance for hepatocellular carcinoma in high-risk patients: abdominal ultrasound compared to cross-sectional imaging: results of 5-year cohort follow-up

L. van Dam, F.E.J.A. Willemssen, R.S. Dwarkasing; *Rotterdam/NL (lievay@hotmail.com)*

Purpose: Hepatocellular carcinoma (HCC) is the most common primary malignant tumour of the liver and is the third leading cancer-related cause of death. Major risk factors are identified including cirrhosis caused by viral hepatitis B and C infection, and hereditary haemochromatosis. According to European guidelines, patients at risk should be surveyed with abdominal ultrasound (US) every 6 months.
Methods and Materials: In our academic hospital, we selected all patients between October 2005 and October 2010 from our HCC database. Inclusion criteria were pathological or histochemical confirmed HCC, abdominal ultrasound and contrast-enhanced computed tomography (CT) or magnetic resonance imaging (MRI) within three months. Number and size of the detected lesions were compared.
Results: In 88 patients included, 83 HCC lesions were described at US evaluation compared to 181 lesions on CT or MRI. Lesions found on US had a mean diameter of 60 mm (range 5-135 mm, median 45), on cross-sectional imaging the mean was 56 mm (range 5-160 mm, median 45). In 30 of the 88 (34%) patients US was negative, whilst cross-sectional imaging detected HCC lesions. In 18 of those 30 cases, all lesions were ≤25 mm (60%). Of all the patients (n=25) with lesions ≤25 mm, 18 ultrasound examinations were false negative (72%).
Conclusion: Surveillance for HCC in high-risk patients using US is inadequate. A significant number of HCC lesions are missed using US surveillance, especially small lesions, resulting in a false-negative result in a third of the cases. This warrants the question if surveillance for HCC should be performed with advanced imaging modalities.

B-0409 10:38

Comparison of diagnostic performance of gadoxetic acid-enhanced liver MR imaging with multidetector CT in detection of Dysplastic nodules and early hepatocellular carcinoma

B. Kim, J. Lee, J. Kim; *Seoul/KR (boram7072@gmail.com)*

Purpose: To compare diagnostic performance of gadoxetic acid-enhanced magnetic resonance. Imaging (MRI) and dynamic enhanced multidetector computed Tomography (MDCT) in detection of dysplastic nodules (DN) and early hepatocellular carcinomas (HCC) in patients with liver cirrhosis using Liver Imaging reporting and Data System Category (LI-RADS).
Methods and Materials: Between June 2009 and November 2014, 112 pathologically proven lesions diagnosed as DNs (n=37, high grade DN: n=17), early HCCs (n=42) or progressed HCCs (n=33) in 68 patients who underwent gadoxetic acid-enhanced MRI with hepatobiliary phase image and dynamic MDCT were included. Three radiologists independently assessed and graded presence of nodule by five point confidence scale and assigned LI-RADS category. Jackknife alternative free-response receiver operating characteristics (JAFROCs) was used to compare diagnostic accuracy.
Results: Reader-averaged figures of merit estimated with JAFROC were 0.774 for MDCT and 0.842 for MRI, indicated difference between modalities was significant for lesion detection (F statistic=12.31, P=0.0018). Readers showed significantly higher detection sensitivity of DNs and early HCCs by gadoxetic acid-enhanced MRI than by dynamic MDCT (46.8% vs. 72.2% [P=.0002], 48.1% vs. 65.8% [P=.007] and 48.1% vs. 62.0% [P=.01], respectively). Most detected early HCCs and DNs were classified as LI-RADS category 3 or 4 and averagely 11 more LI-RADS category 4 lesions were identified in MRI than MDCT.
Conclusion: Gadoxetic acid enhanced MRI with HBP can significantly improve the diagnostic performance in detection of Early HCCs and DNs. In addition, higher detection rate of LI-RADS category 3 or 4 lesion in MRI attribute to superior diagnostic performance.

B-0410 10:46

Added value of Gd-EOB-DTPA enhanced liver MRI for diagnosis of small HCC and atypical hepatic nodules (≤2 cm)

J. Yoon, J. Lee, K. Lee, J. Han; *Seoul/KR (jhjhry@gmail.com)*

Purpose: To determine Added value of Gd-EOB-DTPA enhanced liver MRI for diagnosis of HCC and atypical hepatic nodules (1~2 cm).
Methods and Materials: A total of 130 patients who underwent CECT and Gd-EOB-DTPA liver MRI from 2009 to 2013) were prospectively enrolled. Patients were classified into two groups; a) group 1 (G1): patients who had hepatic nodules (1~2 cm) with suspicion of HCC (n=100); b) group 2 (G2): patients (n=27) who underwent biopsy for hypovascular hypointense nodules (n=36) on CT and MR. Imaging findings were classified as follows: a) typical findings on both modalities; b) discordant pattern; and c) atypical on both exams. Additional value of MR was determined by whether MR changed management plan or diagnosis of the patients.
Results: In G1, patients showed typical findings (n=40); discordant pattern (n=12); and atypical (n=48). Among the 12 discordant cases, 11 nodules showing typical feature on MR only were treated, and one nodule showing typical finding on CT only was confirmed as non-HCC. In 48 atypical nodules, 20 nodules were considered as AP shunts (n=13), non-HCC (n=7). In 28% (28/100), nodules were diagnosed with HCC or non-HCC after MR, suggestive of added value of MR. In G2, 77.8% (28/36) of hypovascular hypointense nodules were HCC. There was no patient whose diagnosis or management plan was changed after MRI.
Conclusion: Gd-EOB-DTPA enhanced liver MRI showed added value in 28% of patients with hepatic nodules.
Author Disclosures:
J. Lee: Advisory Board; Bayer Schering Pharma. Grant Recipient; Bayer Schering Pharma, Guerbet, GE healthcare, Starmed.

B-0411 10:54

Evaluation of combined read-out of Gd-EOB-DTPA and gadobutrol magnetic resonance imaging for the prediction of hepatocellular carcinoma grading

S. Kinner, T.C. Lauenstein, J. Best, S. Bertram, M. Reinboldt, J. Goebel; *Essen/DE*

Purpose: Tumour biopsy is not essential for the diagnosis of hepatocellular carcinoma (HCC), however, grading remains important for the prognosis. Aim of this study was to investigate, whether combined Gd-EOB-DTPA and gadobutrol liver magnetic resonance imaging (MRI) can predict HCC grading.
Methods and Materials: Thirty patients (66.6±7.3 years) with histologically confirmed HCC (grade 1:n=5, grade 1-2:n=6, grade 2:n=13, grade 2-3:n=2, grade 3:n=4) underwent two liver MRIs, one with gadobutrol and one with Gd-EOB-DTPA, on consecutive days. Blinded to grading, two radiologists reviewed the gadobutrol and Gd-EOB-DTPA images in consensus with respect to: (1) HCC hyper-/iso-/hypointensity in the arterial, portal-venous/delayed, and Gd-EOB-DTPA hepatocellular phase and (2) morphologic tumour features (encapsulated growth, vessel invasion, heterogeneity, liver capsule infiltration, satellite metastases).
Results: Neither for the combined dynamic information of all gadobutrol phases (r=-0.187, p=0.331) nor of all Gd-EOB-DTPA phases (r=0.052, p=0.802) a significant correlation with grading was found. No correlation with grading was found for a combination of arterial and hepatocellular phase in Gd-EOB-DTPA MRI (r=0.209, p=0.305), a combination of both arterial phases (gadobutrol and Gd-EOB-DTPA) with the Gd-EOB-DTPA hepatocellular phase (r=0.240, p=0.248), or a combination of all available gadobutrol and Gd-EOB-DTPA phases (r=0.086, p=0.691). Neither for all gadobutrol information (dynamic phases and morphology, r=0.049, p=0.801) nor for all Gd-EOB-DTPA information (r=0.040, p=0.845) a correlation with grading was found. Hepatocellular Gd-EOB-DTPA phase iso-/hyperintensity never occurred in grade 3 HCCs.
Conclusion: Histological HCC grading cannot be predicted by combined Gd-EOB-DTPA/gadobutrol MRI. However, Gd-EOB-DTPA hepatocellular phase iso-/hyperintensity was never detected in grade 3 HCCs.

B-0412 11:02

Quantitative assessment of washout in hepatocellular carcinoma using MRI

R. Kloeckner, D. Pinto dos Santos, K.-F. Kreitner, A. Leicher-Düber, A. Weinmann, J. Mittler, C. Düber; *Mainz/DE (roman.kloeckner@googlemail.com)*

Purpose: Arterial hyperenhancement and washout on computed tomography and magnetic resonance imaging (MRI) are described by all major guidelines as specific criteria for non-invasive diagnosis of hepatocellular carcinoma (HCC). Nonetheless, washout on MRI has never been quantitatively assessed. Therefore, we sought to quantitatively define washout in MRI to determine a cutoff value that may render HCC diagnosis objective.

Methods and Materials: We analysed all patients who either underwent liver transplantation for cirrhosis or underwent liver resection for HCC in our institution (2003-2014). Sixteen hypervascularised non-HCC nodules and 69 HCC nodules were identified. Washout was quantitatively investigated by placing a 25-mm² region of interest over each nodule and two 25-mm² regions of interest over adjacent liver parenchyma. Percentage signal ratio (PSR) (100 × ratio of signal intensity of adjacent liver to that of the lesion) was calculated for each series in both groups.
Results: In the HCC group, the median PSR was 113.6 at equilibrium and 112.4 in the delayed phase. In the non-HCC group, the median PSR was 94.3 at equilibrium and 94.9 in the delayed phase. Receiver operating characteristic analysis indicated areas under the curve of 0.849 ($p < 0.001$) and 0.853 ($p < 0.001$), respectively. PSR cutoffs of 102 at equilibrium and 105 in the delayed phase led to sensitivities of 74% and 70%, respectively, and specificities and positive predictive values of 100%.
Conclusion: Applying PSR-cutoff values of 102 and 105 in equilibrium and delayed phase may improve HCC diagnosis and supports the use of washout as the main diagnostic criterion.

B-0413 11:10

Hepatocellular carcinoma in non-cirrhotic liver. Multimodality imaging findings

M. Diaz-Zamudio, J. Dosal Bañuelos, C. Escalona-Huerta, A. Hernandez-Martinez, F. Hofmann Gonzalez; *Mexico City/MX (diazzmariana@gmail.com)*

Purpose: To describe imaging findings of Hepatocellular carcinoma (HCC) arising from non-cirrhotic liver with a multimodality imaging approach.
Methods and Materials: Patients with diagnosis of HCC were identified from hospital records from january 2005 to january 2015, patients with clinical or histologic diagnosis of cirrhosis were excluded. Demographic and clinical information was obtained from clinical records. All Computed Tomography (CT) studies were multiphasic performed in 64-detector scanners. Magnetic Resonance (MR) studies were performed in a 1.5-T MRI imaging system. Radiologic characteristics were prospectively evaluated, including: number of lesions, margins, density/intensity, enhancement pattern, other components in the lesion and extrahepatic disease.
Results: From a total of 503 patients, 48 (9.5%) occurred in non-cirrhotic liver and were included in the study. Patients were predominantly male (69%) with mean age of 51 years-old. Comorbilities were identified in only 14 patients (29%). Forty-one percent of patients were asymptomatic at diagnosis. Lesion was solitary in 62% [mean diameter 12.2 (4.2-19.8) cm] and multiple in 38% [sum of diameters 26.8 (4-69) cm] of patients. Most of the lesions were hypodense in CT (92%) and always hyperintense in T2-weighted images (100%). Maximum enhancement was identified in portal phase in 54% of the patients, nevertheless 96.4% had some enhancement in arterial phase. Central necrosis was identified in 89% of the patients. Extrahepatic disease was identified in 14% of the patients.
Conclusion: HCC in non-cirrhotic liver frequently presents as a large single lesion with central necrosis. Arterial enhancement is still a hallmark present in most of the lesions.

B-0414 11:18

Comparison of imaging features of intrahepatic mass-forming cholangiocarcinoma on gadoxetic acid-enhanced MR imaging with and without chronic liver disease

J. Kim, J.-Y. Choi; *Seoul/KR (dfl7025@yuhs.ac)*

Purpose: To evaluate the differences in gadoxetic acid-enhanced MR imaging features of intrahepatic mass-forming cholangiocarcinomas (ICCs) between in patients with and without chronic liver disease (CLD).
Methods and Materials: Sixty-five patients (M:F=39:26, mean age, 63 [range, 35-80]) with ICCs who underwent preoperative gadoxetic acid-enhanced MRI retrospectively formed our study population. Among them, histopathology of the background liver revealed chronic hepatitis or liver cirrhosis in 20 patients (M:F=14:6, mean age, 63 [range, 39-78]), and no such diseases in 45 patients (M:F=25:20, mean age, 63 [range, 35-80]). Three observers independently reviewed 28 imaging findings categorised as (1) morphology; (2) pattern of enhancement; (3) appearance of T2-weighted image, diffusion weighted image, delayed phase and hepatobiliary phase image. Statistically significant factors by univariable analyses entered into multivariable analysis performed using logistic regression model. Recurrence free survival data between two groups was evaluated via Kaplan-Meier curve and Log rank test.
Results: Univariable analyses revealed that peripheral location, peritumoral bile duct dilatation, and proportion of arterial enhancement > 20% of the tumour were significantly more frequent in ICCs in CLD patients than those without CLD in all of three observers. On multivariable analysis, proportion of arterial enhancement > 20% turned out to be the only independently significant differential feature in all observers (Observer 1, 2, 3; P=.020, odds ratio (OR) =4.812 [1.286-18.004]; P=.002, OR=10.083 [2.310-44.006]; P=.022, OR=7.052 [1.333-37.307]).
Conclusion: ICCs arising in CLD patients more frequently show large area of arterial enhancement on gadoxetic acid-enhanced MR imaging as compared to those developed in patients without CLD.

B-0415 11:26

Intrahepatic mass-forming cholangiocarcinoma in high-risk patients for hepatocellular carcinoma: how does LI-RADS v2014 work on gadoxetic acid-enhanced MRI?

I. Joo, J. Lee, S. Lee, J. Lee, J. Park, J. Han; *Seoul/KR (hijijin@gmail.com)*

Purpose: To investigate how liver imaging reporting and data system (LI-RADS) v2014 works for intrahepatic mass-forming cholangiocarcinoma (IMCC) on gadoxetic acid-enhanced MRI.
Methods and Materials: This retrospective study was approved by our institutional review board. Thirty-five consecutive patients with pathologically-confirmed IMCCs were at high-risk for HCCs and underwent gadoxetic acid-enhanced MRI were included. Thirty-five tumour size-matched patients with pathologically-confirmed HCCs were selected as a comparison group. Three radiologists independently assigned LI-RADS categories for each observation. Diagnostic performances of LR-M (probable malignancy, not specific for HCC) and LR-5/5v (definitely HCC) were investigated, and MR imaging features were compared between IMCCs of LR-M and non-LR-M.
Results: In three reviewers, 88.6%, 80.0%, and 74.3% of IMCCs and 11.4%, 17.1%, and 8.6% of HCCs were assigned as LR-M, respectively. LR-M assignment showed substantial inter-observer agreements (kappa=0.686~0.771). Among IMCCs, 2.9%, 5.7%, and 11.4% were false-positively diagnosed as HCCs (LR-5/5v), respectively. Compared to IMCCs of LR-M (n=27 on a consensus method), IMCCs of non-LR-M (n=8) were significantly smaller, and showed higher frequency of arterial hyper-enhancement and lower frequencies of favouring imaging features for non-HCC malignancy such as arterial rim or peripheral enhancement, progressive concentric enhancement, peripheral washout, target appearance at hepatobiliary phase, lobulated shape, and liver surface retraction.
Conclusion: On gadoxetic acid-enhanced MRI, a major proportion of IMCCs would be accurately categorized as LR-M. However, some IMCCs with atypical imaging features would be assigned as non-LR-M, and even can result in false-positive diagnosis of LR-5/5v

B-0416 11:34

Comparison of the accuracy between liver and spleen elastography using acoustic radiation force impulse and other noninvasive tests in predicting the presence of esophageal varices

H. Kwon, B. Kim, J. Lee, J. Cho, J. Oh, J. Lee, S. Lee; *Busan/KR (risual@dau.ac.kr)*

Purpose: This study aimed to evaluate the accuracy of liver elastography, spleen elastography, and other noninvasive tests in predicting the presence of esophageal varices in liver cirrhosis.
Methods and Materials: We studied 488 consecutive patients with hepatitis B virus (HBV) (n = 242), hepatitis C virus (HCV) (n = 96), or alcohol-induced liver cirrhosis (n = 130) who underwent biochemical tests, gastrointestinal endoscopy, and liver and spleen elastography by acoustic radiation force impulse (ARFI).
Results: Among the 488 patients, spleen elastography is unreliable in 117 patients while unreliable in 43 patients at liver stiffness. On univariate analysis, the AAR score, the APRI score, the platelet count, platelet/spleen ratio, and spleen elastography were independently associated with esophageal varices. On multivariate analysis, spleen elastography alone was associated with esophageal varices. However, in cases of alcohol-induced liver cirrhosis, spleen stiffness was not reliable for prediction of esophageal varices.
Conclusion: The spleen stiffness measured by ARFI can potentially be used as a non-invasive method for determining the presence of esophageal varices. However, the evidence supporting a similar role for replacing endoscopy is lacking because spleen stiffness is less reproducible and, further, it is not an appropriate predictor for esophageal varices in alcoholic cirrhosis.

B-0417 11:42

Volume CT-perfusion of the liver and spleen: is there a correlation between hepatic venous pressure gradient (HVPG) and perfusion in patients with liver cirrhosis?

E. Talakic, S. Schaffellner, D. Kniepeiss, H. Müller, R. Stauber, H. Schöllnast; *Graz/AT (emina.talakic@medunigraz.at)*

Purpose: To correlate hepatic and splenic CT perfusion parameters with hepatic venous pressure gradient (HVPG) measurements in patients with liver cirrhosis.
Methods and Materials: This study was approved by the institutional review board and informed consent was obtained from all patients. Twenty-one patients with liver cirrhosis (m, 17; f, 4; mean age ± SD, 57 ± 7 years) underwent hepatic and splenic perfusion CT on a 320-detector-row volume scanner as well as invasively measurement of HVPG. Different CT perfusion

algorithms (Maximum slope analysis and Patlak plot) were used to measure blood flow (BF), blood volume (BV) and capillary permeability (CL, clearance) of the liver and spleen, respectively. The Pearson correlation test was used to assess the correlation between perfusion parameters and HVPG.
Results: Pearson correlation showed moderate negative correlation between BF in the spleen and HVPG ($r = -0.57$, $P < .01$), and moderate negative correlation between splenic CL and HVPG ($r = -0.65$, $P < .01$). There was no significant correlation between liver perfusion parameters and HVPG.
Conclusion: In patients with liver cirrhosis, a negative correlation between HVPG and splenic perfusion was found. Therefore, volume CT-perfusion may allow for noninvasive estimation of the portal pressure in these patients.

10:30 - 12:00 **Room C**

Breast

SS 602a
Breast MRI: new sequences and applications

Moderators:
A. Sever; Maidstone/UK
I. Thomassin-Naggara; Paris/FR

B-0419 10:30
Breast cancer detection in dense breast with abbreviated breast MRI protocol: first hundred cases
M. Nadrljanski, D. Pavlovic - Stankovic, N. Spasic, V. Plesinac - Karapandzic, M. Nikitovic, Z. Milosevic; *Belgrade/RS (dr.m.nadrljanski@gmail.com)*

Purpose: To prospectively assess diagnostic performance for cancer detection of breast MRI abbreviated protocol, in dense breasts (ACR type c / ACR d), in high-risk patients with no palpable lesions.
Methods and Materials: After the negative clinical breast examination and inconclusive mammography in patients with dense breast (ACR c / ACR d), breast MRI was performed in consecutive 100 high-risk patients in order to evaluate the diagnostic performance of the abbreviated breast MRI protocol (T1W, T1W C+, SUB, MIP; t=4-5 min.; 1.5 T, gadopentetate dimeglumine), compared to the full-length standardised diagnostic protocol (STIR, T2W, T1W, T1W C+ FLASH, SUB, MIP, DWI; t> 25 min.; 1.5 T, gadopentetate dimeglumine).
Results: According to the abbreviated protocol, the sensitivity and NPV of breast MRI in identifying breast malignant lesions was 100.0% with the high specificity of 97.78%. All ten malignant lesions were identified - invasive and in situ. Four out of four invasive malignant lesions with diameter =< 1.0 cm, were identified (100%). The sensitivity of the standardised full-length protocol was 100% with all malignant lesions identified - invasive and in situ, with comparable specificity of 96.67% and the NPV of 100%.
Conclusion: The two protocols of different duration have comparable diagnostic performance parameters: high sensitivity, high specificity and NPV. The abbreviated breast MRI protocol demonstrated accuracy in cancer detection with the shorter acquisition time and could be considered useful for dense breast analysis in high-risk patients. Further research is needed to support the results.

B-0420 10:38
Only in invasive lobular cancers breast MRI use is associated with a lower risk of surgical margin involvement and reduced number of mastectomies: a "real world" analysis in the Netherlands
M. Lobbes[1], I. Vriens[1], G. Nieuwenhuijzen[2], L. Boersma[1], T. van Dalen[3], H. Struikmans[4], S. Siesling[3], A. Voogd[1], V. Tjan-Heijnen[1]; [1]*Maastricht/NL*, [2]*Eindhoven/NL*, [3]*Utrecht/NL*, [4]*The Hague/NL (marc.lobbes@mumc.nl)*

Purpose: The value of MRI for breast cancer patients remains under debate. We analysed the use of MRI and its impact on surgical treatment and risk of detecting contralateral breast cancer in the Netherlands.
Methods and Materials: All patients who underwent primary surgery for stage I-III invasive breast cancer in the years 2011-2013 were identified through the Netherlands Cancer Registry. Using multivariate analyses, we analysed whether MRI use was related to type of surgery, surgical margin involvement, and diagnosis of synchronous contralateral breast cancer.
Results: MRI was performed in 10,819 (29.8%) out of 36,333 patients. Patients with invasive breast cancer undergoing MRI were more likely to undergo primary mastectomy than those without MRI (OR 1.21, 95% confidence interval (CI) 1.15-1.28, $p < 0.0001$). Interestingly, patients with invasive lobular cancer undergoing MRI were less likely to undergo primary mastectomy (OR 0.85, 95% CI 0.75-0.98, p=0.0201). A significantly lower risk of positive surgical margins was seen in patients with lobular breast cancer and breast conserving surgery who had undergone MRI as compared to those without MRI (OR 0.58, 95% CI 0.44-0.78, p=0.0002) and, consequently, also a lower risk of secondary mastectomy (OR 0.60, 95% CI 0.41-0.87, p=0.0064). Patients who underwent MRI were almost four times more frequently diagnosed with contralateral breast cancer (OR 3.60, 95% CI 3.06-4.24, $p < 0.0001$).
Conclusion: Breast MRI use was associated with less primary and secondary mastectomies in invasive lobular breast cancer. MRI was further associated with an almost fourfold higher incidence of contralateral breast cancer.

B-0421 10:46
Abbreviated combined MR protocol: a new faster strategy for characterising breast lesions
M. Telegrafo, T. Introna, L. Coi, L. Rella, A. Stabile Ianora, G. Angelelli, M. Moschetta; *Bari/IT (mikitele@hotmail.it)*

Purpose: To evaluate the diagnostic accuracy of an abbreviated MR protocol combining STIR,TSE-T2 sequences, a pre-contrast T1 weighted and a single intermediate post-contrast T1 weighted sequence for characterizing breast lesions.
Methods and Materials: 470 patients underwent breast MR examination. Two experienced radiologists evaluated in consensus both standard and abbreviated protocols. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy for both protocols were calculated having the histological findings as reference standard and compared with Mc Nemar test. The MR images post processing and interpretation time were compared with paired t test.
Results: In 177/470 (38%) patients, MR sequences detected 185 breast lesions. Standard and abbreviated protocols obtained sensitivity, specificity, diagnostic accuracy, PPV and NPV values respectively of 92%, 92%, 92%, 68% and 98% and of 89%, 91%, 91%, 64% and 98% with no statistically significant difference ($p < 0.0001$). The mean post processing and interpretation time were respectively of 7 ± 1 and 6 ± 3.2 minutes for the standard protocol and of 1 ± 1.2 and 2 ± 1.2 minutes for the abbreviated protocol with a statistically significant difference ($p < 0.01$).
Conclusion: An abbreviated combined MR protocol represents a time saving tool with the same diagnostic potential as the standard protocol for characterizing breast lesions.

B-0422 10:54
Breast MRI in the screening setting: is maximum intensity projection (MIP) a reliable technique for cancer detection?
M. Orsi, M. Cellina, E. Battaglia, F. Barmettler, G. Oliva; *Milan/IT (m.orsi83@gmail.com)*

Purpose: Contrast-enhanced (CE) breast MRI has been proposed as a reliable screening tool for young women at high risk for breast cancer. MIP reconstruction is a bi-dimensional similar-angiographic view that highlights hypervascular lesions and could be read as a 2D image in axial, coronal or sagittal view. Aim of our work was to test MIP CE breast MRI (axial + coronal views) as a stand-alone tool, measuring its agreement with the standard CE breast MRI evaluation.
Methods and Materials: From September 2013 to March 2015, CE breast MRI (1.5 T Avanto Siemens) scans were evaluated by two independent radiologists that randomly analysed, in blind, the complete exam (A) or the MIP coronal and axial reconstructions only (B) to assess the presence (sf+) or the absence (sf-) of suspicious findings. The agreement between A and B was calculated using Cohen's kappa coefficient.
Results: Seventy-three consecutive CE breast MRI scans were performed in a population of women of a median age of 53 ($\pm$20) years. All the scans and the MIP reconstructions were of good diagnostic quality. In 67/73 patients A and B showed agreement (37 sf-; 30 sf+), in 6/73 patients A and B showed disagreement (4 sf+ only for A; 2 sf+ only for B) resulting in a Cohen's kappa coefficient of 0.836 (strength of agreement: very good).
Conclusion: In CE breast MRI, MIP axial and coronal reconstruction view is sufficient to establish the presence or the absence of suspicious findings and could be used as a screening tool.

B-0423 11:02
Intraductal breast disease in magnetic resonance imaging: a systematic diagnostic approach
P. Clauser[1], M. Marcon[2], M. Mahajan[3], M.A. Marino[1], P. Kapetas[1], R. Woitek[1], P.A.T. Baltzer[1]; [1]*Vienna/AT*, [2]*Zurich/CH*, [3]*Ottawa, ON/CA (clauser.p@hotmail.it)*

Purpose: To provide a systematic diagnostic approach for differential diagnosis of ductal lesions [periductal mastitis (PM), ductal carcinoma in situ (DCIS) and papilloma (Pa)] in breast MRI.
Methods and Materials: Forty women (mean age $\pm$ SD, 51.9 ± 11.6 years) were included in this retrospective IRB-approved study. All underwent breast MRI and had a histopathologically verified diagnosis of PM, DCIS or Pa. Two

blinded readers evaluated MRI in consensus using twelve descriptors encompassing localisation, type of enhancement, unenhanced lesion signal intensity, morphological and dynamic lesion features and ductal abnormalities. A classification algorithm to differentiate DCIS, Pa and PM was calculated using 10-fold cross-validated Chi-square automatic interaction detection (CHAID) methodology, followed by ROC analysis.
Results: 12 PM (30%), 12 DCIS (30%) and 16 Pa (40%) were evaluated. The cross-validated classification algorithm incorporated 2 lesion descriptors: type of enhancement (mass, clumped non-mass, periductal non-mass, unspecific non-mass) and duct dilatation (> 3 mm). All periductal non-masses were proven to be PM (100%); 87% of clumped non-masses were DCIS and 80% of masses were Pa. Unspecific non-masses associated with dilated ducts were never DCIS. The area under the ROC curve for diagnosis of surgical lesions (DCIS and Pa) was 0.945 (95%-CI 0.881-1.000).
Conclusion: Type of enhancement and duct dilatation can accurately differentiate surgical from non-surgical ductal pathology in breast MRI.

B-0424 11:10

B1+ field correction of T1 estimation is necessary for quantitative breast DCE MRI even at 1.5 T

W. Tsai, K. Kao, K. Chang, C.E. Lin; *Taipei/TW (wctsai@kfsyscc.org)*

Purpose: To quantify the effect of T1 estimation in fat by B1+ correction in breast MRI at 1.5 T, and to examine the subsequent quantitative dynamic contrast enhanced (DCE) parameters in breast cancer with and without B1+ correction.
Methods and Materials: B1+ field and variable flip angle (VFA) mapping were included in our DCE breast MRI protocol for a total of 71 breast cancer patients on a GE 450 W MR system. We computed pre-contrast T1 relaxation in fat and breast tumours with and without B1+ correction. The pharmacokinetic parameters of breast cancer were calculated using Tofts model with T1 value before and after B1+ correction. The mean and median of B1+, T1 values and DCE parameters were used for statistical analysis.
Results: The flip angle (FA) in the left breast is 19.12% higher and 2.80% lower, in the right, than the prescribed value. This 21.92% average FA difference created a 42.57% T1 estimation bias in fat between the breasts. The T1 variation in fat was reduced to 0.96% after B1+ correction. There is 49.19% overestimate and 8.84% underestimate of tumour T1 at the left breast and the right, respectively, associated with B1+ error. Assuming T1 after B1+ correction represent the true tumour T1, 40.55% underestimation in the left breast and 12.79% overestimation in the right without B1+ correction were seen in the DCE parameters (Ktrans, ve, IAUGCBN90).
Conclusion: B1+ correction for more accurate T1 value should be considered for quantitative DCE breast MRI even at 1.5 Tesla to offset significant systemic error.

B-0425 11:18

Breast structure and risk of breast cancers: the MR risk factors

C. Iacconi[1], C. Marini[2], G. Angelini[2], D. Della Latta[3], M. Giannelli[2], M. Moretti[2], D. Mazzotta[2]; [1]*Carrara/IT*, [2]*Pisa/IT*, [3]*Massa/IT (chiara.iacconi@tin.it)*

Purpose: To evalute the relationship between Background Parenchymal Enhancement (BPE)/Fibroglandular Breast Tissue (FGT) and age in patients with breast cancer and a group control of patients at intermediate risk according to ACR classification.
Methods and Materials: Retrospective analysis of the database of 2 MR Centres. All the patients having a 1.5 T breast or 3 T MR for staging and/or breast MR screening for intermediate risk from January 2013 to March 2015 were reviewed.BPE and FGT were classified according to BIRADS. Multivariate regression logistic analysis was used for statistical analysis.
Results: 247 staging MR and 379 screening MR (group control) were reviewed.Median (SD) age was 52 (11). BPE and FGT correlate with age of the patients. Age: 1.03 [1.01-1.04], p=0.002 (95% CI, p value); FGT: 0.56 [0.47-0.67], $p < 0.001$; BPE: 1.74 [1.48-2.05], $p < 0.001$. ROC curves were respectively for age: 56.48 (51.91-61.04), FGT: 64.13 (59.91-68.35), BPE: 65.65 (61.58-69.73) and (age + FGT + BPE): 73.16 (69.07-77.24).
Conclusion: BPE and FGT correlate with the age of the patients. The risk of breast cancer is correlated with BPE, FGT and age.The MR evaluation of the background parenchymal enhancement and breast structure may represent an additional useful tool to evaluate the risk of breast cancer. This information may be potentially used especially in intermediate risk patients to decide the timing for screening.This could be helpful to select women for breastMRI and the timing of screening especially where the reduced economical resources and availability of MR require a careful selection of patients.

B-0426 11:26

Pure ductal carcinoma in situ: evaluation of early-phase dynamic characteristics on ultrafast breast MRI

C. Borelli[1], R.D. Mus[2], S. Vreemann[2], M. Dalmis[2], A. Gubern-Mérida[2], R.M. Mann[2]; [1]*Rome/IT*, [2]*Nijmegen/NL (cristinaborelli@hotmail.it)*

Purpose: To assess the early-phase enhancement characteristics of ductal carcinoma in situ (DCIS) and its subtypes on ultrafast breast MRI.
Methods and Materials: We retrospectively reviewed 38 pathologically proven pure DCIS in 38 women who underwent breast MRI including ultrafast time-resolved angiography with stochastic trajectory (TWIST) acquisitions. Time to enhancement (TTE) and maximum slope of the relative enhancement versus time curve (MS) obtained from TWIST sequences were assessed. Predetermined thresholds analogous to conventional curve-type analysis were applied (TTE: < 12.96s type 3, =12.96s type 2, > 12.96s type 1; MS: ≥13.3%/s type 3, < 13.3 and ≥6.4%/s type 2, < 6.4%/s type 1). One-way ANOVA and pooled t tests were used to compare the distribution of TTE and MS across lesion characteristics.
Results: All DCIS lesions were visible on TWIST images. Fourteen lesions showed TTE type 3 (37%), 13 lesions type 2 (34%), and 11 lesions type 1 (29%). MS was classified as type 3 in 18 cases (47%), as type 2 in 17 cases (45%) and type 1 in 3 cases (8%). Regarding all type 2 and type 3 enhancement characteristics as possibly malignant achieved a detection rate of 71% and 92% for TTE and MS, respectively. High-grade DCIS enhanced earlier and exhibited higher MS values than intermediate- and low-grade lesions (p=.017 and p=.009, respectively). TTE and MS were significantly associated with the presence of necrosis (p=.002); most DCIS with comedonecrosis demonstrated TTE and MS type 3 (67%).
Conclusion: DCIS is well visible on ultrafast dynamic breast MRI. Most DCIS exhibit enhancement characteristics that classify them as possibly malignant. Early enhancement patterns in ultrafast breast MRI correlate with the biological profile of DCIS.
Author Disclosures:
R.M. Mann: Speaker; Bayer AG.

B-0427 11:34

Are the magnetic resonance imaging (MRI) features of the pleomorphic variant of invasive lobular carcinoma (ILC) different from classic ILC of the breast?

P.M. Yeap, A. Evans, C. Purdie, J. Lee, S. Waugh, S.J. Vinnicombe; *Dundee/UK (pheymingyeap@gmail.com)*

Purpose: Pleomorphic invasive lobular carcinoma (PILC) is a morphological variant of ILC. A number of clinicopathological and biomarker studies suggest that PILC has a more aggressive profile than classical ILC (CILC). The aim of this study was to assess whether this is reflected in the MR imaging features of the two variants.
Methods and Materials: A retrospective single-centre study of 83 patients with histologically confirmed ILC (21 PILC, 62 CILC) all of whom had preoperative breast MRI, from April 2010 to July 2015. MRI images were reviewed by an experienced radiologist without knowledge of the pathological results. MRI features between the two groups were subsequently compared.
Results: Most lesions were masses (79% in PILC; 69% in CILC; $p > 0.05$). On T2-weighted imaging, PILC lesions were more frequently hyperintense and heterogeneous compared to CILC (50% vs. 11%; $p < 0.001$; 50% vs. 28%, p=0.04). CILC lesions were more commonly iso/hypointense (91% vs. 50%; $p < 0.001$). Perifocal or generalised oedema was more frequent in PILC than CILC (43% vs. 7%; $p < 0.001$). Mean enhancement size of PILC was significantly larger than CILC (35 mm vs. 22 mm; p=0.002) as was maximal percent focal enhancement (169% vs. 119%; $p < 0.001$). Washout curves were more frequent in PILC (68% vs. 18%, $p < 0.001$). There were no significant differences in age, breast fibroglandular volume, and background parenchymal enhancement between the two groups.
Conclusion: Clear differences in the MR imaging phenotype of PILC and CILC support the suggestion of a more aggressive profile for PILC.

B-0428 11:42

Influence of fat separation and spatial resolution on the results of automated volumetric MRI measurements of fibroglandular breast tissue

G.J. Wengert, K. Pinker-Domenig, T.H. Helbich, W.-D. Vogl, P. Clauser, H. Bickel, M.-A. Marino, H. Magometschnigg, P.A.T. Baltzer; *Vienna/AT (georg.wengert@meduniwien.ac.at)*

Purpose: To investigate the influence of fat separation and spatial resolution in magnetic resonance imaging (MRI) on the results of automated quantitative measurements of fibroglandular breast tissue (FGT).
Methods and Materials: Ten healthy volunteers (age range, 28-71; mean, 39.9) were included in this IRB-approved prospective study. All measurements were performed on a 1.5-T scanner (Siemens, AvantoFit) using an 18-channel breast coil. The protocols included isotropic (Di) [TR/TE 6 ms/2.45 ms/2.67 ms,

resolution 1 mm3, TA 3:38 min], and anisotropic (Da) [TR/TE 10 ms/2.39/4.77 ms, resolution 0.7x0.7x2.0 mm, TA 1:25 min] Dixon sequences, and a T1 3D FLASH sequence with the same resolution (T1) without [TR/TE 11.0/4.76 ms, TA 0:50 min] and with fat saturation [TR/TE 29.0/4.76 ms, TA 2:35 min]. Repeating volunteer measurements after 20 min and repositioning were used to assess reproducibility. An automated and quantitative volumetric breast density measurement system was used for FGT calculation.
Results: FGT with Di, Da, and T1 ranged from 4.6-63.0% (mean 30.6%), 3.2-65.3% (mean 32.5), and 1.7-66.5% (mean 33.7), respectively. The highest correlation between different MRI sequences was found with the Di and Da sequences (R2=0.976). Intraclass correlation (ICC) for FGT calculation was nearly perfect: Di (0.996); Da (0.998); and T1 (0.928). Coefficients of variation were higher in T1 (CV=21.5%) compared to Dixon (Di: CV=5.1%; Da: CV=4.2%) sequences.
Conclusion: Spatial resolution did not relevantly affect the results of automated quantitative measurements of FGT. The Dixon fat separation technique showed superior results compared to conventional sequences. A standard dynamic protocol using Dixon fat saturation is best suited for combined diagnostic purposes and prognostic measurements of FGT.

B-0429 11:50

The value of breast MRI for patients with a biopsy showing atypical ductal hyperplasia (ADH): can we safely follow patients rather than perform surgery?
K. Tsuchiya[1], D. Schacht[1], D. Sheth[1], N. Mori[2], K. Kulkarni[1], R. Reddy[1], J. Mueller[1], G. Karczmar[1], H. Abe[1]; [1]*Chicago, IL/US*, [2]*Sendai/JP (keikot@uchicago.edu)*

Purpose: To evaluate the diagnostic value of dynamic contrast enhanced (DCE) MRI for patients with ADH.
Methods and Materials: DCE MRI was performed for 17 patients showing ADH (stereotactic biopsy, n=15; ultrasound-guided biopsy, n=2), with an IRB approved prospective study and with the patients' informed consent (Oct 2011-Jul 2015). All patients underwent lumpectomy after the MRI. Two radiologists reviewed the MR images to see if there were abnormal findings at the site of biopsy, and evaluated the MR features of any lesion present, including lesion size, type and kinetics according to the BIRADS lexicon. The MRI finding was then correlated with the surgical pathology.
Results: 9 of 17 cases were upgraded to malignancy; ductal carcinoma in situ (DCIS) was found in 7 and invasive ductal carcinoma (IDC) was found in 2 at the final pathology. Among the 8 cases without malignancy, a high-risk lesion was present in 7 cases, and only benign pathology was present in one case. All upgraded cases showed non mass enhancement (NME). As for the 8 cases without upgrade, 7 cases showed no suspicious enhancement, one case showed 12 mm mass with rapid-washout kinetics (ADH with intraductal papilloma at the final pathology). Sensitivity, specificity, PPV and NPV of MRI findings were 100, 87.5, 90 and 100% respectively.
Conclusion: Our prospective study revealed a high NPV of MRI for patients with ADH. This suggests that patients with ADH but no suspicious enhancement on MRI could be followed on imaging rather than required surgical excision.

10:30 - 12:00 **Room Z**

Computer Applications

SS 605

Image processing techniques (1)

Moderators:
S. Bickelhaupt; Heidelberg/DE
M. de Bruijne; Rotterdam/NL

B-0430 10:30

An optimum combination of biological fingerprints extracted from edge-enhanced chest radiograph to identify misfiled images in a picture archiving and communication system
Y. Shimizu, Y. Matsunobu, J. Morishita; *Fukuoka/JP (yoichiro.shimizu1124@gmail.com)*

Purpose: Biological fingerprints (BFs) namely whole lung field, cardiac shadow, superior mediastinum, right lower lung, lung apex, circumscribe lung with rectangle, and the upper half of chest radiograph are defined as a part of image having useful information for patient recognition and identification. The purpose of this study is to optimize the combination of BFs with and without edge-enhancement (EE) for searching misfiled images in a picture archiving and communication system (PACS).
Methods and Materials: Two hundred chest radiographs were randomly selected from our database (36,212 patients) as misfiled images. BFs with and without EE were extracted from the images. These BFs and corresponding BFs in all previous images in the database were compared. Normalized cross-correlation values (C values) between the same BF in two images were determined to evaluate similarity. Hypothesis of the study is that summation of C values for the same patients indicates the highest value.
Results: The edge-enhanced lung apex was more effective in patient identification compared with the lung apex without EE. The combination of an edge-enhanced lung apex and six other BFs without EE excluding those with the lowest C values showed the best performance in this study. In total, 83.0% (166/200) of the misfiled images were correctly identified, while 94.0% (188/200) were ranked among top 10 in the database.
Conclusion: BFs, including an edge-enhanced lung apex, would be useful for patient identification and improve performance of automated patient recognition and identification in a PACS environment.

B-0431 10:38

A patient identification system using a combination of objective and subjective similarities in bedside chest radiographs to prevent filing mistakes
Y. Sakai, T. Kato, K. Iwase, K. Takahashi, A. Hattori, Y. Nakamura, J. Morishita; *Fukuoka/JP (yuki.sakai.san@gmail.com)*

Purpose: Storage of medical images in the wrong patient's folder in the picture archiving and communication system (PACS) server due to human error may cause a severe medical accident. Our purpose was to develop a patient identification system using a combination of objective and subjective similarities in chest radiographs of "same" and "different" patients to prevent such mistakes.
Methods and Materials: Correlation values for 1,000 pairs of 2 anteroposterior bedside chest radiographs taken in supine positions for "same" patients and 1,000 for "different" patients were regarded as objective similarities, and used in histogram analysis. Fifty pairs of "same" and 50 pairs of "different" patients were randomly selected as samples for subjective evaluation, which involved grading of image pairs on a continuous rating scale by 6 observers. Subjective evaluation performances of 38 pairs of "same" and 46 pairs of "different" patients in overlap area between histograms of objective similarities were evaluated.
Results: In the objective evaluation, the overlap area between histograms for "same" and "different" patients was 82.6% (1,652/2,000). In the subjective evaluation, 86.8% (33/38) and 97.8% (45/46) of pairs of "same" and "different" patients, respectively, who were not identified in the objective evaluation, were rated correctly. Despite the use of 2 similarities, 5 image pairs of "same" patients were rated incorrectly due to interval changes in lung fields [60% (3/5)] and differences in breathing [40% (2/5)].
Conclusion: The combination of objective and subjective similarities improved patient identification performance and could be useful for preventing filing errors in the PACS server.

B-0432 10:46

Development and evaluation of a computer-aided diagnosis system for diagnosis of interstitial lung diseases in high-resolution CT
S.S. Martin, M.H. Albrecht, T.J. Vogl, V. Jacobi; *Frankfurt a. Main/DE (simartin@outlook.com)*

Purpose: A computer-aided diagnosis (CAD) system is presented to assist observers in identifying correct CT patterns and diagnosis of high-resolution CT (HRCT) scans. Furthermore, it was investigated whether this software can improve diagnostic accuracy of interstitial lung diseases.
Methods and Materials: This software tool illustrates about 100 different sketches of the most common CT signs and patterns of lung disease and describes the corresponding pathologies in detail. The logical setup of the software based on the HRCT basic patterns facilitates a structured CT report. By selecting one or more CT patterns, the program lists the possible diagnoses according to their probability. To evaluate the program, 16 radiologists with different levels of experience reported 10 CT chest scans with twice, on the first pass unaided, on the second pass supported by the software.
Results: Sensitivity for pattern detection was significant higher with CAD compared to assessment without CAD (77.34% vs. 73.02%; $p \leq 0.01$), whereas specificity showed no significant differences (99.76% vs. 99.78%; $p > 0.05$). Moreover, sensitivity for considering the most probable diagnosis and differential diagnoses was significant higher with CAD (89.7% vs. 31.4%; $p < 0.001$), although specificity was lower (98.7% vs. 99.6%; $p > 0.05$). There were no significant differences in interpretation times.
Conclusion: Radiologists benefit substantially from using the CAD system when identifying CT patterns and considering the most probable diagnosis and differential diagnoses.

B-0433 10:54

Comparison of manual vs. fully automated lobe-based quantification of pulmonary air-trapping on paired inspiratory-expiratory MDCT in school age children with CF

P. Konietzke[1], O. Weinheimer[1], M.O. Wielpütz[1], C.P. Heußel[1], H.-U. Kauczor[1], C.J. Galban[2], T.E. Robinson[3]; [1]*Heidelberg/DE*, [2]*Ann Arbor, MI/US*, [3]*Palo Alto, CA/US (p.konietzke@gmx.de)*

Purpose: Air-trapping is an important marker of cystic fibrosis (CF) lung disease severity, and may be quantified with paired inspiratory-expiratory MDCT. We validated fully automatic lobar segmentation on paired inspiratory-expiratory MDCT against manual segmentation, as a new approach for user-independent regional air-trapping quantification.
Methods and Materials: 16 school age children with CF underwent spirometer-controlled paired inspiratory-expiratory low-dose MDCT 4 consecutive times (0-24mon) resulting in 128 datasets. A fully automatic algorithm and a radiologist segmented each lung lobe (RUL, RML, RLL, LUL, LLL) on inspiratory and expiratory MDCT, and air-trapping was quantified by lobe using 3 previously evaluated methods: relative volume change between inspiratory and expiratory scans in range -856 to -950 HU (RVC), expiratory to inspiratory ratio of mean lung attenuation (RMLA) and air-trapping parameter introduced by Robinson et al. (A1). For comparison, linear regression and mean relative error (MRE) were determined.
Results: Best results showed RVC with R^2=0.99 for LLL to 0.94 for RUL ($p < 0.0001$ for all lobes). MRE was between 0.7% (LLL/RLL) and 7.8% (LUL). RMLA showed good results with R^2=0.97 for RUL to 0.88 for RML ($p < 0.0001$). MRE was between 1.6% (LUL) and 3.5% (LLL). Worst results showed A1 with R^2=0.99 for RUL to 0.82 for LLL ($p < 0.0001$). MRE was between 10.5% (RUL) and 20.0% (LLL).
Conclusion: Automatic lobar air-trapping quantification delivers results comparable to the manual approach. The left lung showed a tendency to higher errors. The automatic approach will aid to reduce user-interaction in quantifying CF lung disease severity.

B-0434 11:02

Improvement of perfusion characterisation in two lung tumour subtypes using de-noised CT perfusion maps

S. Baiocco[1], D. Barone[2], G. Gavelli[2], A. Bevilacqua[1]; [1]*Bologna/IT*, [2]*Meldola/IT (s.baiocco@unibo.it)*

Purpose: This study aims at assessing if, and to what extent, removing from blood flow (BF) maps those values based on the error underlying their computation, allows highlighting significant differences in perfusion of squamous cell carcinoma (SCC) and adenocarcinoma (ADK).
Methods and Materials: Six SCC and twenty-eight ADK referring to thirty-four patients who underwent a CT perfusion (CTp) at the diagnosis stage, were considered in this study. BF values were computed according to the maximum slope method. Also, BF values arising from time-concentration curves with high fitting errors have been automatically removed, yielding corrected maps. Finally, thirty-four couples of corrected and uncorrected BF maps were achieved. Five features from first-order statistics were computed on each BF map and the differences between SCC and ADK were assessed through the one-tail Welch's t-test (p-value< 0.01).
Results: Differences in BF values between SCC and ADK groups are not detected with uncorrected perfusion maps. On the contrary, significant differences were highlighted by kurtosis, using corrected maps. In particular, at baseline, perfusion values of the SCC subtype (mean BF=62.2) shows a kurtosis significantly greater (p=0.003) than that of the ADK (mean BF=89.6).
Conclusion: The correction of BF maps emphasizes functional features of these cancer subtypes. In particular, before starting therapy SCC has significantly smaller BF values, pointing out the presence of wide necrotic regions, while ADK BF values are generally higher and more heterogeneous. These findings should be considered for planning optimisation of the anti-angiogenic therapies, assessed with CTp, thus encouraging its use in clinic.

B-0435 11:10

Texture analysis of blood flow maps in CT perfusion studies of NSCLC: correlation with the overall survival

S. Baiocco[1], D. Barone[2], G. Gavelli[2], A. Bevilacqua[1]; [1]*Bologna/IT*, [2]*Meldola/IT (s.baiocco@unibo.it)*

Purpose: This study aims to assess the effectiveness of second-order texture features computed on CT perfusion (CTp) colorimetric maps, rather than on the original CTp sequences, as prognostic biomarkers.
Methods and Materials: 15 patients with primary lung cancer underwent axial CTp examination and survival data were included in the study. Mean overall survival was calculated at 8.3 months. Blood flow (BF) values were computed using the maximum slope method; values undergoing high fitting errors were automatically removed. Seven global features based on first-order statistics and six local-based second-order statistics were computed on BF maps and k-means clustering algorithm was used to assess their correlation with overall survival (OS).
Results: The inverse difference moment and the correlation are the most performing second-order features. In two examinations, the second-order features correlate with OS, where first-order features fail. These perfusion maps clearly show heterogeneity patterns, whose salient features cannot be extracted with simpler global analyses. Values of the couple of the second-order features allow achieving a linear separation between the groups of 10 patients with OS≤8.3 and 5 patients having OS$>$ 8.3.
Conclusion: These results show that the local-based features, computed on CTp maps where unreliable BF values have been removed, result to be a valuable prognostic factor for OS. In fact, the capability to consider the spatial relationships of perfusion values, thus, the functional heterogeneity characterizing the lesions, makes them really attractive. Accordingly, this technique applied on the texture of perfusion maps represents an encouraging step forwards to the clinical utilization of CTp.

B-0436 11:18

Impact of segmentation techniques on the performance of a CT texture-based lung nodule classification system

J.M.Y. Willaime, L.C. Pickup, D. Boukerroui, A. Talwar, M.J. Gooding, F.V. Gleeson, T. Kadir; *Oxford/UK (julien.willaime@mirada-medical.com)*

Purpose: We studied the impact of segmentation methods (manual versus semi-automatic) on the classification performance of a machine learning classification system which generates "probability-of-malignancy" scores for lung nodules.
Methods and Materials: A retrospective dataset comprising all patients with CT reported PNs from Jan-Apr 2013 from one hospital group were collected. Ground-truth diagnosis was determined by histology or 2-year stable follow-up. Patients with missing scans or diagnoses were excluded. The dataset had 705 PNs from 139 patients: 328 benign, 7 primary cancer and 370 metastases. Each PN was contoured manually using commercially available software (XD3, Mirada Medical Ltd., UK), and also using a proprietary semi-automatic Otsu thresholding method. A total of 558 texture features were extracted from each contour. The most discriminative 20 features were selected for each segmentation technique, and a Support Vector Regressor mapped features onto malignancy probabilities. A leave-one-out training and validation strategy was used to compare overall performance (AUC). Additionally, contour overlap was compared using the DICE score, and 95% confidence intervals (CI) of mean differences in normalized feature values (Bland-Altman) were calculated.
Results: There was no difference in classification performance for manual and automatic segmentation (AUC=0.93±0.01 and 0.92±0.01, respectively). The semi-automatic contouring failed to return a result in 7/705 cases, and those were excluded from analysis. DICE score was 0.73 ± 0.21 (mean ± SD) whilst agreement between feature values was high (95% CI was less than 0.23 in all cases).
Conclusion: This study suggests that the classification system is robust to segmentation technique.
Author Disclosures:
J.M.Y. Willaime: Employee; Mirada Medical. Research/Grant Support; Innovate UK (101676). **L.C. Pickup:** Employee; Mirada Medical. Research/Grant Support; Innovate UK (101676). **D. Boukerroui:** Employee; Mirada Medical. Research/Grant Support; Innovate UK (101676). **A. Talwar:** Research/Grant Support; Innovate UK (101676). Other; Working with Mirada Medical. **M.J. Gooding:** Employee; Mirada Medical. Research/Grant Support; Innovate UK (101676). **F.V. Gleeson:** Research/Grant Support; Innovate UK (101676). **T. Kadir:** Employee; Mirada Medical. Research/Grant Support; Innovate UK (101676).

B-0437 11:26

Automatic method to support radiologists in choosing the most representative slices in CT perfusion of lung cancer

S. Malavasi[1], D. Barone[2], S. Baiocco[1], A. Bevilacqua[1], G. Gavelli[2]; [1]*Bologna/IT*, [2]*Meldola/IT (s.malavasi@unibo.it)*

Purpose: At present, several studies still rely on perfusion analysis computed on a single slice. This work provides an effective method to automatically choose the most representative slice, retaining the maximum information content.
Methods and Materials: 26 datasets referring to 12 patients with NSCLC, who underwent axial CT perfusion (CTp), were included in this study. Two experienced radiologists chose in agreement the reference slices and manually delineated the lesion, automatically tracked throughout the CTp sequence. Blood flow (BF) values were computed for each slice of lesions and values undergoing high fitting errors were automatically removed. Global entropy (E) is well known to represent an information measure: it was computed for each BF map, aiming at quantifying functional information, here represented by haemodynamic heterogeneity. All the BF maps of each lesion were ranked for entropy in decreasing order and submitted to the clinician analysis.

Results: E ranges from 5.7 to 8.9. The experiments confirm that perfusion slices with the highest heterogeneity are the most representative ones for clinical assessments. Four times they coincide with the reference slice (E=7.0±1.0), nine times are directly adjacent (E=7.6±0.6). Altogether, the most representative slices have entropy 7.2% greater than the reference slices.
Conclusion: Several criteria have been adopted to choose the most appropriate slice, mostly based on original CT sequences. This approach may work as an objective computer-aided system acting as a second reader, representing a useful tool for more aware clinical considerations. Further analyses including entropy can be used to support visual assessment.

B-0438 11:34

The unfolded chest cage: flat rib projection is superior in the detection of rib fractures for trauma surgeons and medical laypersons compared to conventional multi planar reformation

S. Mauf, U. Held, D. Gascho, R. Baumeister, W. Schweitzer, P. Flach, T. Ruder, T. Nguyen-Kim, M.J. Thali, T. Jentzsch; *Zurich/CH*

Purpose: Correct and fast detection as well as visual appeal of rib fractures is of clinical and forensic interest. This study investigated if medical disciplines other than radiologists, such as trauma surgeons and forensic pathologists, or even laypersons might benefit from curved planar reformation (CPR) compared to multi planar reformation (MPR).
Methods and Materials: Twelve postmortem CT datasets were retrospectively assessed concerning rib fractures by two different methods, CPR and MPR. Four reader groups per two readers consisted of radiologists, trauma surgeons, forensic pathologists, and laypersons. Every reader evaluated all CTs with both methods. Reader's preferences concerning CPR or MPR were investigated by a questionnaire.
Results: The sensitivity for fracture detection varied significantly between the readergroups for each method ($P < 0.001$, chi-squared test). It was increased for the non-radiologist groups of trauma surgeons and laypersons when reading CPR compared to MPR (70.7% vs. 62.0% and 33.7% vs. 22.1% resp). However, it showed similar results for forensic pathologists (53.6% vs. 56.5%). A decreased sensitivity was observed for radiologists (63.8% vs. 76.8%). Overall, a trend emerged that reading CPR was faster than MPR (6.8 min. vs. 7.7 min., P=0.077, Wilcoxon rank sum test). Questionnaire revealed that three-fourths of the readers and all non-radiologists preferred the use of CPR (6/8, 75%). All readers preferred CPR concerning the visual appeal (8/8, 100%).
Conclusion: Curved planar reformation of rib fractures is beneficial for trauma surgeons in the emergency setting and laypersons such as people in court due to its better sensitivity and visual appeal than MPR.

B-0439 11:42

Evaluation of a new fully automated pulmonary lobe segmentation algorithm on inspiratory and expiratory MDCT scans over 4 time-points

O. Weinheimer[1], M.O. Wielpütz[1], P. Konietzke[1], C.P. Heußel[1], H.-U. Kauczor[1], C.J. Galban[2], T.E. Robinson[3]; [1]*Heidelberg/DE*, [2]*Ann Arbor, MI/US*, [3]*Palo Alto, CA/US (weinheimer@uni-heidelberg.de)*

Purpose: The lobe-based determination of the density distribution on inspiratory MDCT scans and the quantification of air-trapping on expiratory MDCT scans are important possibilities to describe the severity of airways diseases. Therefore there is a need for an accurate lobe segmentation algorithm (LSA), applicable on inspiratory and expiratory scans. We developed a fully automated LSA and validated the automatically generated lobe masks (ALM) against manually generated lobe masks (MLM) by a radiologist.
Methods and Materials: LSA was applied to volumetric inspiratory and expiratory low-dose MDCT scans from 16 children with cystic fibrosis acquired at 4 time-points (0-24mon) and reconstructed with soft and hard kernel resulting in 256 volumes. Firstly, bronchial tree labelling is performed by the LSA. Next, the vessels are iteratively assigned to the adjacent bronchi. Finally, fissure information is involved to refine the lobe borders.
Results: The average overlap (Dice-Index) for inspiratory scans over all lobes and time-points was 97.5±-1.5% for the soft and 96.4±7.4% for hard kernel, for expiratory scans 86.0±12.6% and 90.1±8.5% respectively. Best overlap was achieved for right lower lobe 98.3% on inspiratory soft kernel scans, worst overlap for right middle lobe 74.9% on expiratory soft kernel scans. The overlap was not influenced by the time-points.
Conclusion: The new LSA delivers excellent results for inspiratory and good results on expiratory MDCT scans. It can be an important component for lobe-based quantification of airways diseases such as cystic fibrosis or COPD. The automatic approach will aid to reduce necessity for user-interaction in lung MDCT post-processing.

B-0440 11:50

Surface fitting based automatic segmentation and quantification of pulmonary fissures and lobes

Y. Hong, T. Nair, J. Lee; *Suwon-city/KR (yoonmi.hong@samsung.com)*

Purpose: Automated segmentation of pulmonary lobular structures is important for lung treatment such as volume reduction surgery. In this paper, we propose robust segmentation of fissures and lobes using two kinds of segmented fissures and two steps of surface fitting.
Methods and Materials: Pulmonary fissure is a physical boundary between two lobes. We segment fissures using eigenvector-based connected component analysis (CCA). Since the fissures are often incomplete, fissures should be extrapolated to separate lobes. For robust separation, we use two kinds of fissures. The first kind of fissures f_1 with larger threshold for CCA, which may have no minor fissures, is used for surface fitting. The second kind of fissures f_2 with smaller threshold for CCA usually has more voxels. Initial fitting is done with narrow bound using f_1 and outlier voxels are removed from f_2 based on the subsequent fitting.
Results: To verify the performance we tested on 40 cases of EXACT09 and 55 cases of LOLA11 challenges. To evaluate quantification a radiologist created 12 reference fissures, and the average distance from the detected fissures to the references is 0.37 mm. For lobe segmentation, we compared overlapped volumes with the reference lobes and the average DSC measures were 0.95, 0.96, 0.93, 0.85, and 0.95 for left upper, left lower, right upper, right middle, and right under, respectively.
Conclusion: A robust method of segmentation of fissures and lobes is proposed. This method separates lobes without bronchial tree information, which also reduces significant computation time.

10:30 - 12:00 **Room O**

GI Tract

SS 601b

Multimodality imaging of Crohn's disease

Moderators:
S. Gourtsoyianni; London/UK
C. Hoeffel; Reims/FR

B-0441 10:30

Diagnostic value of 4th generation iterative reconstrution algorithm with low dose CT- enterography protocol in follow-up of Crohn's disease patients: comparison with standard dose

S. Lombardi, D. Ippolito, C. Talei Franzesi, C. Trattenero, P. Bonaffini, S. Sironi; *Monza/IT (sophielombardi@mac.com)*

Purpose: To determine the diagnostic efficacy, in terms of radiation dose, image quality and diagnostic performance of low dose CTE protocol combined with iterative reconstruction algorithm (iDose4), in comparison with standard dose CTE in follow-up of patients with known Crohn's disease (CD).
Methods and Materials: Thirty-six patients with CD underwent low-dose CTE scan in a single venous phase on 256 MDCT scanner (iCT, Philips) with 120 kV,automated mAs-modulation and slice thickness 2 mm, using iDose4 iterative reconstruction algorithm.A control group of thirty-seven patients underwent standard dose (120Kv,200-300 mAs)protocol on the same CT scanner.Two radiologists, blinded to clinical and pathological findings,independently evaluated HU values in bowel wall and presence of CD activity features (mural thickening and enhancement pattern,comb sign, lymphoadenomegaly and complications). Image noise, standard deviation (SD) and diagnostic quality were evaluated using a 4-point scale.Dose-length product (DLP) and CT-dose-index (CTDI) were recorded and compared between both examinations.
Results: Low-dose CTE protocol showed high diagnostic quality in assessment of Crohn's disease features. Total DLP and CTDI were significantly ($p < 0.001$) lower in CTE studies with iDose4 (604.98 mGy*cm and 12.29 mGy) as compared to standard dose examinations (974.85 mGy*cm and 19.71 mGy), allowing an overall dose reduction of 37.6%. Noise resulted slightly higher in iDose4 images (SD =15.97 ± 4.87) than in the standard dose (SD=13.61± 3.8), but difference was not statistically significant (p=0.064).
Conclusion: Low-dose CTE protocol combined with iDose4 reconstruction algorithm offers high quality images with significant reduction of radiation dose, being a useful tool in CD patients management, in regard of their young age and the frequent imaging follow-up required.

B-0442 10:38

Warm CO_2 CT enteroclysis or virtual enteroscopy (VE): preliminary experience of a new technique for small bowel imaging on Crohn's patients with subocclusive or complicated disease

D. Szapiro, L. Bidaut, J. Serhan, A. Matthews, T. Hartley, A. Gangi; *Kirkcaldy/UK (dszapiro@nhs.net)*

Purpose: First-line examination of the small bowel in Crohn's is MR-Enterography (MR-E). However, MR-E is sometime clearly suboptimal, which may even lead to inadequate diagnosis and therapeutic strategies. With warm CO_2 insufflation providing full relaxation of the bowel wall, VE may be considered as a viable alternative.
Methods and Materials: Crohn's patients were selected for VE in complicated cases showing stenotic disease or fistulae, and if first-line examinations were deemed negative despite clinical suspicion. Cases with sub-occlusive diseases were expected to benefit most from VE since the need of fluid filling agents for MR-E may be less than tolerable. Following informed consent, VE consisted mainly of double-end insufflation with CO_2 at 43 degrees Celsius through top-end nasojejunal and lower-end rectal tubes.
Results: Higher spatial resolution of CT increases diagnostic confidence when doing VE. Opposed to MR-E, CO_2 is a negative luminal contrast agent allowing 3D post-processing and fly-through alongside further reformatting. Lesions can be localised precisely, and even the length of the resected small bowel is well predicted if surgery is an option. VE differentiates true small bowel stenoses from peristalsis false positives, and also improves the evaluation of proximal Crohn's such as jejunal disease prone to fibrotic complications.
Conclusion: VE should be viewed as a problem-solving technique in Crohn's complex cases, and also be attempted in cases of patent discrepancy between MR-E and clinical or biological findings. VE is able to triage patients ahead of more costly techniques such as Video-Capsule Endoscopy, thus leading to more efficient patient management.

B-0443 10:46

The value of dual energy CT in the detection of pathological intestinal segments in patients with Crohn disease (CD)

A. Villanueva, G. Tardáguila, C. Martínez, C. Varela; *Vigo/ES (avillanueva@povisa.es)*

Purpose: To demonstrate that the use of post-processing parameters obtained in studies using dual energy CT allows us to differentiate between healthy and diseased segments in patients with Crohn disease.
Methods and Materials: A retrospective study of 33 patients with known CD (16 men, 17 women, mean age 54 years); all underwent entero CT with dual energy protocol. All studies were obtained following oral sorbitol solution and the administration of IV contrast at portal phase. The postprocessing of dual energy images were acquired with with iodine (mg/ml) and fat fraction (%) of the intestinal wall of a selected segment of diseased bowel and a healthy segment, and quantified as to whether there were differences between them
Results: Quantification of iodine in the healthy segments is 1.8 ($\pm$ 0.4) mg/ml and 3.7 ($\pm$ 0.9) mg/ml in pathological segments, a statistically significant difference ($p < 0.01$). The fraction of fat present in 32.42% ($\pm$6.5) and 22.23% ($\pm$9.4) pathological segments, a statistically significant difference ($p < 0.01$).
Conclusion: Dual energy CT is useful in order to obtain quatifiable parameters in the assessment of healthy as oppossed to pathological segments in patients with CD.

B-0444 10:54

Long-term performance of readers trained in grading Crohn's disease activity using MRI

C.A.J. Puylaert, J.A.W. Tielbeek, S. Bipat, T.N. Boellaard, C.Y. Nio, J. Stoker; *Amsterdam/NL (c.a.puylaert@amc.uva.nl)*

Purpose: To evaluate the long-term performance and intra-rater reliability of readers that had participated in a previous case-based reader training in grading Crohn's disease activity.
Methods and Materials: Fourteen individuals (8 female; 12 radiologists, 2 residents; mean age 40; range 31-59), who had participated in a previous case-based reader training, participated in a follow-up evaluation (interval: 25-34 months). Evaluation comprised of 25 MRI cases of suspected or known Crohn's disease patients with direct feedback after each case; cases were identical to the evaluation set used in primary training (of which readers were unaware). Grading accuracy, overstaging and understaging were compared between primary training and follow-up evaluation using a consensus score by two experienced abdominal radiologists as the reference standard. Additionally, we evaluated intra-rater agreement for each reader's grading in primary training and follow-up.
Results: In the follow-up evaluation, an overall grading accuracy of 72% (95%CI: 62-81%) was seen, equal to the grading accuracy of 72% (95%CI: 61-80%) at primary training (P=0.883). Overstaging had decreased significantly from 19% (95%CI: 12-27%) to 13% (95%CI: 8-22%) between primary training and follow-up (P=0.041). However, understaging increased significantly from 9% (95%CI: 4-21%) to 14% (95%CI: 7-26%) (P=0.007). Weighted kappa values for intra-rater agreement between primary training and follow-up showed a mean of 0.67 (range: 0.42-0.91).
Conclusion: Readers have a consistent long-term accuracy for grading activity in Crohn's disease patients after case-based training with direct feedback.
Author Disclosures:
J. Stoker: Consultant; Robarts.

B-0445 11:02

Diffusion-weighted MRI for evaluating ileocolonic inflammation in Crohn' disease: how does it contribute to diagnose disease activity?

X. Li[1], X. Jiang[1], Z. Zhang[2], S. Huang[1], J. Lin[1], L. Huang[1], C. Sun[1], Z. Li[1]; [1]*Guangzhou/CN*, [2]*Dallas, TX/US (canhuisun@sina.com)*

Purpose: To assess the efficacy of diffusion-weighted MRI (DWI) for evaluating ileocolic inflammation in patients with Crohn's disease (CD).
Methods and Materials: Forty-four patients with CD underwent MR enterography (MRE) with DWI using three b values of 50, 400 and 800 s/mm^2 and ileocolonoscopy. The mural thickness, signal intensity (SI) on T2-weighted images and DWI, contrast enhancement of ileocolon were qualitatively scored from 0 to 3. Apparent diffusion coefficient (ADC) map was generated by using monoexponential model. The segment disease activity was scored by simplified endoscopic score for Crohn's disease (SES-CD) and was graded as inactive (0-2), mild (3-6) or moderate-severe (≥7). The imaging scores and ADC were compared and correlated with SES-CD.
Results: On 185 evaluated bowel segments including inactive (86), mild (72), and moderate-severe (27) CD, DWI was 94.94% sensitive and 95.35% specific with 95.92% positive and 94.25% negative predictive values. In inactive and mild CD, DWI (r = 0.638, 0.626) and ADC (r = -0.583, -0.656) correlated more closely with disease activity than conventional MRE (r: 0.443-0.594). ROC analysis showed high diagnostic accuracy of DWI (AUC=0.972) and ADC (AUC=0.973) for discriminating CD activity. Only ADC analysis was discriminatory for mild and moderate-severe CD (P=0.002).
Conclusion: Free-breathing DWI with ADC analysis distinguishes inactive, mild and moderate-severe CD without contrast injection, and correlates better than conventional MRE with endoscopic findings in inactive and mild CD.

B-0446 11:10

Evaluation of three MRE index for grading Crohn's disease activity

J. Rimola[1], A. Alvarez-Cofiño[2], T. Pérez-Jeldres[3], C. Ayuso[1], S. Rodríguez[1], I. Alfaro[1], I. Ordás[1], J. Panés[1]; [1]*Barcelona/ES*, [2]*Gijón/ES*, [3]*Santiago de Chile/CL (jrimola@clinic.ub.es)*

Purpose: Different Magnetic Resonance Enterography (MRE) indices are available for use in research in Crohn's Disease (CD). The aim of this work is to compare the accuracy of three MRE indices for detecting activity and for detecting severe disease.
Methods and Materials: MRE and ileocolonoscopies performed within 1 month from 43 patients with CD were reviewed. MRE images were interpreted with proper blinding. MaRIA, Clermond and London scores for each colonic segment and terminal ileum were calculated. Simplified Endoscopy Score for CD (SES-CD) was considered the gold standard.
Results: 224 segments were included in the analysis. According to the established cut-off points for detecting activity using MaRIA, Clermond and London indices, the sensitivity was 0.88, 0.90, and 0.71, and the specificity was 0.97, 0.78 and 0.98 respectively. Sensitivity for detecting ulcerations was 0.90 and 0.83, and specificity 0.92 and 0.89 for MaRIA and Clermond respectively (London index had not defined a cut-off for ulcers). The AUROC for Maria, Clermond and London indices were 0.93, 0.94 and 0.89 for detecting activity, and 0.94, 0.92 and 0.90 for detecting ulcerations. There were no statistical differences ($p > 0.05$) between indices for detecting activity or ulcers, but performance index were superior for MaRIA. Correlations between MaRIA, Clermond and London indices and SES-CD were 0.68, 0.68 and 0.80 respectively ($p < 0.01$).
Conclusion: The 3 MRE-based indices of activity for CD evaluated in the current study have a similar accuracy for the diagnosis of active disease, and to identify severe disease, although the MaRIA index showed a higher performance.
Author Disclosures:
J. Rimola: Advisory Board; Robarts Clinical Research. Consultant; AbbVie, Takeda.

B-0447 11:18

In vivo axial-strain sonoelastography helps distinguish acutely inflamed from fibrotic terminal ileum strictures in patients with Crohn's disease

L.M. Sconfienza[1], L. Pescatori[2], F.M. Doniselli[2], F. Cavallaro[1], G. Tontini[1], L. Pastorelli[1], M. Vecchi[1], F. Sardanelli[1]; [1]*San Donato Milanese/IT*, [2]*Milan/IT (lorenzo.carlo.pescatori@gmail.com)*

Purpose: To ascertain whether RTS could in vivo differentiate fibrotic from inflammatory terminal ileum strictures in patients with Crohn's disease, using magnetic resonance enterography (MRE) as a reference standard.
Methods and Materials: Sixteen patients (13m,3f; median[interquartile interval]age=41[31-48.5]years; median C-reactive protein (CRP)=0.95[0-2.23]mg/dl; median disease duration=108.5[35-213.75]months; median Harvey-Bradshaw Index (HBI)=3[3-5.25]) with terminal ileum CD were prospectively included. Short-axis scans were performed, each cross-section was ideally subdivided into eight circular sectors. Colour map provided by RTS was translated into semiquantitative scale (1=red;2=green;3=blue).
Results: At MRE, inflammation was seen in 9 patients, fibrosis in 7. Total median RTS score was significantly lower in patients with inflammatory stricture (16[16-18]) than in patients with fibrosis (20[17.5-22];P=0.003). The same happened when the four most superficial quadrants of the loop were considered (8[7-9]vs.10[9-11.5];P=0.003). No significant correlation was seen between RTS-HBI (r=0.467;P=0.686), RTS-CRP (r=-0.750;P=0.567), RTS-disease duration (r=0.238;P=0.483).
Conclusion: RTS is a promising imaging modality to differentiate in vivo inflammatory from fibrotic terminal ileum strictures in patients with Crohn's disease.

B-0448 11:26

Dynamic contrast enhanced MRI of small bowel: diagnostic value of quantitative perfusion analysis in vascular assessment between inflammatory and fibrotic lesions in Crohn's disease

S. Lombardi, D. Ippolito, C. Talei Franzesi, S. Sironi; *Monza/IT (sophielombardi@mac.com)*

Purpose: To determine local inflammatory activity of Crohn's disease (inflammation and mural fibrosis) by measurement of bowel wall quantitative perfusion kinetics parameters using dynamic contrast-enhanced magnetic resonance imaging.
Methods and Materials: We analysed 37 patients with known biopsy proven CD,who underwent MR-enterography study, performed on 1.5 T MRI system (Achieva, Philips), using a phased array sense body multi-coil, after oral administration of 1.5-2 of PEG solution. MRE protocol included T1 weighted, sSShT2, sBTFE and gadolinium enhanced THRIVE sequences acquired on coronal and axial planes. Dedicated workstation was used to generate colour permeability maps, and after the placing of Region of Interest (ROI) on bowel site involved by CD localization the following parameters were calculated and statistically analysed: Relative Arterial, Venous and Late enhancement (RAE, RVE, RLE), Maximum Enhancement (ME) and Time To Peak (TTP).
Results: Quantitative perfusion analysis showed a good correlation with local degree of Crohn's inflammation activity, and 26/37 patients showed active inflammatory disease (reference standard disease activity: wall bowel thickness, hyper-enhancement and layered enhancement) with following perfusion parameters: RAE (%): median= 56.4;RVE (%): 81.2;RLE (%): 85.4; ME (%):809.6;TTP (sec): 203.4.The same parameters calculated in patients with mural fibrosis were: REA= 116.1,RVE = 125.3,RLE= 127.1,ME =1054.7, TTP= 157. Significant differences ($p < 0.001$) between inflamed and fibrotic bowel wall vascularity were found in all evalueted parameters,obtaining higher values in active Crohn's disease bowel site.
Conclusion: Vascular assessment of perfusion kinetics of bowel wall by dynamic contrast perfusion-MR analysis represents a complementary diagnostic tool that enables the quantitative evaluation of local inflammation activity in CD patients.

B-0449 11:34

Comparison of magnetisation transfer and diffusion-weighted MRI for detection of bowel fibrosis in Crohn's disease: initial experience

X. Jiang[1], X. Li[1], Z. Zhang[2], S. Huang[1], J. Lin[1], L. Huang[1], C. Sun[1], Z. Li[1]; [1]*Guangzhou/CN*, [2]*Dallas, TX/US (canhuisun@sina.com)*

Purpose: To compare the efficacy of magnetization transfer imaging (MTI) and diffusion-weighted MRI (DWI) for detecting intestinal fibrosis of Crohn's disease (CD).
Methods and Materials: Forty-four patients with CD underwent MR enterography (MRE) with MTI (1,000 Hz off-resonance) and DWI (b values of 50, 400 and 800 s/mm2). According to MRE findings, patients were classified in three subgroups:"A" inflammatory group, "A+B" inflammatory + fibrotic group and "B" fibrotic group. The MT ratio (MTR) and apparent diffusion coefficient (ADC) of the bowel segments were calculated. MTR and ADC were compared using ANOVA analysis and receiver operating characteristics (ROC) curve analysis.
Results: Comparison of MTR and ADC showed significant differences between Group "A" and Group "B" ($P < 0.001$), Group "A+B" and Group "B"($P < 0.001$). No significant difference was found between Group "A" and Group "A+B" (P=0.081) in ADC whereas the difference of MTR was significant ($P < 0.001$). ROC analysis showed higher diagnostic accuracy of MTR (AUC=0.959) than that of ADC (AUC=0.809) for differentiating fibrosis from inflammation. The threshold MTR of 37.50 % and ADC value of 1.00×10-3 mm2/s allowed with 97% sensitivity and 81.8% specificity, 69.7% sensitivity and 90.9% specificity respectively.
Conclusion: Both MTI and DWI with ADC analysis help with detection intestinal fibrosis in CD. MTI shows higher diagnostic efficacy than ADC for differentiating fibrosis from inflammation.

B-0450 11:42

Evaluation of quantitative PET/MR-E biomarkers for discriminating inflammatory from fibrotic strictures in Crohn's disease

O.A. Catalano, M. Gee, D. Sahani, U. Mahmood, B. Rosen, D. Gervais; *Boston, MA/US (onofriocatalano@yahoo.it)*

Purpose: Differentiation of fibrotic from inflammatory strictures is pivotal in Crohn's disease management, but extremely challenging. We prospectively evaluated hybrid FDG PET/MR enterography (PET/MR-E) for differentiation of fibrotic from inflammatory strictures in patients with Crohn's disease.
Methods and Materials: 19 patients with established Crohn's disease underwent PET/MR-E and were found to have strictures. A total of 33 bowel segments were identified in these patients corresponding to strictures that underwent surgical bowel resection within 5 weeks of imaging with histology available. PET/MR-E quantitative biomarkers were assessed in all bowel segments blinded to the histological findings; afterward, their performance for differentiating inflammatory from fibrotic strictures was assessed compared with hystologic reference.
Results: Among the PET/MR-E biomarkers evaluated, SUVmax, T2SI*SUVmax, and ADC*SUVmax all exhibited significant differences between bowel segments with fibrosis and those with either fibrosis plus active inflammation or active inflammation only. The best individual discriminator between fibrosis and active inflammation was the combined PET/MR-E biomarker ADC*SUVmax, which was associated with accuracy/sensitivity/specificity values of 75.8%/81.8%/72.7%. based on a threshold value of < 3000 for fibrosis.
Conclusion: PET/MR-E offers a potential noninvasive technique for differentiating purely fibrotic strictures that will require mechanical therapy, from mixed or inflammatory strictures, in which medical therapy will be the primary treatment. A hybrid biomarker incorporating both MRI and PET information performed better for stricture evaluation than either modality alone.

B-0451 11:50

MRI features of proctitis in Crohn's disease

C.J. Tutein Nolthenius, S. Bipat, B. Mearadji, A. Spijkerboer, A. Montauban van Swijndregt, C.I.J. Ponsioen, J. Stoker; *Amsterdam/NL (c.j.tuteinnolthenius@amc.uva.nl)*

Purpose: Pelvic MRI is widely used in perianal Crohn's disease (CD). Although diagnosing proctitis is important for management, MRI criteria are lacking. In our retrospective study, we studied which MRI characteristics are valuable in assessing proctitis.
Methods and Materials: CD patients (≥18 years) who underwent proctoscopy, sigmoidoscopy or colonoscopy (reference standard) and perianal fistula MRI (T2wTSE, fat sat T2wTSE, fat sat T1w TSE after gadolinium) within eight weeks were included. All predefined 15 MRI features were blindly scored by three observers and correlated to endoscopy using regression analyses. Reproducibility (multirater kappa, intraclass correlation coeffient) was determined for all three observer pairs. MRI features were considered relevant if there was a significant correlation with endoscopy for ≥ two observers, and reproducibility ≥0.40 for two of three observer pairs.
Results: Of 58 CD patients, 26 (45%) had proctitis and 32 (55%) had no proctitis. Rectal wall thickness, perirectal T2 signal, creeping fat and size of mesorectal lymph nodes showed a significant correlation with endoscopy for all three observers (p=0.000-0.023, p=0.000-0.003, p=0.007-0.011 and p=0.000-0.005, respectively) and kappa/intraclass correlation coefficient ≥0.40 for all three observer pairs. Perirectal enhancement and the presence of rectal mural fat showed a significant correlation with endoscopy (p=0.000 and p=0.011-0.025, respectively) for at least two of three observers, reproducibility was ≥0.40 for two of three observer pairs.
Conclusion: Wall thickness, mural fat and perirectal tissue features (perirectal T2 signal, perirectal enhancement, creeping fat and size of mesorectal lymph nodes) were the most valuable MRI features in diagnosing proctitis.
Author Disclosures:
J. Stoker: Consultant; Robarts Clinical Trials.

10:30 - 12:00 **Room N**

Cardiac

SS 603

Evolving techniques

Moderators:
A.J.B.S. Madureira; Porto/PT
M. Meyer; Mannheim/DE

B-0452 10:30

Self-navigated 3D radial whole-heart MRA for the assessment of coronary artery anomalies in paediatric patients: comparison with coronary CTA

A. Varga-Szemes[1], G. Muscogiuri[1], C.N. De Cecco[1], P. Suranyi[1], S. Mangold[1], D. Piccini[2], A. Hlavacek[1], A.C. Nutting[1], U.J. Schoepf[1]; [1]*Charleston, SC/US*, [2]*Lausanne/CH (akos.varga@gmail.com)*

Purpose: The aim of this study was to assess image quality and coronary artery anatomy using a prototype non-contrast self-navigated 3D whole-heart MRA acquisition in comparison with coronary CTA in children.
Methods and Materials: Eleven patients (14±2y) with suspected coronary artery anomalies underwent a standard-of-care CTA and a research non-contrast radial whole-heart MRA for the assessment of the coronary arteries. The steady-state free precession based whole-heart MRA was performed using the following parameters: TR/TE=3.1/1.5 ms, flip angle=115°, FOV=220 mm, voxel size=1.1 mm^3, and 12064 radial views. Subjective diagnostics image quality was evaluated using a 4-grade scale. The ability to visualise the major coronary arteries and the time of acquisition were assessed. A Wilcoxon test was used to compare subjective image quality between CTA and MRA.
Results: The MRA acquisition time was 6.4±1.5 min with an average heart rate of 78 bpm. MRA and CTA image quality ratings were 2.9[2.5; 3.5] and 3.4[3; 4], respectively (p=0.11). MRA allowed the visualisation of the left main (91%), left anterior descending (91%), left circumflex (82%), right coronary (82%), first diagonal (55%), and posterior descending (64%) arteries.
Conclusion: In this preliminary study, there was good agreement in the evaluation of coronary artery anatomy between MRA and CTA. MRA was able to assess the major coronary artery branches. The self-navigated MRA sequence allows for the acquisition of an isotropic volume in a free-breathing fashion in about half the time as the respiratory-navigated coronary MRA, without penalties in image quality, and without radiation exposure, contrast agent administration, or the need for sedation.
Author Disclosures:
A. Varga-Szemes: Consultant; Guerbet. **C.N. De Cecco:** Consultant; Guerbet. **D. Piccini:** Employee; Siemens Healthcare. **U.J. Schoepf:** Consultant; Bayer, Bracco, GE, Guerbet, Medrad, Siemens. Research/Grant Support; Bayer, Bracco, GE, Medrad, Siemens.

B-0453 10:38

Simultaneous positron emission tomography-magnetic resonance imaging for the early detection of cardiac involvement in patients with Anderson-Fabry disease

L. Barbuto, C. Nappi, A. Ponsiglione, M. Puglia, M. Imbriaco, E. Nicolai, L. Spinelli, A. Cuocolo; *Naples/IT (luigibarbuto@hotmail.com)*

Purpose: Anderson-Fabry disease (AFD) is a X-linked lysosomal storage disorder associated with multi-organ failure. Early diagnosis, treatment strategies and monitoring play a key role for patient outcome. We investigated the potential role of hybrid positron emission tomography (PET)-magnetic resonance (MR) imaging in the assessment of early cardiac involvement in AFD patients.
Methods and Materials: Sixteen AFD patients (8 men, age 43±14 years) without known cardiac disease and normal left ventricular (LV) function (ejection fraction 67 ± 9%) underwent simultaneous cardiac PET-MR imaging after administration of 18 F-fluorodeoxyglucose (FDG) and gadolinium-DPTA. One patient was excluded for claustrophobia. Image analysis was performed using automated software.
Results: On MR images, 5 out of 15 patients exhibited LV hypertrophy and focal late gadolinium enhancement (LGE) as expression of intra-myocardial fibrosis. Three out of 5 patients with LV hypertrophy and focal LGE showed positive STIR sequences on MR images and high FDG uptake on PET imaging in the corresponding myocardial territory; the remaining 2 patients had negative STIR sequences and low FDG uptake. Focal intra-myocardial fibrosis, positive STIR sequences and high FDG uptake were observed also in a female without LV hypertrophy. The 9 patients without LV hypertrophy and LGE exhibited negative STIR sequences and homogeneous FDG uptake on PET imaging, by excluding 2 patients with an inhomogeneous FDG uptake.
Conclusion: PET-MR imaging is clinically feasible for the early detection of cardiac involvement in patients with AFD. Further studies evaluating the role of hybrid PET-MR in disease management in larger patients population are warranted.

B-0454 10:46

Relationship between myocardial fibrosis and left ventricular functional impairment in diabetes mellitus type-II: preliminary results

N. Galea, F. Ciolina, R. Pofi, T. Feola, C. Catalano, M. Francone, I. Carbone; *Rome/IT (nicogale2000@yahoo.it)*

Purpose: Diabetic cardiomyopathy (DCM) can determine a progressive dysfunction of ventricular contraction with the evolution to heart failure, independently of ischaemic heart disease or hypertension.Early stages of DCM are asymptomatic and characterised by various degrees of myocardial fibrosis. Our aim was to detect non-invasively myocardial fibrotic infiltration in DM-II patients and to assess its relationship with ventricular function abnormalities.
Methods and Materials: Forty-two diabetic patients with preserved ventricular function and no history of ischaemic disease and 20 matching controls underwent CMR. Imaging protocol included: modified Look-Locker sequence before and 20 minutes after 0.2 mmol/kg gadoterate meglumine injection; T2-mapping; ventricular function module; tagged-cineMR module; late gadolinium enhanced (LGE) imaging. Native myocardial T1 (nT1) and T2 values, extracellular volume fraction (ECV), ventricular torsion angle and myocardial strain values have been calculated and correlated to glycated haemoglobin (HbA1c) and duration of disease. Pearson Correlation, Mann-Whitney test and unpaired T-test were used for statistical analysis.
Results: Patient group had higher nT1 and ECV values compared to controls (1035±94 ms vs. 975±38 ms, 28.2±3.3% vs. 24.8±4.3% respectively, $p < 0.05$ for both), whereas no significant differences occurred in T2 measurements (46.1±2.3 ms vs. 47.0±2.8 ms respectively, p=0.23). nT1 and ECV correlated with HbA1c (nT1:r2=0.98,ECV:r2=0.95,p <.001) and disease duration (nT1:r2=0.98;ECV:r2=0.55,p <.001) in diabetic patients. nT1 and ECV correlate positively with torsion (nT1:r2=0.98;ECV:r2=0.89;p <.001) and negatively with strain value in tagged-cineMR analysis (nT1:r2=-0.98;ECV:r2=0.92; p <.001). Ischaemic LGE areas were found in three patients as marker of silent infarction.
Conclusion: In diabetic patients with preserved ventricular function, HbA1c values and disease duration are correlated to myocardial nT1 and ECV increase, as reflection of diffuse fibrosis, and geometrical modification.
Author Disclosures:
M. Francone: Speaker; Bracco. **I. Carbone:** Grant Recipient; Guerbet. Speaker; Bracco.

B-0455 10:54

Dependency of prevalence and extent of infarct size (IS) and microvascular obstruction (MO) on the timing of imaging and constrast injection after infarction

T. Emrich, N. Abegunewardene, A. Theruvath, K. Oberholzer, T. Muenzel, C. Dueber, K.-F. Kreitner; *Mainz/DE (tilman.emrich@gmail.com)*

Purpose: Cardiac MR (CMR) imaging markers of myocardial damage after acute infarction such as infarct size (IS) and microvascular obstruction (MVO) provide independent and incremental prognostic information. In a prospective study, we analysed the dependency of prevalence and extent of IS and MVO on the timing of imaging after contrast injection and on the timing of imaging after infarction.
Methods and Materials: 40 patients with AMI and successful PCI underwent two CMR examinations within 10 days, the first within 48 hours after AMI. CMR imaging was performed at 1.5 T. The acquisitions were performed 2 (early enhancement, EE) and 10 minutes (late enhancement, LE) after application of 0.2 mmol Gd-DTPA/kg body-weight, respectively.
Results: Areas of MVO were detected in 31/40 early and in 27/40 late after contrast application at exam1. The number decreased at exam2 to 22/40 and 16/40 patients, respectively ($p < 0.001$). In all patients, the extent of MVO significantly decreased from early to late imaging at exam1 (5.4±5.2% vs. 3.0±3.7%, $p < 0.001$) and at exam 2 (2.8±4.1% vs. 1.2±2.3%, $p < 0.001$). The decrease of MVO was also significant on EE and LE images between exam1 and 2 (5.4±5.2% vs. 2.8±4.1%, $p < 0.001$, and 3.0±3.7% vs. 1.2±2.3%, $p < 0.001$). Areas of LE significantly decreased from exam1 to exam2 (20.4±10.1% vs. 16.3±8.9%, $p < 0.001$).
Conclusion: Prevalence and extent of MO and IS is dependent on timing of imaging after PCI and contrast injection. Therefore, standardized imaging after PCI is needed.

B-0456 11:02

Detection and quantification of myocardial infarction using a dark blood late gadolinium enhancement technique

A. Varga-Szemes[1], G. Muscogiuri[1], P. Suranyi[1], W.G. Rehwald[2], C.N. De Cecco[1], S. Mangold[1], D. Caruso[1], S.R. Fuller[1], U.J. Schoepf[1]; [1]*Charleston, SC/US*, [2]*Chicago, IL/US (vargaasz@musc.edu)*

Purpose: The aim of our study was to evaluate the accuracy of a prototype dark blood inversion recovery (IR) technique for the detection and quantification of myocardial late gadolinium enhancement (LGE) in patients with myocardial infarction (MI).

Methods and Materials: Twenty-three patients (58±17y, 17 male) with suspected MI were prospectively enrolled and consented for a 1.5 T cardiac MRI. Conventional "bright-blood" GE imaging and a corresponding prototype dark blood T (Rho) And Magnetisation Transfer IR ("TRAMINER") acquisition were performed 15 minutes after the administration of contrast agent. Image evaluation and MI quantification were performed according to the 17-segment model. Inter-reader agreement and diagnostic accuracy were calculated using κ and McNemar statistics, respectively.

Results: A total of 391 myocardial segments were evaluated. Fifteen segments (3.8%) were excluded from the analysis due to image artifacts. No significant difference was observed in MI volume (4.2±1.9 vs. 4.4±1.6 ml, *P*=N.S). and MI percentage (11.1±8.9 vs. 11.0±6.7%, *P*=N.S). between the conventional and the TRAMINER techniques. Inter-reader agreement was good (κ=0.74) to excellent (κ> 0.81) for the detection of LGE between the readers. Sensitivity and specificity of TRAMINER for the detection of MI were 96.1% and 97.4%, respectively.

Conclusion: In this study, the dark blood TRAMINER acquisition performed similarly to conventional LGE imaging. Given its high sensitivity and specificity, the TRAMINER approach is a non-inferior alternative to LGE imaging for the detection of MI. Due to its dark blood approach, TRAMINER may have benefits in patients with subendocardial MIs for which evaluation by standard LGE imaging can be limited.

Author Disclosures:

A. Varga-Szemes: Consultant; Guerbet. **W.G. Rehwald:** Employee; Siemens Heathcare. **C.N. De Cecco:** Consultant; Guerbet. **U.J. Schoepf:** Consultant; Bayer, Bracco, GE, Guerbet, Medrad, Siemens. Research/Grant Support; Bayer, Bracco, GE, Medrad, Siemens.

B-0457 11:10

Cardiac magnetic resonance characteristics of patients with the clinical signs of ST-elevation myocardial infarction and normal coronary angiography

F. Suhai, C. Czimbalmos, I. Csécs, A. Tóth, B. Horváth, E. Szima Mármarosi, D. Becker, B. Merkely, H. Vágó; *Budapest/HU (suhaiimi987@gmail.com)*

Purpose: Making diagnosis can be challenging in patients with clinical signs of ST-elevation myocardial infarction (STEMI) but with normal coronary angiography. The aim of our study was to investigate the diagnostic role and characteristics of cardiac magnetic resonance imaging (CMR) in this patient population.

Methods and Materials: Our prospective study was performed in 107 (91 males, age: 34±14 years) consecutive patients with the clinical signs of STEMI and with normal coronary angiography. They underwent CMR examination in the first 1-7 days. In patients with myocarditis control CMR examination were performed after 3-4 months.

Results: CMR examinations proved acute myocardial infarction in 10 cases (6 males, age: 47±17 years), Tako-Tsubo cardiomyopathy in 6 (all women, age: 66±16 years) cases. In 12 patients, CMR showed no cardiac disorder. In 79 patients (72 males, age: 30±9 years) characteristics of myocarditis were found. There was no difference in laboratory and MR parameters in pts with myocarditis and STEMI. In pts with Tako-Tsubo cardiomyopathy, left-ventricular ejection fraction (LVEF) was lower compared to pts with myocarditis and infarction (myocarditis: 55±8%, infarction: 57±8%, Tako-Tsubo: 42±12%, $p < 0.05$). We found negative correlation between the maximum level of high-sensitive troponin and the LVEF in patients with myocarditis and myocardial infarction. Control CMR showed higher LVEF (55±7% vs. 59±5%) and lower LV mass compared to acute data (66±12 g/m2 vs. 59±11 g/m2, $p < 0.001$); however, remaining delayed enhancement could be detected in 72% of patients.

Conclusion: In cases with clinical signs of STEMI and normal coronary angiography, CMR is an accurate diagnostic tool, and capable of establishing relevant differential diagnoses.

B-0459 11:18

Cardiac magnetic resonance volume analysis in patients with single ventricle

F. Secchi, M. Petrini, A. Cozzi, P. Cannaò, F. Sardanelli; *Milan/IT (francescosecchimd@gmail.com)*

Purpose: To find a suitable and reliable method to evaluate cardiac function in single ventricle (SVentr) patients.

Methods and Materials: Of consecutive 70 SVentr patients who underwent CMR, 55 (79%, aged 28±8.6 years, had complete exams of sufficient quality for this analysis. Ventricle function and aortic flow (AF) analysis was performed. Short-axis cine images were segmented manually (MEDIS QMass 7.6) including both the principal and the accessory/hypoplastic ventricles. A blood threshold technique (Mass-K mode) was applied to calculate end diastolic volume (EDVi), end systolic volume (ESVi), stroke volume (SV), ejection fraction (EF) and cardiac mass. The AF was evaluated segmenting in through-plane images (MEDIS QFlow 5.6) to obtain forward and backward volumes. Wilcoxon and Spearman test were used. Reproducibility in a subset of 24 randomly selected patients was tested with Bland-Altman method.

Results: Mean EDVi (134±67 mL), ESVi (68±45 mL), SV (67±29 mL), EF (52±11%), mass (104±48 g), aortic forward volume (69±31 mL/beat) and backward volume (3±3 mL/beat) were obtained. No significant difference was found between mean SV and aortic forward flow (p=0.123) and a strong significant correlation between them was found (r=0.789, $p < 0.001$). Intra-reader reproducibility was up to 86% for ventricle function and up to 96% for AF analysis; inter-reader reproducibility was 85% and 96%, respectively.

Conclusion: SV and AF values, calculated with Mass-K mode technique in SVentr patients, show no significant difference. A highly reproducible method to estimate cardiac function in SVentr patients was validated. Due to the absence of other noninvasive techniques, this CMR method can lead clinical/surgical decision making.

B-0460 11:26

Patient satisfaction with coronary CT angiography, myocardial CT perfusion, myocardial perfusion MRI, SPECT myocardial perfusion imaging and conventional coronary angiography

S. Feger[1], M. Rief[1], E. Zimmermann[1], F. Richter[1], R. Röhle[1], M. Dewey[1], E. Schönenberger[2]; [1]*Berlin/DE*, [2]*Hannover/DE (sarah.feger@charite.de)*

Purpose: To evaluate patient acceptance of noninvasive imaging tests for detection of coronary artery disease (CAD), including single photon emission computed tomography myocardial perfusion imaging (SPECT-MPI), stress perfusion magnetic resonance imaging (MRI), coronary CT angiography (CTA) in combination with CT myocardial stress perfusion (CTP) and conventional coronary angiography (CCA).

Methods and Materials: Intraindividual comparison of perception of 48 patients from the CORE320 multicentre multinational study who underwent rest and stress SPECT-MPI with a technetium-based tracer, combined CTA and CTP (both with contrast agent, CTP with adenosine), MRI, and CCA. The analysis was performed by using a validated questionnaire.

Results: Patients had significantly more concern prior to CCA than before CTA/CTP ($p < 0.001$). CTA/CTP was also rated as more comfortable than SPECT-MPI (p=0.001). Overall satisfaction with CT was superior to that of MRI (p=0.007). More patients preferred CT (46%; $p < 0.001$) as a future diagnostic test. Regarding combined CTA/CTP, CTP was characterised by higher pain levels and an increased frequency of angina pectoris during the examination ($p < 0.001$). Subgroup analysis showed a higher degree of pain during SPECT-MPI with adenosine stress compared to physical exercise (p=0.016).

Conclusion: All noninvasive cardiac imaging tests are well accepted by patients, with CT being the preferred examination.

Author Disclosures:

M. Dewey: Author; Grant support from the Heisenberg Program of the DFG for a professorship (DE 1361/14-1), the FP7 Program of the European Commission for the randomised multicenter DISCHARGE trial (603266-2, HEALTH-2012.2.4.-2), the European Regional Development Fund (20072013 2/05, 20072013 2/48), the German Heart Foundation/German Foundation of Heart Research (F/23/08, F/27/10), the Joint Program from the German Research Foundation (DFG) and the German Federal Ministry of Education and Research (BMBF) for meta-analyses (01KG1013, 01KG1110, 01KG1110), GE Healthcare, Bracco, Guerbet, and Toshiba Medical Systems. He has received lecture fees from Toshiba Medical Systems, Guerbet, Cardiac MR Academy Berlin, and Bayer (Schering-Berlex). Prof. Dewey is a consultant to Guerbet, and one of the principal investigators of multi-center studies

(CORE-64 and 320) on coronary CT angiography sponsored by Toshiba Medical Systems. He is also the editor of Coronary CT Angiography, and Cardiac CT, both published by Springer, and offers hands-on workshops on cardiovascular imaging (www.CT-kurs.de). Prof. Dewey is an associate editor of Radiology and European Radiology. Research/Grant Support; The CORE-320 study has received funding from Toshiba Medical Systems. Other; Institutional master research agreements exist with Siemens Medical Solutions, Philips Medical Systems, and Toshiba Medical Systems, the terms of these arrangements are managed by the legal department of Charité – Universitätsmedizin Berlin.

B-0461 11:34

Contrast enhanced magnetic resonance imaging of the heart in the quantification of myocardial damage in drug-resistant hypertension

O. Mochula, W. Ussov; *Tomsk/RU (mochula.olga@gmail.com)*

Purpose: This study was aimed at quantitative evaluation of myocardial damage in patients with drug-resistant hypertension, in the course of follow-up of renal sympathetic denervation using CE-MRI.
Methods and Materials: 26 patients with drug-resistant hypertension and left ventricular hypertrophy (LVH) were referred for the study. In everybody the renal sympathetic denervation (RSD) was carried out. All patients underwent CE-MRI of the heart at admittance and in three to six months after RSD treatment. Paramagnetic was injected as 1 mM per 10 kg BW. Total volume of tissue uptake of paramagnetic to the myocardium (VPM, cm3) and its segmental localization, the spatial distribution of myocardial mass (as thickness of the LV myocardium) and total LV myocardial mass (MMLV) were quantified.
Results: Six months after the RSD treatment there was a decrease of the volume of paramagnetic uptake to myocardium, with complete disappearance in 5 of 26 patients. In particular, at the admittance the VPM was 1.44 (0.96; 2.45) cm3, occupying up to 1/3 the thickness of the LV myocardium, whereas after RSD there was a statistically significant decrease of VPM to 0.66 (0.1; 1.96) cm3 (p=0.02). Also after the RSD there was a statistically significant (p=0.002) decrease in MMLV in everybody from 273.2 (197.34;327.91) down to 219.33 g.(183.42; 290.44)
Conclusion: The CE MRI of the heart provides effective detection and follow-up control of myocardial damage in patients with drug-resistant hypertension. CE MRI of the heart gives evidence the RSD resulted in significant involution of LVH.
Author Disclosures:
O. Mochula: Author; W.Ussov.

B-0462 11:42

Cardiac magnetic resonance (CMR) evaluation of non-compacted myocardium: comparison of two software packages

E. Pershina[1], M. Gutberlet[2], M. Grothoff[2]; [1]*Moscow/RU*, [2]*Leipzig/DE (pershina86@mail.ru)*

Purpose: To evaluate the performance of two commercially available software packages for the assessment of non-compacted myocardium.
Methods and Materials: We retrospectively evaluated CMR data of 26 (mean age 39 ±18, 4 years, male/female - 10/16) patients with left ventricular non-compaction cardiomyopathy (LVNC - n=8), dilated and hypertrophic cardiomyopathy (n=18). Measurements were performed using cmr42 (Circle Cardiovascular Imaging Inc. Version 5.0, Calgary, Canada) and QMassMR (version 7.6, Medis, Leiden, The Netherlands) with a new algorithm for trabeculation detection, the MassK-Mode. Non-compacted myocardial mass index (NCMi) and percentage (NCMp) of the left ventricle (LV) were calculated. The duration of the analysis was determined. The intra- and inter-observer agreement was calculated. Additionally, we compared NCMi and NCMp measured with semi-automatic myocardial contouring methods with QMassMR and manual detection of trabeculae with cmr42 in patients with LVNC.
Results: Median (interquartile range) of the non-compacted MMI using cmr42 was significantly lower than using QMassMR vs. 23 (30) g/m^2, $p < 0.001$). In the group of LVNC patients, mean ICC for the manual trabeculae detection approach with cmr42 and semi-automated trabeculae detection with QMassMR was excellent with narrow limits of agreement. The overall inter- and intra-observer agreement for cmr42 was 0.86, 0.89 and for QMassMR 0.97, 0.99. The mean total evaluation times using semi-automatic trabeculation detection were 3.57±0.67 min for QmassMR vs 4.38±1.43 min for cmr42.
Conclusion: According to the better overall inter- and intra-observer agreement and lower evaluation times, the semi-automated QMassMR method with a special algorithm for trabeculation detection seems to be advantageous in LVNC patients.

10:30 - 12:00 **Studio 2016**

Genitourinary

SS 607a

Female pelvis

Moderators:
O. Nikolic; Novi Sad/RS
K. Pyra; Lublin/PL

K-13 10:30

Keynote lecture

D. Akata; *Ankara/TR*

B-0463 10:39

Preoperative prediction using clinical and CT parameters for optimal resection in advanced ovarian cancer

B. Kim, S. Kim; *Daegu/KR (clubkbj@gmail.com)*

Purpose: We determined and validated the prediction of optimal resection (OR) in patients with advanced ovarian cancer based on clinical and CT parameters.
Methods and Materials: Between 2007 and 2015, 327 consecutive patients with FIGO stage III-IV ovarian cancer and preoperative CT underwent cytoreductive surgery. Patients who were diagnosed during 2007-2012 were assigned to a derivation dataset (n=220) and the others were assigned to a validation dataset (n=107). Clinical parameters were reviewed, and two radiologists assessed the presence or absence of disease at tabulated parameters on CT images. A multivariate stepwise logistic regression model determined the optimal model associating OR versus suboptimal resection (SOR) against available parameters.
Results: Stepwise logistic regression identified that ECOG-PS 2, peritoneal involvement, bowel mesentery involvement, diaphragmatic involvement, suprarenal lymph node and pleural effusion were independent predictors of OR. In the derivation dataset, predictive score could significantly predict SOR with an area under the receiver-operating characteristic curve (AUROC) of 0.792, a sensitivity of 72.4% and a specificity of 75.3%, and AUROC of 0758, a sensitivity of 68.2% and a specificity of 71.8% in the validation dataset. There was a significant difference in residual disease in the derivation and validation datasets (P=0.001) in keeping with improved OR rates from 45.0% (99 of 220 patients) in the derivation dataset to 64.4% (69 of 107 patients) in the validation dataset.
Conclusion: CT is preferentially valid for preoperative prediction of OR, which is able to be incorporated into the treatment selection and stratification of patients with advanced ovarian cancer.

B-0464 10:47

CT predictors for selecting conservative surgery or adnexectomy to treat adnexal torsion

Y. Yim, S. Jung, M. Yu, H. Park, Y. Kim, H. Jeon; *Seoul/KR (youngheeyim@gmail.com)*

Purpose: To identify computed tomography (CT) findings that may help in the selection between conservative surgery and adnexectomy in patients of reproductive age with adnexal torsion.
Methods and Materials: This retrospective institutional review board-approved study included 54 consecutive patients under 40 years of age (median age, 27 years) who underwent preoperative CT imaging before undergoing either conservative surgery or adnexectomy to treat adnexal torsion. The CT findings of patients treated with conservative surgery or adnexectomy were compared using univariate and multivariate logistic regression analysis.
Results: Of the 54 patients, 38 (38/54, 70.4%) underwent conservative surgery, and 16 (16/54, 29.6%) underwent adnexectomy. By univariate analysis, CT findings of tubal thickening (odds ratio [OR] = 11.3, p = 0.005) and eccentric smooth wall thickening of the adnexal mass (OR = 6.2, p = 0.031) were significantly associated with the patients treated with adnexectomy. By multivariate analysis, CT finding of tubal thickening was significantly associated with the patients treated with adnexectomy (OR = 7.6, p = 0.008).
Conclusion: Although the majority of patients of reproductive age with adnexal torsion can be treated with conservative surgery, patients who require adnexectomy tend to have a tubal thickening on CT.

B-0465 10:55

MRI to evaluate myometrium invasion in patients with placenta previa: correlation with histological findings

G. Frauenfelder, M.I. Ginocchio, M. Morlando, P.P. Mainenti, P. Martinelli, S. Maurea; *Naples/IT (giulia.frauenfelder@gmail.com)*

Purpose: Placenta invasion is an important cause of peri-partum morbidity and mortality; accurate detection of placental invasion is crucial for preoperative planning. The aim of the study was to investigate MR accuracy in patients with suspected placental invasion correlating MR imaging results with histopathological findings.
Methods and Materials: A total of 28 patients, ranging in age between 27 and 45 yrs (mean gestational age 32.2 weeks) who underwent pelvis MR because of US suspicious for placenta invasion were retrospectively investigated. Turbo Spin-Echo (TSE) T2-weighted images, with and without fat suppression, were obtained in the three conventional planes using a low-field 1.5 T MR (Intera, Philips®). MR accuracy was evaluated on the basis of myometrium wall invasion (no invasion, accreta, increta, percreta) in comparison with histological findings as standard of reference in all cases.
Results: MR sensitivity in detecting placenta previa was 100%; preoperative MR sensitivity, specificity and accuracy in detecting placental adhesion disorders were respectively 87%, 42% and 68%.
Conclusion: MR is a sensitive imaging method to evaluate placental myometrium invasion, but the diagnostic specificity is significantly lower since false positive results may occur particularly when fat tissue, urinary bladder or sigma infiltration is detected; in these latter cases, the degree of organ distension may uncorrectly affect imaging interpretation.

B-0466 11:03

Magnetic resonance elastography as a predictor of response to treatment of magnetic resonance-guided focused ultrasound surgery for uterine fibroids: a preliminary study

S. Ichikawa[1], U. Motosugi[1], M. Omori[1], K. Sano[2], S. Hirata[1], H. Onishi[1]; [1]*Chuo-shi, Yamanashi/JP*, [2]*Hidaka-shi, Saitama/JP (si99006@yahoo.co.jp)*

Purpose: To evaluate usefulness of magnetic resonance elastography (MRE) for prediction of response to treatment of magnetic resonance-guided focused ultrasound surgery (MRgFUS) for uterine fibroids.
Methods and Materials: Eleven patients with 11 fibroids were enrolled. All patients underwent MRgFUS and MRE with ExAblate 2000 (InSightec) and 1.5-Tesla scanner. Fractional volume reduction of > 10% was defined as "substantial reduction", and fractional change of > 30% in Symptoms Severity Score (SSS; 100-point scale on 8 symptoms) was defined as "substantial improvement" at 12 months after MRgFUS. The following variables of fibroids were analysed as potential predictors of response to treatment: signal intensity of T2-weighted image, location, pre-treatment volume, non-perfused volume (NPV), NPV ratio, stiffness value measured by MRE, and fractional change in stiffness value after treatment.
Results: Mean pre-treatment and post-treatment volume of fibroids were 414.8 mL (range, 28.26-864.6 mL) and 370.1 mL (19.86-750.6 mL). The mean fractional volume reduction was 16.5% (range, -8.83-46.5%). The mean NPV was 172.8 mL (12.22-314.9 mL), and mean NPV ratio was 48.1±19.2%. The pre-treatment stiffness values of fibroids in the patients with substantial reduction (n=6) were significantly higher than the others (n=5) (8.3±1.2 kPa vs. 6.1±1.2 kPa, P=0.0222). The fractional change in stiffness values in the patients with substantial improvement in SSS (n=6) were significantly higher than the others (n=5) (-0.26±0.09 vs. 0.38±0.46, P=0.0446). Other variables had no significant differences between the two groups.
Conclusion: The stiffness values of fibroids measured by MRE can be a predictor of response to treatment of MRgFUS.

B-0467 11:11

A leiomyoma scoring system for selecting patients for uterine artery embolisation

N.N.N. Naguib, N.-E.A. Nour-Eldin, T. Gruber-Rouh, R. Hammerstingl, S. Zangos, T.J. Vogl; *Frankfurt a. Main/DE (nagynnn@yahoo.com)*

Purpose: To suggest a scoring system for evaluating leiomyomas based on pre-embolisation MRI for proper selection of patients for uterine artery embolisation (UAE).
Methods and Materials: The study was retrospectively performed on 38 females with 108 leiomyomas. We tested 4 prognostic factors namely: leiomyoma enhancement (based on the ratio leiomyoma : piriform muscle enhancement, Score 1 (ratio < 1), Score 2 (1-< 2), Score 3 (2-< 3) and Score 4 (≥3), leiomyoma location (pedunculated-submucous=Score 5, submucous=4, interstitial=3, subserous=2 and pedunculated-subserous=1), leiomyoma position (fundal=4, anterior-wall=3, posterior-wall=2 and cervical=1) and size based on maximal diameter (< 3 cm=5), 3 to < 6 cm=4, 6 to < 9 cm=3, 9 to < 12 cm=2 and 12 cm or more=1. Individual parameters were tested for significance against leiomyoma volume change at 3 month follow-up using Kruskal-Wallis-test.
Results: The mean initial leiomyoma volume was 66.38 ml ±131.61 (Range:1.23-987.34). The maximal diameter was 4.27 cm ±2.42 (Range:1.4-14.4). At follow-up the mean volume was 43.69 ml ±110.45 (Range:0.03-875.05). No significant correlation between the position and volume change at follow-up (p=0.79) thus the position was excluded. Enhancement score, location and size showed statistically significant correlation with percentage volume change at follow-up (p=0.043, $p < 0.001$ and $p < 0.001$ respectively). The median score based on significant parameters was 9 (Range:6-13). A statistically significant strong positive correlation between the score and the percentage volume change at follow-up was noted ($p < 0.0001$, rho = 0.71)
Conclusion: A scoring system based on leiomyoma location, maximal diameter and degree of enhancement correlates strongly with the volume changes of leiomyoma at follow-up.

B-0468 11:19

Colorectal infiltrating endometriosis: can MRI predict the need of intestinal resection?

A. Scardapane[1], F. Lorusso[2], P. Pignataro[1], A.A. Stabile Ianora[1], G. Angelelli[1]; [1]*Bari/IT*, [2]*Castellana Grotte/IT (arnaldo.scardapane@gmail.com)*

Purpose: To determine the value of MRI in predicting intestinal resection in patients with colorectal endometriosis.
Methods and Materials: The MR Images of 163 patients operated for pelvic endometriosis were reviewed in consensus by two experienced radiologists. All MR scans were acquired with a 1.5 T scanner and a phased array coil. A standard high resolution pelvic MR was performed in all patients consisting in T2 w TSE sequences in the axial, sagittal and coronal plane and in T1 w and THRIVE sequences in the axial plane. The exam was completed by MR-Colonography (MR-C) in all the cases. All endometriotic pelvic lesions were annotated. Intestinal lesion were measured in short and long axis and the grade of stenosis was established on MR-C. A multivariate logistic regression was used to establish the predictors of intestinal resection in the laparoscopic procedure.
Results: 41/163 patients received an intestinal resection. Multivariate logistic regression demonstrated a predictive value of nodular short axis (OR=1.182 (1.052-1.327); p=0.005) and the degree of stenosis (OR=2.044 (1.119-3.721); p=0.02). ROC curve analysis demonstrated an AUC of 0.991 for the "short axis" and 0.983 for the parameter "stenosis". Using a cut off value of 10 mm of short axis and 20% of stenosis sensitivity and specificity values were respectively 88%-96% and 95%-97%.
Conclusion: The presence of an endometriotic rectal nodule > 10 mm in short axis causing a luminal stenosis > 20% in pelvic MRI reliably predict the need of a rectal resection.

B-0469 11:27

Role and benefits of intraoperative ultrasound guidance in intracavitary brachytherapy for cervical cancer

T. Akbas, G. Ugurluer, M. Acil, T. Arpaci, M. Serin; *Adana/TR (tugana.akbas@acibadem.edu.tr)*

Purpose: The objective of this study was to describe the role and benefits of intraoperative ultrasound guidance in intracavitary brachytherapy in an attempt to minimize the risk of complications.
Methods and Materials: The clinical and radiologic data of 142 patients who received tandem-based intracavitary brachytherapy between January 2010 and June 2015 were retrospectively reviewed. Intraoperative real-time transabdominal ultrasound guidance was carried out for tandem selection and appropriate application as well as to confirm final position of applicators. All patients underwent computed tomography based planning for the delivery of brachytherapy and tomography images were used to assess the complications and applicator conformity. Descriptive statistics were done.
Results: Intracavitary brachytherapy were performed under ultrasound guidance in 113 consecutive cervix cancer patients for 412 insertions. Previously, application for 29 patients was done without ultrasound guidance and 2 patients had uterine perforations (6.9%). After detecting perforations, we decided to perform ultrasound guidance routinely. Only one of 113 patients after ultrasound guidance had uterine perforation (0.9%). For optimal positioning, tandem was tracked and repositioned according to the ultrasound visualisation during procedure. The suitable tandem length and curvature was selected based upon the uterine characteristics before insertion. No other major complications were seen in our patients.
Conclusion: Implementation of routine ultrasound guidance resulted in decreased rates of perforations and increased rates of accurate placement of applicators. Ultrasound imaging provided safe, cost-effective and real-time guidance. Also it is important for radiologists to be familiar with the appropriate positioning of applicator as well as any potential complications.

B-0470 11:35

Leiomyoma maximal diameter versus leiomyoma volume: which is more reliable for proper patient selection for uterine artery embolisation

N.N.N. Naguib, N.-E.A. Nour-Eldin, T. Gruber-Rouh, T. Lehnert, S. Zangos, T.J. Vogl; *Frankfurt a. Main/DE (nagynnn@yahoo.com)*

Purpose: To compare the correlation between the leiomyoma maximal diameter or leiomyoma volume and the percentage change in leiomyoma volume at follow-up following uterine artery embolisation (UAE) using MRI to select the best prognostic parameter for size selection.
Methods and Materials: The study was retrospectively performed on 35 females with 103 leiomyomas. For each leiomyoma the volume and the maximal diameter were determined using MRI. The volume was measured before and 3 months after UAE and the percentage change in leiomyoma volume was calculated. The maximal diameter and leiomyoma volume were tested for significance against the percentage change in volume at follow-up using the Spearman Rank Correlation test.
Results: The mean initial leiomyoma volume was 52.91 ml ±91.79 (Range: 1.23-485.39). The maximal diameter was 4.05 cm ±2.11 (Range: 1.4-10.5). At follow-up the mean volume was 33.32 ml ±74.78 (Range: 0.03-381.27). The mean percentage volume change at follow-up was 56.61% [reduction] ±25.66 (Range: 40.05% [increase] - 99% [reduction]). A statistically significant moderate negative correlation between the initial leiomyoma maximal diameter ($p < 0.0001$, rho= -0.52) and volume ($p < 0.0001$, rho= -0.48) and the percentage volume change at follow-up was noted. Comparison of both correlation coefficients (rho for maximal diameter and for volume) yielded a statistically significant difference between both coefficients (p=0.00059).**Conclusion:** Both leiomyoma maximal diameter and leiomyoma volume correlate significantly negative with the percentage volume change at follow-up. The maximal diameter is however significantly more reliable than the initial volume for predicting the volume change after UAE.

B-0471 11:43

Evaluation of pre-embolisation MRI-parameters of uterine fibroids for predicting volume reduction and quality-of-life score after uterine artery embolisation (UAE)

I. Kalina, A. Tóth, É. Valcseva, P. Kaposi, N. Ács, S. Várbíró, V. Bérczi; *Budapest/HU (berczi@hotmail.com)*

Purpose: To evaluate pre-embolisation MRI-parameters of uterine fibroleiomyomas that are predictive of successful outcome (volume reduction, quality-of-life score).
Methods and Materials: 109 fibroids (largest diameter ≥3 cm) in 70 patients who underwent UAE were analysed retrospectively. MRI was performed at 1.8±1.3 (SD) months before and 6.6±1.8 months after the procedure. Signal intensity of fibroids were compared with that of myometrium and skeletal muscle on T1- and T2-weighted images; contrast perfusion pattern and localization (submucosal, intramural or subserosal) of leiomyomata were also analysed. Numerical quality-of-life score (0-100) was taken before and after UAE. Statistical significance was calculated ($p < 0.05$) using t-test, ANOVA and Chi-square test.
Results: Average fibroleiomyoma volume was 116 cm3 (range, 5-1271 cm3) before treatment. Mean reduction in fibroid volume was 51.1±30.8% at 6 months. Fibroids with high signal intensity compared to myometrium on T2-weighted images and marked contrast enhancement compared to myometrium showed greater volume reduction, than fibroids with low T2 signal intensity and low contrast enhancement (p=0.041 and p=0.035, respectively). Reduction in size was more prominent in submucosal than intramural or subserosal fibroids (p=0.003 and 0.001, respectively). T2SI compared to skeletal muscle and T1SI compared to myomterium or skeletal muscle did not show association with volume reduction. There was no significant correlation between numerical quality-of-life score and any MRI-parameters.
Conclusion: MRI is effective for evaluation of changes in fibroid volume after UAE. Pre-embolisation high T2 signal intensity compared to myometrium, contrast enhancement and submucosal localization showed significant correlation with volume reduction; it can be useful for patient selection.

B-0472 11:51

Guidelines for intra-luminal uterine hypodensity (ILUH) seen on CTs of postmenopausal women

M. Yassin, M. Amitai, N. Kanana, S. Apter, S. Raskin, E. Konen, E. Klang; *Ramat Gan/IL (mohmd_yassin@hotmail.com)*

Purpose: To explore whether the presence of ILUH is pathological, and whether there are measured cut-off values for recommendation of gynecological evaluation.
Methods and Materials: This retrospective study included two groups: Endometrial cancer (EC) group: 21 patients were retrieved using a search for abdominal CTs for endometrial cancer during 1/2012-7/2015. Postmenopausal (PM) group: From CTs performed during 1/2012-3/2012 we collected 63 postmenopausal (age > 54) women without known gynecologic malignancy at presentation and after two years. Two radiologists separately measured ILUH transversely in the axial plane and anterioposteriorly in the sagittal plane. Inter-rater reliability (ICC) was assessed. Association between the presence of ILUH and endometrial cancer was evaluated (chi square). Association between ILUH diameters and endometrial cancer were evaluated (T-test). ROC curves evaluated transverse and anteroposterior diameters predictions of endometrial cancer.
Results: ICC was high (transverse 0.863, anteroposterior 0.822). ILUH was associated with endometrial cancer (EC group 90.5% vs. PM group 38.1%, $p < 0.0001$). Diameters of the groups were statistically significant (transverse: EC group 19.8±19.3 mm vs. PM group 5.0±6.4 mm, p=0.001; anteroposterior: EC group 30.8±17.9 mm vs. PM group 13.6±8.7 mm, $p < 0.001$). Diameters were excellent predictors of endometrial cancer (transverse AUC=0.86, anterioposterior AUC=0.86). Cut-off values of 17.5 mm transverse and 6.0 mm anteroposterior yielded a sensitivity of 84% and 79% and specificity of 79% and 83%, respectively.
Conclusion: Transverse and anteroposterior diameters were excellent in differentiating endometrial cancer patients from postmenopausal women. Cut-off values of 17.5 mm transverse and 6.0 mm anteroposterior are suggested.

10:30 - 12:00 **Room L8**

Vascular

SS 615

Optimising vascular imaging techniques

Moderators:
A.L.J. Bojanovic; Nis/RS
T. Rand; Vienna/AT

B-0473 10:30

Effects on intra-coronary attenuation using different iodine concentrations (240, 300 and 370 mg/ml) whilst maintaining identical IDR (EICAR-trial)

B.M.F. Hendriks, C. Mihl, M. Kok, S. Altintas, B.L.J.H. Kietselaer, J.E. Wildberger, M. Das; *Maastricht/NL (babs.hendriks@mumc.nl)*

Purpose: Enhancement level in coronary computed tomographic angiography (CCTA) is determined by the following formula: Contrast media (CM) concentration * flow rate = iodine delivery rate (IDR). To date, discussion remains regarding which of these factors has the highest impact. Aim of this study was to evaluate intravascular attenuation with varying CM concentrations and flow rates whilst keeping IDR identical.
Methods and Materials: 200 consecutive patients (RCT trial NCT02462044) referred for CCTA to rule out coronary artery disease were prospectively randomised in three groups and scanned on a second-generation DSCT scanner at 100 kV. Prewarmed CM (Iopromide) was administered with constant IDR (2.0 gI/s) and injection time (11 s). Group 1: 240 mgI/ml at 8.3 ml/s (volume: 94 ml), group 2: 300 mgI/ml at 6.7 ml/s (volume: 75 ml) and group 3: 370 mgI/ml at 5.4 ml/s (volume: 61 ml). Hounsfield Units (HU) were measured by two experienced observers in the coronary arteries (LM, LAD, Cx, RCA). Comparison between both groups was performed using sample t test.
Results: No significant differences in attenuation ± standard deviation (SD) between groups were found (all p values ≥0.2). Group 1, LM: 467±97 HU, LAD: 463±105 HU, Cx: 459±110 HU, RCA: 487±90 HU. For group 2 these values were: 465±198 HU, 461±94 HU, 460±95 HU and 479±197 HU, respectively. For group 3: 455±186 HU, 462±90 HU, 454±166 HU and 472±164 HU, respectively. Intra-class observer variability was good to excellent with all values ≥0.8. Maximum injection pressure of 325 psi was never reached with values ranging between 95 and 264 psi.
Conclusion: No statistical difference in attenuation of coronary arteries was found when IDR is identical, proving IDR is the decisive factor.
Author Disclosures:
J.E. Wildberger: Research/Grant Support; Philips, Siemens, GE, Bayer, Bracco, Agfa.m. **Das:** Research/Grant Support; Bayer, Siemens, GE.

B-0474 10:38

Measurement of blood velocities in renal, intrarenal and carotid arteries: comparison of Ultrafast Doppler and conventional color duplex Doppler

G. Ivanac, M. Dzoic Dominkovic, K. Ivanac, B. Brkljačić; *Zagreb/HR (gordana.augustan@gmail.com)*

Purpose: Ultrafast imaging acquires information at frame rates of up to several thousand Hz, an increase by a factor of 100 relative to conventional ultrasound systems. "UltraFast Doppler" renders ultra-high frame rate color flow clips that are up to 10 times faster than conventional color Doppler. The purpose was to compare accuracy of blood velocity measurements of renal, interenal, and

carotid arteries and examination duration of Ultrafast and conventional color-duplex Doppler.
Methods and Materials: Ultrafast Doppler and conventional duplex Doppler examinations of common (CCA), internal (ICA), external carotid arteries (ECA) and renal (RA) and intrarenal interlobar arteries were performed by a single experienced examiner in 30 patients (mean age 52 ± 17 years, range 28-74, 10 male, 20 female). Peak systolic velocity (PSV) was measured in each patient and values were correlated between two methods using Pearson's correlation coefficient.
Results: The values of PSV in all arteries were in the range between 30 and 170 cm/s. The mean PSV ± s.d. in conventional Doppler in all patents was 67.2 ± 26.7 cm/s, while in Ultrafast Doppler it was 64.5± 27.1 cm/s. There were no statistically significant differences between groups (t-test: p=0.703). The Pearson's correlation coefficient in all patients was 0.989. Ultrafast Doppler examination duration was significantly shorter for all arteries compared to conventional Doppler.
Conclusion: Measurements of PSV of carotid, renal and interenal arteries are equally accurate with Ultrafast and conventional color duplex Doppler, while examination duration is significantly shorter using Ultrafast Doppler.

B-0475 10:46

Perfusion quantification of vascular malformations using contrast-enhanced ultrasound (CEUS) with time intensity curve analysis (TIC) before and after percutaneous treatment

I. Wiesinger, W.A. Wohlgemuth, C. Stroszczynski, E.M. Jung; *Regensburg/DE (isabel.wiesinger@gmx.de)*

Purpose: Quantification of perfusion differences of peripheral vascular malformations with CEUS and TIC, before and after percutaneous treatment, for planning and control of interventional procedures.
Methods and Materials: CEUS war performed after injection of 1-2.4 ml of sulfur hexafluoride microbubbles using a 6-9 MHz linear probe. Regions of interest (10x 30 mm) were defined in the centre, and at the margins of the malformation as well as in the healthy tissue. TIC with Time to Peak (TTP), and Area und the Curve (AUC) were calculated using special software.
Results: Retrospective analysis of 197 patients (136 female; 61 male; 3-86 years) with 135 venous, 39 arterio-venous, and 23 combined peripheral vascular malformations before and after percutaneous treatment. There were significant CEUS perfusion differences for AUC in the centre of all malformation compared to the margins as well as the surrounding healthy tissue (437.5 rU vs. 356.3 rU vs. 218.8 rU; $p < 0.001$) before percutaneous treatment. After the intervention AUC in the centre was also significantly different ($p < 0.0001$) from the healthy tissue (372.2 rU vs. 161.1 rU). After the first percutaneous intervention there was an obvious decrease in AUC in the centre (387.5 rU) but not at the margins (316.6 rU).
Conclusion: By recording capillary perfusion CEUS and TIC analysis offer a possibility of monitoring therapy-induced changes of vascular malformations and help planning interventional procedures by displaying feeder vessels.

B-0476 10:54

As low as reasonabily achievable: lowest dose CT angiography in patients with endoleak after endovascular aneurysm repair

R. Pizzolato, M. Belgrano, G. Poillucci, A. Spezzacatene, M. Cova; *Trieste/IT (pizzolatoric@libero.it)*

Purpose: CT Angiography (CTA) represents the gold standard in evaluating endoleak (EL) after Endovascular Aneurysm Repair (EVAR); it has though a significative dosimetric impact, especially in patients undergoing several consecutive follow-up investigations. The purpose of the study was to prove feasibility and efficacy of a low-dose CT examination protocol with a 256 row MSCT scanner in evaluating EL after EVAR.
Methods and Materials: a CT examination protocol was implemented on a 256 row MSCT scanner, with split-bolus contrast administration and a single low dose acquisition (80kv-600 mAs). From February 2014 to June 2015 this protocol has been tested in 25 selected patients with known EL from previous traditional multiphasic full-dose CTA investigations.
Results: a 100% concordancy has ben found in EL detection between the traditional CTA and the aforementioned low-dose CT protocol; a significative statistical difference was not demostrated (p=0.0082) in enhancement conspicuity of the EL, despite a substantially similar intravenous iodine load. No significative difference was seen in image quality on subjective evaluation from two different radiologists, and a significant difference was only seen in image quality on sub-millimeter slices as expressed by standard deviation in densitometry measurements. Dose reduction in comparison with full-dose CTA was on average 74%.
Conclusion: this protocol can be advocated for the routinarely examination of patients with EL afer EVAR. More ample studies are to be needed to evaluate the usefulness of this protocol in surveillance of patients with no known EL after EVAR.

B-0477 11:02

Ultra-low dose and volume contrast medium (CM) for aorta CTA: using IMR for substantial dose and volume CM reduction in a prospective clinical study

P. Hou; *Zhengzhou/CN (houping1221@163.com)*

Purpose: To investigate the image quality of IMR in reduced dose and ultra-low CM volume for aorta CTA.
Methods and Materials: 62 patients underwent aorta CTA were divided into 2 groups:Group A (n=31)was scanned using 120kvp with CM of70 ml and 5 ml/s injection rate. Other patients scanned using 80kvp and 100 mAs/slice with CM of 0.4 ml/kg and injection rate calculated as volume/(delay time + exposure time) were the study group.Paired image sets were created using 3 types ofreconstruction: FBP (group B), iDose4 (group C)and IMR (group D). Objective evaluation [CT values, image noise and CNR of aorta]and subjective rating score among the four groups were obtained and compared by One-way ANOVA and Kruskal-Wallis H test.
Results: The image noise in group A was lower than group B and C, and higher than group D, but showed no differences from group D ($p > 0.05$). There were no significant differences in aorta CT attenuation among the 4 groups ($p > 0.05$). The CNR of group D was better than other groups in all evaluated structures ($p < 0.05$). The images of group B and C were unacceptable for subjective image quality. The visual scores were significantly higher in group D and A. The amount of CM in group A was 70 ml, while (24.7±3.6)ml in study group. The radiation dose was significantly different between the study groups and control group[(2.58±0.94),(9.7±3.1)mGy,respectively]
Conclusion: IMR in aortic CTA with only 40%CM and 74.2%dose reduction was feasible and considerably improved both objective and subjective image quality parameters compared with conventional protocol.

B-0478 11:10

Multi-spectral MPI for real time 3D tracking of endovascular devices

M. Hofmann, J. Salamon, C. Jung, M.G. Kaul, A. vom Scheidt, G. Adam, H. Ittrich, T. Knopp; *Hamburg/DE (m.hofmann@uke.de)*

Purpose: Proof of concept of multi-spectral discrimination of solid magnetic particle imaging (MPI) markings on a guidewire and PTA-catheter and a liquid (blood pool) MPI tracer for in-vitro MPI guided stenosis treatment.
Methods and Materials: A standard guide wire and a balloon catheter were labeled with a thin layer of a solid MPI agent (magnetic lacquer) at the tip and on both sides of the balloon, respectively. Stenosis treatment was performed on a vessel phantom with an induced stenosis filled with solute superparamagnetic iron oxide particles (MM4), by inflating the balloon with saline to a pressure of 20 bar. During treatment MPI (Philips, Amsterdam / Bruker, Billerica) data were recorded at a rate of 46 frames/sec in a field of view of 37.3 x 37.3 x 18.6 mm³. For MPI guidance multi-spectral 3D images were reconstructed at a rate of 2 frames/sec in real time.
Results: It was possible to discriminate the marked interventional instruments within the blood pool MPI tracer filled vessel phantom using the multi-spectral magnetic particle images. The positioning of the interventional instruments and the inflation of the balloon could be guided and monitored in real time solely on the basis of MPI data.
Conclusion: Colored-MPI allows for 3D real time guidance of endovascular devices and MPI based in-vitro stenosis treatment. Multi-spectral MPI might emerge as a powerful tool for radiation free 3D intervention.

B-0479 11:18

Investigation into MR angiography as a possible replacement for rotational angiography or CT angiography for cerebrovascular computational fluid dynamics

H. Isoda[1], Y. Yoneyama[1], A. Fukuyama[1], M. Terada[2], M. Kamiya[2], K. Otsubo[2], T. Kosugi[3], Y. Komori[4], S. Naganawa[1]; [1]*Nagoya/JP*, [2]*Iwata/JP*, [3]*Hamamatsu/JP*, [4]*Tokyo/JP (isoda@met.nagoya-u.ac.jp)*

Purpose: We conducted a flow experiment using a cerebrovascular phantom to investigate whether magnetic resonance angiography (MRA) could be used instead of three-dimensional rotational angiography (RA) and computed tomography angiography (CTA) for computational fluid dynamics (CFD) geometric images.
Methods and Materials: We performed MRA and 3D cine phase contrast (PC) MR imaging for a silicone cerebrovascular phantom of an internal carotid artery-posterior communicating artery aneurysm (IC-PC An) using blood mimicking fluid flowing at the systolic volume flow rate (VFR) controlled with Coriolis flowmeters and a pump. We also obtained phantom microCT, RA and CTA data without flowing fluid. CFD (microCT-based CFD) analysis with geometric images obtained from microCT and with measured VFRs by the flowmeters in the flow experiment set as a boundary condition was used as a standard. We compared CFD (RA-, CTA-, MRA-based CFD) analysis using

geometric images created from RA, CTA and MRA data by four analysts and using VFRs obtained with cine PC MR as boundary conditions to the standard.
Results: The variation coefficient for blood vessel diameter, cross-section maximum velocity and spatially averaged wall shear stress (WSS) from RA- and MRA-based CFD analysis was less than 0.1. WSS distributions and streamlines of MicroCT-based CFD and MRA-based CFD were similar. Accuracy for blood vessel diameter, cross-section maximum velocity and spatially averaged WSS was highest for RA -based CFD, followed by MRA-based CFD and CTA-based CFD.
Conclusion: MRA could be used for cerebrovascular CFD geometric images in our study.
Author Disclosures:
H. Isoda: Research/Grant Support; A research grant (JSPS KAKENHI Grant Number 25293264) from the Ministry of Education, Culture, Sports, Science and Technology in Japan. **T. Kosugi:** Employee; Renaissance of Technology Corporation. **Y. Komori:** Employee; Siemens Japan K.K.

B-0480 11:26

Submillisievert CT angiography for carotid arteries using new adaptive statistical iterative reconstruction - V
A.D. Annoni, A. Formenti, G. Pontone, E. Nobili, A. Baggiano, E. Conte, P. Montorsi, M. Pepi, D. Andreini; *Milan/IT (andrea.annoni@ccfm.it)*

Purpose: To assess evaluability of an ultra low dose CT angiography (CTA) protocol for carotid arteries using new iterative reconstruction algorithm V (ASIR-V).
Methods and Materials: 65 patients underwent CTA with 80 kV, modulation dose mA, ASIR-V and 50 ml of low concentration iso-osmolar (iodixanol 320 mg I/mL) iodinated contrast medium. The image quality of carotid arteries and Willis circle was evaluated with a 4-point Likert-scale. For each exam attenuation, image noise, signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR) at level of common carotid artery (CCA), internal carotid artery (ICA) and at level of Circle of Willis and Effective Dose (ED) were evaluated.
Results: The mean image quality score was 1.24±0.2. Mean attenuation values were 711.8 ± 162.4 and 710.4 ± 159.7 for right and left CCA respectively and 675.3 ± 172.7 and 695.8 ± 180.1 for right and left ICA respectively. Mean SNR and CNR for right and left CCA were 38.6 ± 18.2, 35.5 ± 16.9 and 41.3 ± 17.5, 36.7 ± 16.5 respectively. Mean SNR and CNR for right and left ICA were 27.3 ± 8.0, 24.1 ± 7.5 and 32.5 ± 13.2, 28.7 ± 11.9 respectively. Mean SNR for right and left anterior cerebral arteries were 25.9 ± 8.6 and 23.8 ± 4.2 respectively. The mean value of SNR of the basilar artery was 25.5 ± 9.9. Mean ED was 0.53 ± 0.09 mSv
Conclusion: CTA for carotid arteries using new adaptive statistical iterative reconstruction-V allows good quality exams with submillisievert radiation exposure.

B-0481 11:34

Comparison of quantitative analysis to qualitative analysis for interpretation of lower limb lymphoscintigraphy
E.C. Nganga; *Nairobi/KE (chegesoft@gmail.com)*

Purpose: To compare quantitative analysis to qualitative analysis of lower limb lymphoscintigraphy in the diagnosis of lymphedema.
Methods and Materials: 52 lymphoscintigrams of consecutive patients meeting the study criteria were analysed quantitatively. 53 normal and 51 abnormal limbs were analysed. For both the normal and abnormal limbs, a region of interest was drawn around the injection site (B) and illioinguinal nodes (A) at 1.5 hr. static images and the counts in these ROIs recorded. Percentage illioinguinal nodes uptake was computed as: analysis of variance was done to determine whether there is significant difference in illioinguinal uptake between normal and abnormal limbs. Using different cut-offs, and qualitative analysis as a reference standard, specificity and sensitivity was calculated and the figures used to plot a receiver operator characteristics (ROC) curve. Area under the curve was estimated.
Results: 52 patients; 36 females and 16 males (104 limbs) were analysed. Proportion of male limbs with a lymphoscintigraphy proven lymphedema was significantly higher (78% vs 36%, $p < 0.000$). ANOVA revealed a statistically significant difference between the mean uptake of normal and abnormal limbs ($F=81$, $p < 0.000$). ROC had a maximal AUC of.924 ($p < 0.000$) indicating that quantitative analysis of lymphoscintigraphy is useful in the diagnosis of lymphedema.
Conclusion: Illioinguinal lymph node nodes uptake is a reliable parameter in quantitative analysis and can be used to differentiate normal from abnormal limbs where qualitative analysis is equivocal. It can also be used as an objective measure in monitoring patient progress.

B-0482 11:42

Head and neck CT-angiography (HNCTA): Low and patient tailored versus standard contrast medium protocol
L. Capitolo, F. Cesarani, C. Vaudagna, E. Armando; *Asti/IT (enrico.armando@gmail.com)*

Purpose: to evaluate the feasibility of a low-contrast media volume protocol for HNCTA, adapting flow rate and iodine volume on patient's body surface area (BSA)
Methods and Materials: 30 patients underwent HNCTA in a 64-slice scanner (Philips Brilliance) and were injected iopromide 370 mg/ml for 8 seconds, followed by 40 ml of saline chase. Flow injection rate (between 3.3 and 5.2 ml/sec) was adapted on patient's BSA, using Livingston formula; total iodine volume ranged between 25 and 42 ml. As a control group 30 patients matched by sex, age and weight were extracted from PACS archive; they were previously examined with a standard protocol, using 70 ml of iopromide 370 mg/ml and a flow rate of 4.5 ml/sec.Arterial and venous enhancements were recorded for quantitative assessment. Statistical analyses were performed with Statistica 10 software, using Student T-test and Pearson's correlation coefficient for regression analysis.
Results: Mean arterial enhancement (MAE) was higher in control group (375 vs 306 HU, $p < 0.001$); there were no significant differences in arterious SNR (22.4 vs 21.84 p=0.855) or CNR (18.02 vs 19.07 p=0.73). Venous enhancement was higher in control group with more streak artifacts at the thoracic inlet. Regression analysis showed a constant MAE independently of patient weight in the study group (r=0.009), while there was a moderate inverse correlation in the control group (r=0.41).
Conclusion: Despite a reduction in mean arterial enhancement, a low iodine protocol tailored on patient's BSA guarantees a good and reproducible quality for HNCTA, with lower artifacts.

B-0483 11:50

Diagnostic accuracy for the detection of arterial bleeding of the abdomen can be improved with noise-optimized virtual monoenergetic dual-energy CT
S.S. Martin, J.L. Wichmann, J.-E. Scholtz, H. Weyer, A.M. Bucher, R.W. Bauer, V. Jacobi, T.J. Vogl, M.H. Albrecht; *Frankfurt a. Main/DE (simartin@outlook.com)*

Purpose: To evaluate the impact of a noise-optimized virtual monoenergetic reconstruction technique in dual-energy CT angiography (DE-CTA) on diagnostic accuracy in patients with acute arterial hemorrhage of the abdomen.
Methods and Materials: DE-CTA datasets of 65 patients (42 men; 63.1±13.8 years) with suspected arterial bleeding were reconstructed as traditional (VMI) and advanced virtual monoenergetic images (VMI+) in 10-keV increments from 40-100 keV besides linearly-blended reconstructions (M_0.5, 50% low-kV spectrum). ROI measurements were performed in the area of hemorrhage, if present, and the feeding artery for objective contrast-to-noise ratio (CNR) calculation. Five-point Likert scales were used to evaluate subjective suitability for bleeding assessment and diagnostic accuracy for the objectively best series of each reconstruction technique.
Results: 38 patients showed findings of acute arterial bleeding. Mean CNR was superior ($p < 0.001$) in 40 keV VMI+ compared to VMI series which showed highest values at 70 keV and M_0.5 images (19.7±11.1, 12.9±11.7 and 15.2±8.9, respectively). VMI+ 40 keV series were found most suitable for bleeding assessment ($p < 0.001$). Sensitivity and specificity for the detection of arterial hemorrhage were 96% and 65% for 40 keV VMI+, 88% and 56% for 70 keV VMI, and 89% and 59% for M_0.5 reconstructions. Area under curve (AUC) was significantly superior ($p < 0.001$) for 40 keV VMI+ (0.953) compared to 70 keV VMI (0.776) and M_0.5 series (0.802).
Conclusion: Diagnostic accuracy in patients with arterial bleeding of the abdomen can be significantly increased using 40 keV VMI+ reconstructions compared to standard linearly-blended and traditional VMI images in DE-CTA.

10:30 - 12:00 **Room E1**

Musculoskeletal

SS 610a

Body composition

Moderators:
G. Guglielmi; Andria/IT
A.S. Issever; Berlin/DE

B-0484 10:30

The diagnostic efficiency of CT value in the patients with osteoporosis compared with bone mineral density (BMD) based on quantitative computed tomography (QCT)

P. Lei, J. Jiao, X. Chai; *Guiyang/CN (pingguilei@foxmail.com)*

Purpose: To assess the diagnostic accuracy of CT value in the patient with osteoporosis compared with BMD based on QCT.
Methods and Materials: Three hundred consecutive patients (male 150, female 150) with different age were enrolled and analysed retrospectively in this study. All the patients were performed on MSCT and mindways (MN) solid calibration body model. Three regions of interest (ROIs) were measured on lumbar vertebra 3 (L3), L4, L5 in each patients by using QCT software. Correlation analysis was observed between the value of CT attenuation and BMD, diagnostic efficiency of CT value was analysed by ROC curves, sensitivity, specificity and positive and negative predictive values were also calculated.
Results: There was significant positively correlated between the value of CT attenuation and BMD in L3, L4, L5 ($r3=0.892$, $P < 0.05$; $r4=0.890$, $P < 0.05$; $r5=0.900$, $P < 0.05$), respectively. The cutoffs of CT value were 145 HU and 96 HU, the area under ROC curve for CT value were 0.975, 0.770, 0.971, respectively. Diagnostic efficiency of CT value: 1) CT value < 96 HU indicates osteoporosis, the sensitivity, specificity and positive and negative predictive values were 88.32%, 93.58%, 71.18%, 97.81%, respectively. 2) CT value 96 HU indicates osteopenia, diagnostic efficiency were 67.86%, 90.43%, 73.39%, 87.86%. 3) CT value above 145 HU is considered normal, diagnostic efficiency were 90.80%, 92.77%, 93.55%, 88.37%.
Conclusion: The value of CT attenuation was significantly positively correlated with BMD in lumbar vertebra, CT value could be available for quantitative assessment in the patients with osteoporosis.

B-0485 10:38

Association of MRS-based bone marrow fat fraction and unsaturation level with vertebral bone strength

T. Baum[1], S. Ruschke[1], C. Cordes[1], M. Dieckmeyer[1], H. Kooijman[2], R. Burgkart[1], E.J. Rummeny[1], J.S. Bauer[1], D.C. Karampinos[1]; [1]*Munich/DE*, [2]*Hamburg/DE (thbaum@gmx.de)*

Purpose: The assessment of bone marrow composition has recently gained significant attention in the context of bone health. Therefore, the purpose of this in-vitro study was to investigate the association of magnetic resonance spectroscopy (MRS)-based bone marrow fat fraction and unsaturation level with vertebral bone strength.
Methods and Materials: Quantitative computed tomography (QCT)-based bone mineral density (BMD) was obtained in twelve, formalin-fixed, thoracic vertebrae from human donors. Single-voxel MRS using a STEAM (Stimulated Echo Acquisition Mode) sequence was performed to measure vertebral bone marrow proton density fat fraction (PDFF). Diffusion-weighted, single-voxel MRS using a STEAM sequence was used to determine vertebral bone marrow fat unsaturation level. Vertebral failure load (FL) was assessed by destructive biomechanical testing.
Results: BMD, bone marrow PDFF, and unsaturation level correlated significantly ($p < 0.05$) with FL ($r=0.85$, -0.47, and 0.63, respectively). BMD showed significant correlations with bone marrow PDFF and unsaturation level ($r=-0.70$ and 0.48, respectively; $p < 0.05$). However, MRS-based parameters did not improve the prediction of vertebral FL beyond BMD in multi-variate regression models ($p > 0.05$).
Conclusion: MRS-based assessment of bone marrow composition showed an association of bone marrow fat fraction and unsaturation level with FL. However, studies with larger sample size are needed for establishing whether these advanced imaging biomarkers can improve fracture risk prediction beyond BMD.
Author Disclosures:
T. Baum: Research/Grant Support; DFG BA 4906/1-1. **H. Kooijman:** Employee; Philips Healthcare. **J.S. Bauer:** Research/Grant Support; DFG BA 4085/2-1. **D.C. Karampinos:** Research/Grant Support; Philips Healthcare.

B-0486 10:46

MRI to evaluate the effectiveness of enzyme replacement therapy in type 1 Gaucher's disease patients

B.C.S. Rabelo, R.R. Nobre, A.M.A. Lopes, R.T. Domingues, R.M.V. Mota, R.G. Horta, L.L.S. Gavio, R. Strecker; *Belo Horizonte/BR (brenorabelomed@gmail.com)*

Purpose: The purpose of this study was to evaluate the effectiveness of enzyme replacement therapy (ERT) in patients with type 1 Gaucher disease with a quantitative method obtained by a 3D T2*-corrected Dixon sequence in a cohort of patients with Gaucher's disease.
Methods and Materials: Serial magnetic resonance images (MRI) were performed in lumbar spines of 24 type 1 Gaucher patients with a follow-up evaluation performed 12 months from initial evaluation, and in lumbar spines of 20 healthy volunteers to determine a parameter to evaluate bone marrow response to ERT. The fat fraction measurements to evaluate were made at three spots of the lumbar spine. A pattern was created with anatomical references to make the measurements close to the same spot and with the same size at each topography. The fat fraction measures were summed and differences between groups were analysed.
Results: This prospective study included 24 patients (mean age 37 years), the mean of the sum of the fat fraction values for the first evaluation was 93.70 (95%CI, 89.60-97.80) and with a follow-up interval of 12 months, the mean change in fat fraction was a significant increase of 9.42 (95%CI, 7.30-11.54) ($p=0.03$) observed in 19 patients (79%). In the control group with 20 patients (mean age 35 years), the mean fat fraction was 129.05 (95%CI, 116-140.10).
Conclusion: Treatment effects on bone disease can be demonstrated by a 3D T2*-corrected Dixon sequence. Further research should be performed to determine more definitely the strength of this sequence as a follow-up bone marrow response parameter in Gaucher's disease.

B-0487 10:54

Body mass is associated with chronic adventitial shearing injuries in subcutaneous fat

T.C. Gaunt, F. Carey, A. Toms; *Norwich/UK (trevorgaunt@gmail.com)*

Purpose: Fluid in the subcutaneous fat is a common finding anterior to the knee on MRI. This may be caused by chronic low-grade shearing injuries in overweight patients. The aim of this study was to determine if there is a difference in body mass between patients with these lesions and controls.
Methods and Materials: This was a retrospective case-controlled study. Following a sample size calculation on pilot data eighteen sequential patients demonstrating hyperintense subcutaneous signal changes around the knee on fat-saturated T2W MRI were identified from PACS (18 females, mean age 45, range 31-62). Age and gender-matched patients without abnormal T2W MR signal changes were selected. Two observers independently drew regions of interest representing cross-sectional areas of bone and fat. Location of T2 signal lesions was characterised by consensus.
Results: Intra and inter-rater interclass reproducibility was excellent (ICC > 0.91). Consensus agreement demonstrated all changes were anterior to the knee extensor mechanism. The mean cross-sectional area of bone for patients with T2 lesions was 31.79 cm square (SD 2.57) and for controls 30.11 cm square (SD 3.20). This was not significantly different ($p=0.09$) suggesting that skeletal size was equivalent for the two groups. The mean percentage cross-sectional fat for patients with T2 lesions was 46% (SD 0.05, 95% CI: 0.11-0.19) and for controls 31% (SD 0.06, 95% CI: 0.11-0.19) which was significantly different ($p < 0.0001$).
Conclusion: Subcutaneous fluid around the knee is associated with increased subcutaneous fat. This may be caused by shearing injuries in fat with reduced elasticity associated with metabolic syndrome.

B-0488 11:02

Current smokers have a faster decline in bone density than former smokers: a longitudinal CT study

F.A.A. Mohamed Hoesein[1], E. Pompe[1], J. Bartstra[1], H.J.J. Verhaar[1], M. Oudkerk[2], H.J. de Koning[3], J.-W.J. Lammers[1], P.A. de Jong[1]; [1]*Utrecht/NL*, [2]*Groningen/NL*, [3]*Rotterdam/NL (fmohamedhoesein@gmail.com)*

Purpose: Cigarette smoking negatively affects bone quality and increases fracture risk. Current smokers have lower bone mineral density (BMD) compared to former smokers. However, less is known about the effect of smoking on BMD decline. We evaluated the association of smoking with changes in BMD after 3-year follow-up.
Methods and Materials: Male current and former smokers participating in a lung cancer screening trial who underwent baseline and 3-year follow-up computed tomography (CT) were included. BMD was measured by manual placement of a region of interest in the first lumbar vertebra (L1). Multiple linear regression analysis was used to evaluate the association between smoking and packyears with BMD after follow-up.

Results: 415 participants were included with mean ± SD age of 60.1 ± 5.4 years. At the start of the study, 216 (52.0%) participants were current smokers. There was no difference in BMD between current and former smokers at baseline (108 ± 34 HU vs. 108 ± 32 HU, p = 0.93). Mean BMD decline was 1 ± 13 HU. Multiple linear regression analysis, showed that smoking status was independently associated with BMD decline (-4 HU compared to former smokers, $p < 0.001$). Age, FEV1 % predicted, packyears, COPD, and the presence of a fracture at baseline did not associate with BMD decline.
Conclusion: Current smokers have lower BMD after 3-year follow-up (-4 HU) compared to former smokers. This confirms the negative effect of smoking on BMD and may provide important prognostic information regarding BMD assessment in smokers.

B-0489 11:10

Validity of estimating muscles and fat volume from single MRI slice in older adults with sarcopenia and sarcopenic obesity

Y.X. Yang, M.S. Chong, L. Tay, S. Yew, A. Yeo, C.H. Tan; *Singapore/SG (yuxin_yang@ttsh.com.sg)*

Purpose: Muscle and fat volume are particularly relevant to management of sarcopenia and sarcopenic obese (SO) patients. The objectives of this study were (i) to determine the correlation between the cross-sectional areas (CSAs) of a single slice and the muscle and fat volumes in thigh for sarcopenic and SO populations using MRI, and (ii) to assess the correlation between thigh MRI data and patients' sarcopenia status.
Methods and Materials: 190 healthy community dwelling older adults (age 50-99) were recruited and categorized into four subgroups based on Asian established criteria: normal, obese, sarcopenia, and SO. Dixon GRE sequences were acquired and muscles, subcutaneous fat (SF), and inter-muscular fat (IMF) were automatically segmented in both thighs using an in-house machine learning based segmentation method. Volumes of muscles and fat were calculated from the middle third of each patient's thigh and CSAs were assessed for a slice at 50% femur length in each patient.
Results: Spearman correlation coefficients (CCs) between CSA and volume were significantly high ($p < 0.001$) for all components: CCSF = 0.984, CCIMF = 0.942, and CCMuscle = 0.960. Thigh CSA and thigh volume both correlated significantly with clinical diagnosis of normal, obesity, sarcopenia, and SO ($p < 0.03$).
Conclusion: A single CSA at 50% femur yields a good estimation of muscle and fat volume in thighs for older adults and correlates closely with clinical criteria for sarcopenia and SO. This has potential to greatly reduce scan time and imaging costs in clinical practice.

B-0490 11:18

Sex estimation using cross sectional MDCT anatomy of C1 vertebrae

A. Solmaz Tuncer[1], S. Gürel[2], S. Halıcıoğlu[2], E. Dağıstan[2], Z. Coşgun[2], S. Gür[2]; [1]*Manisa/TR*, [2]*Bolu/TR (solmaza@yahoo.com)*

Purpose: To determine the computed tomographic morphometric data of the bony features of C1 vertebra in man and woman.
Methods and Materials: In this study, parameters for C1 vertebrae consisting of fifteen distances, three ratios and two areas were measured and calculated using cross-sectional axial images from temporal MDCT examinations. Measurements are performed and recorded by a radiologist, who had no information about patient's sex, on the workstation using a digital caliper on cross-sectional CT images. Below given are the definition of measurement parameters; Distance between inner (A) and outer surfaces of foramen transversarium (B), Outer (C) and inner (D) surface A-P diameter along midsagittal plane Width of C1 vertebra (E) Ratio of; distances between inner and outer surfaces of foramen transversarium (A⁄B), distances between outer surface A-P diameter along midsagittal plane and both edges of transverse processes (C⁄E), inner surface length of posterior archus (P), inner surface length of anterior archus (O), inner surface length of posterior and anterior archus (P/O), minimum and maximum diameter of right and left foramen transversarium (Right and left X ,Y), area of right and left foramen transversarium (Right and left FT area). The length and width of right and left superior articular facets (Right and Left F,G).
Results: The comparative data between man and woman showed significant difference ($p < 0.005$) on all measurements except A/B, C/E, and P/O ratios.
Conclusion: This study shows that multiparametric C1 vertebrae measurements obtained from cross-sectional CT images has provided objective and additional value to current sex determination criteria.

B-0491 11:26

Five-year follow-up T2 mapping of the lumbar intervertebral disc at 3.0 Tesla: quantified imaging methods for prognostic patient assessment

M. Raudner, D. Stelzeneder, C. Kronnerwetter, K. Pieber, R. Windhager, V. Juras, S. Trattnig; *Vienna/AT (marcus.raudner@meduniwien.ac.at)*

Purpose: Targeting new disc herniation as end point in a five-year follow-up study, the usefulness of T2 relaxation times as a prognostic marker was evaluated.
Methods and Materials: Twenty-five symptomatic patients (mean age 39 years, range 18 - 60; 13 males, 12 females) with low back pain and without radicular symptoms or previous surgery were assessed at baseline and five-year follow-up. All patients were examined using a 3-T MR scanner and a spine array coil. A sagittal T2 mapping sequence was conducted at baseline and follow-up alongside morphological imaging using sagittal T1- and sagittal and axial T2-weighted sequences. Rectangular regions of interest for the annulus fibrosus (AF) were drawn manually anteriorly and posteriorly in the outermost 20% of the disc on two adjacent slices. The space in between was defined as the nucleus pulposus (NP) and assessed using three independent ROIs of 20% of the sagittal disc space each. Unpaired t tests were used for comparison of T2 values and new herniation, diagnoses and clinical parameters.
Results: There was a significant difference between baseline T2 values of the NP grouped by new herniation at follow-up ($p = .002$) with a mean difference of 37.05 ms. Additionally, the same was true for baseline NP T2 values and new annular tear ($p < .001$) and Modic changes ($p = .017$) at follow-up.
Conclusion: Our data suggest that T2 values of the nucleus pulposus could provide predictive additional value regarding patient examination for risk assessment regarding the development of disc herniation.

B-0492 11:34

The impact of MRI total spine on targeted patient selection for surgical therapy of geriatric vertebral fractures

C. Weber, C. Ossadnik, T. Abel, H. Hentschel, P. Bannas; *Hamburg/DE (c.weber@amalie.de)*

Purpose: To assess the accuracy of total spine MRI in the diagnosis of vertebral fractures in comparison to conventional radiographs (CR) and to evaluate its effect on surgical therapy (vertebroplasty, osteosynthesis, etc). in geriatric patients.
Methods and Materials: The vertebral bodies of 112 patients, average age 84 yrs (74-96 yrs). were measured by the method of Genant from B4 to L5 on total spine MRI and CR performed on average 2 days before (0-17d) to determine morphology (normal, wedge, biconcave, crush) and to graduate deformity. Two radiologists independently evaluated the images (T1/T2/STIR sequences). Agreements between observers were assessed by kappa statistics. Surgical treatment was indicated, when the fracture was fresh (fluid sign on STIR sequence), the patient had no more than 5 total fractures and the posterior border was involved.
Results: All 1568 vertebral bodies were measured, 1007 (64%) showed deformities. 416 (27%) of these height reductions were classified as moderate or severe of which 128 showed a fluid sign. In 32 patients surgical therapy was indicated based on MRI, 55 based on CR. For 13 patients both methods of imaging resulted potentially in surgery. κ-scores for interobserver agreement for existing fractures were as follows: MRI, $\kappa = 0.754$; CR, $\kappa = 0.488$; for involved posterior border, respectively: MRI, $\kappa = 0.718$; CR, $\kappa = 0.567$.
Conclusion: Interobserver agreements were much better for MRI than for CR. For an accurate selection of patients with vertebral fractures for surgical therapy total spine MRI represents a significant improvement and is the method of choice.

B-0493 11:42

Comparison of changes in quantitative computed tomography bone structure and bone density using two different iterative reconstruction methods

J. Borggrefe[1], N. Abdullayev[1], F. Thomsen[2], M. Hellmich[1], T. Damm[3], C.-C. Glüer[3], B. Krug[1]; [1]*Cologne/DE*, [2]*Bahía Blanca/AR*, [3]*Kiel/DE (Jan.Borggrefe@uk-koeln.de)*

Purpose: To investigate the effects of iterative reconstruction (IR) algorithms on QCT trabecular bone structure (TBST) and bone mineral density (BMD) and to assess these changes in view of the results of HR-pQCT as reference standard.
Methods and Materials: QCT scans of 8 human vertebrae embedded in epoxy-resin and a QRM-abdomen-phantom with an underlying Mindways-Type3®-phantom for calibration. QCT scans were performed with dose protocols from 100 mAs/80 kVp to 500 mAs/120 kVp on a Philips-iCT® and Siemens-Somatom-Definition-Flash® Scanner. CT datasets were reconstructed with filtered-back-projection (FBP) and IR modes of the two manufacturer systems (Siemens-SAFIRE®/Philips-iDose®). StructuralInsight

Software was used for QCT analyses. HR-pQCT was performed with Scanco Xtreme-CT®.
Results: Visual analysis showed that use of IR leads to image noise reduction, thinning of larger trabecular structures and a deletion of small trabecular struds. This leads to an increase of trabecluar separation and decrease of trabecular number. The correlation between QCT and HR-pQCT TBST measures was stronger with IR than with FBP and increased stepwise with each higher IR mode.
Conclusion: Iterative reconstruction of trabecular bone is associated with strong image noise reductions, thinning of larger trabecular structures and a deletion of small trabecular rods. Compared to HR-pQCT, the depiction of trabecular structures appeared to be falsely lower than with the use of FBP. However, in comparison with FBP and HR-pQCT, the positive effects of image noise reduction with IR improved TBST measurements towards a better estimation of trabecular bone mass and led to higher correlation of TBST with HR-pQCT.

B-0494 11:50

Evaliation of diffusion-weighted MRI in osteoporosis
Q. Ren; *Shijiazhuang/CN (ren_qingyun@163.com)*

Purpose: Using diffusion-weighted MR imaging technology (DWI) to search correlation between the ADC value of lumber bertebral body and bone density measured with the DXA t-scores, To investigate the diagnostic value of MRI and DWI in osteoporosis.
Methods and Materials: The suspected osteoporosis patients of 80 cases were performed routine MRI examination of Lumbar vertebra, DWI and bone density examination by DXA respectively ,BMD was obtained by DXA at lumbar spine (L2-L4). the subjects were divided into three groups : normal group, osteopenic group and osteoporotic group according to DXA results, The difference in ADC value between different groups ,and the correlations between the ADC value and BMD were analysised.
Results: (1) The values of ADC of lumbar vertebral body for three groups were $(0.304 \pm 0.098) \times 10^{-3}\ mm^2/s$, $(0.244 \pm 0.084) \times 10^{-3}\ mm^2/s$, $(0.225 \pm 0.052) \times 10^{-3}\ mm^2/s$ respectively, comparing with the values of to the normal, osteopenic ,osteoporotic groups, there was significant difference among the three groups (P=0.003), Comparing with the ADC values between two groups, there was significant difference between the normal group and osteopenic group (P=0.009), the ADC values between normal group and osteoporotic group also showed significant difference (P=0.002), the ADC values between osteopenic group and osteoporotic group showed no significant difference (P =0.501). (2) the ADC value is positively correlated with BMD, the correlation coefficients were 0.309 (P=0.001).
Conclusion: DWI can be used for making quantitively evaluation of osteoporosis.

10:30 - 12:00 **Room E2**

Neuro

SS 611

Cerebrovascular disease (1)

Moderators:
K.M. Thierfelder; Munich/DE
P. Vilela; Almada/PT

K-14 10:30

Keynote lecture
P. Vilela; *Almada/PT*

B-0495 10:39

Collateral flow assessment in intracranial major trunk stenoocclusive diseases by fast non-contrast time-resolved MR angiography using arterial spin labelling
K. Tsuchiya, M. Yamashita, S. Ichisaka, M. Hara, M. Kokan, T. Suzuki; *Tokyo/JP*

Purpose: It is possible to perform non-contrast time-resolved MRA using arterial spin labelling (ASL). Contrast inherent inflow enhanced multiphase angiography combining spatial resolution echo planar imaging-based signal targeting and alternating radiofrequency (CINEMA-STAR) is such a technique that generates angiograms of good temporal resolution in a short time. We assessed its feasibility in assessing collateral flow in intracranial major trunk stenoocclusive diseases.
Methods and Materials: We examined 31 cases with conventional MR imaging, 3D-TOF MRA, ASL perfusion imaging, and CINEMA-STAR MRA at 1.5 T for stenosis or occlusion of the internal or middle cerebral artery. CINEMA-STAR MRA was performed with following parameters: TR/TE, 200/11 msec; FA, 35°; matrix, 160x160; slice thickness, 6 mm; slice gap, 0.6 mm, slice number, 6; and TI1/ΔTI/cycle duration, 100/200/2000 msec. We obtained images of 10 cycles in 4 min 52 sec. First, we compared the CNR at M1 between the two MRA methods. Then, we compared demonstration of the collateral flow on CINEMA-STAR MRA and 3D-TOF MRA as well as ASL perfusion imaging. In addition, we also compared CINEMA-STAR MRA with SPECT in 16 cases.
Results: In the CNR assessment, CINEMA-STAR MRA significantly exceeded 3D-TOF MRA. CINEMA-STAR MRA better demonstrated collaterals and/or patent lumen than 3D-TOF MRA in 27/31 cases, while it better depicted collaterals and/or antegrade flow than ASL perfusion imaging in 24/31 cases. CINEMA-STAR MRA corresponded to SPECT in 13/16 cases.
Conclusion: CINEMA-STAR MRA reliably demonstrates collateral flow in intracranial major trunk stenoocclusive diseases in a short imaging time.

B-0496 10:47

Internal carotid artery stenosis and collateral recruitment in stroke patients
J.W. Dankbaar, K. Kerckhoffs, A.D. Horsch, I.C. van der Schaaf, L.J. Kappelle, B.K. Velthuis; *Utrecht/NL (j.w.dankbaar@umcutrecht.nl)*

Purpose: Leptomeningeal collaterals improve outcome in stroke patients. There is great interindividual variability in their extent. It is hypothesised that an internal carotid artery (ICA) stenosis leads to more extensive recruitment of leptomeningeal collaterals. The purpose of this study was to evaluate the association of pre-existing ICA stenosis with leptomeningeal collateral grade visualized with CT perfusion (CTP).
Methods and Materials: From a prospective acute ischemic stroke cohort (Dutch acute Stroke Study) patients were included with an M1 middle cerebral artery occlusion and no ipsilateral, extracranial ICA occlusion. ICA stenosis was determined on admission CTA. Leptomeningeal collaterals were graded as good (> 50%) or poor (≤50%) collateral filling in the affected MCA territory on admission CTP. The association between ICA stenosis ≥70% and extent of leptomeningeal collaterals was analysed using logistic regression. In a multivariable analysis the OR of ICA stenosis ≥70% was adjusted for complete circle of Willis, gender and age.
Results: We included 188 patients in our analyses. Fifty (26.6%) patients were classified as having poor collaterals and 138 (73.4%) as good collaterals. Eighteen patients had an ICA stenosis ≥70%. The unadjusted and adjusted OR of ICA stenosis ≥70% for good collateral grade were 1.30 (0.41-4.15) and 2.67 (0.81-8.77) respectively. Patients with poor collateral had a significantly worse outcome (90 day modified Rankin scale 3-6) than patients with good collaterals (80% versus 52%, p=0.001).
Conclusion: No association was found between pre-existing ICA stenosis and extent of CTP derived leptomeningeal collaterals in a relatively large cohort of 188 ischemic stroke patients.

B-0497 10:55

Comparison of four different collateral scores in acute ischemic stroke by CT angiography
F. Seker, A. Potreck, M. Möhlenbruch, M. Bendszus, M. Pham; *Heidelberg/DE*

Purpose: Multiple scores have been described for the assessment of collateralization in acute ischemic stroke. Currently, there is no gold standard for collateral assessment by CT angiography (CTA). This study compared four frequently used collateral scores regarding their correlation with early infarct core and mismatch ratio.
Methods and Materials: 30 consecutive patients with acute occlusion of the M1 segment or terminal carotid artery were reviewed retrospectively. Collaterals were assessed using dynamic and additionally single-phase CTA according to grading systems by ASITN/SIR, ASPECTS (on collaterals), Christoforidis and Miteff. Christoforidis and ASITN/SIR scores which were initially designed for conventional angiography were adapted to become applicable to CTA. The scores were compared with respect to early infarct core and mismatch ratio in perfusion CT estimated by RAPID software using Spearman correlation.
Results: ASITN/SIR and ASPECTS collateral scores showed high correlation with early infarct core (.696; P <.001 and -.677; P <.001) and mismatch ratio (.609; P <.001 and.581; P <.001). In contrast, Christoforidis and Miteff scores correlated less with infarct core (.245; P=191 and -.272; P=.145) and mismatch ratio (-.329; P=.075 and.279; P=.135). ASPECTS and ASITN/SIR revealed an excellent cross-correlation (.901; P <.001).
Conclusion: Compared to Christoforidis and Miteff scores, modified ASITN/SIR and ASPECTS collateral scores showed consistently higher correlation with the extent of early infarct core and mismatch volume. This is probably because these scores evaluate the extent and delay of vascular enhancement in the affected territory rather than the backflow of contrast medium to the occlusion.

B-0498 11:03

Perfusion CT indexes and derived blood-brain barrier permeability predicts haemorrhagic transformation risk after intravenous thrombolysis in acute stroke

G. Carbo[1], V. Cuba[1], J. Puig[1], G. Blasco[1], J. Daunis-i-Estadella[1], M. Castellanos[1], C. Van Eendenburg[1], C. Aboud[2], S. Pedraza[1]; [1]*Girona/ES*, [2]*Valencia/ES (gercarbo@gmail.com)*

Purpose: Blood-brain barrier (BBB) permeability has been proposed as an imaging predictor of haemorrhagic transformation (HT) after tissue plasminogen activator (tPA) administration; however, perfusion computed tomography (PCT) permeability imaging has not yet been established as a reliable technique for stroke treatment. We aimed to determine the performance of PCT indexes and PCT-derived BBB permeability in predicting HT after intravenous tPA administration in patients with acute stroke.
Methods and Materials: We retrospectively studied consecutive patients with acute middle cerebral artery stroke treated with tPA. We used delayed-acquisition to calculate admission PCT-derived BBB permeability surface (5 ml/min/100 g defined threshold). HT was graded according to the European-Australasian Acute Stroke Study II criteria at 24 h CT follow-up study. Age, gender, blood pressure, basal NHISS and basal Rankin were recorded.
Results: Of 144 patients, 30 (20.8%) developed HT: 12 parenchymal hemorrhage type 2 (PH2) or remote (PHr). Patients with HT had higher MTT altered volume (p=0.016), greater necrotic tissue area (p=0.003) and greater permeability surface (p = 0.004). Binary logistic regression analysis identified that the necrosis area (p=0.002) and PCT-derived BBB permeability surface (p = 0.002) as independent predictors of HT.
Conclusion: Perfusion CT indexes and derived blood-brain barrier permeability surface might be useful for predicting HT after thrombolysis in acute stroke patients.

B-0499 11:11

Blood brain barrier disruption after endovascular stroke therapy: prediction of infarct development with dual-energy computed tomography

T. Djurdjevic, B. Glodny, M. Knoflach, B. Matosevic, S. Kiechl, E.R. Gizewski, A.E. Grams; *Innsbruck/AT (astrid.grams@i-med.ac.at)*

Purpose: During endovascular stroke therapy (EST) a blood-brain barrier (BBB) disruption can occur. The aim of the present study was to investigate the future development of BBB disrupted, non-haemorrhagic areas, detected with postinterventional dual-energy computed tomography (DECT).
Methods and Materials: ROI density measurements were performed in 36 BBB disrupted areas of 14 patients (eight females, six males; mean age 65±13 years), who received DECT (100 and 140 kV) after EST, in the different reconstructed series: "weighted brain window" (BW), "iodine map" (IM) and "virtual non-contrast" (VNC). The future development of the BBB disrupted areas (brain tissue, ischemic infarct or haemorrhagic infarct), later detected on CT or MRI scans, amount of administered intra-arterial contrast agent, etiology of stroke, severity of initial symptoms, blood pressure, blood sugar and clinical outcome were considered.
Results: Future infarct areas displayed significantly higher densities than future non-infarct areas (20.0±11.6 and 7.9±4.6) in IM (p=0.0017) and significantly lower densities than non-infarct areas (30.3±3.7 and 35.7±5.1) in VNC (p=0.0131) series. The severity of initial clinical symptoms was connected with increasing VNC densities (rs=0.40; p=0.016), and patients with stroke due to large vessel atherosclerosis displayed higher IM densities than patients with stroke of undetermined etiology (p=0.0071).
Conclusion: A higher amount of BBB disruption, measured by IM density, can predict future infarct development. There are hints that in patients with severe clinical affection higher rates of haemorrhagic components and in patients with stroke due to large vessel atherosclerosis an increased rate of BBB disruption may occur.

B-0500 11:19

Cerebrovascular reserve mapping in severe intracranial arterial stenosis

A. Krainik, O. Heck, N. Boudiaf, I. Favre, E. Condamine, J. Pietras, K. Boubagra, F. Tahon, O. Detante; *Grenoble/FR (akrainik@chu-grenoble.fr)*

Purpose: Patients with Severe Intracranial Arterial Stenosis (SIAS) are at risk of stroke despites aggressive medical treatment. Impaired cerebrovascular reserve (CVR) has been advocated to explain low grade ischemia and recurrent hemodynamic disorders. CVR mapping may help to identify such patients in order to better discuss additional treatment such as percutaneous stenting.
Methods and Materials: Between 2011 and 2014, all patients referred for stroke with SIAS were examined using CVR fMRI BOLD contrast with a block-design hypercapnic challenge (CO_2 8%) at 3 T. Averaged end-tidal CO_2 pressure ($EtCO_2$) was used as a physiological regressor for regression analyses (SPM8). We conducted regions of interest (ROI) measures of %BOLD signal change/mmHg $EtCO_2$ on segmented gray matter of the MCA territories. We calculated a laterality index with LIMCA=(Left_CVRMCA-right_CVRMCA)/(Left_CVRMCA+Right_CVRMCA). Previously, we showed in 100 controls that 95% of LIMCA ranged from -0.07 to +0.07.
Results: Among 73 patients, 38 patients (9 females; 62.7±15.1 years) had a unilateral SIAS of internal carotid (n=19) or middle cerebral artery (MCA) (n=19). Nineteen out of these 38 patients had an abnormal |CVR LIMCA| ≥ 0.08, leaving 19 patients with a normal vascular reserve. All impaired CVR values were ipsilateral to the stenosis.
Conclusion: Our series show that 50% of patients with SIAS of the anterior circulation have a significant CVR impairment. Thus, CVR mapping in addition to clinical data could be considered to better manage patients with SIAS and to further discuss percutaneous stenting.

B-0501 11:27

CT-perfusion (CTP) and lepto-meningeal score (LMs) for imaging based patient selection thrombectomy in acute ischemic stroke

E. Puglielli, R. Lattanzi, S. Roiati, V. Di Mizio, L. Gregori, V. Di Egidio; *Teramo/IT (edopug@hotmail.com)*

Purpose: Trials of endovascular therapy for AIS have produced variable results. Aim of the study is to test whether advanced imaging selection using CTP - CTA with subsequent earlier intervention, can improve AIS outcomes.
Methods and Materials: 195 consecutive patients with AIS (mean age 55.7y, April 2009-September 2015), with classic on-set, undergoing to endovascular multimodal treatment after basal CT, Computed Tomography Angiography. The LMs is based on scoring pial and lenticulostriate collaterals arteries (0, no; 1, less; 2, equal or more prominent compared with matching region in opposite hemisphere) in 6 ASPECTS regions (M1-6) plus anterior cerebral artery region and basal ganglia. Good clinical outcome was defined as mRS ≤ 2 at 90 days.
Results: CTA can well define arterial occlusion, depict arterial state, grade collateral blood flow, and characterise atherosclerotic status, whereas PCT promptly delineates the salvageable tissue. In our series 135/195 (69.23%) had a good (17-20), 43/195 (22.05%) a medium (11-16), and 17/195 (8.71%) a poor (0-10) LMs. In multivariable analysis, the LMs (good versus poor: OR, 15.8; 95% CI, 3.3%-97.4%; medium versus poor: OR, 9.5, 95% CI, 1.7%-50.6%), age (< 80 years), baseline ASPECTS (≥ 8). CTP were independent predictors of good clinical outcome.
Conclusion: CTP and LMs appears to be as a strong imaging parameter for predicting clinical outcomes, but knowledge about the individual vascular pathology, vascular factors such function of collaterals, it represent a new challenge in the management of AIS therapy.

B-0502 11:35

Utility of diffusion and perfusion MRI for predicting perihaemorrhagic edema growth after intracerebral haemorrhage

G. Carbo, V. Cuba, J. Puig, G. Blasco, J. Daunis-i-Estadella, M. Terceño, Y. Silva, J. Serena, S. Pedraza; *Girona/ES (gercarbo@gmail.com)*

Purpose: Intracerebral haemorrhage (ICH) is a devastating disease with ICH volume being the main predictor of poor outcome. Growing evidence suggests that perihematomal edema (PHE) contributes to secondary brain injury. However, predictive methods for predicting PHE growth are lacking in a clinical scenario. We aimed to determine the utility of diffusion (DWI) and perfusion (PWI) MRI indexes for predicting PHE growth in patients with ICH.
Methods and Materials: Twenty-five patients with spontaneous ICH admitted within 12 hours of symptom onset were prospectively investigated. MRI was performed on admission and at 72 hours including DWI and PWI sequences. ICH and PHE volumes were measured on fluid-attenuated inversion recovery images and ADC values, cerebral blood volume (CBV), cerebral blood flow (CBF), mean transit time (MTT) and time to peak (TTP) were obtained. ICH and PHE growth were calculated on the basis the volume difference between baseline and 72 hours follow-up studies. Age, gender, blood pressure, NIHSS score and Rankin score was also assessed.
Results: PHE growth correlated with NIHSS at baseline (r=0.430; p=0.036), PHE-MTT values (r=0.486; p=0.026) and PHE-ADC values (r=0.632; p=0.001). There was not any statistically significant correlation for ICH growth. Of note, multivariate linear regression analysis identified the PHE-ADC as an independent predictor PHE growth at 72 hours (p=0.024).
Conclusion: Our preliminary study suggests that DWI on MRI can be a useful tool in predicting PHE growth in the first 72 hours, and thus should be further evaluated as a potential imaging biomarker for therapeutic strategies in ICH.

B-0503 11:43

Combining motor function and diffusion tensor imaging in the hyperacute intracerebral haemorrhage accurately predict functional motor outcome

V.L. Cuba Camasca, G. Carbó, J. Puig, G. Blasco, S. Pedraza; *Girona/ES (victorcuba70@hotmail.com)*

Purpose: Predictive models stratify functional recovery following intracerebral hemorrhage (ICH, We determined whether clinical scores and diffusion tensor imaging (DTI)-derived data in the hyperacute phase of ICH improves prediction of motor outcome.
Methods and Materials: Multimodal MRI including DTI was performed on patients with ICH in the first 12 h after symptom onset. We assessed ICH and perihematomal edema location and volume and CST displacement or involvement by ICH. We calculated affected corticospinal tract (CST)-to-unaffected CST ratios for fractional anisotropy (FA), mean diffusivity (MD), and axial (AD) and radial diffusivities. The degree of paresis was graded by the motor subindex scores of the mNIHSS. Motor outcome at 3 months was classified as good (mNIHSS 0-3) or poor (4-8).
Results: : Of 62 consecutive patients, 49 patients were included for analysis at 3-months follow-up (37 men; median age 69.5 years, interquartile range 59-76). At admission, median NIHSS was 11.5 (IQR5-17), and 25 (71.4%) had some motor deficit (median mNIHSS 4 [IQR2-7]). Motor outcome was poor in 13 (22.41%). Independent predictors of outcome were NIHSS, mNIHSS, rMD at posterior limb of internal capsule (PLIC), PLIC-rAD, rFA of the whole CST (wrFA), PLIC-involvement by ICH, 72h-NIHSS and 72h-mNIHSS. The sensitivity, specificity, and positive and negative predictive values for unfavourable motor outcome at 3 months by combined mNIHSS$>$ 6 and PLIC-involvement $<$ 12h were 84%, 80%, 64%, and 94%, respectively (AUC 0.91, CI 0.82-0.99).
Conclusion: Combining motor function and PLIC damage may predict the functional motor outcome in patients with hyperacute ICH.

B-0504 11:51

Iterative model reconstruction in brain CT in patients with stroke

X. Liu, L. Chen, W. Qi, Y. Jiang, Y. Liu, M. Zhang, N. Hong; *Beijing/CN (Lynn.Jiang@philips.com)*

Purpose: This study aimed to evaluate whether iterative model reconstruction (IMR) technique can improve the contrast-to-noise ratio (CNR) and reduce noise when compared with hybrid iterative reconstruction (HIR) and filtered back projection (FBP) techniques of both routine and thin slice brain CT in patients with strokes.
Methods and Materials: Thirteen patients (68±15.49 years, 7 male, 6 female) with acute-subacute stroke who was confirmed on MRI underwent unenhanced brain CT with a routine dose protocol (120 kV, 300 mAs) on a 256-slice CT scanner (Brilliance iCT; Philips Healthcare). Images were reconstructed with a routine slice of 5.0 mm and thin slice of 1.0 mm by IMR, HIR and FBP respectively. The conspicuity of infarcted lesions was measured on a 5-piont scale by two blinded radiologists. Infarct lesion to normal brain, contrast-to-noise ratio (CNR) between grey and white matter and image noise and were calculated.
Results: For conspicuity of infarcted lesions, IMR was significant greater than HIR and FBP for both slice thickness (both $P < 0.01$). Both routine and thin slice IMR images showed the best CNR and lower image noise (both $P < 0.01$).
Conclusion: For brain CT in patients with stroke, IMR improves CNR and reduces noise by comparison to HIR and FBP images of both slice thickness, which indicated IMR may help thin-section brain CT to become a routine use and enable dose reduction in brain CT scan.

10:30 - 12:00 **Room F1**

Oncologic Imaging

SS 616

Advanced imaging methods (1)

Moderators:
V. Panebianco; Rome/IT
B.M. Schaarschmidt; Düsseldorf/DE

B-0505 10:30

Nasopharyngeal carcinoma: predictive value of IVIM-DWI on the radio-sensitivity

Y. Xiao, Y. Chen, Y. Chen, Z. He, J. Pan; *Fuzhou/CN (xyp999@yeah.net)*

Purpose: To evaluate dynamic the changing characteristics of intravoxel incoherent motion diffusion weighted imaging (IVIM-DWI) parameters after radiotherapy and their values in predicting radio-sensitivity of nasopharyngeal carcinoma (NPC).
Methods and Materials: IVIM-DWI with 14 b-factors (0~1000s/mm2) was performed on 47 consecutive NPCs on 3.0 T MR system (Philips Healthcare, The Netherlands), before radiotherapy, at the end of 5th, 10th, 15th, 20th, 25th fraction and end of radiotherapy. IVIM-DWI parameters were measured on the IDL6.3 software. Comparing to baseline D (D0), D of Xth fraction and its corresponding change or change rate were identified as DX and ΔDX or δDX, and the same as D* and f. Patients were categorized into response group (RG, 37 cases) and non-response group (NRG, 10 cases) after radiotherapy and their IVIM-DWI parameters were compared by Student t test or Mann-Whitney U test.
Results: The general changes of D, f and D* during the course of radiotherapy were significant ($P < 0.001$). D of post-radiation (except D5) were significantly higher than D0 ($P < 0.05$), while post-radiation D* (except D*5 and D*10) were significantly lower than D*0 ($P < 0.05$). f0 was significantly lower than f5 and f10 ($P < 0.001$), but it was significantly higher than fend ($P < 0.05$). RG behaved a more significant change of IVIM-DWI parameters than NRG. The D5, D10, D15, f0, f10, D*20 and D*25 between them were significantly different ($P < 0.01$). Furthermore, the difference of ΔD10, Δf20, ΔD*20, δf10, δf20 and δD*20 between them were also significant ($P < 0.05$).
Conclusion: The changes of IVIM-DWI parameters between treatment response groups of radiotherapy were significantly different. Thus, IVIM-DWI parameter can be potentially valuable in predicting radio-sensitivity of NPC.

B-0506 10:38

Intravoxel incoherent motion imaging (IVIM) in head and neck cancers and nodal metastases: can we predict patient outcome?

R. Balaji, D. Arivudainambi; *Chennai/IN (ravikanthbalaji@gmail.com)*

Purpose: To evaluate use of intravoxel incoherent motion (IVIM) imaging for evaluating primary head and neck cancers with nodal metastases and evaluating IVIM efficacy in predicting treatment outcome.
Methods and Materials: Twenty-four patients with proven head and neck malignancies underwent IVIM DWI on a 1.5 T MRI scanner. Of the 24 patients studied 11 had buccal mucosal tumours, 5 had malignancy of the tongue, 5 had hypopharyngeal malignancies and 3 had tonsillar cancer, all with metastases to nodes. Significance of parametric difference between primary tumours and metastatic nodes were tested.Probability of disease-free survival was estimated using the Kaplan-Meier analysis.
Results: Primary tumours in general irrespective of site of origin had higher vascular volume fraction (VF) ($p < 0.0008$) and lower diffusion coefficient (DCeff) ($p < 0.0002$). Patients with lower standard deviation for DCeff had longer disease free survival.
Conclusion: IVIM evaluates inherent diffusion and perfusion characteristics of tissues including primary malignancies and metastatic nodes. Primary tumours had higher volume fraction and lower diffusion coefficients than metastatic nodes. The standard deviation of diffusion coefficients obtained from primary tumour and nodes can predict outcome.

B-0507 10:46

Image quality and radiation dose of third generation dual-energy CT of the head and neck compared with a standard acquisition

S. Suntharalingam, A. Wetter, E. Stenzel, N. Guberina, A. Ringelstein, T. Schlosser, M. Forsting, K. Nassenstein; *Essen/DE (Saravanabavaan.Suntharalingam@uk-essen.de)*

Purpose: To evaluate the radiation dose and image quality performance of head and neck imaging between a third-generation Dual-Energy CT (DECT) and a standard acquisition (SECT).
Methods and Materials: For the baseline exam 30 cancer patients underwent SECT with automated tube current modulation and automated tube voltage selection. The follow-up CT was performed on DECT (80 and Sn150 kVp). Radiation doses and attenuation measurements of the internal jugular vein, submandibular gland, sternomastoid and tongue muscles were compared. Objective image noise was compared at 5 anatomic levels. Image quality was also visually evaluated by two radiologists.
Results: CTDIvol was 54 % lower with DE than with SECT (4.2 vs 9.2 mGy; p = 0.002). Median objective noise was lower in DECT at all anatomic levels (nasopharynx: 4.3 vs 6.2 HU; p = 0.02 - floor of mouth: 3.2 vs. 4.5 HU; p = 0.02 - arytenoids: 3.5 vs. 4.9 HU; p = 0.08 - lower thyroid: 4.7 vs. 30.2 HU; p = 0.03 - arch of aorta: 6.6 vs 27.1 HU; p: 0.002). No different attenuation measurements were observed between DECT and SECT in submandibular gland (106.1 vs 119.6 HU; p = 0.85), in sternomastoid (65.8 vs 70.0 HU; p=0.38) and tongue muscles (77.5 vs 76.4 HU; p = 0.42). Only signal intensity in internal jugular vein was lower in DECT (196.4 vs 263.2 HU; p=0.002). Visual image quality showed no significant differences.
Conclusion: Head and neck imaging with DECT can reduce radiation dose by half, while maintaining excellent image quality.

B-0508 10:54

Dual phase dual-energy CT in patients treated with erlotinib for advanced non-small cell lung cancer: possible benefits of iodine quantification in response assessment

J. Baxa[1], T. Matouskova[1], T. Flohr[2], B. Schmidt[2], M. Sedlmair[2], J. Ferda[1]; [1]*Plzen/CZ*, [2]*Forchheim/DE (baxaj@fnplzen.cz)*

Purpose: To investigate the relationship of development in the iodine related attenuation parameters derived from dual-phase dual-energy CT (DE-CT) and change of the tumour size in the evaluation of the response to anti-EGFR therapy in patients with advanced non-small cell lung cancer (NSCLC).
Methods and Materials: Dual-phase DE-CT was performed in 31 patients with NSCLC before the onset of anti-EGFR (erlotinib) therapy and as follow-up (mean of 8 weeks). Iodine uptake (IU; mg/ml) was quantified using prototype software in arterial and venous phases, arterial enhancement fraction (AEF) was calculated. The change of IU before and after therapy onset was compared with anatomical evaluation in maximal transverse diameter and volume (responders vs. non-responders).
Results: A significant decrease of IU in venous phase was proved in responders according to all anatomical parameters (p=0.002-0.016). In groups of non-responders, a significant change of IU was not proved with variable trends of development. The most significant change was observed using the anatomical parameter of volume (cut-off 73%). A significant difference of percentage change in AEF was proved between responding and non-responders (p=0.019-0.043).
Conclusion: Dual-phase DE-CT with iodine uptake quantification is a feasible method with potential benefit in advanced assessment of anti-EGFR therapy response. We demonstrated a decrease in vascularisation in the responding primary tumours and non-significant variable development of vascularisation in non-responding.
Author Disclosures:
T. Flohr: Employee; Employee of Siemens Healthcare. **B. Schmidt:** Employee; Employee of Siemens Healthcare. **M. Sedlmair:** Employee; Employee of Siemens Healthcare.

B-0509 11:02

Thyroid incidentalomas on 18 F-FDG PET/CT in oncology patients: are there any predictors for malignancy?

H.A. Nasr[1], H.R.S. Farghaly[2], A.O. Al Qarni[3]; [1]*Cairo/EG*, [2]*Assiut/EG*, [3]*Riyadh/SA (hussen2h@yahoo.com)*

Purpose: To determine the predictors of malignancy in incidental thyroid metabolic abnormalities on 18 F-FDG PET/CT.
Methods and Materials: 3304 18 F-FDG-PET/CT scans of 1909 patients (Pts) were reviewed. Pts with thyroid (THY) metabolic abnormalities were analysed. To differentiate benign (B) from malignant (M) lesions SUVmax> 4.7and HU> 42 based on ROC analysis were used. The various parameters were compared to histopathologicl findings. Sensitivity, specificity, PPV, NPV and accuracy in detecting M were calculated. Multivariate regression analysis was performed to assess the most powerful predictors for M.
Results: 78 pts showed increased focal or diffuse FDG activity. Histopathology was available for 30/78 pats (38.5%). M was confirmed in 13/30 (43.3%) while B lesions were noted in 15/30 (50%). THY M included 10papillar, 1follicular, 1Hurthle cell neoplasm and 1 lymphoma. B lesions were 11 B follicular or colloid nodules and 4autoimmune thyroiditis, while in 2/30 FNAB was undetermined. The mean SUVmax and HU were higher in pats with M versus B lesions (7.7±6.8 Vs. 3.6±1.6,p=0.032) and (44.3±13.2 Vs. 32.5±12.6,p=0.039) respectively. None of the other factors were statistically significant. The sensitivity, specificity, PPV, NPV and accuracy to predict M for SUVmax> 4.7 versus HU> 42 were 76.9%, 86.7%, 83.3%, 81.3 & 82.1% and 75.0%, 90.9%, 90.0%, 76.9 & 82.6% respectively while the combined both parameters revealed further improvement compared to either parameter alone with sensitivity, specificity, PPV, NPV and accuracy of 92.3%, 80.0%, 92.3%, 80.0% and accuracy of 85.7% respectively.
Conclusion: SUVmax and HU are valid predictors of malignancy in thyroid gland insidentalomas and when combined are more powerful with high accuracy.

B-0510 11:10

Comparison of clinicoradiologic characteristics of lung adenocarcinomas harbouring ALK rearrangements or EGFR mutations treated by surgical resection

H. Wang[1], M. Schabath[2], Y. Liu[1], Y. Han[1], Q. Li[1], R. Gillies[2], Z. Ye[1]; [1]*Tianjin/CN*, [2]*Tampa, FL/US (wanghua0718@163.com)*

Purpose: To explore the differences in clinicoradiologic characteristics between lung adenocarcinomas harbouring ALK rearrangements and those with EGFR mutations in a cohort of patients treated by surgical resection.
Methods and Materials: Patients who had surgical resection and histologically confirmed lung adenocarcinoma were enrolled, including 41 patients with ALK rearrangements and 66 patients with EGFR mutations. Eighteen categorical CT characteristics, the longest dimension of the tumour and tumour shadow disappearance rate (TDR) were used to evaluate the tumours. Chi-square, Fisher's exact test, or Wilcoxon rank-sum test was used to explore differences of clinical, pathological and CT characteristics between the two groups. The clinical and CT characteristics that were significant in univariate analysis were included in a multiple logistic regression model.
Results: Lepidic predominant invasive adenocarcinomas were more common (P = 0.001) in adenocarcinomas with EGFR mutations and solid predominant invasive adenocarcinomas were more common (P = 0.001) in adenocarcinomas with ALK rearrangements. In multivariate analysis, patients with ALK rearrangements were younger than those with EGFR mutations (OR = 0.93; 95% CI 0.89 - 0.98), GGO was more common in adenocarcinomas with EGFR mutations than in those with ALK rearrangements (OR = 0.14; 95% CI 0.03 - 0.67), and lymphadenopathy of N2 or N3 area was more common in patients with ALK rearrangements than in those with EGFR mutations (OR = 4.15; 95% CI 1.49 - 11.60).
Conclusion: Patients with lung adenocarcinoma harbouring ALK rearrangements appeared to have younger age, solid tumour, and more distant lymphadenopathy compared with those with EGFR mutations.
Author Disclosures:
H. Wang: Research/Grant Support; This research was supported by Tianjin Science and Technology Major Project (grant 12ZCDZSY1550) and Public science and technology research funds projects of NHFPC of the P.R. China (grant 201402013).

B-0511 11:18

Intravoxel incoherent motion diffusion weighted imaging in evaluating the radio-sensitivity of nasopharyngeal carcinoma xenografts

Y. Xiao, Y. Chen, J. Pan, D. Zheng, X. Zheng, Y. Chen; *Fuzhou/CN (xyp999@yeah.net)*

Purpose: To investigate the characteristics of intravoxel incoherent motion diffusion weighted imaging (IVIM-DWI) parameters in different radio-sensitive nasopharyngeal carcinoma (NPC) xenografts after fractional radiations.
Methods and Materials: 60 nude mice with different radio-sensitive NPC xenografts (30 xenografts of CNE-1 and another 30 of CNE-2) were sub-categorized into the following five groups: non-radiation (G0), and radiation of 10Gy (G1), 20Gy (G2), 30Gy (G3), and 3 days after 30Gy radiation (G4), respectively. All xenografts received the fractional radiations at alternative days with each fraction of 10Gy. On a 3.0 T MR system (Philips Healthcare, Best, The Netherlands), IVIM-DWI were performed on NPC xenografts by applying a special mouse coil (Chenguang, Shanghai, China). IVIM-DWI parameters were calculated on the IDL 6.3 software (Boulder, IL, Chicago, USA), and IVIM-DWI parameters between CNE-1 and CNE-2 xenografts were compared by Student t test or Mann-Whitney U test on SPSS 18.0 software.
Results: The general changes of D, f and D* values in CNE-2 xenografts after radiation were significant (P0.1). During the course of fractional radiations, D value increased while D* and f value decreased more significantly in CNE-2 xenograft than in CNE-1 xenograft (P < 0.01). D values of G3 and G4 in CNE-2 xenograft were significantly higher than those of CNE-1 xenograft (P=0.012; P=0.002), while D* and f values of G4 in CNE-2 xenograft were significantly lower than CNE-1 xenograft (P=0.001; P=0.003).
Conclusion: IVIM-DWI derived parameters and their corresponding changes after fractional radiations were characteristically and significantly different between CNE-1 and CNE-2 xenografts. Thus, IVIM-DWI can be valuable in evaluating the radio-sensitivity of NPC xenografts.

B-0512 11:26

Pseudoprogression in cancer immunotherapy: diagnostic imaging features

V. Kurra, R.J. Sullivan, J.F. Gainor, F.S. Hodi, L. Gandhi, C.A. Sadow, G.J. Harris, K.T. Flaherty, S.I. Lee; *Boston, MA/US (VKURRA@PARTNERS.ORG)*

Purpose: Measure rates and describe imaging features of pseudoprogression and associated patient outcomes in immunotherapy trials.
Methods and Materials: Cohort was retrospectively drawn from subjects enrolled in phase I and II trials from January 2012 to July 2015 at two hospitals within one cancer center network. Inclusion required follow-up with every 4-12 week scheduled torso CT or MRI for > 1 year or until demise/hospice analysed using RECIST 1.1 and irRC criteria by imaging core lab. A single investigator blinded to patient outcome abstracted the core lab database; another blinded to imaging assessment abstracted patient survival from the medical record. Pseudoprogression was defined as progression from nadir followed by response from peak.
Results: 191 subjects comprised of 105 melanoma, 64 non-small cell lung, 12 breast, 5 bladder and 5 other cancers were included. 109 (57%) were alive at 1 year. Pseudoprogression was seen in 5 (3%, 1-6 95% CI) and 10 (5%, 3-9 95% CI) with RECIST and irRC respectively. Pseudoprogression, response and intervening time respectively occurred at 71 (range 29-108), 182 (range

57-360), and 111 (range 28-252) days with RECIST and 73 (range 90-120), 184 (range 120-150) and 111 (range 28-201) days with irRC. New or enlarging lesions were seen in nodes, lung, liver, bone and kidney. Among pseudoprogression subjects, 5/5 (100%, 50-100 95% CI) of RECIST and 9/10 (90%, 60-98 95% CI) of irRC were alive at 1 year.
Conclusion: Pseudoprogression is uncommon, occurs within 120 days of immunotherapy initiation and indicates a high likelihood of > 1 year survival.

B-0513 11:34

Potential prognostic impact of CT-quantified abdominal muscle and fat re-distribution under chemotherapy in lung cancer patients
J. Nattenmüller, R. Wochner, T. Muley, M. Steins, S. Hummler, H.-U. Kauczor, M.O. Wielpütz, C.P. Heussel; *Heidelberg/DE (johannawelzel@gmx.de)*

Purpose: Cachexia is associated with poor outcome in lung cancer patients. However, the differential influence of obesity, sarcopenia and cachexia on patient outcome in the context of first-line-chemotherapy is not yet understood.
Methods and Materials: In 200 lung cancer patients (70 female, mean age 62y; mean BMI 25 kg/m2; median follow-up 15.97 months) who underwent staging-CT before and after chemotherapy (mean interval: 4.3 months), densitometric quantification of total (TFA), visceral (VFA), and subcutaneous fat area (SFA), fat within muscle (FiMA), muscle density (MD), muscle area (MA) and muscle index (SMI) at level L2/3 was performed to evaluate changes under chemotherapy and the impact on survival.
Results: There was a significant increase in adipose tissue compartments (TFA, VFA, SFA, VFA/SFA, and FiMA) ($p < 0.04$-0.001), while there was a significant decrease in MA ($p < 0.001$) and BMI ($p < 0.05$) after chemotherapy. High pre-therapeutic VFA/SFA (HR=1.272; p=0.008) was a predictive factor for lower survival, high pre-therapeutic MD (HR=0.93; $p < 0.05$) for better survival. A decrease of BMI (HR=1.303; p=< 0.001), weight (HR=1.067; $p < 0.001$) and SMI (HR=1.063; $p < 0.001$) after chemotherapy were associated with a significantly lower survival.
Conclusion: A high pre-therapeutic amount of visceral fat (high VFA/SFA) was a predictor of poor survival. After chemotherapy, muscle mass was decreased while adipose tissue compartments and especially visceral fat were increased. As high pre-therapeutic VFA/SFA and loss of BMI, weight and muscle mass were associated with poor survival, sarcopenia prevention, e.g. via physical exercise and nutrition, may potentially improve outcome after chemotherapy.

B-0514 11:42

Intravenous vs intratumoral: effect of different inection routes on biodistribution and tumour accumulation of Pluronic-P94
C. Santini[1], A. Arranja[2], A. Dankova[3], F. Schosseler[2], K. Morawska[4], P. Dubruel[4], E. Mendes[3], M. de Jong[1], M. Bernsen[1]; [1]*Rotterdam/NL*, [2]*Strasbourg/FR*, [3]*Delft/NL*, [4]*Ghent/BE (c.santini@erasmusmc.nl)*

Purpose: Recent studies have shown that Pluronic-P94 (P94) tri-block copolymers have high stability and long circulation in vivo, suggesting a potential in tumour drug delivery. Intravenous injection (IV) of 111In-radiolabelled P94 (111In-DTPA-P94) may result in undesired off-target accumulation, especially liver and poor tumour uptake. Alternatively, intratumoural injection (IT) can overcome these limitations and may improve tumour uptake. In this study, biodistribution and tumour accumulation over time of radiolabelled P94 after IT or IV administration are compared.
Methods and Materials: 111In-DTPA-P94 was administered to tumour-bearing mice either IV or IT. SPECT/CT imaging was performed at different time points and the retention in selected organs was determined at 48 h and 96 h post-injection (pi).
Results: IV administration of 111In-DTPA-P94 resulted in considerable liver accumulation and limited tumour uptake, further confirmed by biodistribution analyses with measured tumour uptake of ~1% injected dose per gram (ID/g), and liver uptake of ~15% ID/g. In contrast, after IT administration, most of the 111In-DTPA-P94 concentrated in the tumour (~15% ID/g), no off-target tissue was visible and liver accumulation diminished (~5% ID/g). Although retention was higher following IT administration, independent from the injection route, 111In-DTPA-P94 was retained in the tumour over time whilst it was progressively cleared in other tissues.
Conclusion: IV injection of 111In-DTPA-P94 resulted in limited tumour uptake, whereas IT administration substantially improved uptake and retention in the tumour. The minimal off-target tissue involvement, and the tracer retention over time especially after IT administration, confirmed the potential of P94 to be used as a carrier for therapeutic radionuclides.

B-0515 11:50

CT perfusion heterogeneity as a prognostic biomarker in NSCLC
S. Baiocco[1], D. Barone[2], G. Gavelli[2], A. Bevilacqua[1]; [1]*Bologna/IT*, [2]*Meldola/IT (s.baiocco@unibo.it)*

Purpose: To explore correlation between features extracted by CT perfusion (CTp) colorimetric maps and overall survival, to assess whether they could work as a prognostic image-based biomarker.
Methods and Materials: 16 axial CTp examinations, referring to as many patients (age range 36-79 years) with NSCLC, were considered and survival data were included in the study. Median overall survival was calculated at 8 months. Blood flow (BF) values were computed according to the maximum slope method and values undergoing high fitting errors have being automatically removed. Seven different features are computed on BF maps and k-means clustering algorithm was used to assess their correlation with overall survival (OS).
Results: Two texture features, uniformity (U) and entropy (E), this reflecting irregularity and inhomogeneity, used together result to be the most effective prognostic factors for OS. The group of 11 patients with $E > 7.0$ and $U < 0.01$ shows OS≤8 and are clearly linearly separated from the second group of 5 patients having $OS > 8$.
Conclusion: These results confirm the common expectation that higher heterogeneity correlates with higher aggressiveness and this heavily reflects on the OS parameter. In addition, while often predictive features are looked for original (HU) CT images, results prove a strong correlation with OS by simple features computed on perfusion maps, after that erroneous perfusion values have been automatically removed. This finding also implicitly considers the measure of hemodynamic heterogeneity of tumour as a relevant and objective prognostic factor for OS and represents a promising approach to clinical utilization of CTp.

10:30 - 12:00 **Room F2**

Emergency Radiology

SS 617

Cardiothoracic emergencies

Moderators:
F. Carbonetti; Rome/IT
J.B. Dormagen; Oslo/NO

K-15 10:30

Keynote lecture
V.E. Sinitsyn; *Moscow/RU*

B-0516 10:39

Radiological pattern of bomb blast injuries
A. Raouf, R. Sayani; *Karachi/PK (drabdulraouf84@yahoo.com)*

Purpose: To evaluate the imaging pattern, frequency and severity of bomb blast injuries and compare injury pattern of suicide blasts with that of implanted blast devices.
Methods and Materials: We evaluated 200 bomb blast victims who presented to our hospital during last 7 years. The patients having at least one radiologic investigation were included. Radiological pattern, frequency, severity of injuries were evaluated. The patients undergoing radiologic intervention procedures were also evaluated in terms of their success and clinical outcome.
Results: Out of 200 patients 65 died due to lethal injuries. 37 of the patients suffered severe head and neck injuries evident on imaging and who required immediate surgical or radiologic intervention. Incidence of head neck injuries (26%) among survivors of suicide bomb attack was more in comparison to victims of implanted explosion devises (13 %).90 suffered intra-abdominal injuries depicted on x-rays and CT. 35 patients underwent interventional radiology procedures most common 57% of which was angiographic embolisation for active bleed.
Conclusion: It is very important to familiarize radiologists with imaging of bomb blast injuries due to current worldwide threat of terrorism and also because of their unique radiological pattern and management. We found different injury pattern in blast victims as compared to other routine trauma patients. There was also difference among injury patterns inflicted by suicide bombs versus implanted explosion devices. The suicide bombs are more associated with head and neck injuries, this is likely due a higher level at which the shrapnel's are projected as compared to implanted devices.

B-0517 10:47

Volume of intra-abdominal air measured by CT: a potential marker for abdominal compartment syndrome in trauma patients?

E.C. Schubert, E.J. Rummeny, K.-G. Kanz, K. Holzapfel; *Munich/DE (elaine.schubert@tum.de)*

Purpose: Purpose of our study was to compare intra-abdominal air volumes determined by CT of prehospital intubated trauma patients with those of a non-ventilated control group to identify patients at risk for developing abdominal compartment syndrome (ACS).
Methods and Materials: In 30 preclinically intubated polytrauma patients (CT performed at admission; mean age 49.3±7.8 years; 21 men, 9 women; ISS score over 16) and 40 non-ventilated control subjects (follow-up CT scans of non-abdominal tumour patients in complete remission; mean age 52.9 ±8.4 years; 29 men, 11 women) intra-abdominal air volumes were determined by CT using Philips Intellispace Portal software. Mean intra-abdominal air volumes of trauma and control patients were compared using the Mann-Whitney U test. In addition, patients with exceedingly high volumes of intra-abdominal air, a known risk factor for developing ACS from experimental studies, were identified.
Results: Mean intra-abdominal air volumes of ventilated trauma patients (420.6 ml; range 123.7-5763.3 ml) were significantly higher than that of non-ventilated control subjects (272.5 ml; $p < 0.05$; range 112.2-580.6 ml). In 20% of trauma patients (and in none of the control group) air volumes exceeding 1000 ml were measured (range 1024.4-5763.3 ml), raising the intra-abdominal pressure.
Conclusion: Prehospital intubation of trauma patients results in higher volumes of intra-abdominal air compared to control subjects. In 20% of ventilated polytrauma cases, a massive distension of stomach and bowel is observed. This may be a sign of impending ACS and can be identified by the radiologist; immediate gastric tube placement or surgical decompression should be recommended.

B-0518 10:55

Cardiovascular signs suggestive of thoracic compartment syndrome (TCS) in emergency setting

C. Liguori[1], G. Frauenfelder[1], F. Giurazza[2], P.P. Saturnino[1], C. Acampora[1], L. Romano[1]; [1]*Naples/IT*, [2]*Rome/IT (carlo.liguori@gmail.com)*

Purpose: TCS is an emergency condition based on heart compression due to increased intra-thoracic pressure. MDCT allows a fast and accurate examination of chest and cardiovascular structures in emergency setting. Aim of the study is to evaluate MDCT specificity and sensitivity in detecting cardiovascular signs suggestive of TCS.
Methods and Materials: From January 2014 to May 2015, retrospective study included 25 patients (mean age 44.6; 21y-82y) admitted to the emergency department with clinical symptoms and signs suspicious for TCS. All patients underwent a standard multiphasic MDCT. Two radiologists analysed images based on direct and indirect heart-compression signs due to increased compartment pressure: enlargement of superior and inferior cava veins greater than 2/3 of respectively thoracic and abdominal aorta diameter; presence of periportal lymphedema or contrast material reflux in inferior cava/azygos veins; interventricular septum bowing sign, flattened heart sign, compression of the coronary sinus. Imaging findings were compared with final clinical diagnosis as gold standard.
Results: Without an ECG-synchronised CT image, heart signs were obtained examining each post-contrast phase image for adequate results. Sensitivity and specificity were respectively evaluated for each sign: enlargement of superior/inferior cava veins (98%-40%), periportal lymphedema (97%-54%), contrast material reflux (97%-52%), interventricular septum bowing (80%-98%), flattened heart sign (45%- 96%), coronary sinus compression (77%-95%).
Conclusion: MDCT showed a high specificity (97%) and sensitivity (98%) in detecting respectively direct and indirect signs of TCS. Since most of clinical symptoms are non-specific, radiologists play a key role in the definitive correct diagnosis of TCS.

B-0519 11:03

Triple rule-out CT in the emergency department patient: should we just do it?

F. Morsbach, K. Higashigaito, D. Benz, H. Alkadhi; *Zurich/CH (fabian.morsbach@usz.ch)*

Purpose: To evaluate the frequency of further testing for coronary artery disease (CAD) in patients after receiving a chest CT for simultaneous aortic and pulmonary artery evaluation.
Methods and Materials: This retrospective study was conducted over a 3-year period including all patients that visited the emergency department of a 150'000 annual-visit European maximum care academic medical center. In the final patient population all patients were included that received CT testing for chest pain asking simultaneously for two or more of the following diagnoses: aortic dissection (AD), pulmonary embolism (PE) or CAD. Patients with CT testing for AD and PE were further evaluated whether they received further testing for coronary artery disease during their visit to the emergency department or up to 1 month after their initial visit.
Results: The final patient population included 229 patients. The majority were tested simultaneously for AD and PE (n=160, 60 %), followed by AD, PE and CAD (n= 42, 18 %). Patients receiving simultaneous testing for AD and PE received additional testing for CAD afterwards (n=54, 34%), most commonly coronary catheter angiography (n=31, 19%).
Conclusion: Most patients presenting at the emergency department with unclear chest pain commonly receive further testing for CAD after a chest CT for simultaneous evaluation of AD and PE. Evaluating patients for CAD routinely in cases of simultaneous testing for PE and AD is feasible and could reduce additional testing.

B-0520 11:11

Assessment of the adequacy of the coronary CT scan requests at the Emergency Department

V. García de Pereda De Blas, I. Tavera Bahillo, E. Camuera González, J. Correa Zapata, I. Arrieta Artieda, M. Carreras Aja; *Barakaldo/ES (vedeblas@gmail.com)*

Purpose: Evaluating the appropriateness criteria of the requests and the results of the coronary CT scans performed in the Emergency Department (ED).
Methods and Materials: We show a descriptive and retrospective study of 132 patients (from January 2014 to September 2015) that presented acute chest pain with normal EKG and enzymes after other causes of chest pain were discarded. We use the risk scale of the 2013 guide of the European Society of Cardiology (ESC), which includes age, gender and the type of chest pain and considers a pretest probability (PTP) of acute coronary syndrome between 15 and 65% suitable to perform the CT scan.
Results: We performed 132 coronary CT scans with a prevalence of male gender (57.6%) and an age rank between 30 and 79 years (mean of 50 years). Most of them (59.9%) were classified as atypical angina, whilst the rest were considered typical angina (22%) and not anginous chest pain (18'1%). 110 patients (83.3%) were suitable for coronary CT scan considering their PTP (15-65%), founding at least one significative stenosis (≥50%) in 16.7% of the studies. No significant stenosis was shown in the 14 patients that underwent a CT scan with a PTP of < 15%.
Conclusion: In our experience, the use of the ESC 2013 guide PTP of ischaemic cardiopathy helps in the adequacy of the coronary CT scan requests at the Emergency Department.

B-0521 11:19

Pulmonary embolism: do we evaluate the risk factors properly in the ED? Pulmonary angio-CT in risk stratified patients according to the revised Geneva score

M. Arias L., H. Maestre, M. Lorente, R. Jimenez, J. Perez, F. Garcia, A. Mas, A. Franco; *San Juan de Alicante/ES (ariasl.ma.eugenia@gmail.com)*

Purpose: Evaluate the diagnostic rentability of performing pulmonary angio-CT in patients with low, medium or high risk for pulmonary embolism (PE) according to the Revised Geneva score (rGeneva).
Methods and Materials: Retrospective study of 726 pulmonary angio-CT performed between January 2014-September 2015. We classified the patients in positive and negative for PE and applied the rGeneva score, to stratify them into low (0-3), intermediate (4-10) or high (11+) risk for PE.
Results: Of the 726 patients, we had 69.2% negative and 30.8% positive for PE. Within our negative group the rGeneva score was distributed as follows: 51.7% low, 43.1% intermediate and 5.2% high risk. Of our patients with positive angioCT for PE 16.7% was low, 71.7% intermediate and 11.6 high risk for PE.
Conclusion: Regarding PE there are 2 validated systems: the Modified-Wells score and the rGeneva score. According to some authors, Modified-Wells score seems to be more specific, but has lower sensibility than rGeneva and some subjective parameters. Therefore, considering we had limited clinical data available, we employed the rGeneva score. However, our results produced too many false negatives (16.7%) and the sensibility in our study was too low compared to whats expected in rGeneva (< 8%). Altogether, we believe that the risk factors taken into consideration for stratifying the patients were not accurately reportedin the clinical history, resulting in an error when stratifying the patients. This conclusion has led to a prospective study obtaining more accurate data regarding the risk factors, which is now taking place in our institution.

B-0522 11:27

First-line diagnosis of paediatric pneumonia in emergency: lung ultrasound in addiction to chest-XR and its role in follow-up

C.L. Piccolo, S. Ianniello, B. Sessa, G.L. Buquicchio, M. Trinci, V. Miele; *Rome/IT (clapiccolo@libero.it)*

Purpose: To evaluate the role of Lung Ultrasound (LU) integrated with chest XR for the first-line diagnosis of paediatric pneumonia, and to define its role during the follow-up, in order to exclude complications.
Methods and Materials: We performed a retrospective review of a cohort including 84 consecutive children (age-range: 3-16 years; mean age: 6 years; 44 M; 40 F) with clinical signs of cough and fever. All the patients underwent CXR at the admission in order to identify any signs of lung consolidation, integrated with LU. Those positive at LU were followed up with LU until the complete resolution of the disease.
Results: Chest XR showed 47/84 pneumonic findings. LU showed 60/84; 34/60 had a typical pattern of lung consolidation; 13/60 showed multiple B-lines, as for interstitial involvement; 13 patients with normal CXR had a positive LU because of small and hidden consolidations, not achievable by x-rays. 1 case was negative at LU because of retroscapular location. 60 patients were followed-up with LU; 28/60 showed a complete regression of the disease; 23/60 showed a significant decrease in size of consolidation, 9/60 disease stability or insignificant decrease in size, requiring thus adjunctive LU exams.
Conclusion: In our limited experience, LU, integrated with chest XR, revealed to be a first-line accurate technique to identify also small pneumonic consolidations, especially for "CXR-occult" findings and for pleural effusion early diagnosis; furthermore, LU follow-up allows to verify complications and to avoid additional XR exposures.

B-0523 11:35

Comparisons of CT grading with clinical outcome of gastric corrosive injury at emergency room

Y.-C. Wong, L.-J. Wang, C.-H. Wu; *Taoyuan City/TW (ycwong@cgmh.org.tw)*

Purpose: Corrosive injury of the stomach is usually assessed by endoscopy. However, this invasive procedure may cause more harm to the patients in acute settings. This study is to compare CT grades of gastric corrosive injury with clinical outcome at emergency room.
Methods and Materials: From January 2010 to December 2014, records of 18 patients (8 men, 10 women; mean age 53.7 ± 17.4 years, range 34 to 86 years) of acute gastric corrosive injury who had undergone contrast-enhanced CT were retrieved from radiology information system. Their CT examinations were retrospectively reviewed and CT grades of corrosive injury were assigned. Blood gas data were reviewed for base deficits and acidity. The CT grades and blood gas data were compared with clinical outcome (alive or dead).
Results: All 18 patients had suicidal attempt ingesting caustic agents before admission. Among them, 4 (22.2%) were grade I injury (intact mucosal and serosal enhancement), 5 (27.8%) were grade II injury (diminished mucosal enhancement), 9 (50.0%) grade III injury (diminished mucosal and serosal enhancement). None of grade I injury, 3 of grade II injury and 2 of grade III injury underwent surgery. None of grade I and grade II injuries died. Seven (7/9, 77.8%) grade III injury patients died despite aggressive treatment. Death was significantly associated with CT grade III injury (p=0.003) and age (0.006). It was not significantly associated with base deficit (p=0.097) and blood pH (0.118).
Conclusion: Contrast-enhanced CT can be used to grade the severity of gastric corrosive injury at emergency room.

B-0525 11:43

Value of multi-detector CT in identifying diagnostic findings in blunt bowel and/or mesenteric trauma: our experience

M.C. Firetto, A.A. Lemos, E. Perucchini, T. Canini, P.R. Biondetti; *Milan/IT (cristinaf75@libero.it)*

Purpose: To compare CT findings with surgical findings in the diagnosis of bowel and/or mesenteric blunt traumatic injuries.
Methods and Materials: From January 2010 to March 2015, 138 consecutive multi-system trauma patients with an ISS > 16 who underwent multi-detector CT were retrospectively evaluated (Siemens Somatom Definition ®, Germany). The patient population consisted of all males subjects (mean age 39.6 years old, range 18-70 years old). Reference standards were surgical findings, clinical follow-up and discharge diagnosis.
Results: Fourteen out of 138 patients had bowel and/or mesenteric injuries, mentioned in the initial radiological report. Nine out of 14 patients had an open laparotomy after CT. Five out of 14 patients did not have an open laparotomy, in this group of patients CT findings were as follows: extra-luminal air (n=2), intramural air (n=1), bowel wall thickening (n=2), abnormal bowel wall enhancement (n=1), mesenteric infiltration/stranding (n=2), intra/retroperitoneal free fluid (n=1). No bowel discontinuity, extra-luminal contrast extravasation or active bleeding were observed. Three out of 5 patients had concomitant solid organ injuries. In the group of 9 patients who had an open laparotomy, CT findings were as follows: extra-luminal air (n=4) wall thickening (n=4), abnormal bowel wall enhancement (n=3) mesenteric infiltration/stranding (n=4), active bleeding (n=4), and free fluid (n=9).No extra-luminal contrast extravasation was observed.
Conclusion: Active bleeding and bowel discontinuity are reliable and surgically proven predictors of unsuccessful conservative non surgical management.Free fluid is an important indicator of underlying bowel injury. The significance of intramural air without an extra-luminal component is controversial.

10:30 - 12:00 **Room D1**

Breast

SS 602b

Breast ultrasound

Moderators:
B. Brkljačić; Zagreb/HR
A. Domingo; Tarragona/ES

K-12 10:30

Keynote lecture

B. Brkljačić; *Zagreb/HR*

B-0526 10:39

Does pleomorphic invasive lobular carcinoma (ILC) have different mammographic and ultrasound features compared with classical ILC?

P.M. Yeap, S.J. Vinnicombe, C. Purdie, J. Lee, A. Evans; *Dundee/UK (pheymingyeap@gmail.com)*

Purpose: Pleomorphic invasive lobular carcinoma (PILC) is a distinct morphological variant of ILC with a more aggressive course than classical ILC (CILC) and shorter overall survival. The aim of this study was to evaluate any differences in the imaging features between PILC and CILC.
Methods and Materials: A single centre retrospective review of histologically confirmed ILC in 157 patients (39 PILC; 118 CILC) from April 2010 to July 2015. Mammographic and ultrasonographic images were evaluated independently by an experienced breast radiologist without knowledge of the pathological results.
Results: 11% of PILC and 16% of CILC were mammographically occult. On mammography, mean size of PILC was greater than CILC (32 mm vs. 20 mm, $p < 0.001$). PILC more frequently presented with inflammatory features and microcalcification compared with CILC (14% vs. 1%, $p < 0.001$; 28% vs. 6%, $p < 0.001$, respectively). Architectural distortion was the dominant feature in 28% of CILC compared to 6% of PILC (p=0.005). More PILC lesions were categorised as BIRADS 5 than CILC (47% vs. 29%, p=0.04). On ultrasound, mean size of PILC was again greater (23 mm vs. 16 mm; p=0.001). PILC more often exhibited indistinct mass (70% vs. 50%; p=0.035), inflammatory features (8% vs. 0%; p=0.014), echogenic surrounding fat (35% vs. 10%; $p < 0.001$), intraductal extension (24% vs. 10%, p=0.02) and posterior enhancement (11% vs. 1%; p=0.013) than CILC. Mean shear wave elastography stiffness was higher for PILC (152.7 vs. 125.5kPa; p=0.027).
Conclusion: Differences in the imaging features of CLIC and PILC reflect the more aggressive phenotype of PILC.

B-0527 10:47

Fast and accurate screening of women with dense breasts with a dedicated computer-aided detection-based reading protocol in automated 3D breast ultrasound

J. van Zelst[1], A. Gubern-Merida[1], D. Drieling[2], T. Tan[1], M. Rutten[3], N. Karssemeijer[1], R. Mann[1]; [1]*Nijmegen/NL*, [2]*Bremen/DE*, [3]*'s-Hertogenbosch/NL (jan.vanzelst@radboudumc.nl)*

Purpose: Automated breast ultrasound (ABUS) is a promising supplemental screening modality for detection of additional cancers in women with dense mammograms. However, reading ABUS is considered time consuming. This study investigates the effect of computer-aided detection (CAD) software-based reading on radiologists' performance and reading time (RT).
Methods and Materials: We randomly selected 120 ABUS cases (378 volumes) of women with dense breasts including 60 normal, 30 benign, 20 mammography-negative and 10 mammography-positive cancers. We designed a fast CAD-based (Qview, Medical, Los Altos, CA, USA) step-by-step screening workflow, using a workstation developed for this study. Three specialised breast radiologists read the dataset twice, once conventional and once in the dedicated CAD-ABUS screening workflow. An independent crossover, and counterbalanced reader study was performed with > 9 weeks in between sessions. Suspicious findings were scored on a likelihood scale (0-

100) based on BI-RADS. RT was measured for each case assessment. Multi-case-multi-reader AFROC analysis was used to evaluate reader performance. ANOVA was used to compare RT.
Results: The mean area under the curve was 0.84 for both reading methods (p=0.87). The dedicated CAD-ABUS workflow decreased RT significantly by 22% [CAD-ABUS: on average 143.0 (SD 70.6) seconds/case; conventional: on average 184.3 seconds/case (SD 104.5), ($p < 0.0001$)].
Conclusion: A dedicated step-by-step workflow using CAD-software allows significantly faster reading of ABUS cases without decreasing the accuracy. CAD-ABUS-based reading is therefore more efficient than conventional reading of ABUS.
Author Disclosures:
D. Drieling: Employee; Mevis Medical Solutions AG. **M. Rutten:** Speaker; Siemens Healthcare. **N. Karssemeijer:** CEO; Screenpoint Medical Inc. Shareholder; Matakina Ltd., Qview Medical Inc. **R. Mann:** Speaker; Siemens Healthcare, Bayer.

B-0528 10:55

Comparison of SR_{max}, SR_{ave} and color map of elastography in differentiating malignant from benign breast lesions
J. Moon, J. Cheung, S. Koh, K. Lee; *Anyang, Gyeonggi-do/KR (geenie-m@hanmail.net)*

Purpose: The maximum value of strain ratio is newly developed measurement in elastography. The purpose of this study was to compare diagnostic performance of three different measurements of strain elastography, maximum value of SR (SR_{max}), average value of SR (SR_{ave}) and color map, prospectively in differentiating malignant from benign breast lesions.
Methods and Materials: The study was approved by the institutional review board and written informed consent was obtained. Two hundred and ninety patients with 314 breast lesions were prospectively enrolled between August 2014 and March 2015. Two radiologists performed elastography and obtained SR_{max} and SR_{ave} of targeted lesion with tissue to nodule strain ratio and color map using five-degree score system. Diagnostic performances of $SR_{max,}$ SR_{ave} and color map were compared using receiver operating characteristic (ROC) curve analysis.
Results: Of the 314 lesions, 246 (78.34%) were benign and 68 (21.66%) were malignant. The AUC of SR_{max} (0.7674) was larger than AUCs of SR_{ave} (0.7138) and color map (0.6324) with statistical significance (p=0.0383 for SR_{max} vs SR_{ave}, p=0.0000 for SR_{max} vs color map). The AUC of SR_{ave} was larger than color map however, there was no statistical significance. The optimal cutoff point of SR_{max} balancing sensitivity (91.12%) and specificity (50.81%) was 5.16.
Conclusion: The SR_{max} is more reliable diagnostic tool in comparison to SR_{ave} and color map of elastography in differentiating benign and malignant breast lesions. With balancing diagnostic accuracy, we recommend 5.16 of SR_{max} as cutoff value.

B-0529 11:03

HER2 positive breast cancer: correlation with quantitative contrast-enhanced ultrasound parameters
W. Jia, J.-N. Shi, X.-C. Fei, K.-W. Shen, M. Chen; *Shanghai/CN (jiawanru@126.com)*

Purpose: To explore whether contrast-enhanced ultrasound (CEUS) performances correlated with breast cancer subtypes.
Methods and Materials: A total of 189 histologically proved breast cancer patients (mean age 53.56±11.41 years; age range 21-82 years) who underwent CEUS preoperatively were selected. Qualitative features enhancement order, margin, distribution, perfusion defect and radial or penetrating vessels were recorded, while parameters peak, TP, Sharpness and AUC were obtained, and ratio between the whole lesions and surrounding reference tissues were calculated for further analysis. The molecular subtypes were decided by the expression of estrogen receptor (ER), progesterone receptor (PR), human epidermal growth factor receptor 2 (HER2) and Ki-67.
Results: There were 46, 75, 37 and 31cases of Luminal A, Luminal B, HER2 positive and triple negative breast cancers respectively. Primary tumour size (P=0.012), tumour grade (P=0.000), and positive lymph node rate (P=0.006) were significantly different among these subtypes. Quantitative parameter Peak showed differences among them (P=0.001), and significantly higher for HER2 positive breast cancer than for Luminal (P=0.000) and triple negative (P=0.003) ones, simultaneously, AUC of HER2 positive ones were also higher than Luminal ones with significance (P=0.049).
Conclusion: For HER2 positive breast cancer, Peak and AUC were significantly higher than luminal ones, and Peak were also higher than triple negative ones. Quantitative CEUS parameters had potentials in prediction of biological behaviours.

B-0530 11:11

The added value of breast ultrasound elastography for differentiating between benign and malignant lesions
H.-J. Kim[1], S. Kim[1], M. Jang[1], B. Yun[1], J. Chang[2], N. Cho[2]; [1]*Gyeonggi-do/KR*, [2]*Seoul/KR (khjsm4@gmail.com)*

Purpose: The purpose of this study was to investigate the added value of breast ultrasound elastography (UE) combined with conventional sonography for differentiating between benign and malignant breast lesions.
Methods and Materials: In this prospective study, 135 non-palpable breast lesions (92 benign and 43 malignant) from 135 women (mean age, 52.9 years; range, 23-77 years) were evaluated by conventional sonography and UE (strain and shear-wave images). Four radiologists independently reviewed obtained images. At first, each lesion captured by conventional sonography was scored on a scale of 0% to 100% for suspicion of malignancy. They were rescored on the same scale, when color scale UE images were added and lesion to fat strain ratios of both strain and shear-wave elastography were obtained. Diagnostic performance was analysed by pairwise comparison of receive operating characteristic curves.
Results: Adding UE images to conventional images improved the diagnostic accuracy of malignancy. Mean areas under the curve (AUC), 0.741 for conventional images alone, 0.824 (p=.0003) when strain images were combined and 0.817 (p=.0005) when shear-wave images were combined. Also the diagnostic performance was higher in using the strain ratios (AUC in strain images: 0.819, [p=.0017], AUC in shear-wave images: 0.825, [p=.0006]) than using conventional images alone. The cut-off values of the strain ratios were> 2.93 in strain and > 3.5 in shear-wave elastography.
Conclusion: The addition of either color visual assessment or the strain ratios of UE to conventional sonography may improve diagnostic performance.

B-0531 11:19

Impact of Real-time Virtual Sonography, a coordinated US and MRI system, on the detection of conventional B-mode-occult lesions in second-look US for MRI-detected breast lesions
S. Nakano, R. Tetsuka, K. Fujii, J. Kousaka, Y. Mouri, T. Ando, M. Goto, T. Imai, T. Ishiguchi; *Aichi/JP (snakano1@aichi-med-u.ac.jp)*

Purpose: The aim of this study was to verify the utility of evaluating US-occult MRI-detected breast lesions with second-look US using Real-time Virtual Sonography (RVS), a system that coordinates US with MRI using an image fusion technique.
Methods and Materials: Between July 2011 and May 2015, 53 consecutive patients who underwent second-look US to identify MRI-detected lesions on prone MRI were enrolled in this study. For MRI-detected lesions that were not identified using conventional B-mode (cB-mode), second-look US using RVS was performed after an additional supine MRI.
Results: In the 53 patients, 59 lesions were initially detected by prone MRI and followed by second-look US. Of the 59 lesions, 20 (34%) were identified with second-look US using cB-mode. Of the 39 (66%) cB-mode-occult lesions, 33 (85%) were detected with second-look US using RVS. The MRI morphology types of the 33 lesions were as follows: mass, 16; non-mass, 5; and focus, 12. US-guided biopsy or excisional biopsy demonstrated that of the 33 lesions, 8 (24%) were malignant and the remaining 25 (76%) were benign. A total of 53 (90%) MRI-detected lesions were sonographically identified by using both cB-mode and RVS. The remaining all 6 US-occult lesions could be followed up under RVS after the enhancing area was marked on the breast surface by using RVS.
Conclusion: Our results suggest that RVS is a useful modality on the sonographic detection of cB-mode-occult lesions in second-look US for MRI-detected breast lesions and may contribute to identifying cases in which MRI-guided biopsy is absolutely necessary.

B-0532 11:27

Breast elastography: does strain ratio value depend on Regions of Interest (ROIs) placement?
E. Maggini, E. Mancuso, V. Maldur, F. Pediconi, P. Ricci; *Rome/IT (elenamaggini@yahoo.it)*

Purpose: To evaluate ROIs (Regions of Interest) placement during strain ratio acquisition in breast elastography.
Methods and Materials: From January to August 2015, 242 breast lesions have been evaluated using semi-quantitative free-hand elastography. Strain ratio data were obtained placing reference ROIs at different depth in breast healthy tissue. In the first image acquired, reference ROI was placed in fatty tissue at the same depth of the nodule (the maximum depth difference between the measurements in the fat tissue and in the lesion was limited to 5 mm). In the second image acquired, reference ROI was placed at different depth from target lesion (depth difference ranged from 5 mm to 15 mm). A strain ratio cut-off value of 3.0 has been reached. Histological results were available in all cases.

Results: No significant difference between data derived from comparison with fat tissue at the same or at different depth was observed (sensitivity: 77.46% vs. 84.51%; specificity: 70% vs. 68%).
The diagnostic performance of strain ratio using reference ROI at the same or at different depth was compared by Receiver Operating Characteristic (ROC) curve analysis.
Conclusion: According to our experience, fat tissue seems to provide a constant modulus over various compression loading, unrelated to depth of reference ROIs.

B-0533 11:35

Categorisation of focal breast lesions according to the BI-RADS US lexicon: role of a computer-aided decision-making support (S-Detect)
A.A.M. Orlando, M. Safina, L. Lodato, G. Buffa, A. Cirino, R. Ienzi, A. Taibbi, T.V. Bartolotta; *Palermo/IT (orlandoalessiamed@hotmail.it)*

Purpose: To assess the role of a software capable of a semi-automated lesion extraction and guided BI-RADS US classification (S-Detect) in the categorisation of focal breast lesions (FBLs).
Methods and Materials: In accordance with BI-RADS US to descriptors, two radiologists classified by consensus 160 FBLs (size range: 2.6 - 47.2 mm; mean: 11.5 mm ± 6.5 SD) in 123 patients with and without S-Detect. Two more independent readers also classified the same 160 FBLs to assess inter-and intra-observer variability. Core-biopsy acted as SOR for all the FBLs classified as BI-RADS 4 or 5. Sensitivity, specificity, positive (PPV), negative (NPV) predictive values, inter- and intra-observer agreement were calculated considering BI-RADS 4 or 5 FBLs as malignant and BI-RADS 2 or 3 FBLs as benign masses.
Results: For the 160 FBLs, BI-RADS category was 2 (n=70), 3 (n=54), 4 (n=21) and 5 (n=15) without S-Detect and 2 (n=70), 3 (n=51), 4 (n=26), and 5 (n=13) with S-Detect, respectively. Corresponding sensitivity, specificity, PPV and NPV were of 81.6%, 95.9%, 86.1% and 94.3% without S-Detect, and of 92.1%, 96.7%, 89.7% and 97.5% with S-Detect. With S-Detect the initial BI-RADS categorisation changed in 17 of 160 (10.6%) FBLs and this re-classification was correct in 12 of 17 (70.6%) cases. Intra-observer agreement improved after S-Detect evaluation (k score: 0.854 vs 0.652: $p < 0.0140$ and 0.813 vs 0.574: $p < 0.0104$), whereas inter-observer variability showed no statistically significant changes ($p > 0.05$).
Conclusion: Our experience validated S-Detect as an effective computer-aided decision-making tool for categorisation of FBLs according to BI-RADS US lexicon.

B-0534 11:43

Ultrasound within the Austrian mammography screening: benefit of regular quality assurance for clinical partners
S. Wildner, C. Kollmann; *Vienna/AT (sonja.wildner@ages.at)*

Purpose: Faults in ultrasound devices and equipment are often not recognised in clinical routine. With the implementation of a regular technical quality assurance for diagnostic ultrasound devices in the Austrian Mammography Screening such faults can be classified and thus overcome at an early stage. Clinical partners therefore benefit from the best image quality possible, hence from improvement of diagnostic quality.
Methods and Materials: DICOM-images from initial and additional testing as well as monthly consistency checks of 198 radiology departments were evaluated quantifying parameters such as equipment age, transducer defects, depth of penetration and cyst resolution. Sets of equal device and transducer types were evaluated with in-house software to analyse the range of penetration depth and cyst resolution.
Results: A total of 22.4% transducer problems were detected of which 19.7% have been classified as not fine for diagnostic use. Analysis of device data revealed 33.5% of the devices and 11.2% of the transducers are up to 10-year old. Depth of penetration and cyst resolution vary considerably within the data sets as a result of sub-optimal device settings and divergences in DICOM-image format (lossy image compression vs. lossless).
Conclusion: Old ultrasound devices not representing the state of the art any more, divergent lossy DICOM formats, and severely defective transducers result in a loss of image quality, thus diagnoses cannot be made at its best. Regular quality assurance is able to detect such flaws, which were not detected before, guaranteeing our clinical partners the best technical quality possible, thus improvement of diagnostic quality.

B-0535 11:51

Imaging molecular subtypes of invasive ductal carcinoma in automated 3D breast ultrasound: how to recognise cancers with a poor prognosis
J. van Zelst, M. Balkenhol, M. Imhof-Tas, N. Karssemeijer, R. Mann; *Nijmegen/NL (jan.vanzelst@radboudumc.nl)*

Purpose: To investigate the differences in sonographic features of molecular signatures of invasive ductal carcinoma (IDC) in automated 3D breast ultrasound (ABUS).
Methods and Materials: Sixty-three consecutive patients with 70 primary invasive ductal carcinoma's that underwent ABUS as part of clinical evaluation from 2010 to 2014. The receptor status (ER/PR/HER2) and proliferation rate were extracted from the pathology reports of the surgical specimens. Proliferation was based on the Mitotic Activity Index (MAI). MAI > 6 was considered high (HP) and MAI ≤ 6 low (LP). Four molecular signatures of IDC were recognised based upon receptor status and proliferation; luminal-A: ER+/PR+/HER2- (LP) (n=29), luminal-B: ER+/PR+/HER2+- (HP) (n=26), HER2-type ER-/PR-/HER2+ (n=5) and basal-like: ER-/PR-/HER2- (n=10). A breast radiologist evaluated all IDCs, blinded to the pathological assessment, according to the BI-RADS-US lexicon and rated the coronal retraction phenomenon (CRP) on a five-point scale (1=none, 5=severe). $\chi 2$-statistics were used for the association between BI-RADS-US features, CRP and IDC subtypes. $p < 0.05$ was considered significant.
Results: Posterior shadowing was more common in luminal A compared to luminal B, HER2-type and basal-like IDCs (82.8% vs. 34.6%, 20% and 20%, respectively), and vice versa HER2-type and basal-like IDCs showed posterior enhancement more often than luminal A and B (60% and 40% vs 0% and 19.2%, respectively) ($p < 0.0001$). Luminal-A IDCs had the highest CRP scores (mean 3.55) followed by luminal-B (mean 2.46, p=0.013), basal-like (mean 1.4, $p < 0.0001$) and HER2-type (mean 1.2, $p < 0.0001$).
Conclusion: In automated 3D breast ultrasound, IDCs associated with poor prognosis present with relatively benign-like posterior acoustic characteristics and minimal coronal retraction phenomenon severity.
Author Disclosures:
N. Karssemeijer: CEO; Screenpoint Medical Inc. Shareholder; Matakina Ltd., Qview Medical Inc. **R. Mann:** Speaker; Siemens Healthcare, Bayer.

10:30 - 12:00 **Room D2**

Interventional Radiology

SS 609

Non-vascular techniques in the abdomen

Moderators:
O. Akhan; Ankara/TR
D. Kuhelj; Ljubljana/SI

B-0536 10:30

The minimally-invasive-treatment of ureteric stenosis in children with balloon-angioplasty and double-J-stenting
A. Sanabria, S. Lombardo, J. Espejo, M. Perez, L. Zurera, J. Betancourth; *Cordoba/ES (mslombgalera@hotmail.com)*

Purpose: The minimally-invasive-treatment of ureteric stenosis in children is consider a excellent alternative to pyeloplasty. The aim of this study is to report our experience.
Methods and Materials: A retrospective study of 25 children (5:1 M:F) average-age 12 months, with ureteric stenosis was performed. They were treated with retrograde-endourologic-balloon¬-dilation under radioscopic control and double-J-stenting. The diagnostic protocol included ultrasound, cystogram and diuretic renogram. There was a mean follow-up of 15 months. A statistical analysis of the complications and success rate was done.
Results: Percutaneous-anterograde-dilation was performed through percutaneous nephrostomy (N=8) if retrograde dilation was not achieved or previous nephrostomy had been made (N=21). 29 dilations (17 PUJ and 12 UVJ stenosis) were performed. The double-J-stent was removed with cystoscopy without complications 2.5 months after surgery. There was no intraoperative complications. The mean length of hospital stay was 2 days. Stent-related-complications included urinary tract infection (12 %), stent obstruction (4%), balanitis (4%), urethritis (4%) and one patient had a fulminant pyonephrosis that required nephrectomy. During follow-up (average of 23 months) 1 patient migrate to another institution, 1 required a second dilation that was effective and finally 1 overwent a failed second dilation requiring dismembered pyeloplasty. The success rate was up to 90 %.All patients are asymptomatic with improvement in excretion times and antero-posterior renal pelvis diameter.
Conclusion: Balloon dilatation is an excellent option in the management of PUJ/UVJ obstruction in children: is a minimally invasive technique with good results, short hospital stay and no intraoperative complications.

B-0537 10:38

Combined endoscopic-radiological ureteral rendezvous: technique and results

C. Zini, M. Corona, C. Cirelli, P. Lucatelli, G. Ricciuti, F.M. Salvatori; *Rome/IT (zini.chiara@gmail.com)*

Purpose: To describe and evaluate the feasibility of the endoscopic-radiological rendezvous procedure for re-establishing ureteral continuity in case of iatrogenic ureteral trauma.
Methods and Materials: 14 patients (4 males, 10 females; mean age: 56±16 y.o.; range 30-82) were referred to our service because of iatrogenic ureteral trauma after prostatectomy (N=2), gynaecological surgery (N=8), right colectomy (N=2), and rectum/anus resection (N=2). Apart from two bilateral injuries, 12 left ureteral lesions were present in our sample population; all lesions were in the distal third of the ureter. The treatment was performed during the same session with a combined percutaneous anterograde and cystoscopic retrograde approach to realign the ureter; double J stent was subsequently indwelled. Double stents were replaced every 6 months until the complete restoration of the ureter.
Results: Patients were treated by rendezvous procedure after a mean time of 320 days (range 5-2229 days) after surgery. Realignment was successful in all cases (100%) and the initial nephrostomy has been removed after a mean time of 5.8 days. Ureteral restitutio ad integrum was obtained in five patients after 4 double-J stents (N=3) and 3 double-J stents (N=2). No surgical ureter reconstruction was necessary. No major complications related to the technique were registered. All patients were able to complete oncological therapies.
Conclusion: Combined endoscopic-radiological rendezvous technique could be a valid option in iatrogenic ureteral lesion, especially in oncological patients, avoiding the open surgery.

B-0538 10:46

Colonic stenting: is still useful in the treatment of malignant obstruction?

P. Crivelli, M. Carboni, S. Profili, M. Conti, G. Meloni; *Sassari/IT (paocri2000@gmail.com)*

Purpose: To report clinical characteristics, efficacy and morbidity of the stenting procedure with self-expandable uncoated metallic colonic stent (SEMS) in patients with malignant colonic obstruction (MCO).
Methods and Materials: Medical charts of subjects consecutively referred from 2012 to 2015 to a tertiary University hospital in Sassari, Italy, with MCO were retrospectively evaluated to collect demographics, clinical and stenting data in an ad-hoc e-form.
Results: 47 patients (males 35, 74%; mean age 69 ± 2.5 S.D) were identified; 49 SEMS were placed: as a bridge to chemotherapy in 45 patients, as palliative treatment in 2; the procedure was performed under fluoroscopic guidance in 26 patients and under combined (fluoroscopic and endoscopic) guidance in 21. The cause of MCO was metastatic adenocarcinoma in 42 patients, other tumours in 5. The procedure was technically successful in 44 patients; early migration occurred in three patients. Two patients required the placement of two stent for each one, due to the length of stenosis. The mean time of positioning was 27 minutes under fluoroscopic guidance and 18 minutes under combined guidance; the time hospitalitation time was shorter in the subgroup with combined guidance (2 vs 5 days). Two complications were reported: late stent migration and a very late perforation (after 4 months) possibly related to the concomitant Bevacizumab chemotherapy.
Conclusion: SEMS represent a valid, safety and low-cost option treatment of MCO. The combined guidance, reducing the operative time, the hospitalation time and the necessity of sedation, represent actually the best therapeutic strategy in this setting.

B-0539 11:54

Percutaneous radiologic gastrostomy in amyotrophic lateral sclerosis (ALS) patients with minimal intravenous analgesia: technical success, safety and efficacy

N. Mani[1], R.K. Varma[2]; [1]*St. Louis, MO/US*, [2]*Pittsburgh, PA/US (maninbs@hotmail.com)*

Purpose: Percutaneous radiologic gastrostomy (PRG) has been the favored method for placing feeding tubes in patients in amyotrophic lateral sclerosis (ALS) There is growing evidence that this is the preferred technique over endoscopic placement in patients with respiratory compromise. There is controversy in literature about how to manage the patients periprocedurally with use of general anesthesia, conscious sedation or local anesthesia.
Methods and Materials: In this retrospective study, we included 66 ALS patients who underwent PRG using retrograde approach over 5 years. The procedures were done with flouroscopic guidance.The electronic medical records, procedure charts and follow-up notes and imaging/interventions were analysed for the type and amount of intravenous analgesics used, technical success, complications, reinterventions within a month.
Results: The procedural success rate was 95.4% (63/66). Minimal intravenous sedation using opioid analgesic Fentanyl was used in 93.6% (58/63) of patients. Rest underwent the procedure with only local analgesia using 1% buffered lidocaine. The doses of Fentanyl ranged from 25mcg to 100mcg with a mean of 50mcg. The procedure related complications were 6/63 (.5%) including site infection, pain, pneumoperitoneum and clogging. Reinterventions or management of complications were needed in the follow-up period of 1 month in these patients.
Conclusion: PRG is safe and effective procedure and can be performed with minimal intravenous analgesia using Fentanyl only in ALS patients who can have severe respiratory compromise along with dysphagia. The requirement of general anesthesia was not needed in our subset and can help in reducing the need for additional resources.

B-0540 11:02

Endoluminal RFA assisted percutaneous recanalisation of biliary and main pancreatic duct obstruction, caused by inoperable malignancy

M. Mizandari[1], N. Habib[2]; [1]*Tbilisi/GE*, [2]*London/UK (mgmizandari@gmail.com)*

Purpose: Malignant obstruction percutaneous recanalisation technique is presented.
Methods and Materials: 163 biliary and Wirsung duct recanalisation procedures has been attempted to 149 patients; Unresectable biliary block - 142 (cholangiocarcinoma 51, pancreatic cancer 37, gallbladder cancer 8, liver metastatic invasion 27, papilla of Vater tumour 10, gallbladder cancer - 9, hepatocellular carcinoma 7, lymphoma - 1), Unresectable Wirsung block - 7 (all pancreatic cancer) 10 to 15 Watts for 2 minutes was applied using bipolar endoluminal RF device (5 Fr diameter for pancreatic and 8 Fr diameter for biliary cases), positioned using guidewire technique via percutaneous biliary or Wirsung drainage fistula. Procedure finishes with metal stent placement. Safety drainage catheter was repositioned in order to maintain access for follow-up.
Results: Biliary&Wirsung patency has been completely restored in 163 (95.3%) of 171 procedures. In the rest 8 (4.7%) cases procedure recanalisation could not be fulfilled because of guidewire conduction failure. There was no 30 day mortality, haemorrhage or pancreatitis following biliary and Wirsung duct RFA&stenting.
Conclusion: Endoluminal RFA&stenting is safe and effective in biliary&Wirsung duct block recanalisation and should be routinely suggested as an effective treatment option in biliary and PD inoperable malignant obstruction cases.
Author Disclosures:
N. Habib: Shareholder; EMCision LTD.

B-0541 11:10

Does preoperative percutaneous transhepatic biliary drainage (PTBD) plays a role in reducing complications after pancreaticoduodenectomy for pancreatic head carcinoma?

M. Fronda, G. Di Guardia, S. Silvestri, A. Discalzi, A. Doriguzzi Breatta, D. Righi, P. Fonio, G. Gandini; *Turin/IT (marco.fronda@hotmail.it)*

Purpose: To evaluate the effect of preoperative Percutaneous Transhepatic Biliary Drainage on surgical complications after pancreaticoduodenectomy for pancreatic adenocarcinoma (PAC).
Methods and Materials: We retrospectively analysed the preoperative and postoperative data of 122 consecutive patients subjected to pancreaticoduodenectomy for PAC. Preoperative Endoscopic Biliary Drainage (EBD) was performed in 27 cases (22%), 26 (21%) were subjected to preoperative Percutaneous Transhepatic Biliary Drainage (PTBD), while 69 (57%) underwent surgery without BD (NBD). All patients underwent standard Whipple procedure. The PTBD was left in place and held open for 8-10 days after surgery, while the EBD was removed during surgery. Comparison between variables was performed using Fisher's Exact, Chi Squared and Student's T tests.
Results: No PTBD-related complications occurred. In PTBD group, pancreatic fistula (POPF) rate was nihil; a statistical difference was found with EBD group (22.2%, p=0.04), not with NBD group (13%, $p > 0.05$). Non statistically significant differences were found in the incidence of biliary fistulae (PTBD 7.7 %, NBD 7.2% $p > 0.05$, EBD 0% $p > 0.05$), however no further procedures were needed to solve the fistula in the PTBD group. The incidence of other surgical complications (pancreatitis, wound infection, fluid collections) was reduced in the PTBD group (3.8%), compared with the EBD group (29.6%, p=0.018), without statistical differences with the NBD group (21.7%, $p > 0.05$). Lenght of Hospital Stays (days) was 20.8 for PTBD, 21.7 for NBD ($p > 0.05$) and 25.9 for EBD ($p > 0.05$).
Conclusion: PTBD is safe and effective for patients scheduled for PD, improving outcomes by reducing POPF as well as other surgical complications.

B-0542 11:18

Hepatic encephalopathy after TIPS: time to improve the classification?

A. Discalzi, M. Calandri, E. Soncin, M. Fronda, A. Doriguzzi Breatta, C. Gazzera, D. Righi, P. Fonio, G. Gandini; *Turin/IT (marco.calandri@live.it)*

Purpose: to evaluate the incidence of hepatic encephalopathy (HE) after TIPS procedures with a novel classification, considering gravity and time frequency, compared with the modified West Haven criteria.
Methods and Materials: Using our TIPS registry, we designed a retrospective study evaluating the incidence of HE at 6 months in 81 consecutive cirrhotic patients (55 y.o. ± 9.4) who successfully underwent TIPS procedures from 2008-2014. None of those patients had a previous episodes of HE before TIPS. Like most authors, we adopted the West Haven criteria divided by gravity to Moderate (Grade I - II) and severe (Grade III - IV). In addition we also classified HE as episodic, recurrent bouts of HE that occur within a time interval of 6 months or less, or persistent (pattern of behavioral alterations always present and interspersed with relapses of overt HE).
Results: 52/81 (65%) patients had no episodes of HE. According to the simplified West-haven criteria 25/81 (31%) had moderate HE and 3/81 (4%) had severe HE. Stratifyng the HE considering gravity and time frequency 7 (9%) was episodic, 11 (14%) recurrent, 2 (2%) patients have persistent moderate HE. Of severe HE, of whom 1 (1%) episodic and 2 recurrent (2%). No patients developed a persistent severe HE.
Conclusion: although the overall HE incidence after TIPS is still apparently high, persistent HE is rare (2%) like severe recurrent HE (2%). This novel classification better suits a real life clinical practice where close clinical monitoring and proper medical care make HE manageable.

B-0543 11:26

Tunnelled peritoneal catheter placement in the palliative treatment of malignant ascites: technical results and overall clinical outcome

I. Indesteege, A. Laenen, C. Verslype, H. Prenen, I. Vergote, G. Maleux; *Leuven/BE (geert.maleux@uzleuven.be)*

Purpose: To assess the technical and clinical outcome of percutaneous insertion of tunnelled peritoneal catheters in the palliative treatment of refractory malignant ascites and to determine the safety and feasibility of intraperitoneal administration of cytotoxic drugs through the tunnelled catheter.
Methods and Materials: The patients' medical history, procedural and clinical follow-up data, including complications and estimated survival, were reviewed. Additionally, a sub-group analysis was additionally carried out of the patients with widespread ovarian cancer and refractory ascites treated with or without intraperitoneal administration of cytotoxic drugs.
Results: In all 94 patients it was technically feasible to insert the peritoneal drainage catheter and to drain a median of 3260 cc (range 100 cc - 8500 cc) of malignant ascitic fluid. Post-procedural complications included catheter infection (n=2; 2%), fluid leakage around the entry site (n=4; 4%), catheter occlusion (n=2; 2%), sleeve formation around the catheter tip (n=1; 1%) and accidental loss of the catheter (n=1; 1%). There was no increase in catheter infection rate in patients treated with or without intraperitoneal administration of cytotoxic drugs. Median overall survival after catheter insertion is 1.7 months with longer survival in patients with gynecological cancers compared to patients with gastrointestinal cancers (P=0.002).
Conclusion: Percutaneous insertion of a tunnelled peritoneal catheter for palliative drainage of malignant ascites and intraperitoneal infusion of cytotoxic drugs is feasible and associated with a very low complication rate, including catheter infection. Patients with widespread gynecological cancers and refractory malignant ascites might benefit for a longer time of this palliative interventional procedure.

B-0544 11:34

Outcomes of fluoroscopic and ultrasound guided placement versus laparoscopic placement of peritoneal dialysis catheters

A.M.K. Abdel Aal[1], A.S. Moustafa[1], M.F. Hamed[2], N. Ertel[1]; [1]*Birmingham, AL/US*, [2]*Tuscaloosa, AL/US (AKAMEL66@HOTMAIL.COM)*

Purpose: A variety of peritoneal dialysis catheter (PDC) placement techniques are available including laparoscopic and percutaneous techniques. The aim of this study was to compare our one-year outcomes of both techniques.
Methods and Materials: We retrospectively reviewed the medical records of 100 patients who had their first PDC placed between January 2005 and October 2014.We compared the outcomes of the catheters placed using laparoscopic technique (n=61) and ultrasound guidance technique (n=29). The primary endpoint was complication-free catheter survival at 365 days. Secondary endpoints were complication-free catheter survival at 90 days, overall catheter survival at 365 days, median days-to-first complication and median days-to-catheter removal.
Results: In the radiologic group, the complication-free catheter survival at 90 and 365 days were 62% and 55% respectively, compared to 64% (p=0.99) and 38% (p=0.17) respectively, in the laparoscopic group. Catheter malfunction was the only complication that was statistically significantly higher in the laparoscopic group (41%) compared to the radiologic group (14%, p=0.05). The overall catheter survival at 365 days was 83% and 72% in the radiologic and laparoscopic groups respectively (p=0.31). The median days-to-first complication and the median days-to-catheter removal were 31 and 14 respectively in the radiologic group which was significantly less, compared to 98 (p=0.0036) and 179 (p=0.0006) respectively, in the laparoscopic group.
Conclusion: Fluoroscopic and ultrasound guided placement of a PDC offers a clinically effective alternative to laparoscopic placement with similar survival and complication rates. Catheter complications and removals occurred earlier in the radiologic group compared to the laparoscopic group.
Author Disclosures:
A.M.K. Abdel Aal: Consultant; St Jude Medical, Baxter Health Corp, Bard Peripheral Vascular Inc.

B-0545 11:42

CT-guided placement of hyperthermia catheters in oncologic patients to support regional deep hyperthermia treatment

P. Kröpil, R. Wessalowski, C. Thomas, G. Antoch, R. Lanzman; *Düsseldorf/DE*

Purpose: Percutaneous hyperthermia catheters (PHC) allow for the placement of Bowman probes for temperature measurements inside the tumour during deep regional hyperthermia treatment. The aim of this study was to evaluate safety and effectiveness of CT-guided PHC placement in patients with sarcoma or recurrent malignancies.
Methods and Materials: Forty-nine patients (23 female, 26 male, 46.4±15.6 years) scheduled for regional deep hyperthermia treatment of primary sarcoma (n=36) or recurrent malignancies (n=13) were included in this retrospective analysis. A total of 55 PHC were placed under CT-guidance into tumours in the extremities (n=20), pelvis (n=16), thoracic/abdominal wall (n=7), liver/upper abdomen (n=5) and retroperitoneum (n=7). The tumour was approached using a 13G puncture sheath under CT-guidance and a 6 F PHC (Somatex Medical Technologies) was placed via the sheath inside the tumour. The duration of the intervention, technical success, periinterventional complications and catheter distance within the tumour were analysed.
Results: 53 of 54 (98.1%) PHC were placed successfully inside the tumour (one catheter adjacent to the tumour). Mean tumour diameter was 8.4±5.0 cm and mean catheter distance within the tumour 6.7±3.8 cm. Mean procedure time was 31.1±11.2 min. Periprocedural complications were observed in 2 of 54 (3.7%) patients (one subcutaneous abscess, one self-limiting abdominal hematoma). 2 of 54 (3.7%) catheters dislocated within 2 weeks after the procedure.
Conclusion: CT-guided hyperthermia catheter placement is a safe and reliable procedure to support temperature measurements inside the tumour during deep regional hyperthermia and can therefore be recommended to support this promising salvage treatment option for sarcoma and recurrent malignancies.

B-0546 11:50

Radiologic placement of uncovered stents for the treatment of malignant colonic obstruction at ascending and transverse colon

J. Yoon, S. Kwon; *Seoul/KR (mk5 gti@naver.com)*

Purpose: To evaluate the effectiveness of radiologic placement of uncovered stents for treatment of malignant colonic obstruction at ascending and transverse colon.
Methods and Materials: From March 2003 to March 2015, 58 radiologic placements of uncovered stents were attempted in 44 patients with malignant colonic obstructions at ascending and transverse colon. The location of stent insertion, technical and clinical success, procedure time, complication rates, and patency rates of the stents in a palliative group were also evaluated. In palliative group, the follow-up period was 2~868 days.
Results: Radiologic stent placement was technically successful in 54 of 58 cases (93.1%). 43 cases (79.6%, 43 of 54) were performed with palliative intent, while 11 cases (20.4%, 11 of 54) were for preoperative decompression purposes. Of 4 cases of technical failures, stent insertion was successfully achieved in 3 of the patients with colonoscopic assistance. The locations of successful stent insertion in 54 cases were ascending colon (n=3, 5.5%), hepatic flexure (n=14, 26.0%), transverse colon (n=28, 51.9%), and splenic flexure (n=9, 16.6%). There were no procedure-related major complications. In total 54 cases, obstructive symptoms were relieved, for a clinical success rate of 100%. In 43 patients of palliative group, patency rates were 94.4% at 1 month, 84.0% at 3 months, 64.8% at 6 months, and 48.6% at 12 months.
Conclusion: Radiologic placement of uncovered stents for treatment of malignant obstruction at ascending and transverse colon is feasible and safe and provides acceptable clinical results not only for preoperative decompression but also for palliative cases.

10:30 - 12:00 **Room G**

Musculoskeletal

SS 610b

Cartilage assessment

Moderators:
E.H.G. Oei; Rotterdam/NL
S. Trattnig; Vienna/AT

B-0547 10:30

Grating-based x-ray phase-contrast imaging: a new high-resolution non-contrast enhanced quantitative cartilage imaging technique? An experimental feasibility study

P.M. Jungmann[1], L. Birnbacher[2], M. Viermetz[2], P. Föhr[1], D.C. Karampinos[1], F. Lohöfer[1], M. Wildgruber[1], E.J. Rummeny[1], J. Herzen[2]; [1]*Munich/DE*, [2]*Garching/DE*

Purpose: To demonstrate the feasibility of non-contrast-enhanced high-resolution grating-based x-ray phase-contrast cartilage imaging and to evaluate the performance regarding differentiation between healthy and degenerated cartilage in comparison to high-resolution 3 T and 7T MRI and biomechanical stiffness measurements in quantitative analyses.
Methods and Materials: Osteochondral samples (6 mm diameter, cartilage thickness: 1.7±0.4 mm) were harvested of n=6 bovine knees (n=2 each). From each knee, one sample was degraded using 2.5%Trypsin, one sample remained untreated. In addition to grating interferometry-based x-ray phase-contrast tomography (41µm pixel size) and biomechanical cartilage stiffness measurements, 3 T and 7T MRI was performed using intermediate-weighted sequences and multi-slice multi-echo spin echo T2 sequences and multi-echo gradient echo T2* sequences for relaxation time measurements. Paired t-tests and Receiver Operating Characteristics (ROC) Curves were used for statistical analyses.
Results: Osteochondral samples were measured using grating-based x-ray phase-contrast tomography providing high-resolution images for improved morphological evaluation. Quantitative analyses that provided Hounsfield Unit (HU)p-values revealed significant differences between healthy and degenerated cartilage (58.3±14.1 HUp versus 46.6±4.8 HUp; P=0.036). T2 mapping at 3 T (51.5±13.1 ms vs 83.3±8.9 ms, P=0.003), T2* mapping at 3 T (34.7±4.2 ms vs 59.5±3.3 ms, $P < 0.001$), T2 mapping at 7T (42.8±3.8 ms vs 80.9±14.6 ms, P=0.003) and stiffness measurements (18.8±6.1N/mm vs 9.8vs1.9N/mm, P=0.033) also showed differences between the two groups. AUC-values were 1.0 for quantitative MRI techniques, 0.92 for biomechanical measurements and 0.78 for phase-contrast analyses, respectively.
Conclusion: Grating-based x-ray phase-contrast tomography provides high-resolution morphological images of osteochondral samples. Quantitative HUp-values may provide ideal X-ray based information complementary to MRI and biomechanical analyses for improved characterisation of osteochondral tissue.
Author Disclosures:
D.C. Karampinos: Research/Grant Support; Philips Healthcare.

B-0548 10:38

Focal cartilage defects are associated with cartilage damage progression in the same subregion and new cartilage damage development in the same tibiofemoral compartment: the MOST Study

A. Guermazi[1], D. Hayashi[1], F.W. Roemer[1], J. Niu[1], E.K. Quinn[1], M.D. Crema[1], M.C. Nevitt[2], D.T. Felson[1]; [1]*Boston, MA/US*, [2]*San Francisco, CA/US (guermazi@bu.edu)*

Purpose: To determine if depth of focal cartilage damage affects risk of incidence and progression of cartilage loss in tibiofemoral joint (TFJ).
Methods and Materials: Using data from the MOST study, semiquantitative MRI analysis was done using WORMS for cartilage damage, meniscal damage and extrusion, BML, effusion and synovitis. Focal cartilage damage was defined as grade 2 (partial-thickness) or 2.5 (full-thickness). In a subregion-based analysis, we assessed risk of cartilage loss over 30 months comparing subregions of TFJ with baseline cartilage grade 2.0, 2.5 and combined 2.0/2.5 against those without cartilage damage (grade 0/1). In the compartment-based analysis, we included only knees with a solitary grade 2 or 2.5 lesion at baseline and all other subregions in the same compartment having no cartilage damage. Knees or compartments with grade 2.0 and/or 2.5 cartilage damage at baseline were compared to those without. Logistic regression was used to account for correlations among multiple subregions/compartments within a knee.
Results: 927 subregions (683 knees) were included in the subregion-based analysis. Compared to subregions with no cartilage damage at baseline, subregions with grade 2.0, 2.5 and 2.0/2.5 cartilage defects had higher risk for cartilage loss (aOR 6.0-8.0, $p < 0.001$). 374 compartments were included in the compartment-based analysis. Compared to compartments with no baseline cartilage damage, those with grade 2.0 and/or 2.5 cartilage defects in a subregion had higher risk for incident cartilage damage in other subregions (aOR 1.6-1.9, $p \leq 0.05$).
Conclusion: Both superficial and deep focal cartilage defects are relevant for structural progression in OA disease process.
Author Disclosures:
A. Guermazi: Consultant; TissueGene, OrthoTrophix, Merck Serono. Owner; Boston Imaging Core Lab, LLC. **F.W. Roemer:** Shareholder; Boston Imaging Core Lab. **M.D. Crema:** Shareholder; Boston Imaging Core Lab. **M.C. Nevitt:** Research/Grant Support; National Institute of Health. **D.T. Felson:** Research/Grant Support; National Institute of Health.

B-0549 10:46

Weight loss is associated with slower cartilage degeneration over 96 months in obese and overweight subjects: data from the Osteoarthritis Initiative

A.S. Gersing, B.J. Schwaiger, J. Zarnowski, G. Feuerriegel, J. Guimaraes, L. Facchetti, N. Chancheck, M.C. Nevitt, T.M. Link; *San Francisco, CA/US (alexandra.gersing@ucsf.edu)*

Purpose: To investigate the association of different degrees of weight loss with progression of knee cartilage degeneration in overweight and obese subjects over 96 months.
Methods and Materials: In this study, 516 subjects (age 62.4±8.9y; 314 females) with a BMI> 25 kg/m2 from the Osteoarthritis Initiative with risk factors for or radiographically mild to moderate osteoarthritis, were included. Subjects with weight loss were categorised into two groups with either a large (≥10%, n=78) or moderate amount of weight loss (5-10%, n=108), and were frequency matched to controls with stable weight (n=258). Change of focal cartilage defects, assessed over 96 months with 3 T MRI cartilage Whole-Organ Magnetic Resonance Imaging Score (WORMS), and cartilage composition, assessed with right knee T2-maps, including laminar and texture analysis, were analysed using mixed random effects models to calculate associations with the degree of weight loss.
Results: Progression of cartilage WORMS was significantly lower in weight loss groups compared to controls (5-10% weight loss (WL), P=0.02; > 10%WL, P=0.009) over 96 months. Subjects with weight loss showed significantly less T2-value increase in the patella (> 10%WL, P=0.024) and in the bone layer of all compartments (5-10%WL (mean difference 0.9 msec [95%CI 1.1, 0.6]; P=0.047), suggesting slower cartilage deterioration. Entropy was decreased (> 10%WL, P=0.029) and homogeneity was increased in weight loss groups (10%WL, P=0.049; 5-10%WL, P=0.036).
Conclusion: Our study shows evidence that cartilage degeneration is slowed through weight loss in obese and overweight subjects and that the protective effect over 96 months was strongest in subjects with a large amount of weight loss.

B-0550 10:54

Quantitative T2* analysis of articular cartilage of the tibiotalar joint in professional soccer players and healthy individuals at 3 T MRI

C. Behzadi, F.O. Henes, A. Quitzke, M.G. Kaul, G. Adam, M. Regier; *Hamburg/DE (C.Behzadi@uke.de)*

Purpose: Comparison of T2* relaxation times in the tibiotalar cartilage of professional soccer players and age-matched healthy volunteers at 3 T.
Methods and Materials: 20 ankles of professional soccer players from the highest European level and 20 age-matched healthy individuals were investigated. After resting in supine position for 30 minutes, all individuals underwent morpholigic multiplanar T1w and Pdw sequences MRI. For quantitative analysis a 3D T2* (24 echoes ranging from 4.6-52.9 ms; image resolution 0.5x2x2 mm) sequence was performed in sagittal orientation. Using a dedicated software tool (ImageJ) data were postprocessed and quantitative maps were generated. The articular cartilage was subdivided into 6 areas and regions-of-interest (ROI) were manually placed in all zones of the tibial and talar cartilage encovering the full cartilage layer. For statistical workup Pearson product-moment correlation coefficients and confidence intervals were calculated.
Results: T2* values were significantly higher in professional soccer players compared to matched healthy individuals (mean, 48.6 ms vs. 39.74 ms; $p < 0.001$). This difference was most evident in the posterior zones of the tibiotalar cartilage. In the athletes, there was a trend towards higher T2* values at the anterior medial compartments of the articular cartilage, however, compared to the healthy control group this was not statistically significant (p,0.08).
Conclusion: Based on these initial results, T2* values of the tibiotalar joint seem to be elevated in professional soccer players compared to age-matched individuals. Longitudinal studies have to show if these results represent early subtle cartilage leasions prior to clinical manifestation, or possible adaption to increased loading.

B-0551 11:02

Chondrocalcinosisis associated with accelerated degeneration of the knee joint: data from the Osteoarthritis Initiative

A. Gersing[1], B.J. Schwaiger[1], U. Heilmeier[1], L. Facchetti[1], N. Lane[2], M.C. Nevitt[1], C.E. McCulloch[1], L.S. Steinbach[1], T.M. Link[1]; [1]*San Francisco, CA/US*, [2]*Sacramento, CA/US (alexandra.gersing@ucsf.edu)*

Purpose: To determine the association between radiographic evidence of chondrocalcinosis and changes in structural knee abnormalities over 48 months.

Methods and Materials: All study subjects were enrolled in the Osteoarthritis Initiative. Subjects with radiographic evidence of chondrocalcinosis on PA right knee radiographs (n=80, age 67.5±7.3y, 45 females) were randomly selected from the cohort and pair-wise matched for age, sex, baseline KL and BMI to controls without chondrocalcinosis (n=80). 3 T MRI scans of the right knee were analysed for structural abnormalities at baseline and their changes over 48 months using Whole-Organ Magnetic Resonance Imaging Score (WORMS). Paired t-tests were used to compare the progression of structural changes between subjects with and without radiographic evidence of chondrocalcinosis.

Results: At baseline, overall WORMS (P=0.003) and the WORMS subscores for cartilage (P=0.011) and both menisci (Pmedial meniscus=0.016; Plateral meniscus=0.001) had higher scores in knees with radiographic evidence of chondrocalcinosis compared to controls. Progression of WORMS subscore for cartilage degeneration was significantly greater in knees with radiographic evidence of chondrocalcinosis (median (range) 3.5 (0.5-12.0)) compared to controls (1.5 (-1.0, 7.0); P=0.02), and analysis by compartment found similar differences in cartilage deterioration at both the patella (P=0.026) and lateral tibia (P=0.028). Also, progression of the lateral meniscus damage was significantly higher in knees with radiographic evidence of chondrocalcinosis compared to controls (P=0.038).

Conclusion: Radiographic evident chondrocalcinosis in the knee is associated with more severe degeneration of cartilage and menisci over 48 months compared to controls.

B-0552 11:10

The role of MRI in the diagnosis of early forms of osteoarthritis at visualisation of articular cartilage lesions of knee and ankle joints in young athletes

I.N. Dutova, A. Karpenko; *St. Petersburg/RU (irina.dtv@mail.ru)*

Purpose: The purpose of this study was to assess early signs of post-traumatic degenerative changes of the articular cartilage of the knee and ankle in professional athletes using imaging of cartilage, including T2-mapping.

Methods and Materials: MRI was performed using 1.5 T MR. We evaluated the cartilage of patella, femur and tibia. The cartilage injuries were graded using a WORMS, an Outerbridge classification. The protocol includes middle-weighted sequences with FatSat, 3D GRE. We performed a direct MR arthrography for the detection of cartilage defects. To evaluate the zonal structure of cartilage, we performed T2-mapping in three planes (3 mm slice thickness, TR=631, TE=4, 8/13/21, 3/29, 5/37, 8).

Results: MRI was performed on 135 athletes with articular trauma, after ACL reconstruction. On middle-weighted images, hyperintense areas with signs of the cartilage lesion were identified, which were compared with T2-maps. On T2-mapping evaluated morphological changes of articular cartilage: areas of swelling [57 patients (42%)], cracks [25 patients (18.5%)], defects [18 patients (13%)]. Lesions of medial femoral condyles were found mainly after ACL reconstruction [29 patients (21.5%)]. Patella cartilage lesions were differentiated in 53 patients (39%). Cartilage lesions of the medial talar surface were found more often [24 patients (18%)] than in the lateral [10 patients (7.5%)]. On direct MR arthrography, defects of cartilage were clearly detected.

Conclusion: T2-mapping is useful in detecting early alterations in cartilage and used for non-invasive grading of cartilage defects. The combination of T2-mapping and direct MR arthrography gives good results to identify defects of cartilage, which help in prevention of osteoarthritis progression in athletes.

Author Disclosures:

I.N. Dutova: Author; Dutova I.N., Karpenko A.K. Speaker; Dutova I.N.

B-0553 11:18

Efficacy of an outpatient musculoskeletal interventional radiology practice model in the treatment of knee osteoarthritis using autologous blood derived growth factors

A.X. Doss; *Nedlands/AU (rocki.doss@igtc.com.au)*

Purpose: To assess the efficacy of an outpatient healthcare delivery model, where the treating interventional radiologist assessed, treated and followed up patients with knee osteoarthritis. All patients were evaluated clinically and radiologically prior to performing ultrasound guided interventional procedures using autologous blood derived growth factors from plasma (GFP) for tissue augmentation.

Methods and Materials: A retrospective analysis of functional knee score WOMAC index in OA patients treated with autologous blood derived GFP procedures by the treating radiologist. All patients were clinically and radiologically evaluated by the treating radiologist and determined to be suitable for percutaneous procedures. Retrospective data was collected for a period of 12 months. Effect size was calculated using difference of the mean divided by the pooled standard deviation. A two tailed test was used to assess the null hypothesis.

Results: A total of 16 patients and 17 knees was evaluated. Average age of patients treated was 63.05 yrs (range: 40-79 yrs, standard deviation 9.9 years, male = 7, female =9). The average follow-up period was 5.65 months (range: 5.3 to 6 months). Mean WOMAC knee score pre treatment of 51.34 (sd = 16.49) improved to mean post treatment 14.85 (sd= 15.9) ($p < 0.01$, effect size 'd'= 2.25, 95% CI= 1.03-3.46).

Conclusion: A health care delivery model where the interventional radiologist clinically and radiologically assesses and treats knee osteoarthritis using ultrasound imaging guided percutaneous blood derived GFP shows a large effect size in improving the function of knee osteoarthritis in the medium term.

B-0554 11:26

Value of fat-suppressed fluid-sensitive MRI sequences for the detection and characterisation of Modic I end-plate changes of the lumbar spine

T. Finkenstaedt[1], F. Del Grande[2], N. Bolog[1], N. Ulrich[1], S. Tok[1], O. Kolokythas[3], J. Steurer[1], G. Andreisek[1], S. Winklhofer[4]; [1]*Zurich/CH*, [2]*Lugano/CH*, [3] *Winterthur/CH*, [4]*San Francisco, CA/US (tim.finkenstaedt@usz.ch)*

Purpose: To assess the value of fat-suppressed fluid-sensitive sequences for the assessment of Modic I end-plate changes on magnetic resonance imaging (MRI) of the lumbar spine.

Methods and Materials: Institutional review board-approved multi-center study with written informed consent. Sagittal T1-weighted (T1w), T2w, and fat-suppressed fluid-sensitive MRI images of 100 consecutive patients (consequently 500 vertebral segments; 52 female, mean age 74±7.4 years; 48 male, mean age 71±6.3 years) with suspected lumbar spinal canal stenosis were retrospectively evaluated. We recorded the presence (yes/no) and extension (i.e. Likert-scale of height, volume, and end-plate extension) of M1 end-plate changes in T1w/T2w sequences and compared the results to fat-suppressed fluid-sensitive sequences using the McNemar and Wilcoxon signed-rank test.

Results: Fat-suppressed fluid-sensitive sequences revealed significantly more Modic I changes compared to T1w/T2w sequences (156 vs. 93 segments, respectively; $p < 0.001$). The extension of Modic I changes in fat-suppressed fluid-sensitive sequences was significantly larger compared to T1w/T2w sequences (height: 2.27±0.79 vs. 2.53±0.82, volume: 2.1±0.65 vs. 2.35±0.76, end-plate: 2.19±0.81 vs. 2.46±0.76), ($p < 0.05$). Modic I changes which were only visible in fat-suppressed fluid-sensitive sequences but not in T1w/T2 w sequences were significantly smaller compared to Modic I changes which were visible in T1w/T2w sequences (height: 1.8±0.8 vs. 2.54±0.8, volume: 1.72±0.7 vs. 2.34±0.8, end-plate: 1.97±0.9 vs. 2.46±0.8), ($p < 0.05$).

Conclusion: In conclusion, fat-suppressed fluid-sensitive MRI sequences of the lumbar spine revealed significantly more Modic I end-plate changes and demonstrated a greater extent compared to standard T1w/T2w imaging. We suggest that fat-suppressed fluid-sensitive MRI sequences should be part of clinical routine protocols.

B-0555 11:34

Cross-sectional and longitudinal layer-specific femorotibial cartilage T2 mapping in knees without risk of, with risk of, and with early knee osteoarthritis

W. Wirth[1], F.W. Roemer[2], S. Maschek[1], F. Eckstein[1]; [1]*Salzburg/AT*, [2]*Erlangen/DE (frank.roemer@uk-erlangen.de)*

Purpose: To study laminar femorotibial cartilage spin-spin relaxation time (T2) in knees without risk of, with risk of, and with presence of early radiographic knee osteoarthritis (ROA).

Methods and Materials: To differentiate the effect of ROA vs. risk factor status, we studied 50 subjects (age 61±9y; BMI 27.7±4.7) with definite osteophytes in one knee (early ROA) in whom the contralateral knee had no radiographic signs of OA (non ROA), and 89 subjects (age 54±8y; BMI 24.4±3.2) without radiographic/clinical signs or risk factors of OA in either knee. Baseline and 1-year follow-up T2 of superficial and deep femorotibial cartilage was analysed in using multi-echo spin-echo (MESE) magnetic resonance imaging.

Results: Baseline T2 did not display significant differences between early ROA (48.3±3.7 ms in the superficial layer) vs. non-ROA knees with risk factors (48.3±3.1 ms). T2 in healthy reference knees (45.4±2.3 ms), however, was significantly lower than in non-ROA knees with risk factors; the difference was stronger for the superficial (Cohen D=-1.17) than for the deep cartilage layers (Cohen D = -0.84). A significant longitudinal increase in deep (0.8±1.3 ms) and

superficial (0.5±1.4 ms) cartilage T2 was detected in healthy knees, but not in early ROA or non-ROA knees.
Conclusion: Significant differences in femorotibial cartilage T2 were detected between knees from subjects with risk factors vs. those without risk factors for OA, particularly in the superficial layer. Previously observed differences in cartilage T2 between ROA and non-ROA knees may thus have been due to differences in risk factor profiles rather than to differences in actual ROA status.
Author Disclosures:
W. Wirth: Shareholder; Chondrometrics GmbH. **S. Maschek:** Shareholder; Chondrometrics GmbH. **F. Eckstein:** CEO; Chondrometrics GmbH. Shareholder; Chondrometrics GmbH.

B-0556 11:42

Initial experience of high resolution PET/MRI imaging of ACL graft viability using 18 F-FDG and 3 T
K. Binzel[1], R. Magnussen[1], C. Kaeding[1], D. Flanigan[1], W. Wei[1], M.U. Knopp[2], M.V. Knopp[1]; [1]*Columbus, OH/US*, [2]*Malibu, CA/US (binzel.1@osu.edu)*

Purpose: Combined PET/MR has proven feasible for evaluation of ACL graft healing following surgery. We assessed the impact of higher resolution PET reconstruction on quantification of graft metabolic activity.
Methods and Materials: 10 patients had an MRI on a 3 T Achieva MT (8 channel knee coil) and PET/CT on a Gemini TF 64 (Philips Healthcare Cleveland). An in-house fabricated mold of the MR knee coil was used during PET to ensure identical positioning between image sets. A single bed position centered on the knees was acquired following a 111 MBq 18 F-FDG injection. Listmode data were reconstructed using a 576x576 matrix with 1 mm3 voxel volumes. Patients were grouped by time since surgery and SUVmax was measured in the proximal, middle, and distal portions of the graft, femoral and tibial tunnels, the posterior cruciate ligament (PCL), and quadriceps muscle for reference. Matched ROIs were drawn in the contralateral knee.
Results: In the 0-6 month group, the average SUVmax was 3.4 in the distal graft, 3.8 in the mid graft, 3.1 in the proximal graft, and 3.1 in the femoral tunnel. In the 24+ month group the averages were 0.7, 0.6, 0.5, and 0.7, respectively. Graft and bone tunnel uptake decreased with increasing time since surgery, approaching SUVs comparable to those of healthy knees.
Conclusion: PET/MRI imaging of the knee, especially ACL grafts, benefits from higher resolution reconstruction due to improved quantitative precision enabled by a reduction of partial volume effects. Higher matrix PET reconstruction also enables better voxel-wise registration to MRI.

B-0557 11:50

Sensitivity and specificity of the Whole-Organ Magnetic Resonance Imaging Score (WORMS) in patients after anterior cruciate ligament injury
B.J. Schwaiger[1], A.S. Gersing[1], B. Ma[1], S.A. Rodeo[2], A.J. Krych[3], T.M. Link[1], S. Majumdar[1]; [1]*San Francisco, CA/US*, [2]*New York, NY/US*, [3]*Rochester, MN/US*

Purpose: To assess the sensitivity and specificity of the semi-quantitative Whole-Organ Magnetic Resonance Imaging Score (WORMS) for cartilage and meniscal abnormalities in patients with anterior cruciate ligament (ACL) injury, using arthroscopy as a standard of reference.
Methods and Materials: Sixty-one subjects with acute ACL injury (age 29.3±12.9, 45.9% female) were recruited from three centers. Baseline MRI scans were scored by two readers using the UCSF-modified WORMS. Arthroscopy was performed within 12 weeks of injury, at which time meniscal and cartilage abnormalities were recorded according to the Noyes classification. Sensitivity/specificity for binary data were assessed in crosstabs with Chi-squared tests, and correlation of ordinal data by Spearman's rho was performed.
Results: Meniscal abnormalities were detected in 39.7% during arthroscopy and in 35.3% by MRI, with WORMS for menisci showing a sensitivity of 73.9% and specificity of 90.0% ($p < 0.001$). Arthroscopy detected cartilage abnormalities in 12.1% of the compartments, and MRI in 19.8%. Overall, the sensitivity of WORMS for cartilage lesions was 79.1% and specificity was 88.4% ($p < 0.001$), and the trochlea showed the highest values (sensitivity, 100%; specificity, 94.6%, $p < 0.001$). Also, a significant correlation was found between WORMS and arthroscopic Noyes scores for cartilage ($r=0.54$; $p < 0.001$). WORMS inter-reader agreement was excellent (Kappa, 0.88).
Conclusion: MRI assessed semi-quantitatively with WORMS showed high sensitivity and specificity when compared to arthroscopy findings as the standard of reference for cartilage and meniscus abnormalities. This suggests that WORMS is an adequate tool for the evaluation of joint abnormalities after ACL injury.

10:30 - 12:00 **Room M 1**

Head and Neck

SS 608

Pre- and post-operative imaging in oncology

Moderators:
A. Borges; Lisbon/PT
S. Steens; Nijmegen/NL

B-0558 10:30

Diffusion-weighted imaging using readout-segmented EPI sequence (RESOLVE) in the head and neck cancer
S. Kim, S. Jung; *Seoul/KR (lucidnature@naver.com)*

Purpose: To evaluate the value of diffusion-weighted imaging (DWI) using readout-segmented EPI sequence (RESOLVE) for the preoperative assessment of head and neck cancer: tumour size and conspicuity as compared to surgical specimen and other image sequences, respectively.
Methods and Materials: Between 2013-10 and 2015, forty-eight patients who underwent MRI and the surgical resection for the head and neck cancer were included in this study. DWI using RESOLVE was performed and compared with surgical specimen and T2WI and post-contrast T1WI. Patients with poor visualisation of the tumour due to artefact or tiny size and neo-adjuvant chemotherapy were excluded. Two radiologists (faculty and 3rd-degree resident) evaluated MRI. The maximum tumour diameter was measured on pathology and images. Tumour conspicuity was graded on a three-point scale: 1 = poor; 2 = fair; 3 = good.
Results: Primary sites of the cancer were oral cavity, oropharynx, hypopharynx, larynx, and salivary gland. Mean tumour size at histology was 34 mm and was mostly correlated with that on ADC map (Pearson correlation coefficient: 0.812 on ADC map, 0.737 on T2WI, and 0.666 on CE-T1WI). Tumour conspicuity was best on ADC map (number of 3 points: 25 on ADC map, 11 on T2WI and 15 on CE-T1WI). Inter-observer agreement for tumour conspicuity between faculty and resident was also greater on ADC map (calculated kappa values: 0.618 on ADC map, 0.438 on T2WI, and 0.266 on CE-T1WI).
Conclusion: DWI using RESOLVE may be valuable for preoperative size and tumour conspicuity in head and neck cancer.

B-0559 10:38

SR EPI DWI vs. SS EPI DWI in head and neck cancer
I. Platzek, H.H. Kitzler, V. Plodeck, H. Leonhardt, V. Gudziol, M. Laniado; *Dresden/DE (ivan.platzek@uniklinikum-dresden.de)*

Purpose: To compare segmented-readout echoplanar diffusion-weighted imaging (SR EPI DWI) and single-shot EPI DWI (SS EPI DWI) at 3 T in head and neck cancer.
Methods and Materials: Thirty-one patients with squamous cell carcinoma of the head and neck region undergoing initial staging were included in this retrospective study. The MR examination included SR EPI DWI and SS EPI DWI of the head and neck in transverse orientation (b-values of 0, 500 and 1000). Tumour detection and the total number of lymph nodes were recorded for both types of DWI. Geometric distortion was rated using a five-point scale. The t-test for paired samples was used to compare the number of lymph nodes. Distortion scores were compared using the Wilcoxon test.
Results: Tumour detection was improved with SR EPI DWI in comparison to SS EPI DWI (19/31 cases, or 61.2% vs. 10/31 cases, 32.2%; $p = 0.002$). The total number of lymph nodes detected using SR EPI DWI was significantly higher compared to SS EPI DWI (488 vs. 305 lymph nodes; $p < 0.0001$). Distortion scores were significantly lower with SR EPI DWI compared to SS EPI DWI ($p < 0.0001$).
Conclusion: The use of SR EPI DWI instead of conventional SS EPI DWI in staging of head and neck cancer at 3 T leads to a significant reduction of geometric distortion and to a significant improvement of tumour and lymph node detection.

B-0560 10:46

Differentiation of incidental tracer uptake in the head and neck area: a comparison between 18 F-FDG PET/CT and 18 F-FDG PET/MRI
B.M. Schaarschmidt[1], B. Gomez[2], C. Buchbender[1], J. Grueneisen[2], L.M. Sawicki[1], V. Ruhlmann[2], A. Wetter[2], G. Antoch[1], P. Heusch[1]; [1]*Düsseldorf/DE*, [2]*Essen/DE*

Purpose: To compare the diagnostic accuracy of 18 F-fluordesoxyglucose positron emission tomography/magnetic resonance imaging (18 F-FDG

PET/MRI) to 18 F-FDG PET/computed tomography (18 F-FDG PET/CT) concerning incidental tracer uptake in the head and neck area.
Methods and Materials: A retrospective analysis of 81 oncological patients that underwent contrast-enhanced 18 F-FDG PET/CT and subsequent 18 F-FDG PET/MRI was performed. Fused PET/CT and PET/MRI datasets were analysed in separate sessions under consideration of the clinical indication. Incidental tracer uptake was classified in three groups: most likely benign, indeterminate and most likely malignant. The reference standard was defined for all lesions by an expert reader using clinical reports, cross sectional imaging examinations and histopathological reports. Differences between the amount of accurately and inaccurately classified lesions were investigated using McNemar's test between both modalities.
Results: Of 46 detected lesions, 27 and 31 lesions were classified as most likely benign, 18 and 14 as indeterminate and one as most likely malignant in PET/CT and PET/MRI respectively. According to the reference standard, 43 lesions were benign, one was malignant and in two lesions, a definite diagnosis was not possible. PET/MRI was not superior to PET/CT concerning the correct diagnosis of an incidental 18 F-FDG uptake (p=0.125). The correct classification of an incidental uptake was possible in 28 findings on PET/CT and PET/MRI. Fourteen findings were misclassified by either modality and four findings that were misclassified on PET/CT could be classified correctly on PET/MRI.
Conclusion: PET/MRI is not superior to PET/CT in the classification of incidental tracer uptake in the head and neck area.

B-0561 10:54

Role of pre-operative ultrasonography for tumour thickness evaluation in guiding management in patients with oral tongue squamous cell carcinoma

A.V. Nair[1], P. Meera[2], P.K. Nazer[2], P.V. Ramachandran[2]; [1]*Trivandrum/IN*, [2]*Kochi/IN (dranirudhnair@gmail.com)*

Purpose: 1. To assess statistical correlation between tumour thickness (TT) by ultrasonography versus microscopic measurement. 2. To assess predictive capacity of TT by ultrasound in detecting nodal metastasis
Methods and Materials: Prospective analysis in 24 patients for a period of 3 years. Nodal status and TT evaluated preoperatively by neck and intra-oral ultrasonography respectively. Lesions in anterior 2/3rd of tongue assessible by ultrasound were included in the study. After histopathological confirmation of malignancy, all patients underwent resection of primary lesion and ipsilateral elective neck dissection (Level-I to IV). TT was obtained intraoperatively from fresh glossectomy specimen and post-operatively from histopathological paraffin section examination. Statistical correlation between TT by ultrasonography and histopathology assessed by Pearson's correlation coefficient. Chi-square test used to find the association of pathological T stage, TT with pathological nodal status
Results: Significant statistical correlation seen between TT by ultrasonography and microscopic measures. Ultrasonography versus histological measurements were within 1 mm in 37.5 %, within 2 mm in 29.16%, greater than 2 mm in 33% of cases. Pearson's correlation r is 0.678 ($p < 0.001$). ICC (Interclass Correlation Coefficient) between microscopic and US thickness is 0.808. Average difference between Microscopic and US thickness (Bias) is -0.14637 and limits of agreement is (4.717, -4.863) with 95% limits of agreement. TT of 4 mm and above was predictor of cervical nodal metastasis.
Conclusion: Ultrasonographic evaluation is a reliable and cost effective tool to measure the TT pre-operatively, which will be of help in deciding the management of an early oral tongue squamous cell carcinoma

B-0562 11:02

Vascular pattern analysis on microvascular ultrasonography in differentiating metastatic lymphadenopathy from tuberculous lymphadenitis

I. Ryoo, S. Suh, S. Chae, A. Park, M. Ku, H. Shin, H. Seol; *Seoul/KR (csyloo@naver.com)*

Purpose: To evaluate the usefulness of vascular pattern analysis on microvascular ultrasonography in distinguishing metastatic lymphadenopathy (ML) from tuberculous lymphadenitis (TL) and to evaluate the level of agreement between readers in the interpretation of microvascular ultrasonography.
Methods and Materials: Thirty-four patients with ML and 27 patients with TL confirmed by core-needle biopsy were included. Vascular patterns of lymph nodes (vascular distribution, internal vascularity, and internal vascular features) were analysed on both microvascular and power Doppler ultrasonography. The level of inter-observer agreement in determining each vascular pattern on microvascular and power Doppler ultrasonography was evaluated using inter-rater agreement test. The vascular patterns of ML and TL were compared on both microvascular and power Doppler ultrasonography.
Results: Inter-observer agreement was excellent in all aspects of vascular pattern analyses on both ultrasonographic examinations except only vascular distribution analysis on microvascular ultrasonography showing good level of agreement. Vascular distributions, internal vascularity, and internal vascular features on microvascular ultrasonography showed significant difference ($p < 0.001$ for vascular distributions and internal vascular features, and $p = 0.001$ for internal vascularity) between ML and TL. Mixed or central vascular distribution is predominant in ML and avascular pattern is predominant in TL. More internal vascularity was seen in metastasis than in tuberculosis. Vascular patterns on power Doppler ultrasonography showed no significant difference between two groups.
Conclusion: Vascular pattern analysis based on microvascular ultrasonography could be an adjunct examination with good level of inter-observer agreement in differentiating ML from TL which has been reported to have many limitations.

B-0563 11:10

Standardisation of diffusion weighted MRI technique in characterisation of cervical lymphadenopathy

A.M. Aboelsouad, H. Atta, M. Abd Ellah, A. Gabr, H.M.K. Imam; *Assuit/EG (haisamasa@yahoo.com)*

Purpose: To prospectively determine the best ADC map used to discriminate non-neoplastic from neoplastic and metastatic from lymphomatous cervical lymphadenopathy to facilitate meta-analysis of the future diffusion studies.
Methods and Materials: Ethics committee approval and patient written informed consent was obtained. 69patients (36men, 33women, mean age. 35years) from April 2012 to July 2014with clinically palpable cervical lymphadenopathy were examined by 1.5 T DW-MRI. Patients were divided into 2 groups according to pathological results; non-neoplastic and neoplastic groups where the latter subdivided into metastasis and lymphoma groups. Diffusion was done for all groups with 5 b-values (50, 400, 800, 1000 and 2000s/mm2)that reproduced 5 different ADC maps; ADC50, 400, ADC50, 400, 800, ADC50, 400, 800.1000 and ADC50, 400, 800, 1000, 2000 with ADC50,400,800.1000,2000done by two methods; single section method and average of multiple sections method. ADC values of lymph nodes were calculated for each map and compared with histopathological results. Each of two groups was compared by independent t-test. Receiver operating characteristic analysis and Youden index were employed to determine the best cutoff ADC for discrimination. ADC map that yields the best cutoff ADC value for discrimination is considered the best ADC map.
Results: The best cut-off ADC that can differentiate between non neoplastic from neoplastic groups and metastasis from lymphoma groups was generated from ADC50, 400, 800, 1000, 2000 done by single section method being had 86.89%, 63.64%, 92.98% and 46.67% sensitivity, specificity, PPV and NPV respectively in differentiation between non neoplastic and neoplastic groups and had 80%, 51.16%, 36.4% and88% sensitivity, specificity, PPV and NPV respectively in differentiation between metastasis and lymphoma groups.
Conclusion: The best ADC map can be used to characterise cervical lymphadenopathy is ADC50,400,800.1000,2000 performed by single section method.

B-0564 11:18

Estimation of tumour and lymph node volumes in head and neck cancer to predict response to radiochemotherapy

G. Widmann, C. Url, D. Dejaco, A.-K. Haug, N. Fischer, D. Riedl, H. Riechelmann; *Innsbruck/AT (gerlig.widmann@i-med.ac.at)*

Purpose: Tumour volume is a predictor of response to radiochemotherapy in head and neck squamous cell carcinoma (HNSCC). Slice-by-slice manual or semi-automated segmentation requires dedicated software and is time consuming. Aim was to assess the accuracy of volume estimations based on the maximum tumour diameters in three dimensions.
Methods and Materials: In 74 patients with advanced HNSCC, contrast enhanced CT scans were obtained. Slice-by-slice manual segmentation of primary tumour and suspect cervical LNs was performed using an AW-Workstation (GE Healthcare, Vienna, Austria) and served as the reference method. Maximum orthogonal diameters were measured using the distance measurement tool in standard visualisation software in axial and coronal sections and used to estimate volumes using the cubic and ellipsoid formula. Bland-Altman plots were used to compare results.
Results: On average, the ellipsoid formula resulted in an 8% underestimation of tumour volume (95%CI -1% to -14%) and an 18% underestimation of LN volume (95%CI -12% to -25%). The underestimations were stable over a wide range of sizes (p=0.23, p=0.27). Total suspect LN volume correlated closely with the volume of the largest LN ($r=0.96$; $p < 0.01$). The cubic formula was clearly inferior and showed an overestimations of 54% of tumour volume (95%CI 48% to 60%) and 44% of LN volume (95%CI 38 to 51%).
Conclusion: Approximation of tumour and cervical LN volumes using an ellipsoid formula is easily available using standard visualisation software. It tends to underestimate the actual size. However the underestimation is stable and may be easily corrected.

B-0565 11:26

Role of dynamic contrast-enhanced and diffusion weighted MRI in the differentiation between post-treatment changes and recurrent laryngeal cancers

S.D. Abouelenein; *Alexandria/EG (salaheldin3@yahoo.com)*

Purpose: To examine the potential of dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI), diffusion weighted imaging (DWI) and apparent diffusion coefficient (ADC) for differentiating recurrent laryngeal cancer from post-treatment changes.
Methods and Materials: A prospectively designed study was conducted on 61 patients having laryngeal cancers treated by surgery or chemoradiotherapy or both. In all subjects, conventional MRI sequences were performed apart from DWI and DCE sequences. Mean ADC values in benign and malignant groups were compared. Different patterns of dynamic curves were compared qualitatively and semiquantitatively using washout ratio (WR), time to peak (Tpeak) and maximum contrast enhancement in both groups.
Results: ADC cutoff value of 0.9667 effectively differentiated benign and malignant lesions with 100% sensitivity, 74.2% specificity and 84% accuracy. Mean WR in benign or inflammatory lesions was significantly lower than in malignant tumours. A cutoff value of WR -7.995 can differentiate benign post treatment changes from malignant recurrence with sensitivity of 96.6 %, specificity of 81.2 % and overall accuracy of 88.9 %.
Conclusion: ADC mapping and DCE MRI are effective MRI tools for the differentiation of benign post treatment changes from malignant recurrence in laryngeal cancer.

B-0566 11:34

Change in ADC as a promising imaging biomarker for predicting long-term loco-regional control for locally advanced head and neck cancer treated with chemo-radiotherapy

A. Balbo Mussetto, M. Petracchini, A. Tribunella, A. Macera, S. Cavanna, C. Lario, T. Gallo, S. Cirillo; *Turin/IT (cavanna86@hotmail.com)*

Purpose: Around 30-40% of patients with locally advanced head and neck squamous cell carcinoma fail to achieve long-term locoregional control (LRC) with combined radio-chemotherapy. The aim of this study was to investigate if the change in ADC after therapy (ΔADC) can be used as a valid predictive indicator of locoregional recurrence (LRR).
Methods and Materials: We retrospectively reviewed 22 patients (mean age 65 years, with a male-to-female ratio of 2.9:1) that underwent DW-MRI for staging and after completion of therapy. Primary site on MRI was considered target lesion for ADC analysis: pre- and post-treatment ADC mean value (ADC_{preT} and ADC_{postT}) was measured, then ΔADC and ΔADC% were calculated and correlated with LRC.
Results: During a mean follow-up of 22 months, complete LRC was achieved in 14 patients whilst 8 developed LRR. Difference between ΔADC of patients with LRC (0.1275 ± 0.36) and ΔADC of patients with LRR (0.5893 ± 0.30) was statistically different (p=0.0046). On ROC curve analysis, a threshold of $< 27\%$ in ΔADC% revealed a sensitivity of 75% and specificity of 85% for the prediction of LRC, with LR of 5.25. The difference in progression-free survival between the two groups divided by the threshold value of ΔADC% was significant ($p < 0.0058$) with hazard ratio 6.9 (CI95%: 1.29 to 37.40).
Conclusion: Changing of ADC mean during therapy can be used as a valid imaging predictive clinical factor, showing a significant association with LRC in patients with HNSCC treated by chemo-radiation.

B-0567 11:42

Discrimination post-therapeutic changes from local residual / recurrent tumoural tissue in malignant neck masses following therapy using MR diffusion weighted imaging

A. Baiomy, A. Youssef, E.M.M. Mahmoud, M.A.M. Yehya; *Cairo/EG (aly.abdelkhalek@hotmail.com)*

Purpose: To determine the efficiency of MR DWI in detection of local residual / recurrent lesions in malignant head and neck tumours after completion of therapy.
Methods and Materials: 40 patients (28 male and 12 female) with pathologically proven head and neck malignant lesions who completed therapy whether surgery, chemotherapy, radiotherapy or combined therapy. These cases underwent follow-up by conventional MRI that was interpreted by a qualified specialised radiologist. Diffusion weighted images were obtained for these cases as a complementary study and were interpreted by another qualified specialised radiologist. The final results were confirmed by biopsy of the suspected lesions or follow-up for at least further 6 months.
Results: A significant negative correlation between average ADC and residual /recurrent tumoural tissue ($P < 0.01$) was noted. Mean ADC value of the residual / recurrent tumoural tissue were (1.22±0.49) X 10-3 mm2/sec while Mean ADC value of the Post-therapeutic changes were (1.78±0.42) X 10-3 mm2 /sec and the Cutoff ADC value of Active tumoural Tissue is ≤ 1.3 X 10-3 mm2/sec that was used for differentiation between residual / recurrent tumoural tissue and Post-therapeutic changes with a sensitivity of 88 % and specificity of 84 % respectively.
Conclusion: Diffusion MRI is a useful significant technique for Differentiation of Residual / Recurrent tumours from Post therapeutic Changes in head and neck malignancy.

B-0568 11:50

Detection of cartilage invasion in laryngeal carcinoma with dynamic-contrast enhanced CT

J.W. Dankbaar, J. Oosterbroek, E.A. Jager, H.W. de Jong, F.A. Pameijer, C.P. Raaijmakers, S.M. Willems, C.H. Terhaard, M.E. Philippens; *Utrecht/NL (j.w.dankbaar@umcutrecht.nl)*

Purpose: Staging of laryngeal cancer largely depends on cartilage invasion. Presence of cartilage invasion affects treatment choice and prognosis. On MRI and contrast enhanced CT (CECT) it may be challenging to differentiate cartilage invasion from inflammation. The purpose of this study is to compare diagnostic properties of dynamic contrast enhanced CT (DCECT) and CECT for visual detection of cartilage invasion in laryngeal cancer.
Methods and Materials: We evaluated a prospectively collected series of patients with T3 or T4 laryngeal squamous cell carcinoma treated with total laryngectomy (TLE) using 0.625 mm slice CT. From the DCECT data, permeability and blood volume (BV) maps and CECT images were visually evaluated for presence of cartilage invasion and invasion of the different T-stage subsites in laryngeal cancer, using histological evaluation of the surgical TLE specimen as gold standard. Sensitivity, specificity, negative predictive value (NPV), and positive predictive value (PPV) were calculated.
Results: From 14 included patients, a total of 462 subsites were available for T-stage analysis, of which 84 were cartilage. The median time between CT imaging and TLE was 1 day (range 1-34 days). There was no significant difference in the detection of cartilage invasion between DCECT derived permeability and BV maps and CECT. The sensitivity of CECT was better for all subsites combined (0.85 vs 0.75; $p < 0.01$).
Conclusion: CECT and DCECT derived permeability and BV maps have similar diagnostic properties for visual detection of cartilage invasion in T3 and T4 laryngeal cancer.

10:30 - 12:00 **Room M 2**

Genitourinary

SS 607b

New frontiers: urolithiasis and renal function

Moderators:
M.-F. Bellin; Le Kremlin-Bicêtre/FR
J. Lopes Dias; Lisbon/PT

B-0569 10:30

Determination of optimal imaging setting for urolithiasis CT using FBP, statistical IR, and knowledge-based IMR: physical human phantom study

S. Park; *Seoul/KR (pksungbin@paran.com)*

Purpose: The purpose of our study was to compare the image quality of CT for evaluating urolithiasis using filtered back projection (FBP), statistical iterative reconstruction (IR), and knowledge-based IMR according to various scan parameters and radiation dose.
Methods and Materials: A 5 x 5 x 5 mm3 uric acid stone was placed in physical human phantom at the pelvis level. Three tube voltages (120, 100 and 80 kV) and four current-time products (100, 70, 30 and 15 mAs) were performed for twelve scans. Each scan was reconstructed with FBP, statistical IR (level 5, 6, 7), and knowledge-based IMR (Soft Tissue level 1, 2, 3) techniques. The objective image noise and subjective assessment were evaluated.
Results: The effective doses ranged from 0.095 to 2.621 mSv. The FBP, statistical IR, and knowledge-based IMR showed significantly ($p < 0.001$) different objective image noise (53.5±10.0 vs 22.1±39.2 vs 9.2±7.2). Among subjective assessment, subjective image noise showed a significant difference ($p = 0.003$) among three reconstructed methods. All groups divided at a break point of 100 kV and 30 mAs showed significant ($p < 0.001$) results.
Conclusion: At the setting of 100 kV and 30 mAs, radiation dose can be decreased by about 84% while keeping subjective image assessment.

B-0570 10:38

Feasibility of in vitro differentiation of urinary stones using manufacturer-recommended and dose-optimised protocols with single-source split-filter dual-energy CT

A. Parakh[1], A. Euler[1], D. Boll[1], F. Morsbach[2], D. Mueller[2], Z. Szucs-Farkas[3], S. Schindera[1]; [1]*Basle/CH*, [2]*Zurich/CH*, [3]*Berne/CH*
(anushri.parakh@gmail.com)

Purpose: To examine efficacy of a novel single-source split-filter dual-energy CT (DECT) equipped with gold and tin filter's in characterising renal stones as compared to second-generation dual-source dual-energy CT in intermediate-sized phantoms using vendor-suggested protocols and dose optimisation.
Methods and Materials: Urinary stones (n=96, size; 2.2-7.8 mm) of known chemical composition (24 each for calcium, struvite, cystine and urate) were cast in a custom-made model and placed in an anthropomorphic phantom simulating an intermediate-sized patient. The phantom was consecutively scanned on two DECTs (Siemens) using dual-source [SOMATOM Definition Flash; protocol A (vendor-suggested) tube A 100 kVp, 210 reference mAs; tube B Sn 140 kVp, 162 reference mAs; protocol B (dose-optimised; tube A 100 kVp, 110 reference mAs; tube B Sn140 kVp, 85 reference mAs] and split-filter technology [SOMATOM Definition Edge; protocol C (vendor-suggested) AuSn 120 kVp, 640 reference mAs; protocol D (dose-optimised) AuSn 120 kVp, 440 reference mAs]. Stones were assessed by a dedicated post-processing software. A comparison of radiation doses was made using CTDIvol parameter.
Results: The CTDIvol (in mGy) for protocols A to D measured 18.3, 10.5, 13.3 and 10.1, respectively. Presence of all stones was detected by four protocols. The accuracy of characterisation for non-urate stones (n=72) by protocols A, B, C and D was 100%, 100%, 95.8% and 95.8% and for urate stones (n=24) 87.5%, 83.3%, 87.5% and 91.6%, respectively. The size of the incorrectly characterised stones ranged from 2.2 to 5.4 mm.
Conclusion: Split-filter DECT demonstrates similar efficacy for renal stone characterisation and detection as dual-source DECT at lower radiation dose, even in dose-optimised protocols.

B-0571 10:46

Attenuation-based automatic tube voltage selection with tube current adaption in nonenhanced CT for detection of urolithiasis: diagnostic performance and radiation exposure

G.-M. Zhang, H. Sun, H.-D. Xue, Z.-Y. Jin; *Beijing/CN*
(zhang_stacey@163.com)

Purpose: To evaluate the diagnostic performance and radiation dose of an attenuation-based automatic kilovolt (kV) selection algorithm with tube current adaption in nonenhanced CT (NECT) of abdomen and pelvis for detecting urinary stones.
Methods and Materials: Sixty patients (52.6±13.0 years; 31 men; 29 women) suspected of urolithiasis underwent conventional-dose NECT (CD-NECT) using a 120-kV protocol followed by NECT using automated kV selection with tube current adaption (LD-NECT) (group A, Reference 100 kV, n=31; group B, Reference 80 kV, n=29). Stone characteristic and dose-length product were recorded and the effective dose (Deff) was calculated. Urinary stones detection and Deff were compared between LD-NECT and CD-NECT.
Results: A total of 191 stones from 46 patients were detected by CD-NECT and 174 of 191 were correctly identified by LD-NECT. The overall detection of LD-NECT was 91.1% (174/191), and the detection of stones ≥ 2 mm was 99.4% (171/172). Compared to CD-NECT, the average Deff of LD-NECT was significantly lower (2.2±1.4 versus 9.0±2.2 mSv, $p < 0.05$) with a mean dose reduction of 75.5%. In group A and B, a significant dose reduction was also obtained compared with corresponding CD-NECT (group A, 3.3±1.1 versus 9.2±2.6 mSv, 64.1% decrease, $p < 0.05$; group B, 1.1±0.2 versus 8.8±1.8 mSv, 87.5% decrease, $p < 0.05$).
Conclusion: The attenuation-based kV-selection algorithm with tube current adaption in NECT allowed significant reduction of radiation exposure while maintaining an excellent diagnostic accuracy of detecting urinary stones.

B-0572 10:54

Virtual nonenhancced images generated from spectral CT: determinants of detection of urinary calculi in the renal collecting system

Y. Chen, P.J. Lv, J.B. Gao; *Zhengzhou/CN, Henan/CN*
(chenyan1989314@yeah.net)

Purpose: To determine which features of urinary calculi are associated with their detection on VNE images generated from Spectral CT urography.
Methods and Materials: A total of 53 patients were examined with true nonenhanced (TNE) CT and Spectral CT urography in the excretory phase. The contrast medium was virtually removed from excretory-phase images using material suppressed iodine (MSI) and calcium-based (CaB) material decomposition (MD) analysis in the spectral imaging viewer. The sensitivity regarding the detection of calculi on these groups and the subjective scoring were determined using true nonenhanced (TNE) images as the reference standard. Using logistic regression, the influences of image noise, attenuation, and stone size, as well as attenuation of the contrast medium, on the stone detection rate were assessed on VNE images.
Results: 169 stones were detected on the TNE images; 149 stones were identified on CaB images (sensitivity 88.2%), whilst 160 stones on MSI images (sensitivity 94.6%) with significant difference. Compared with the TNE images, the relatively lower subjective scoring of the VNE images ($P > 0.05$) and higher SNR, CNR ($P < 0.05$) were identified. Size (long-axis diameter and short-axis diameter), and attenuation of the calculi, except for the image noise were significantly associated with the detection rate on VNE images ($P < 0.05$). As threshold values on CaB, MSI images, size larger than 2.68 mm, 2.03 mm, maximum attenuation of the calculi greater than 223 HU, 203 HU respectively were found.
Conclusion: After virtual elimination of contrast medium with material decomposition and MSI, large and high-attenuation calculi can be detected with high reliability.

B-0573 11:02

Prediction of surgically induced chronic kidney disease after total nephrectomy: body surface area adjusted virtually calculated renal cortical volume on CT

S. Hwang, D. Sung, S. You, N. Han, B. Park, M. Kim, S. Cho; *Seoul/KR*
(syongtae@naver.com)

Purpose: To predict the surgically induced chronic kidney disease (CKD-S, estimated glomerular filtration rate, eGFR < 60 ml/min/1.73 m2) in the patients who underwent total nephrectomy through the body surface area (BSA)-adjusted virtually calculated renal cortical volume (RCV) measured on preoperative CT angiography (CTA).
Methods and Materials: This retrospective study was approved by the institutional review board, and informed consent was waived. Between January 2008 and January 2013, a total of 73 patients with normal preoperative eGFR who underwent preoperative CTA and total nephrectomy for kidney donation (n=44) or solitary renal mass (n=29) were included, and they were divided in two groups according to the postoperative renal function, group A (CKD-S (-), 71.2%) and group B (CKD-S (+), 28.8%). Retrospectively, pre- and post-operative eGFR and other laboratory findings were collected and BSA-adjusted RCV was measured using semiautamated segmentation technique on preoperative CTA.
Results: The logistic model revealed that BSA-adjusted preoperative RCV, age and the reason of operation (donation or tumour) were significant factors for predicting CKD-S at the.05 level (p-value = 0.015, 0.022, 0.048). Estimated probability for CKD-S could be calculated by this formula; Logit (P (CKD-S)) = (-0.019*BSA-adjusted pre-operative RCV) + (0.068*age) + (-1.304 if donor) + 1.176, and the optimal cutoff-value for predicting CKD-S was 0.380 (Sn. 66.7, Sp 86.5, AUC 0.836). This formula was revealed as a fair tool for predicting CKD-S on cross validation (cutoff value: 0.244, Sn. 76.2, Sp 73.1, AUC 0.789).
Conclusion: BSA-adjusted virtually calculated RCV is a significantly important factor for predicting CKD-S.

B-0574 11:10

Evaluation of Iterative model reconstruction (IMR) in ultra low-dose MDCT for urinary stone detection: a comparison to filtered-back-projection and iDose level 4

J. Schmidt-Holtz, A. Laqmani, S. Butscheidt, M. Kurfürst, M. Avanesov, C. Behzadi, H.-D. Nagel, G. Adam, M. Regier; *Hamburg/DE*
(jak.schmidt-holtz@uke.de)

Purpose: To assess diagnostic accuracy and image quality of sub-milisievert ureteric MDCT using iterative model reconstruction (IMR) in comparison to filtered-back-projection (FBP) and iDose4™ level 4.
Methods and Materials: The raw data of unenhanced 256 slice MDCT (120 kV, 30 mAs, mean CTDIvol: 2.5 mGy) of 34 patients were reconstructed using FBP, iDose4™ (level 4) and IMR (level 1 - 3). Image analysis was independently performed by two blinded radiologists applying a 5-point grading scale regarding readers confidence (1, certain exclusion; 5 concrement definitively present) and image quality (1, poor; 5, excellent). Statistical analysis included weighted kappa and Wilcoxon-test.
Results: Sensitivity rates were equivalent for FBP, iDose4™ and IMR. Applying IMR, a distinct improve in mean image quality was assessed at any level (FBP, 1.95; iD4, 2.87; IMR L1, 4.25; IMR L2, 3.99; IMR L3, 3.93; p0.05). IMR reduced streak artifacts and image noise with no loss of anatomical information.
Conclusion: With IMR the Detection of urinary stone disease can reliably be achieved by ultra low-dose MDCT at radiation doses in the submilisievert range. Increased mean image quality and reduction of image noise compared to FBP and iDose4™ can be reached. The confidence for stone detection is limited as depicition of concrements can be achieved using FBP and iDose4™ as well.

B-0575 11:18

Non-invasive measurements of renal haemodynamics over 24 hours in healthy volunteers using ASL, BOLD and phase contrast

P. Eckerbom[1], E. Cox[2], I. Subasic[1], J. Weis[1], F. Palm[1], P. Hansell[1], S. Francis[2], P. Liss[1]; [1]*Uppsala/SE*, [2]*Nottingham/UK (per.eckerbom@akademiska.se)*

Purpose: Due to the risks associated with contrast media and impaired renal function (CIN-Contrast-Induced Nephropathy and NSF-Nephrogenic Systemic Fibrosis), there is a need of non-invasive methods for imaging renal disease. Also, avoidance of ionising radiation is desirable. Arterial Spin Labelling (ASL), BOLD and Phase Contrast are three non-invasive MR techniques suitable for measuring renal blood flow and oxygenation which is tightly controlled by at least two different intrinsic mechanisms which should guarantee a stable flow. However, it is currently unknown if renal haemodynamics is influenced by a circadian rhythm over 24 hours. Knowledge of this is important for further studies.
Methods and Materials: We measured total and cortical renal blood flow and oxygenation using Phase Contrast, ASL and BOLD techniques in 6 healthy volunteers (3 males, 3 females). Every fourth hour for a total of 24 hours (six measurements).
Results: Total renal blood flow averaged 14.9 ml/sec for both right and left kidney respectively with a drop during evening-night but with individual variations. Cortical renal blood flow in the kidney averaged 289±77 and 274 ml/min/100 g for right and left kidney respectively with rising values during the day and dropping values during the evening-night. Regional renal tissue oxygenation of the cortex as determined by T2* (ms) by BOLD showed no certain circadian variation pattern.
Conclusion: Both total and cortical renal blood flow measured by Phase Contrast and ASL respectively show circadian variations with dropping values during evening and night. Renal cortical oxygenation determined by BOLD shows no certain circadian variation.

B-0576 11:26

Comparison of CT findings between bacteremic and non-bacteremic acute pyelonephritis due to Escherichia coli

D. Kim, S. Oh, B.-K. Je, S. Lee, D. Hong; *Ansan/KR (dj8827@naver.com)*

Purpose: To identify computed tomographic (CT) findings which are associated with the presence of bacteremia in patients with acute pyelonephritis (APN) due to Escherichia coli (E.coli).
Methods and Materials: The clinical data and CT images of 128 patients (109 female, 19 male; median age, 43±25years) diagnosed with APN due to E.coli were retrospectively reviewed by two radiologists with consensus. The patients were divided into two groups according to the presence of bacteremia. CT findings were evaluated and compared between two groups: renal findings which included APN grade, urothelial thickening, bilateral involvement, perirenal infiltration and rupture of renal abscess and extrarenal findings which included diffuse peritoneal thickening, cystitis, pulmonary congestion and pleural effusion. The chi-square test and univariate logistic regression were used to compare CT findings between two groups.
Results: Among 128 patients, 34 patients (26.6%) were classified as bacteremic group and 94 patients (73.4%) as non-bacteremic group. Among CT findings, renal findings such as urothelial thickening (p=0.03) and extrarenal finding such as diffuse peritoneal thickening (p≤0.01), cystitis (p≤0.01) and pulmonary congestion (p≤0.01) were associated with bacteremia with statistical significance. With multivariate logistic regression analysis, we suggested that urothelial thickening (OR 3.16; 95% CI 1.20-8.28, p=0.02), diffuse peritoneal thickening (OR 7.50; 95% CI 2.18-25.81, p≤0.01), cystitis (OR 4.15; 95% CI 1.82-9.45, p≤0.01) and pulmonary congestion (OR 4.73; 95% CI 2.15-10.42, p=0.00) were predictive CT findings of bacteremic APN.
Conclusion: CT findings including urothelial thickening, diffuse peritoneal thickening, cystitis, and pulmonary congestion are more frequently demonstrated in patients with bacteremic APN due to E.coli, as compared with those without bacteremia.

B-0577 11:34

Radiation dose and image quality of 80 kVp renal artery CT angiography with SAFIRE: comparison with 120 kVp renal artery CT angiography with FBP

P. Lei, G. Shen, J. Jiao, X. Wang; *Guiyang/CN (pingguilei@foxmail.com)*

Purpose: To evaluate radiation dose and image quality of renal artery CT angiography with sinogram-affirmed iterative reconstruction (SAFIRE) at 80 kVp in the patients suspected with renal mass.
Methods and Materials: Thirty-one consecutive patients were prospectively classified into two groups according to the tube voltage: Group A (n = 13), 80 kVp renal artery CTA with 3 levels of SAFIRE reconstruction (S1-S5); Group B (n = 18), 120 kVp with filtered back projection (FBP) reconstruction. CT attenuation values, noise, signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) of the renal artery were measured. Subjective image quality was evaluated by two experienced radiologist with five scale methold. CTDIvol was recorded and SSDE was estimated according to size of body in each patient.
Results: CT attenuation and noise of the aorta and renal artery in Group A were higher than those of Group B (all P 0.05; t=0.95, P> 0.05), respectively. All the CT imaging were satisfactory with clinical application (≥3), there was significant difference in overall image quality and sharpness of renal artery between Group A and Group B (z=-3.61, P < 0.05; z=-3.54, P 0.05). CTDIvol was 4.62 mGy for Group A with 72% CTDIvol reduction in comparison to Group B (16.75 mGy), SSDE was 6.99 ± 0.8 mGy for Group A with 69% SSDE reduction in comparison to Group B (22.85 ± 2.74 mGy).
Conclusion: Renal artery at 80 kVp is feasible and provides satisfactory diagnostic image quality for clinic, and allowing for substantial radiation dose reduction.

B-0578 11:42

Contrast-induced nephropathy, does it occur in an unselected cohort with normal or moderately reduced renal function? A prospective study

J. Carlqvist, J. Brandberg, M. Hellström; *Göteborg/SE (jeanette.carlqvist@gmail.com)*

Purpose: Previous studies of contrast-induced nephropathy (CIN) have shown highly variable incidence, often based on high doses of intra-arterial contrast media during interventional procedures on patients with significant comorbidity. The aim of this study was to determine the incidence of CIN in an unselected population when using standardized doses of low-osmolar nonionic contrast medium at computed tomography.
Methods and Materials: Within SCAPIS (Swedish CArdioPulmonary bioImage Study) 442 randomly chosen individuals (50 to 64 years of age) with estimated glomerular filtration rate > 50 ml/min, underwent coronary CT angiography with intravenous injection of iohexol. Blood sampling for serum creatinine (SCr) was performed twice within a month before CT angiography, in order to detect intraindividual fluctuations in SCr. 2-4 days after contrast medium injection, a third SCr sample was obtained. Individuals with CIN (> 25% increase in SCr from baseline or > 44 µmol/L increase in absolute value), were contacted for additional follow-up.
Results: CIN was found in 6 of 442 participants (1.4%). One participant (0.2%) had a corresponding reduction of renal function between the two pre-injection samples.
Conclusion: CIN after routine diagnostic doses of contrast medium is a rare finding in an unselected population. The clinical significance of a moderate transient increase in SCr remains uncertain.

B-0579 11:50

Measurement of CT perfusion parameters in kidneys with single renal artery vs double renal arteries: is it different?

M.T. El-Diasty, G. Gaballa, M.E. Abou-Elghar, T.A. El-Diasty; *Mansoura/EG (meldiasty@hotmail.com)*

Purpose: To assess the effect of renal artery multiplicity on measurement of CT perfusion parameters.
Methods and Materials: CT examinations of 15 kidney donors with unilateral double renal arteries were enrolled in this retrospective study. Total of 30 kidneys were divided into two groups; group 1 (15 kidneys) with single renal artery and group 2 (15 kidneys) with double renal artery. Perfusion parameters were obtained by drawing regions of interest around the renal cortex. Results were compared between the two groups using independent samples t test.
Results: For group 1: Perfusion was 105.6 ± 37 ml/100 ml/min, peak enhancement intensity (PEI) was 70.8 ± 12 HU, and blood volume (BV) was 64 ±20 ml/100 gm. For group 2: Perfusion was 109 ± 34.7 ml/100 ml/min, PEI was 74.5 ± 13 HU, and BV was 66.5 ±19 ml/100 gm. No statistically significant difference was found between the two groups with p values of 0.8, 0.4 & 0.75 for perfusion, PEI and BV, respectively.
Conclusion: Measurement of CT perfusion parameters was not affected by multiplicity of renal artery. This confirms the validity of this technique in functional assessment of the kidneys irrespective to vascular anatomy.

10:30 - 12:00 **Room M 3**

Chest

SS 604

Spectral CT, advanced CT analysis and emphysema

Moderators:
F. Molinari; Lille/FR
M. Silva; Parma/IT

B-0580 10:30

Transforming thoracic oncologic CT examinations into a CT pulmonary angiography for the detection of pulmonary embolism using ultra low keV monoenergetic reconstructions

H. Haubenreisser, A. Tecl, M. Meyer, S.O. Schönberg, T. Henzler;
Mannheim/DE (Holger.Haubenreisser@medma.uni-heidelberg.de)

Purpose: To retrospectively investigate the feasibility to transform oncologic dual energy thoracic CT (DECT) into diagnostic pulmonary CT angiographies (CTA) for the assessment of pulmonary embolism (PE) using ultra low keV monoenergetic reconstructions.
Methods and Materials: 100 patients (59 men, 71±16 years) that underwent DECT were retrospectively included in this study. They received a slow contrast injection protocol due to limited peripheral venous access with bolus tracking in the descending aorta. The dual-energy data was used to calculate virtual monoenergetic image (MEI) datasets at 40keV. Vessel and soft tissue attenuation and image noise were evaluated. Differences in attenuation and CNR were compared between MEI, 120 kVp polyenergetic images (PEI). In addition, attenuation and CNR were compared to conventional images (CoI) of additional 50 patients that underwent a dedicated pulmonary embolism CT protocol on the same DSCT system.
Results: All MEI were considered diagnostically acceptable for the evaluation of the pulmonary vessels. Vessel attenuation and CNR of MEI at 40keV was found to be superior to PEI and comparable to the CoI (all $p < 0.05$). MEI provided a statistically significant increase in mean vessel attenuation compared to PEI (186.4±25.3 HU vs. 506.3±43.7 HU; $p < 0.05$) and a statistically significant increase in mean CNR (6.4±3.1 vs. 11.2±4.1; p0.05).
Conclusion: Oncologic DECT examinations performed with a slow contrast rate can be transformed into a dedicated pulmonaryCTA study by means of calculated monoenergetic low keV datasets. This leads to significantly improved diagnostic image quality for the assessment of pulmonary embolism that frequently occur in oncologic patients.
Author Disclosures:
H. Haubenreisser: Speaker; Siemens Healthcare, Bayer Healthcare. **M. Meyer:** Speaker; Bracco. **T. Henzler:** Speaker; Siemens Healthcare.

B-0581 10:38

Single energy scanning of large adult patients: can we improve image quality with spectral shaping?

R. Daghistani, V. Delannoy, J.-B. Faivre, J. Giordano, J. Rémy, M. Remy-Jardin; *Lille/FR (martine.remy@chru-lille.fr)*

Purpose: To evaluate the image quality of single-energy CT with tin filtration in routine chest CT examinations of large patients.
Methods and Materials: 50 patients with a BMI > 25 kg/m2 underwent two non-contrast CT examinations: (a) the first examination was obtained with a second-generation dual-source CT system with an individually-adapted selection of the kilovoltage according to the patient's body weight (Group 1); (b) the second examination was performed with a third-generation dual-source CT system at 150 kV with tin filtration (150 Sn kV/200 mAs) (Group 2).
Results: In Group 1: (a) CT examinations were obtained at 100 kV (n=4; 8%), 120 kV (n=30; 32%) and 140 kV (n=16; 32%) with a single X-ray tube; (b) the overall image quality was diagnostic with a subjective noise rated as mild to moderate on lung and mediastinal images; (c) the mean DLP was 168 ± 56.6 mGy.cm. Compared to Group 1, Group 2 examinations were characterised by (a) a significantly lower mean objective noise (14.51 ± 2.95 HU vs 19.5 ± 4.96 HU; $p < 0.0001$) despite a non-significant difference in the mean DLP (167.3 ± 23.13 mGy.cm; p=0.89); (b) a better SNR (3.46 ± 0.91 vs 2.41 ± 0.67; $p < 0.0001$); (c) a significantly lower score of subjective image noise (1.22 ± 0.16 vs 1.27 ± 0.19; p=0.008); (d) all but 4 examinations were acquired with a dual-source, high pitch mode.
Conclusion: Chest scanning at 150 Sn Kv improves the overall image quality in overweight and obese patients with no dose penalty.

B-0582 10:46

What is the optimal monochromatic keV level for lung parenchyma analysis in spectral CT? A qualitative study on 50 patients

M. Ohana, A. Labani, M.-Y. Jeung, C. Roy; *Strasbourg/FR (mickael.ohana@gmail.com)*

Purpose: To determine the optimal energy level for lung parenchyma analysis in spectral CT imaging.
Methods and Materials: 50 patients (58% men, 64.8±16yo) from a previously published prospective study who underwent a single-source DE-CTPA in search of a pulmonary embolism were included. Monochromatic images in lung window reconstructed every 5keV from 40 to 140keV were independently and randomly assessed by two experienced chest radiologists. Based on the overall image quality and the depiction/conspicuity of potential parenchymal lesions, each reader had to designate for every patient the keV level providing the best diagnostic and image quality.
Results: Mean radiation dose was 243±33 mGy.cm and mean BMI was 25.6±4.5. 72% of the examinations were abnormal, exhibiting emphysema (n=15), alveolar consolidation (n=10), fibrosis (n=7), nodule greater than 5 mm (n=6), ground glass opacities (n=6), interstitial septal thickening (n=4), bronchiectasis (n=3) and mass (n=3). Reader 1 picked the 55keV monochromatic reconstruction in 52% of cases, 50keV in 30% and 60keV in 18%. Reader 2 chose 50keV in 52% cases, 55keV in 40%, 60keV in 6% and 40keV in 2%. Merging 50 and 55keV into one category results in an optimal setting selected by reader 1 in 82% of patients and by reader 2 in 92%, with a 74% concomitant agreement. There was not any correlation between the preferred keV and the BMI for both readers ($p< 0.05$ with $p> 0.05$).
Conclusion: The best image quality for lung parenchyma analysis in spectral CT is obtained with the 50-55keV monochromatic reconstructions.

B-0583 10:54

Diagnosis of solitary pulmonary nodule: one-step spectral and perfusion imaging

S. Wang, J. Gao; *Zhengzhou/CN (wsyzaizhengda@163.com)*

Purpose: To observe the value of one-step spectral imaging and perfusion imaging in diagnosis of solitary pulmonary nodule.
Methods and Materials: 30 patients with SPN proved by pathology underwent perfusion scan with using gemstone Spectral imaging mode,who were divided into malignant group (20 cases), benign group (10 cases).The parameters of CT perfusion including blood volume (BF), blood flow (BF), mean transit time (MTT), permeability surface (PS) were analysed.Iodine concentration (IC), normalised iodine concentration (NIC) and slope rate of spectral curve in both arterial phase and venous phase were measured and calculated. The independent sample t test was performed to compare quantitative parameters between malignant and benign SPN.
Results: BF, BV, PS in malignant SPN were highter than benign SPN (P0.05). IC, NIC and slope rate of spectral curve in malignant SPN were highter than benign SPN in both phases ($P < 0.05$).
Conclusion: One-step spectral imaging and perfusion imaging can accept more parameters and it is helpful to diagnosis of SPN.

B-0584 11:02

Can spectral CT imaging improve the differentiation between malignant and benign solitary pulmonary nodules?

Y. Zhang, J. Cheng, X. Hua, M. Yu, C. Xu, F. Zhang, J. Xu, H. Wu; *Shanghai/CN (renji_zy@163.com)*

Purpose: To quantitatively assess the value of dual-energy CT (DECT) in differentiating malignancy and benignity of solitary pulmonary nodules (SPNs).
Methods and Materials: Sixty-three patients with SPNs underwent contrast enhanced CT scans in arterial phase (AP) and venous phase (VP) with spectral imaging mode. Region of interest was placed on the nodule to measure iodine concentration (IC) on iodine-based material decomposition images and CT numbers on monochromatic image sets to generate spectral HU curve. Normalized IC (NIC), slope of the spectral HU curve (λHU) and net CT number enhancement on 70 keV images were calculated. The two-sample t-test was used to compare quantitative parameters. Receiver operating characteristic curves were generated to calculate sensitivity and specificity.
Results: There were 63 nodules, with 37 malignant nodules (59%) and 26 benign nodules (41%). NIC, λHU and net CT number enhancement on 70 keV images for malignant nodules were all greater than those of benign nodules. NIC and λHU had intermediate to high performances to differentiate malignant nodules from benign ones with the areas under curve of 0.89 and 0.86 respectively in AP, 0.96 and 0.89 respectively in VP. Using 0.30 as a threshold value for NIC in VP, one could obtain sensitivity of 93.8% and specificity of 85.7% for differentiating malignant from benign solitary pulmonary nodules. These values were statistically higher than the corresponding values of 74.2%, 53.8% obtained with the conventional CT number enhancement.

Conclusion: DECT imaging with GSI mode could provide promising value for distinguishing malignant SPNs from benign ones.
Author Disclosures:
Y. Zhang: Founder; Shanghai Municipal Health Bureau (20124176), Shanghai Municipal Science and Technology Commission (14411968100). Speaker; Ying Zhang.

B-0585 11:10

Patient information in connection with radiological examinations is inadequate

L. Ukkola, H. Oikarinen, A. Henner, O. Tervonen; *Oulu/FI (leila.ukkola@ppshp.fi)*

Purpose: To find out the coverage, content and source of the information related to radiological examinations obtained by patients.
Methods and Materials: A questionnaire comprising general information, dose and risks of radiation and source of information was prepared. Altogether 147 patients (18-85 years; convenience sampling) were interviewed after radiological examinations exposing to a low (under 1 mSv), medium (1-10 mSv) or high dose (over 10 mSv) in a university hospital.
Results: Ninety-five (65%) patients obtained at least some information related to the examination whilst 52 (35%) received no information. The patients with a previous medium- or high-dose examination obtained information significantly more often (73% and 85%, respectively) than those with a low-dose examination (23%; $p < 0.001$). All the patients with a nuclear medicine examination received information, compared to 72% of other medium- or high-dose examinations (p=0.004). The information mainly comprised the indication (64%), course of the examination (56%), or reference to radiation use (36%). The information concerning the dose and risks of radiation (7%), consequences if the procedure is not done (4%) or consent (5%) was provided to only a few patients, and information about other possible options to none. Median rating of the obtained information on the scale 1-5 was 2. The information was mostly, and variably, provided by letter, radiographer or referring practitioner.
Conclusion: Patients receive inadequate information from variable sources in connection with radiological procedures. The results confirm the need for improved communication between professionals and patients. Responsibilities for providing the information should also be established.

B-0586 11:18

Mortality prediction in pulmonary fibrosis: comparison of computer and visual CT analysis and pulmonary function tests (PFT) with the gender, age, physiology (GAP) staging system

J. Jacob[1], B. Bartholmai[2], A. Brun[1], R. Egashira[1], A. Nair[1], S. Rajagopalan[2], S.L.F. Walsh[1], A. Wells[1], D. Hansell[1]; [1]*London/UK*, [2]*Rochester, MN/US (akelajacob@gmail.com)*

Purpose: The GAP staging system has been used to predict outcome in fibrosing lung diseases (FLD), but requires a specific FLD diagnosis. Prognostication without a specific diagnosis was evaluated using computer-based CT analysis and compared to the GAP system.
Methods and Materials: Baseline CT imaging from 872 consecutive FLD patients were analysed by a computer algorithm (CALIPER) developed at the Biomedical Imaging Resource, Mayo Clinic, Rochester, USA. CT parenchymal patterns including emphysema, honeycombing, reticulation, ground glass densities, visual traction bronchiectasis and CALIPER-derived pulmonary vessel volume (PVV) were analysed by two experienced sub-specialty thoracic radiologists. PFTs evaluated included FVC, DLco and composite physiologic index (CPI). A multivariate mortality model using CALIPER variables and a combined model (COMBINED) derived from CALIPER, visual scores and PFTs were compared to the GAP system (GAP-STAGE) using bootstrapped Cox proportional hazards analyses.
Results: Univariate analysis: the CALIPER model including PVV, emphysema, reticulation and honeycombing was of similar strength (HR=2.38, $p < 0.0001$, CI=2.13-2.67) to the COMBINED model including CALIPER-derived PVV and emphysema, visual honeycombing and traction bronchiectasis and CPI (HR=2.45, $p < 0.0001$, CI=2.18-2.75) and the GAP-STAGE model (HR=2.40, $p < 0.0001$, CI=2.14-2.68). Bivariate analysis with bootstrapping: the GAP-STAGE model (p=0.001, CI=0.49-0.74) was of similar strength to the CALIPER model (p=0.001, CI=0.45-0.73). The GAP-STAGE model (p=0.001, CI=0.48-0.73) was similar in strength to the COMBINED model (p=0.001, CI=0.46-0.75).
Conclusion: Mortality prediction with CALIPER variables are comparable to the GAP system, furthermore the CALIPER system does not require a specific FLD diagnosis.

B-0587 11:26

Prognostication using longitudinal change in idiopathic pulmonary fibrosis (IPF): analysis of change in computer and visual CT variables and forced vital capacity (FVC)

J. Jacob[1], B. Bartholmai[2], R. Karwoski[2], A. Nair[1], S. Raghunath[2], S. Rajagopalan[2], S. Walsh[1], A. Wells[1], D. Hansell[1]; [1]*London/UK*, [2]*Rochester, MN/US (akelajacob@gmail.com)*

Purpose: Most predictors of disease progression in IPF are constrained by measurement variation. The prognostic ability of computer-based analysis of serial CTs was compared to visual serial CT evaluation and relative FVC change.
Methods and Materials: Serial volumetric CT imaging performed within 6-24 months in 82 IPF patients were analysed by a computer algorithm (CALIPER) developed at the Biomedical Imaging Resource, Mayo Clinic, Rochester, USA. Visual analysis was performed by two experienced sub-specialty thoracic radiologists. CT parenchymal patterns analysed included change in emphysema, honeycombing, reticulation, ground glass opacities, visual traction bronchiectasis and CALIPER-derived pulmonary vessel volume (PVV). Univariate and multivariate Cox proportional hazards analysis separately evaluated change in CALIPER and visual CT variables. A final combined multivariate mortality model evaluated CALIPER and visual CT variables with relative FVC change added to the final model.
Results: Univariate analysis: CALIPER predictors of mortality included change in ground glass opacities (p=0.001), reticulation (p=0.002), honeycombing (p=0.03), interstitial lung disease (ILD) extent (p=0.0002) and PVV ($p < 0.0001$). Visual predictors of mortality included change in honeycombing (p=0.04), ILD extent (p=0.0004) and traction bronchiectasis ($p < 0.0001$). Relative FVC change was strongly predictive of mortality (p=0.0003). Two independent predictors of mortality were identified on combined multivariate Cox analysis of CALIPER and visual scores: CALIPER honeycombing (p=0.02) and PVV ($p < 0.0001$). Importantly, relative FVC change did not retain significance in the model (p=0.682).
Conclusion: CALIPER variables, particularly PVV change are stronger predictors of mortality than relative FVC change, and require further evaluation for their clinical utility and as endpoints in drug trials.

B-0588 11:34

Impact of different types and levels of iterative reconstructions on emphysema quantification by computed tomography scanner

S.P. Martin, J. Gariani, A.-L. Hachulla-Lemaire, D. Adler, W. Karenovics, X. Montet; *Geneva/CH (Steve.Martin@hcuge.ch)*

Purpose: To prospectively evaluate the impact of iterative reconstructions (IR) as compared to filtered back projection (FBP) reconstructions on objective and subjective emphysema assessment.
Methods and Materials: The local ethics committees approved this study. Multiple level IR of 110 non-contrast thoracic computed tomography scanners (M:F ratio 11:4, mean age 62 [range, 18-92]) acquired on two different units (GE Discovery 750HD; Siemens Somatom Definition Flash) were compared to FBP reconstructions on the basis of emphysema index, lung volume and voxel densities. Objective emphysema (based on a lung density < 950 HU) assessment was performed with software provided by each manufacturer. Subjective emphysema analysis was performed as double-blinded visual assessment, based on a 5-point likert scale (0=no emphysema present, 5=emphysema present). The quantitative values were compared using repeated ANOVA analysis with a p value < 0.05 considered statistically significant. The subjective values were compared using a Kendall's W.
Results: The use of IR modified the emphysema index on both systems. Quantification goes from 3.57±0.53%(FBP) to 2.38±0.48%(IR) ($p < 0.0001$) on the GE unit and from 3.13±0.59 (FBP) to 2.00±0.58%(IR) (p0.05) on both systems. Significant differences in minimal lung density were found (FBP vs IR, p≤0.003). Subjective evaluation of emphysema reveals a good intra- and inter-observer agreement (W ≥0.77).
Conclusion: Even at the lowest levels of IR, emphysema quantification was modified, due to differences in minimum voxels density. IR does not alter visual assessment of emphysema. Hence, the use of IR technique for emphysema quantification should be strongly discouraged.

B-0589 11:42

Computed tomography quantification of emphysema with COPD module in IntelliSpace Portal7

E. De Boer, N. Warringa, L. Meijering, J. Wiersma, S. Walen, J.W.K. van den Berg, M.F. Boomsma; *Zwolle/NL (e.de.boer@isala.nl)*

Purpose: To correlate the quantitative results of degree of emphysema by the COPD module IntelliSpace Portal (ISP) 7 with ISP6 using different iterative reconstruction (IR, iDose[4]) levels. Pulmonary function testing (PFT), served as the reference.

Methods and Materials: 24 patients with COPD who received both a PFT and a low-dose chest CT in the same period were included. CT scans were reconstructed using seven different iDose levels on both the COPD modules ISP6 and ISP7. ISP7 contained an optional denoising algorithm. Percentage of emphysema calculated by the COPD module was correlated with the golden standard, using %FEV1 and FEV1/FVC.
Results: Degree of emphysema was 20% lower with ISP7 compared to ISP6. The standard deviation of mean percentage of emphysema using ISP7 and ISP6 was 0.54 and 1.4 respectively. The standard deviation for CTs without denoising on COPD module ISP7 was also 1.4. There was an excellent correlation between the percentage of emphysema and FEV1/FVC ($p < 0.001$). The best correlation between FEV1/FVC for both ISP6 and ISP7 was iDose^4 level 6. The Spearman correlation coefficient for FEV1/FVC and iDose^4 level 6 of ISP7 were -0.847 and of ISP6 -0.790.
Conclusion: This study shows that the degree of emphysema is significantly lower using ISP7 compared to ISP6. ISP7 results in quantifying emphysema were more consistent compared to ISP6 for al iDose^4 levels. The best correlation with the gold standard is iDose^4 level 6. Caution should be taken in quantifying emphysema using computed tomography.

B-0590 11:50

Is spectral separation improved with the third-generation of dual-source CT systems?

M. Remy-Jardin, C. Bortolotto, S. Khung, J.-B. Faivre, A. Duhamel, J. Rémy;
Lille/FR (martine.remy@chru-lille.fr)

Purpose: To compare the image quality of dual-energy lung perfusion images obtained with a second- and third-generation dual-source CT (DSCT) system.
Methods and Materials: The population was composed of 25 patients fulfilling the following criteria: (a) an initial (T0) and a follow-up (T1) CT angiographic examinations obtained with a second- then a third-generation DSCT system; (b) no change in body weight (±3 kg) nor severity of the underlying disease between T0 and T1; (c) similar scanning protocols at the exception of the voltage combination at T0 (80 kV/300 mAs and 140 kV with 0.4 mm tin pre-filtration [Sn]/100 mAs) and T1 (80 kV/ 207 mAs and 150 kV with 0.6 mm tin pre-filtration/15 mAs); (d) similar injection protocols.
Results: Compared to T0, T1 perfusion images showed: (a) a higher mean level of attenuation within pulmonary microcirculation (43.05±14.5 HU vs 34.76 ±9.27 HU; p=0.02); (b) a higher gradient of attenuation between areas of normal perfusion and hypoperfused areas (36.28 ± 14.04 HU versus 26.06 ± 12.99 HU; $p < 0.0001$); (c) a greater score of fissure visibility ($p < 0.0001$). At T1 (a) the mean score of beam-hardening artifacts was higher (1.29 ±0.52 vs 0.84 ± 0.52; p=0.0002), without altering perfusion analysis in the upper lobes (p=0.65); (b) a situation related to a higher speed of data acquisition and thus, a less efficient saline chaser in the caudo-cranial acquisitions. The DLP was significantly lower at T1 (302.2 ±41.2 mGy.cm) compared to T0 (387.3 ± 49.1 mGy.cm)($p < 0.0001$).
Conclusion: Lung perfusion imaging was significantly improved with the third-generation DSCT system.

14:00 - 15:30 **Room B**

Abdominal Viscera

SS 701a

Functional imaging of liver and spleen

Moderators:
P. Leander; Malmö/SE
A. Wibmer; Vienna/AT

B-0591 14:00

Diffusion-weighted imaging (DWI) of the liver in assessing chronic liver disease: effects of the fat and iron deposition on apparent diffusion coefficient (ADC) values

A. Kahraman, B. Kahraman, Z. Ozdemir, C. Gormeli, N. Sahin, S. Yilmaz;
Malatya/TR (mdasagir2003@hotmail.com)

Purpose: This study was designed to evaluate whether fat and iron affect the apparent diffusion coefficient (ADC) values of liver in the settings of fibrosis and inflammation.
Methods and Materials: The diffusion-weighted images (DWI) of 58 patients with chronic liver disease who underwent concomitant liver biopsy or transplantation and 48 control subjects were evaluated. Liver specimens were scored for fibrosis and necroinflammation and graded for hepatic iron and steatosis. Liver, spleen and normalized liver ADC (defined as the ratio of the liver ADC to spleen ADC) values were analysed between control group and patient groups stratified by either fibrosis stages or HAI scores. Afterwards, histopathological findings were examined between patient groups and the relationship between ADC values and histopathological findings were analysed with multiple linear regression analysis.
Results: The median liver and normalized liver ADC values were significantly lower in higher stages of fibrosis and HAI scores. Compared to control group, patients with highest stages of fibrosis and inflammation had significantly higher spleen ADCs. The effects of fibrosis stages on liver ADC and normalized liver ADC values were significant in group 1 stratified by HAI scores, whereas degree of steatosis and iron grade had no effect on these ADC values.
Conclusion: ADC values are useful for the diagnosing and distinguishing both later stages of liver fibrosis and inflammation. There is no significant effect of fat and iron on ADC values. Therefore, even in patients with fat or iron, DWI may be reliable to evaluate fibrosis stage and HAI score.

B-0592 14:08

The ADC value of focal solid liver lesions: does it depend on tumour cellularity?

K.K. Lomovtseva, A. Glotov, D. Babaeva, D. Kalinin, G. Karmazanovsky;
Moscow/RU (karmazanovsky@yandex.ru)

Purpose: To evaluate the correlation between apparent diffusion coefficient (ADC) and cellularity in focal solid liver lesions.
Methods and Materials: Diffusion-weighted imaging (DWI) of 24 patients who underwent surgeries was retrospectively evaluated. The ADC of the focal solid liver lesions was manually calculated with two b values (b=0, 600 s/mm^2) using the following equation: ADC=(ln (SI0/SI600))/(b600-b0). Tumour cellularity was quantitatively assessed on haematoxylin-eosin-stained tumour specimens. Five representative digitised high-power fields at x400 magnification were taken from the original microscopic images. The number of tumour cells nuclei was manually counted using a computer programme ImageJ. Tumour cellularity was taken as a sum of all calculated tumour cells. Total estimated tumour area was 0.0935 mm^2. The Pearson correlation was performed to evaluate the relationships between ADC values and tumour cellularity.
Results: 24 focal solid liver lesions were evaluated. Amongst them there were 16 malignant (8 hepatocellular carcinomas, 8 colorectal metastases) and 8 benign (6 focal nodular hyperplasias, 2 hepatocellular adenomas) lesions. Benign solid lesions were characterised by less cellularity (mean value 994) than malignant solid lesions (mean value 1669) with statistical significance ($p < 0.01$). There was a significant inverse correlation between ADC values of focal solid liver lesions and tumour cellularity ($r=-0.495$, $p < 0.05$).
Conclusion: There is a significant inverse correlation between the ADC of focal solid liver lesions and tumour cellularity.

B-0593 14:16

A step towards scan time minimisation: simultaneous multislice-accelerated diffusion-weighted imaging of the liver

J. Taron[1], P. Martirosian[1], M. Erb[1], T. Kuestner[2], J. Weiss[1],
M. Notohamiprodjo[1], N. Schwenzer[1], K. Nikolaou[1], C. Schraml[1]; [1]*Tübingen/DE*, [2]*Stuttgart/DE (taronjana@yahoo.com)*

Purpose: To investigate the influence of different gradient preparation schemes and acceleration factors on acqusition time, image quality and quantitative parameters of simultaneous multislice-accelerated diffusion-weighted imaging of the liver in comparison to conventional sequences.
Methods and Materials: Respiratory-triggered simultaneous multislice diffusion-weighted imaging (sms-DWI) of the liver was performed at 1.5 T in ten healthy volunteers using a monopolar (MP) versus a bipolar (BP) gradient preparation with an sms-acceleration factor (AF) of 2 and 3 and compared to conventional diffusion-weighted images (c-DWI). Qualitative image analysis was carried out by two independent readers. Signal-to-noise ratios (SNR) and apparent diffusion coefficient (ADC) values were measured in a region-of-interest analysis. Total scan time was measured. The Kruskal-Wallis test followed by Steel-Dwass comparisons was executed for statistical analysis with p-values < 0.05 considered significant.
Results: Image quality in sms-DWI with AF2 was equivalenty high compared to c-DWI, with a reduction of scan time by 67%. AF3 resulted in only minor additional scan time reduction (by 69%) but was associated with a statistically significant deterioration of image quality. ADC values in sms-DWI were lower, SNR was higher as compared to c-DWI. Image quality was slightly higher using the MP diffusion preparation in sms-DWI and c-DWI.
Conclusion: Sms-DWI with an AF of 2 is a promising approach for scan time minimization while maintaining high image quality in DWI of the liver. The diffusion preparation did not significantly influence image quality in sms-DWI. The lower ADC values in sms-DWI should be considered in diagnostic reading studies.

B-0594 14:24

Diffusion weighted imaging of upper abdominal organs in different time points: value of normalisation using spleen as a reference organ

J. Song, J. Byon, E. Kim; *Jeonju/KR (pichgo@gmail.com)*

Purpose: To compare the apparent diffusion coefficient (ADC) of upper abdominal organs acquired at different time points and to investigate the usefulness of normalisation.
Methods and Materials: We retrospectively evaluated 75 patients who underwent magnetic resonance (MR) imaging of the upper abdomen for 3 times. 11 patients were excluded because of innumerable hepatic mass (n = 4), severe susceptibility artifact (n = 5), atrophic change of both kidneys (n = 1) or pancreatitis (n = 1). Finally, 64 patients (46 men, 18 women; mean age, 62.1 years) were enrolled in this study. MR examinations were performed using three different 3.0-T and one 1.5-T systems. ADC values of the right liver lobe, left liver lobe, spleen, pancreas, right kidney and left kidney from three different time points were measured and analysed. ADC values of the spleen were used for normalisation. Intraclass correlation coefficients (ICC) and comparison of dependent ICC was used to compare ADC values with and without normalisation.
Results: Fifty four patients (84%) had liver cirrhosis. ICC of non-normalised ADC showed slight or fair agreement, while normalised ADC showed moderate to substantial agreement. ICC of normalised ADC of all anatomical regions showed less degree of variability compared with non-normalised ADC ($p < 0.05$).
Conclusion: Normalised ADC using spleen as a reference organ significantly decreased variability in ADC measurement of the upper abdominal organs in different MR systems and could be used as an imaging biomarker for future multi-center longitudinal studies.

B-0595 14:32

Biexponential model of intravoxel incoherent motion MRI in evaluation of the hepatic warm ischemia reperfusion injury: A preliminary experimental study in a rabbit model

Q. Ji, Z.-Q. Chu; *Tianjin/CN (jiqianq@aliyun.com)*

Purpose: To explore the characteristics and diagnostic value of intravoxel incoherent motion (IVIM) in hepatic warm ischemia reperfusion injury (WIRI) in rabbits.
Methods and Materials: Hepatic WIRI was induced in rabbit by occluding hepatic inflow for 30 minutes and reperfusion for 6 hours. 10 test and 10 control rabbits were involved and underwent IVIM imaging. Four diffusivity indices were calculated with 11 b-values: ADC, pure molecular diffusion (Dslow), perfusion-related diffusion (Dfast) and perfusion fraction (PF). Rabbits were sacrificed for biochemical ananlysis (ALT, AST, LDH, MDA, MPO, SOD) and histomorphology. In vivo ADC and IVIM parameters were compared between the two groups, and matched with biochemical parameters. The receiver operating characteristic (ROC) curves were used to determine their diagnostic accuracy.
Results: ADC, Dslow, Dfast, and PF were significantly higher in control group than in test group ($P < 0.01$). For biochemical ananlysis, ALT, AST, LDH, MDA, and MPO were higher, while SOD was lower in control group than in test group ($P < 0.01$). Histopathological analysis showed diffuse hepatocyte swelling, the central vein and sinusoids congestion, inflammatory cell infiltration in test group. Mostly MR parameters corresponded well with postmortem outcomes ($P < 0.05$).The AUC of ADC, Dslow, Dfast, and PF was 0.895, 0.865, 0.970, and 1.000, respectively, there was no statistically significant difference between them.
Conclusion: IVIM imaging is a noninvasive and valuable technique in assessing the pathophysiologic changes of hepatic WIRI in a rabbit model, which implies its further application for early detection and dynamic monitoring of hepatic WIRI, and preclinical assessment of new pharmaceutics.

B-0596 14:40

The characteristics for metabolism and diffusion in various hepatic masses: a preliminary study

E. Kong, I. Cho; *Daegu/KR (kongej@yu.ac.kr)*

Purpose: The purpose of this study was to evaluate the relationships between metabolism and cellularity of various hepatic mass using integrated PET/MRI system with 18 F-FDG.
Methods and Materials: Forty-one patients (63±13 y-o, 31 male) with hepatic mass [18 hepatocellular carcinomas (HCC), 6 cholangiocarcinomas (CCC), 10 metastatic tumours, 1 neuroendocrine malignancy and 6 benign lesions] underwent 18 F-FDG PET/MRI before treatment. Maximum standard uptake values (SUVmax) from 18 F-FDG PET and apparent diffusion coefficient (ADC) from diffusion weighted image were obtained for the tumour and their relationships were examined by Pearson correlation analysis. Additionally, we investigated the difference of SUVmax and ADC in each tumours by Kruskal Wallis test.
Results: SUVmax showed significant negative correlation with ADC (r = -0.404, p = 0.009). The mean of SUVmax was 5.44 (1.84-16.63) in HCC, 6.29 (3.71-8.26) in CCC, 7.36 (3.1-12.97) in metastatic tumours and 3.18 (1.5-10.18) in benign lesions. The mean of ADC was 1030.04 (737-1390) in HCC, 1285.3 (1078-1911) in CCC, 882.7 (323-1352) in metastatic tumours, and 1342.2 (1079-1629) in benign lesions. SUVmax of metastatic lesion was higher than benign lesions (p=0.023). Metastasis showed lower ADC value than CCC (p=0.038) and benign lesions (p=0.004). HCC showed lower ADC value than benign lesion with a suggestive trend (p=0.006).
Conclusion: Our results indicate that ADC is inversely correlated with SUVmax in hepatic tumour, and each tumour group has different characteristics in metabolism and cellularity. The evaluation of hepatic masses by PET/MRI could be helpful in understanding tumour characteristics and differential diagnosis.

B-0597 14:48

The value of Gadoxetic acid-enhanced and diffusion-weighted MR imaging for distinguishing benign and malignant splenic masses

S.-Y. Choi[1], S. Kim[2], K. Jang[2], T. Kang[2], K. Song[2], J. Moon[2]; [1]*Bucheon/KR*, [2]*Seoul/KR (chuisiran@naver.com)*

Purpose: To assess the value of gadoxetic acid-enhanced and DW MR imaging for differentiating malignant from benign splenic lesions.
Methods and Materials: Retrospective study included 51 patients with 35 benign and 16 malignant focal splenic lesions. All patients underwent gadoxetic acid-enhanced and DW MR imaging. Two radiologists evaluated MR images in consensus. Significant imaging findings on univariate and multivariate analyses were identified and their diagnostic performance for predicting malignant splenic lesion was analysed. Using ROC analysis, optimal ADC cut-off value corresponding to maximal Youden's index (*J*) for differentiating two groups was determined.
Results: In univariate analysis, low SI on arterial, portal, and 3 minute-delayed phase images, high or iso SI on DW image, iso or low SI on ADC map, the presence of diffusion restriction, and arterial hypovascularity with progressive enhancement pattern were more frequently observed ($P < 0.05$) in malignant splenic lesions. ADC value was significantly lower for malignancy than benignancy (0.78 ± 0.24 versus $1.16 \pm 0.53 \times 10^{-3}$ mm^2/s, $P < 0.001$). Optimal cut-off ADC value for differentiating two groups was 0.995×10^{-3} mm^2/s. In multivariate analysis, findings that differentiated malignant from benign splenic lesions were low SI on 3 minute-delayed phase image (OR, 27.68; $P = 0.006$) and presence of diffusion restriction (OR, 48.01; $P = 0.002$).When two of these criteria were combined, 12 (75.0%) of 16 malignant splenic masses were identified with a specificity of 100%.
Conclusion: Gadoxetic acid-enhanced and DW MR imaging may be helpful for differentiating malignant from benign splenic lesions.

B-0598 14:56

Role of apparent diffusion coefficient values using 3 T magnetic resonance imaging in differentiation of hepatic alveolar echinococcosis from primary hepatic tumours

H. Ogul[1], L. Karaca[1], R. Sade[1], M. Kantarci[1], U. Bayraktutan[1], B. Gündogdu[1], N. Karabulut[2], Y. Akyuz[3], M. Turkeli[1]; [1]*Erzurum/TR*, [2]*Denizli/TR*, [3]*Yozgat/TR (drhogul@gmail.com)*

Purpose: To identify the added value of diffusion-weighted magnetic resonance imaging (DW MRI) in the distinction of alveolar echinococcosis (AE) in the liver and evaluate the potential role of apparent diffusion coefficient (ADC) values in characterisation of hepatic AE lesions comparing with most common primary hepatic tumours that are hepatocellular carcinoma (HCC) and cholangiocellular carcinoma (CCC).
Methods and Materials: In our study, we included 49 patients with 57 surgically and histologically proven hepatic AE lesions, 50 patients with 61 histologically proven HCC and 50 patients with 54 histologically proven intrahepatic CCC lesions as a control group, and evaluated with DW MRI using b values of 50, 400 and 800 sec/mm², in addition to conventional MRI sequences. Two radiologists jointly evaluated the following lesion characteristics: size, location, presence of cystic and/or solid components, T1- and T2-weighted MRI characteristics and the patterns of lesion contrast enhancement were recorded. The total ADC values were measured in each lesion and compared with control group.
Results: The solid areas of hepatic AE lesions had mean 1.48±0.41 x 10-3 mm2/s ADC values. The solid areas of hepatic AE lesions higher ADC values as compared with the solid areas of the CCC lesions (mean, $1.05 \pm 0.22 \times 10-3$ mm2/s) and HCC lesions (mean, 0.99±0.29 x 10-3 mm2/s) ($p < 0.05$).
Conclusion: DW MRI could play a complementary role to conventional MRI in the accurate identification and distinction of hepatic AE lesions.

B-0599 15:04

Spectral CT combined with contrast-enhanced ultrasonography (CEUS) in evaluation on the blood perfusion and the correlation with angiogenesis of rabbit VX2 liver tumour

M. Wang, J. Gao; *Zhengzhou/CN (wangmingyue.xxmu@163.com)*

Purpose: To observe the value of Spectral CT combined with contrast-enhanced ultrasonography (CEUS) in evaluation on the blood perfusion and the correlation with angiogenesis of rabbit VX2 liver tumour.
Methods and Materials: 24 VX2 liver tumour models were performed Spectral CT and CEUS 14 days after VX2 tumours inoculated. The tumour and the surrounding liver parenchyma without tumour were defined as the regions of interest (ROIs).The iodine content in artery and portal venous phase (Ia and Ip) was obtained in the Spectral CT. The arterial iodine fraction (AIF) was calculated as AIF=Ia/Ip. The ascent slope (AS), ascent time (AT), time to peak (TTP), peak intensity (PI) and area under curve (AUC) were obtained in CEUS. MVD in tumour was assessed immunohistochemically, and the correlation between MVD with AIF and CEUS parameters were analysed.
Results: The AIF in tumour was significantly higher than that in surrounding liver parenchyma (0.6377±0.07579 vs 0.2563±0.05212, $p < 0.01$).There was positive correlation between MVD and AIF ($r=0.901$, $p < 0.05$). The AT and TTP of tumours were earlier than those of the surrounding liver parenchyma (10.824±4.16405 vs 16.0840±4.54021, $p < 0.05$; 20.0960±6.34394 vs 28.9140±6.22363, $p < 0.05$). There were significant different of AS, PI and AUC between tumour and surrounding liver parenchyma (1.1860±0.52757 vs 0.7020±0.45510, $p < 0.05$; 14.1180±1.57937 vs 12.5520±5.20394, $p < 0.05$; 1.1860±0.52757 vs 0.7020±0.45510, $p < 0.05$). There was positive correlation between MVD and PI ($r=0.606$, $p < 0.05$) and AS ($r=0.874$, $p < 0.05$). And there was negative correlation between MVD and TTP ($r=-0.796$, $p < 0.05$).
Conclusion: Spectral CT combined with CEUS can quantitatively reflect the perfusion characteristics and distribution of rabbit liver VX2 tumours, which may indirectly reflect the level of MVD and therefore to evaluating tumour angiogenesis.

B-0600 15:12

Spectral CT combined with dynamic contrast-enhanced magnetic resonance imaging in evaluation on the blood perfusion and the correlation with angiogenesis of rabbit VX2 liver tumour

M. Wang, J. Gao; *Zhengzhou/CN (wangmingyue.xxmu@163.com)*

Purpose: To observe the value of Spectral CT combined with Dynamic Contrast-enhanced Magnetic Resonance Imaging (DCE-MRI) in evaluation on the blood perfusion and the correlation with angiogenesis of rabbit VX2 liver tumour
Methods and Materials: 24 VX2 liver tumour models were performed Spectral CT and DCE-MRI 14 days after VX2 tumours inoculated. The tumour and the surrounding liver parenchyma without tumour were defined as the regions of interest (ROIs). The iodine content in artery and portal venous phase (Ia and Ip) were obtained in the Spectral CT. The arterial iodine fraction (AIF) were calculated as AIF=Ia/Ip. The Maximum slope of Increase (MSI),Maximum slope of Decrease (MSD),Positive Enhancement Integral (PEI) and Time to Peak (TP) were obtained in DCE-MRI. MVD in tumour were assessed immunohistoehemically, and the correlation between MVD with AIF and DCE-MRI parameters were analysed
Results: The AIF in tumour was significantly higher than that in surrounding liver (0.6377±0.07579 vs 0.2563±0.05212,$p < 0.01$).There was positive correlation between MVD and AIF ($r=0.901$,$p < 0.05$).The TP of tumours were earlier than that of the surrounding liver parenchyma (78.66±16.70 vs 103.18±17.54,$p < 0.05$).There were significant different of MSI,MSD and PEI between tumour and surrounding liver parenchyma (943.26±165.75 vs 641.83±154.52, $p < 0.05$; 926.49±132.99 vs 610.99±179.70, $p < 0.05$; 860.95±87.73 vs 603.93±109.80 $p < 0.05$).There was positive correlation between MVD and MSI ($r=0.800$,$p < 0.05$) and PEI ($r=0.833$,$p < 0.05$)
Conclusion: Spectral CT combine with DCE-MRI can quantitatively reflect the perfusion characteristics and distribution of rabbit liver VX2 tumours, which may indirectly reflect the level of MVD and therefore to evaluating tumour angiogenesis

B-0601 15:20

Unexpected increase of apparent diffusion coefficient (ADC) value in conversion from regenerative nodule/degenerative nodule (RN/DN) to hepatocellular carcinoma (HCC)

J. Kim, C. Lee, Y. Park, J. Lee, J. Choi, K. Kim, C. Park, H. Lee; *Seoul/KR (pridebio@naver.com)*

Purpose: Lower ADC value is considered more characteristic of malignancy reflecting increased cellularity. However, we came across HCC converted from RN/DN showing unexpected ADC value increase ("atypical" HCC). The purposes of our study were to investigate incidence of "atypical" HCC, and to identify imaging features that can differentiate "atypical" HCC from "typical" HCC.
Methods and Materials: This retrospective study was approved by our institutional review board and the requirement for informed consent was waived. 42 HCCs converted from RN/DNs in 36 patients who underwent at least two serial Gd-EOB-DTPA-enhanced liver MRIs were included. ADC values were measured in RN/DN and HCC on serial MRIs before and after conversion. HCCs were classified into two groups, "atypical" HCC with ADC value increase and "typical" HCC with ADC value decrease. We identified 6 "atypical" HCCs. 12 "typical" HCCs were matched with "atypical" HCCs for tumour size. Signal intensity (SI) on preenhanced T1- and T2-weighted images, SI ratios of arterial phase and hepatobiliary phase were evaluated and compared between two groups.
Results: Incidence of "atypical" HCC was 14.29%(6/42) in our study. Mean differences of ADC values before and after conversion were 0.190 and -0.297 (×10-3 mm2/sec) in "atypical" and "typical" HCCs, respectively ($p < 0.0001$). Among MR imaging features, iso- or hyperintensity on preenhanced T1-weighted imaging was more frequent in "atypical" HCCs than in "typical" HCCs (66.7% vs. 8.3%, p=0.022).
Conclusion: Incidence of HCCs converted from RN/DN showing unexpected ADC value increase was approximately 14%. These "atypical" HCCs were more likely iso- or hyperintense on preenhanced T1-weighted image than "typical" HCCs.

14:00 - 15:30 **Room C**

Breast

SS 702

Breast MRI-DWI (1)

Moderators:
F. Pediconi; Rome/IT
F. Thibault; Paris/FR

B-0602 14:00

Diffusion tensor imaging (DTI) is an accurate and solid imaging biomarker for early response evaluation to neoadjuvant chemotheraphy

E. Garcia Oliver[1], J. Camps Herrero[1], M. Forment Navarro[1], V. Ricart Selma[1], E. Furman-Haran[2], N. Nissan[2], H. Degani[2]; [1]*Alzira/ES*, [2]*Rehovot/IL (elegarol@gmail.com)*

Purpose: To evaluate the usefulness of DTI in early response evaluation. To our knowledge, this is the first research project to do so.
Methods and Materials: 20 consecutive patients with 26 lesions treated with neoadjuvant chemotherapy were studied with DTI (spatial resolution 2.5 mm, b values 0 and 700 and 15 directions) in a 1.5-T Intera Achieva Philips MRI after two cycles of anthracyclines. Image analysis was performed with Dr. DTI software (Weizmann Institute, Israel). Parametric maps of lambda 1 were evaluated (1) qualitatively for response estimation using colour-coded pixels and (2) quantitatively using ROIs and calculating percentage of change in lambda 1 and ADC values pre- and post-treatment. These findings were correlated with UICC response criteria and Miller&Payne pathologic evaluation criteria were used as the gold standard.
Results: Qualitative analysis with lambda 1 maps predicted absence or presence of response in 23/26 lesions (88%) and in 18/20 patients (90%) and exact type of response (partial major, minor, no response) in 19/26 lesions (73%) and in 15/20 patients (75%). Quantitative analysis predicted absence or presence of response in 23/26 lesions (88%) and exact type of response (partial major, minor, no response) in 9/26 lesions (34.6%).
Conclusion: DTI can predict early presence or absence response to neoadjuvant chemotherapy as well as type of response with a high degree of accuracy using qualitative and quantitative lambda 1 maps. DTI is a solid surrogate imaging biomarker for response and can be used to take early go/no go decisions in oncological patients.

B-0603 14:08

Microstructural environment analysis of breast lesions with diffusion kurtosis imaging

L. Nogueira[1], F. Borlinhas[2], S. Brandão[3], R.G. Nunes[2], J. Loureiro[3], I. Ramos[3], H.A. Ferreira[2]; [1]*Vila Nova de Gaia/PT*, [2]*Lisbon/PT*, [3]*Porto/PT (mlpnogueira@gmail.com)*

Purpose: To evaluate diffusion kurtosis imaging (DKI), namely the mean kurtosis (MK) parameter in breast lesion differentiation and characterisation.
Methods and Materials: Images were acquired in 3 Tscanner with 8 b-values (50-3000 s/mm2) before contrast injection, using a SS-SE-EPI sequence. Signal intensity was measured for each lesion and fitted with the DKI model using the Levenberg-Marquardt algorithm in MATLAB (Mathworks, Inc). MK

was calculated by lesion histological type and differences evaluated using the Mann-Whitney test.
Results: 43 benign and 83 malignant lesions were studied. Mean±standard deviation, [minimum-maximum] MK values were: 7 ductal carcinoma in situ (DCIS) 0.59±0.17 [0.39-0.86], 44 invasive ductal carcinoma (IDC) 0.75±0.20 [0.33-1.06], 4 lobular carcinoma in situ (LCIS) 0.72±0.13 [0.56-0.84], 19 invasive lobular carcinoma (ILC) 0.67±0.28 [0.28-1.43], 22 fibroadenoma (FA) 0.41±0.15 [0.04-0.65], 3 epithelial proliferative lesion (EPL) 0.47±0.01 [0.46-0.48], 3 papilloma (PA) 0.56±0.09 [0.50-0.67], 2 hamartoma (HA) 0.56±0.01 [0.55-0.57], 13 other benign (OB) 0.47±0.14 [0.29-0.67] and 9 other malignant (OM) 0.73±0.25 [0.35-1.19]. MK values differed between benign and malignant lesions ($p < 0.001$), DCIS vs FA ($p < 0.05$); IDC vs FA ($p < 0.001$); IDC vs EPL ($p < 0.01$); IDC vs PA ($p < 0.05$); IDC vs OB ($p < 0.001$); LCIS vs FA (0.001); LCIS vs OB ($p < 0.05$); ILC vs FA ($p < 0.001$); ILC vs OB ($p < 0.05$) and FA vs OM ($p < 0.01$). Significant differences were found comparing malignant lesion histological subtypes: IDC vs DCIS ($p < 0.05$) and IDC vs ILC ($p < 0.05$).
Conclusion: MK evidenced differences between benign and malignant breast lesions and within histological subtypes, reflecting distinctive microstructural environments; this type of measurement could improve lesion differentiation and characterisation.

B-0604 14:16

Apparent diffusion coefficient values of breast cancer and normal breast tissue in diffusion-weighted imaging: effects of the menstrual cycle and menopausal status

J. Kim, H. Kang; *Busan/KR (youdosa@naver.com)*

Purpose: To prospectively investigate whether apparent diffusion coefficient (ADC) values of breast cancer and normal fibroglandular tissue vary with the menstrual cycle and menopausal status.
Methods and Materials: Fifty-seven women (29 premenopausal and 28 postmenopausal) with newly diagnosed breast cancer underwent diffusion-weighted imaging twice (interval 12-21 days) before surgery. Two radiologists independently measured ADC values of breast tumour and normal contralateral breast tissue and the differences according to the phases of the menstrual cycle and menopausal status were evaluated.
Results: The ADC values of normal fibroglandular tissue were significantly lower in postmenopausal than in premenopausal women (1.599×10^{-3} *vs.* 1.754×10^{-3} mm^2/s; $P = 0.041$). In premenopausal women, the ADC values of either breast cancer or fibroglandular tissue did not differ significantly between proliferative and secretory phases ($P = 0.969$ and $P = 0.202$, respectively). In postmenopausal women, no differences were noted in the measured ADC values between two time intervals ($P = 0.983$ and $P = 0.961$, respectively). The within-subject variability in ADC values, as expressed by the coefficient of variation (CV), was relatively small. In the respective premenopausal and postmenopausal women, the mean CV was 2.9% and 3.4% for tumour ADC, and 4.3% and 2.5% for fibroglandular tissue ADC. The intra- and interobserver agreement was excellent for all ADC measurements, with intraclass correlation coefficient ranging from 0.897 to 0.979.
Conclusion: The ADC values of breast cancer and normal fibroglandular tissue are not affected by changes in the menstrual cycle and the ADC measurements are highly reproducible within and across observers.

B-0605 14:24

DCIS (ductal carcinoma in situ) in breast MRI: comparison of diffusion-weighted imaging findings in pure DCIS and in DCIS with associated invasive cancer or microinvasion

S. Bednarova, I. Bednarova, P. d'Angelo, A. Linda, R. Girometti, C. Zuiani, M. Bazzocchi; *Udine/IT (sandra.bednarova@gmail.com)*

Purpose: To compare apparent diffusion coefficient (ADC) values from pure DCIS (p-DCIS) and from DCIS associated with invasive cancer or microinvasion (i-DCIS) in the preoperative evaluation of patients with histologically proven DCIS.
Methods and Materials: From January 2013 to January 2015, we retrospectively reviewed 110 patients (age, 36-80 years) with histologically proven DCIS on surgical specimen who underwent MR examination (1.5 T). Forty-one lesions were detectable at MRI (19/41 p-DCIS, 22/41 i-DCIS). DWI and ADC maps were acquired using b-values of 0 and 800 s/mm2 and reviewed by two experienced radiologists in consensus for both groups. Collected data were evaluated by means of descriptive statistics. For statistical analysis, unpaired t-test was performed in order to compare ADC values in the two groups ($p < 0.05$ was considered significant).
Results: The mean ADC of normal breast tissue was (1.68±0.31) x 10 (-3) mm (2)/s. When comparing p-DCIS and i-DCIS we found ADC values of (1.02±0.28) x 10 (-3)mm (2)/s and (0.90±0.24) x 10 (-3) mm (2)/s respectively and this difference was was at a statistically significant level ($p < 0.05$).
Conclusion: We found statistically significant difference in ADC values between p-DCIS and i-DCIS. The combination of DWI and DCE-MRI might represent a promising and readily available imaging method in the differential diagnosis between pure DCIS and DCIS with associated invasive breast cancer on pre-operative MRI evaluation.

B-0606 14:32

The usefulness of the qualitative analysis of breast lesions at high-resolution diffusion-weighted MRI as an adjunct to quantitative analysis

Y. An[1], J. Byeon[1], B. Kang[2]; [1]*Suwon/KR*, [2]*Seoul/KR (xenon58@naver.com)*

Purpose: To evaluate the usefulness of the combined use of both qualitative and quantitative analyses of high-resolution diffusion-weighted MRI (DWI) in the characterisation of breast lesions.
Methods and Materials: A total of 99 patients with 144 pathologically confirmed lesions were included in our prospective study (112 malignant and 32 benign). The DWI was acquired using readout segmented echo planar imaging (RESOLVE) at 3.0 T. DCE-MRI images were used for the reference standard. For the qualitative analysis, the morphological descriptors (lesion type, shape, margin, distribution, internal pattern) were analysed. The mean apparent diffusion coefficient (ADCmean) values were used for quantitative analysis. We evaluated statistically which DWI features were the strongest indicators of malignancy. The diagnostic performance of DWI (the qualitative or quantitative analysis alone and the both combinations) was calculated and compared with it of DCE-MRI.
Results: The round/irregular shape, irregular/spiculated margin, linear/segmental distribution and heterogeneous/rim sign, ADC value equal or smaller than 1.0 x 10-3 mm2/sec were significantly correlated to the malignancy. The heterogeneous pattern (P= 0.005) and ADC value ≤1.0 x 10-3 mm2/sec (P= 0.002) were the DWI features to be the strongest indicators of malignancy. The area under the curve (AUC) values for DWI using (1) the qualitative analysis alone, (2) the quantitative analysis alone, and (3) the both combination and (4) DCE-MRI were 0.75, 0.80, 0.84, and 0.89, respectively ($P < 0.0001$).
Conclusion: The combined use of both qualitative and quantitative analyses on high-resolution DWI showed comparable diagnostic performance compared to it of DCE-MRI.

B-0607 14:40

Role of diffusion weighted imaging with background suppresion in early detection of breast cancer in young patients

K.E. Allam; *Cairo/EG (keallam@yahoo.com)*

Purpose: To evaluate the Role of Diffusion Weighted imaging With Background Suppression DWIBS in early detection of breast cancer in young patients with dense breasts by allowing acquisition of volumetric diffusion-weighted images.
Methods and Materials: 40 women (range, 20-35 years) are included, who had suspicious screening mammograms and an indication for biopsy, from November 2013 to August 2015. Before biopsy, full diagnostic contrast-enhanced MR imaging was performed that included DWIBS (b = 1500 sec/mm2). Two abbreviated protocols (APs) based on MIPs were evaluated regarding the potential to exclude malignancy: DWIBS (AP1) and subtraction images from the first postcontrast and the unenhanced series (AP2).
Results: Twenty of 40 participants had a breast carcinoma. With AP1 (DWIBS), the sensitivity was 0.90, the specificity was 0.92, the negative predictive value (NPV) was 0.90, and the positive predictive value (PPV) was 0.91. The mean reading time was 35 seconds. With the AP2 protocol, the sensitivity was 0.8, the specificity was 0.85, the NPV was 0.82, and the mean reading time was 34 seconds.
Conclusion: Unenhanced diagnostic MR imaging (DWIBS mammography), with an NPV of 0.90 and an acquisition time of less than 8 minutes, could help early detection of malignancy in young patients with dense breasts, and also to exclude malignancy with suspicious x-ray screening mammograms. The method can be used as a complement after the regular screening procedure to reduce unnecessary invasive procedures and emotional distress for breast cancer screening participants.

B-0608 14:48

Predicting tumour proliferation and aggressiveness with breast MRI: role of quantitative diffusion-weighted imaging (DWI)

G. Cristel, A. Damascelli, C. Losio, E. Schiani, M. Panzeri, M. Rodighiero, P. Panizza, F. De Cobelli, A. Del Maschio; *Milan/IT (cristel.giulia@hsr.it)*

Purpose: To assess whether apparent diffusion coefficient (ADC) provided by diffusion-weighted imaging (DWI) correlates with the proliferation index (Ki-67) and the biological features in breast cancer.
Methods and Materials: One-hundred-and-sixty-one patients with breast cancer underwent locoregional staging with breast MRI at 1.5 T. The protocol included T2-TSE sequences, DWI (b-values:0.900s/mm2) and dynamic study. For each lesion, the mean ADC value was quantified and compared with

histological type, grade, proliferation index (dividing the tumours in low proliferating [Ki-67< 20%] or high proliferating [Ki-67≥20%]) and receptor expression (oestrogen and progestin receptor, HER-2). Based on these features, the lesions were classified as Luminal-A (LumA), Luminal-B (LumB), HER2-enriched (Her+) and triple-negative (TN). Data were analysed using the Student t-test, one-way ANOVA test and Pearson correlation coefficient.
Results: MRI detected 223 malignant lesions, confirmed by histological analysis (158 invasive ductal, 32 invasive lobular, 9 tubular and 1 mucinous carcinomas, 22 ductal and 1 lobular in situ carcinomas). There was a statistically significant difference in mean ADC values among the various histotypes, with invasive ductal and lobular carcinomas showing a lower ADC ($p < 0.001$). The mean ADC value was significantly lower in high-proliferating (0.90x10-3 mm2/s, n=78) than low-proliferating (0.99x10-3 mm2/s, n=87) tumours ($p < 0.001$). Moreover, there was a significant inverse correlation between mean ADC and Ki-67 values ($p < 0.001$). A significant difference in mean ADC was found among the immunohistochemical subtypes (48LumA, 91LumB, 12Her+, 14TN,$p < 0.001$), with more aggressive tumours showing a lower ADC, (p=0.013).
Conclusion: ADC is a promising non invasive prognostic quantitative parameter associated with proliferation index and tumour aggressiveness.

B-0609 14:56

Inter-observer agreement of semi-automated quantitative lesion analysis in breast diffusion-weighted imaging

H. Dijkstra[1], M.D. Dorrius[1], M. Wielema[1], K. Jaspers[1], R.M. Pijnappel[2], M. Oudkerk[1], P.E. Sijens[1]; [1]*Groningen/NL*, [2]*Utrecht/NL (h.dijkstra01@umcg.nl)*

Purpose: To assess the agreement between multiple readers of semi-automated quantitative lesion analysis in diffusion-weighted imaging (DWI).
Methods and Materials: Hundred and twenty patients with 139 breast lesions (≥1 cm) and known pathology were prospectively examined (1.5 T) with DWI (b=0.50,200,500,800.1000 s/mm2) between November 2008 and July 2014. Three independent readers with different expert levels (an expert breast radiologist with more than 15 years experience; a radiology resident; and a radiology researcher without any experience on mammography) applied a semi-automated procedure for setting regions-of-interest for each lesion and recorded the apparent diffusion coefficient (ADC) and intravoxel incoherent modeled motion (IVIM) parameters: molecular diffusion (Dslow), microperfusion (Dfast), and the fraction of Dfast (ffast). The agreement of the lesion segmentation between the readers was tested using the Dice Similarity Coefficient (DSC). Sensitivity and specificity were calculated and compared between readers using McNemar's test.
Results: Twenty three out of the 139 lesions were benign. The agreement of the lesion segmentation was high with a median DSC ranging from 0.75 to 0.85. Sensitivity and specificity among the readers were 90.5-93.1% and 43.5-52.2% respectively for IVIM, and 94.8-95.7% and 13.0-21.7% for ADC (p≤0.0034) without inter-reader differences (p=1.000).
Conclusion: The presented semi-automated method for breast lesion evaluation is reader independent and yields significantly higher specificity for IVIM compared to the ADC.

B-0610 15:04

The additional value of ADC and IVIM in dynamic contrast-enhanced MRI of the breast

M.D. Dorrius[1], H. Dijkstra[1], M. Wielema[1], K. Jaspers[1], R.M. Pijnapel[2], M. Oudkerk[1], P.E. Sijens[1]; [1]*Groningen/NL*, [2]*Utrecht/NL (m.d.dorrius@umcg.nl)*

Purpose: To validate the feasibility of quantitative diffusion-weighted imaging (DWI) implemented after dynamic contrast-enhanced (DCE-) MRI by using semi-automated breast lesion analysis.
Methods and Materials: 139 breast mass lesions were examined with 1.5 T DCE-MRI and DWI (b=0.50,200,500,800.1000 s/mm^2) and histopathology and the BI-RADS classification were obtained. Intravoxel incoherent motion (IVIM) and apparent diffusion coefficient (ADC) were calculated for each lesion using semi-automated breast lesion analysis: only the optimal fraction (Fo) of voxels in the lesions was used. The IVIM parameters were combined in parallel to exclude malignancy based on three thresholds. The sensitivity (Se), specificity (Sp) and negative-predictive-value (NPV) between IVIM, ADC and DCE-MRI, and the combinations of IVIM or ADC following DCE-MRI were compared.
Results: Twenty-six out of the 139 breast lesions were classified as BIRADS-3 or 4. Twenty-three out of the 139 breast lesions were benign. Sp of IVIM (52.2%) was significantly higher than DCE-MRI (30.4%) (p=0.007). However, Se and NPV of IVIM (Se=92.2%; NPV=57.1%) and ADC (Se=95.7%; NPV=44.4%) were significantly lower than DCE-MRI (Se=100%; NPV=100%) (p=0.007). DCE-MRI combined with ADC (Sp=34.8%) or IVIM (Sp=43.5%) did not significantly improve specificity of DCE-MRI alone (Sp=30.4%) (p≥0.25).
Conclusion: Quantitative DWI has a lower NPV compared to DCE-MRI for evaluation of breast lesions and can therefore not replace DCE-MRI. Our data show that IVIM could improve the specificity when combined with DCE-MRI in a diagnostic algorithm, especially for BIRADS 3 and 4 lesions; this has, however, to be assessed in a larger group of patients with BIRADS 3 and 4 lesions.

B-0611 15:12

Apparent diffusion coefficient values for discriminating benign and malignant breast MRI lesions

D. Rajgopal[1], K. Bhawat[2]; [1]*Manglore/IN*, [2]*Davangere/IN (drdhruvarajgopal@gmail.com)*

Purpose: To determine the role of diffusion weighted MRI in differentiating benign and malignant mass lesion.
Methods and Materials: This study included 25 out of 100 women who presented with breast pain and had an MRI detected mass lesion. An initial ultrasound survey was performed and patients having mass lesion were subjected to MR evaluation. Diffusion-weighted images (DWI) were acquired during clinical Breast MR imaging, which included conventional sequences apart from dynamic contrast enhancement. 'b' values of 0 and 600 s/mm2 were used to acquire diffusion-weighted images. Lesion was identified on Dynamic Contrast Enhanced (DCE) MR images and Apparent-diffusion coefficient (ADC) values of all the lesions were recorded using optimal Region of interests (ROI's). Differences in ADC value of benign and malignant lesions were compared and correlated with histopathological findings.
Results: Out of 25 patients histologically proved malignant and benign breast lesions were 14 and 11 respectively. Malignant lesions included both mass lesions and non-mass like enhancement. The mean ADC value of malignant lesions (mean, 1.21 ± 0.31 x 10 -3 mm2/s) was significantly lower than Benign lesions (mean 1.9 ± 0.51 x 10 -3 mm2/s).
Conclusion: Diffusion-weighted MR evaluation of breast lesions is a relatively new concept, used in the approach of breast neoplasms. Diffusion-weighted MRI shows promising results in differentiating benign from malignant mass lesions found on dynamic contrast enhanced MR imaging.

B-0612 15:20

Role of MRI diffusion as an adjunct to contrast enhanced MRI of the breast for the evaluation of breast cancer patients receiving neoadjuvant chemotherapy

H.H.N. El Kassas, M. Helal, A. Abu Rabia, N. Abd El Razik, S. Gareer, A. Farahat, M.H. Zedan; *Cairo/EG (heba.elkasas50@gmail.com)*

Purpose: To assess the role of MRI diffusion of the breast in predicting future responders and non responders early during the course of neoadjuvant chemotherapy given to patients with locally advanced breast cancer.
Methods and Materials: Thirty five patients with locally advanced breast cancer scheduled to receive neoadjuvant chemotherapy (NAC) between January 2014 and January 2015 were enrolled in this prospective study. MRI with diffusion weighted and contrast enhanced images was performed and parameters including number, longest diameter and ADC values of lesions, were recorded at 4 stages: before starting NAC, during (after first and second cycles) and after completion of therapy. The percentage change in ADC values and tumour size before and after the two courses of NAC was then calculated. The diagnostic performance of MRI (morphological and functional imaging) in predicting early response to treatment was then compared to histopathalogical results.
Results: The percentage change in the ADC values measured before NAC and after the 1st cycle was significant, while the change in tumour diameter after the second cycle was only of border line significance. Following the first cycle of treatment, DWI had a sensitivity of 79 % and a specificity up to 95% in differentiating responders from non responders, while contrast-enhanced MR imaging had 60% and 84 % results.
Conclusion: Diffusion weighted MRI is a valuable tool in identifying early responders in patients with advanced breast cancer receiving NAC, hence selecting patients that will benefit from treatment and avoid any unnecessary toxicity to non responders.

14:00 - 15:30 **Room Z**

Vascular

SS 715

Endovascular therapies: what's new?

Moderators:
F. Fanelli; Rome/IT
D.K. Tsetis; Iraklion/GR

K-18 14:00

Keynote lecture
F. Fanelli; *Rome/IT*

B-0613 14:09

TPA immobilisation on iron oxide nanocubes and localised magnetic hyperthermia accelerate blood clot lysis
E. Vörös[1], M. Cho[2], Z. Garami[2], I. Battyáni[1], P. Decuzzi[3], K. Tóth[1]; [1]*Pecs/HU*, [2]*Houston, TX/US*, [3]*Genoa/IT (eszter.voros21@gmail.com)*

Purpose: The low specifi city and high risk of intracranial hemorrhage associated with currently approved thrombolytic therapies limit their efficacy in recanalizing occluded vessels. Here, a nanoscale thrombolytic agent is demonstrated by immobilizing tissue plasminogen activator molecules (tPA) over 20 nm clustered iron oxide nanocubes (NCs).
Methods and Materials: All animal experiments were performed in accordance with protocols reviewed and approved by The Houston Methodist Institutional Animal Care and Use Committee. Statistical Analysis: Values are expressed as mean ± standard error and examined by one-way analysis of variance and Tukey's HSD test.
Results: The resulting nanoconstructs (tPA-NCs) are capable of dissolving clots via both direct interaction of tPA with the fibrin network (chemical lysis) and localized hyperthermia upon stimulation of superparamagnetic NCs with alternating magnetic fields (AMFs) (mechanical lysis). In vitro, as compared to free tPA, the proposed nanoconstructs demonstrate a ≈100-fold increase in dissolution rate, possibly because of a more intimate interaction of tPA with the fi brin network. The clot dissolution rate is further enhanced (≈10-fold) by mild, localized heating resulting from the exposure of tPA-NCs to AMF. Intravital microscopy experiments demonstrate blood vessel reperfusion within a few minutes post tail vein injection of tPA-NCs. The multifunctional properties and the 3 orders of magnitude enhancement in clot dissolution make tPA-NCs a promising nano-theranosis agent in thrombotic disease.
Conclusion: The nanoconstructs (tPA-NCs) are capable of dissolving clots via both direct interaction of tPA with the fibrin network and localized hyperthermia upon stimulation of superparamagnetic NCs with alternating magnetic fields.

B-0614 14:17

3D-guidance for catheter-based interventions with tessellated heart models for cardiovascular interventions in congenital heart disease (CHD)
M. Glöckler, N. Ehret, O. Rompel, S. Dittrich; *Erlangen/DE (martin.gloeckler@uk-erlangen.de)*

Purpose: Segmented and tessellated heart and vascular models might overcome the non-standardized VRT-models for 3D-guidance in CHD. Novel 2D-3D registration may be feasible with unenhanced biplane fluoroscopy.
Methods and Materials: In 50 paediatric patient's segmentation from MRI and CT was performed. From each segment of interest a separate mesh was generated. For image integration in the live fluoroscopy a prototypic workstation (Siemens) was used. The trachea was used as fiducial marker. Accuracy of 2D-3D registration was assessed as well as potential benefit for the catheterization performance, rated by two paediatric interventionalists with a 5-point Likert scale. Fluoroscopy time, radiation dose and contrast dye consumption were evaluated. Image quality and accuracy was compared with a 50 cases with VRT imaging and 3D-3D-registration (control group).
Results: Accuracy of registration was sufficient in all cases using the trachea as fiducial marker. Quality of segmented and tessellated heart models was rated superior to overlaid VRT-images. The 3D-guidance was used in all cases to define the ideal C-arm angulation and in 43 cases for accurate device positioning without repetitive control angiographies. Median dose-area-product in the total investigation was 331.0 µGym2 (6.6-5306.1) [median; (range)], used contrast dye was 1.2 ml/kg (0.0-8.5) and total fluoroscopy time was 7.1 min (2.5-39.6).
Conclusion: The technique of 3D-image fusion with live fluoroscopy can be applied successfully in most catheter-based interventions in CHD. Visualisation by tessellated 3D-models is superior to VRT-models for image guidance and can successfully be displayed on both cameras with a new technique.

B-0615 14:25

Balloon-assisted n-butyl cyanoacrylate glue embolisation mixed with Lipiodol and ethanol to reduce catheter adhesion
J. Koizumi[1], T. Hara[1], T. Sekiguchi[1], C. Itou[1], T. Ichikawa[1], B.J. d'Othee[2]; [1]*Isehara City/JP*, [2]*Baltimore, MD/US (jkoizumi@is.icc.u-tokai.ac.jp)*

Purpose: Glue embolisation using n-butyl cyanoacrylate (NBCA) is applied in various clinical settings. However, the risks of catheter adhesion to the vessel and distal glue migration may limit the use. We applied newly developed less adhesive mixture of NBCA with Lipiodol and ethanol (NLE, JVIR2012;23:1516) to proximal 'on site' embolisation under balloon occlusion (bNLE) and evaluated the feasibility.
Methods and Materials: Twenty eight injections in 25 patients (M20:F5, 63.6±15.7y/o) were included. The etiology includes 13 visceral artery aneurysms, 4 internal iliac and 3 inferior mesenteric artery embolisation prior to EVAR, 4 PSE, 1 portal vein embolisation, 1 TACE, and 2 renal preoperative embolisation. The ratios of 1:1:2, 1:1:1, 2:2:1 of NLE were injected under temporary occlusion by a balloon catheter (2.8-5.2 F) in 2, 8, and 18 injections correspondingly. Of these, 5 aneurysms were embolised using side balloon-assisted technique. When glue showed any movement by partial deflation of the balloon, reinflation was continued until complete hemostasis was obtained.
Results: The duration times from injection to balloon deflation were 12.5±10.6, 1.6±1.4, 2.6±0.9 minutes corresponding to each ratio. No migration or adhesion was observed in NLE 1:1:2 and 1:1:1. Mild adhesion of the catheter to the glue was observed in 6 of 18 injections of NLE 2:2:1 and 5 tiny fragments were migrated without any catheter retention or clinical sequelae. In 2 patients incomplete embolisation required additional glue injections. During 502±333 days of follow-up, only one patient showed incomplete embolisation.
Conclusion: 'bNLE' allowed adjustable rapid proximal 'on site' embolisation without any catheter retention.

B-0616 14:33

Rotational atherothrombectomy in combination with drug eluting balloon angioplasty for femoropopliteal occlusions: 12 month outcome
F. Scheer, C. Luedtke, E. Schlöricke, P. Kamusella, R. Andresen, C. Wissgott; *Heide/DE (cwissgott@wkk-hei.de)*

Purpose: The rotational atherothrombectomy with Straub Rotarex® is a safe and efficient treatment of acute/subactute vascular occlusions. The purpose of this study was to evaluate the benefit of paclitaxel-coated angioplasty after rotational atherothrombectomy over an observation period of 12 months.
Methods and Materials: Overall 29 patients were treated due to the Rotarex® catheter in combination with paclitaxel-coated balloon angioplasty (DEB-PTA). All patients had acute/subacute or chronic occlusions of the superficial femoral artery and/or popliteal arteries. The treated lesion length was 16.2 ± 8.5 cm. In the middle 1.8 DEB/patient were used. In the follow-up, the ankle-brachial index (ABI), Rutherford stage, walking distance and also colour-coded duplex sonograohy were performed after 6 and 12 months.
Results: The technical success of atherothrombectomy and DEB-PTA was 100%. In the follow-up the ABI shows an increase from 0.52 ± 0.17 prior to the treatment to 0.91 ± 0.25 after 6 month and a decrease to 0.88 ± 0.27 after 12 month. In the follow-up collective group there were no hemodynamically significant restenoses detected by colour-coded duplex sonograohy. Two patients declined to follow-up because of an advanced tumour disease. 6 patients died in observation period not related to the intervention.
Conclusion: The rotational atherothrombectomy in combination with paclitaxel-coated angioplasty shows a very good clinical outcome after 12 months.

B-0617 14:41

Time extended lyse-and-wait technique for thrombosed hemodialysis access
S. Regus, W. Lang, M. Heinz, M. Uder, A. Schmid; *Erlangen/DE (susanne.regus@uk-erlangen.de)*

Purpose: We describe our single-center experience performing a modified lyse-and-wait technique characterised by time- extended recombinant tissue plasminogen activator (rtPA) local exposure time.
Methods and Materials: From February 2009 to April 2014 84 patients presented with 152 acute haemodialysis access thrombosis. They proceeded to local thrombolysis including a single shot application of rtPA, local reaction time up to several hours and finally percutaneous stenosis treatment. Success rates, major adverse events and need for temporary catheter placements (TCP) were retrospectively analysed.
Results: The local thrombolysis time after single shot infiltration was 18.6 hours (range 2 - 40). Mean rtPA- dosage was 2.7 mg ± 1.2 (range 1-9). The overall success rate was 89.5 % and the major complication rate was 3.3 %, whereas TCP was necessary in 12.5 %. The PP/SP at 1, 3, 6, 12, 18 and 24 month were 86 ± 3%/ 95 ± 2%, 68 ± 4%/ 92 ± 2%, 43 ± 4%/ 90 ± 2%, 28 ± 4%/82 ± 3%, 12 ± 3%/82 ± 3%, 7 ± 2%/ 63 ± 4%, respectively.

Conclusion: The modified lyse-and-wait technique is a safe and effective declotting procedure, which allows planning of challenging angioplasty maneuvers into regular working hours.

B-0618 14:49

Paclitaxel-coated balloon vs plain balloon angioplasty for the treatment of symptomatic central venous stenosis in dialysis access

P.M. Kitrou, S. Spiliopoulos, P. Papadimatos, V. Theodosiadou, A. Lepida, N. Christeas, D. Karnabatidis; *Patras/GR (panoskitrou@gmail.com)*

Purpose: To report outcomes from a prospective single-center randomised trial comparing paclitaxel-coated balloon (PCB) versus plain balloon angioplasty (PBA) for the treatment of symptomatic central venous stenosis in dialysis access.
Methods and Materials: Between January 2014 to August 2015, 40 dialysis patients with symptomatic central venous stenosis were randomised (1:1) to undergo either dilation with a 2 µg/mm2 PCB (group PCB, n=20) or PBA (group PBA, n=20). Both de novo and restenotic [15/20; (75%) group PCB and 12/20; (60%) group PTA] lesions were treated. Primary endpoints were technical success and lesion primary patency (LPP). Secondary endpoints included complication rates and circuit primary patency. Individual subgroup longitudinal analysis was performed to compare outcomes of PCB versus previous treatment in the same patients.
Results: Until today, 6-month follow-up is available in 14/20 (70%) cases in group PCB and in 18/20 (90%) cases in group PBA and according to Kaplan Meier analysis, LPP is 60% for group PCB and 45% for group PBA [p=0.094; HR: 0.48 (95%CI: 0.201-1.13)]. Longitudinal analysis between treatments show a statistically significant difference in favor of PCB treatment compared to previous PBA [9/15 (60%) vs. 4/12 (33.3%); p=0.001 HR: 4.39 (95%CI: 1.79-10.78].
Conclusion: Interim results of this prospective randomised trial show a trend to improved patency for PCB in the treatment of symptomatic central venous stenosis. Final results will be announced.

B-0619 14:57

Influence of renal denervation on aortic distensibility in ApoE-deficient rats: assessment by ultrahigh field MRI

P. Fries, A. Müller, J. Stroeder, M. Hohl, D. Linz, M. Böhm, F. Mahfoud, G. Schneider, A. Buecker; *Homburg/DE (drpeterfries@googlemail.com)*

Purpose: The aim of this study was to evaluate the influence of renal denervation on aortic distensibility in a rat model of atherosclerosis using black blood Cine MRI sequences at 9.4 Tesla.
Methods and Materials: Apolipoprotein-E-deficiency (ApoE) and Sprague-Dawley (SprDaw) rats (n=6 per group) were subjected to bilateral surgical renal denervation (RDN). 8 weeks after RDN all animals were examined with a 9.4T animal scanner (Bruker, Germany) acquiring black blood self-gated CINE sequences perpendicular to the ascending aorta (TR/TE=8.9/2.1 ms, FA=10°, voxel size: 0.12x0.12x1 mm3, 25 cine frames, temporal resolution: 10 ms/frame). Systolic (RRsys) and diastolic (RRdias) blood pressure was assessed by tail cuff measurements. RR amplitudes were calculated with dRR=RRsys-RRdias. Based on ROI measurements the cross-sectional vessel areas of the ascending aorta were evaluated at endsystole (AES) and enddiastole (AED). Aortic distensibility was calculated as (AD=(AES-AED)/(AEDxdRR)x100). Aortic specimens were analysed in-vitro with aortic ring tension recordings and sirius red staining.
Results: AD was significantly reduced in ApoE animals as compared to healthy controls (mean±SD (1/mmHg): ApoE: 0.512±0.257; SprDaw: 1.263±0.523; $p < 0.02$). AD could be significantly improved with RDN in ApoE animals (ApoE-RDN: 1.280±0.497; $p < 0.001$) compared to untreated ApoE rats. In SprDaw rats with RDN AD did not significantly change as compared to untreated SprDaw animals (SprDaw-RDN: 1.767±0.821; p=0.15). These in-vivo findings correlated with in-vitro results of endothelium-dependent relaxation of aortic rings and aortic fibrosis formation.
Conclusion: Renal denervation improves aortic distensibility in rats with atherosclerosis. These changes can be assessed in-vivo by means of ultrahigh field MRI.

B-0620 15:05

2-years experience in endovascular treatment of ruptured cerebral aneurysms: comparison between simple coiling and stent-assisted-coiling

F. Giurazza[1], R. Pimentel Silva[2], M. Tecame[3], G. Guarnieri[3], M. Muto[3]; [1]*Rome/IT*, [2]*Lisbon/PT*, [3]*Naples/IT (francescogiurazza@hotmail.it)*

Purpose: Endovascular coiling approach is an accepted technique to treat ruptured cerebral aneurysms. Certain aneurysmal morphologic characteristics do not allow this approach, requiring neck protection with balloon- or stent-assistance; in the latter it is described an increased risk for re-bleeding due to double-antiplatelet therapy requirement. Here is reported a 2-years experience of endovascular treatment of acute aneurisms ruptures comparing simple coiling and stent-assisted-coiling.
Methods and Materials: During 2 years 80 patients diagnosed with SAH have been treated by endovascular approach. They were divided into 2 groups of 40 patients: A) favourable neck-aneurysms (dome/neck ratio > 2) treated by simple coiling; B) wide-neck-aneurysms (dome/neck ratio < 2) treated by stent-assisted coiling. Patients treated by stent-assisted-coiling were treated by intraprocedural intravenous bolus of Flectadol (500 mg) followed by post-procedural double-antiplatelet oral therapy. 24-hours and 3-weeks post-procedural CT-scans were performed to detect intracranial complications.
Results: Overall mean aneurysm diameter was 7 mm (2.5-23 mm). Sac occlusion was obtained in 95% in group-A and in 92% in group-B. In group-A two intra-procedural small aneurysm haemorrhages were promptly solved with coiling. 24-hours follow-up CT scans showed: In group-A four ischemia and in group B two intrastent thrombosis; no haemorrhage was registered. 3-weeks follow-up CT scans showed: In group-A three ischaemia and in group B one ischaemia and one haemorrhage.
Conclusion: Endovascular approach is a safe and effective method to treat aSAH; in this study, stent-assisted-coiling in acute aSAH seems to have similar peri-post-procedural outcomes and complications rates compared to simple-coiling; furthermore it allows the treatment of larger sample of lesions.

B-0621 15:13

Placement of central venous catheters in the routine clinical setting: estimation of the costs and the learning curve of radiologist newly learning the implantation procedures

R. Rotzinger[1], B. Gebauer[1], D. Schnapauff[1], F. Streitparth[1], G. Wieners[1], C. Grieser[1], P. Freyhardt[1], B. Hamm[1], M.H. Maurer[2]; [1]*Berlin/DE*, [2]*Berne/CH (roman.rotzinger@charite.de)*

Purpose: Retrospective analysis of interventional radiologic implantation of central venous port catheters (CVPS) and peripherally inserted central catheters (PICC) in a large patient population including a cost comparison of both methods, and analysis of the learning curve of radiologists newly learning both procedures.
Methods and Materials: All CVPS and PICC line related interventions (implantations, revisions, explantations) performed in an interventional radiology department during a 3-year period from January 2011 to December 2013 were examined. A cost analysis including intervention times was performed based on the prorated costs of equipment use, staff costs and expenditures for disposables.
Results: A total of 2,987 interventions were performed by 16 radiologists, thereof 1,777 CVPS and 791 PICC lines. An average implantation took 22.5 ± 0.6 min (CVPS) and 10.1 ± 0.9 min (PICC lines). For CVPS, this average time was achieved by 7 radiologists newly learning the procedures after performing 20 CVPS implantations. Total costs per implantation were EUR 242 (CVPS) and EUR 201 (PICC lines).
Conclusion: Interventional radiologic implantations of CVPS and PICC lines are well established procedures that can be performed at low risk for patients. Both implantation techniques are easy to learn by residents and provide a genuine low-cost alternative to surgical implantation.

B-0622 15:21

Radiation dose reduction during transjugular intrahepatic portosystemic shunt (TIPS) implantation using a novel image-processing platform

C. Spink, T. Schmidt, M. Grass, M. Avanesov, G. Adam, P. Bannas, A. Koops; *Hamburg/DE (c.spink@uke.de)*

Purpose: To compare the patient radiation doses during transjugular intrahepatic portosystemic shunt (TIPS) implantation performed with Philips Allura Clarity versus the precursor technology Philips Allura Xper imaging acquisition and processing platform.
Methods and Materials: In a retrospective single-center-study cumulative air kerma (AK), cumulative dose area (DAP), total fluoroscopy time and number of exposure frames were gathered from 108 patients during TIPS implantation from 01/2012 to 08/2015. All procedures were performed on a Philips Allura FD20 system by a matched group of operators. 54 procedures were performed using Philips Allura Xper and 54 after the Philips Allura Clarity upgrade. Mean values of were compared using a two-tailed t-test.
Results: After the Philips Allura Clarity upgrade a 57% reduction in mean DAP (402.8 vs. 173.3 Gycm2, $p < 0.001$) and a 58% reduction in mean AK (1.7 vs. 0.7 Gy, $p < 0.001$) could be observed compared to procedures performed under Philips Allura Xper. The number of exposure frames was significantly reduced by 35% in the Allura Clarity group (158 vs. 102 frames, $p < 0.001$). Fluoroscopy time (29.4 vs. 31.9 min p=0.450) and the amount of contrast agent used (109.4 vs. 114.9 ml, p=0.627) did not differ significantly in both of the BMI and age matched patient groups.

Conclusion: Philips Allura Clarity imaging acquisition and processing platform significantly reduces patient radiation dose compared to the precursor technology Philips Allura Xper during TIPS implantation. Fluoroscopy time and amount of contrast did not increase significantly indicating sufficient image results using the novel platform.

14:00 - 15:30 **Room O**

GI Tract

SS 701b

Advanced imaging of the oesophagus and stomach

Moderators:
O. Ekberg; Malmö/SE
M.A. Mazzei; Siena/IT

B-0623 14:00

Quantitative radiomics features as prognostic indicator of esophageal cancer undergoing chemoradiotherapy

Y. Cho, C. Park, S. Park, J. Goo; *Seoul/KR (blue1010c@gmail.com)*

Purpose: To determine the value of quantitative radiomics features for tumour response to chemoradiotherapy in primary esophageal cancer.
Methods and Materials: Eighty-four patients (74 male, 10 female; mean age, 65) with primary esophageal cancer (stage I, 11; stage II, 55; stage III, 18) underwent chemoradiotherapy in our institution from January 2005 to January 2014, which constituted this study. CT radiomics parameters of primary tumours featuring its size, shape, histogram, and texture features were extracted from contrast-enhanced CT images taken prior to chemoradiotherapy using an in-house software program. The relationship between radiomics parameters and progression free survival (PFS) was investigated by Kaplan-Meier analysis and Cox proportional hazards model.
Results: The median PFS was 5.8 months (95% CI 5.0-7.0 months). There were no significant differences in PFS according to tumour stage. However, mean Hounsfield units (HU) < 67.2 HU (median PFS, 188 vs. 353 days, $p=0.022$), effective diameter > 25.6 mm (median PFS, 188 vs. 362 days, $p=0.012$), skewness >-0.112 (median PFS, 131 vs. 238 days, $p=0.007$) and Gray Level Co-occurrence Matrix (GLCM) moment < 0.498 (median PFS, 174 vs. 330 days, $p=0.044$) were significantly associated with shorter PFS in patients with esophageal cancer treated with chemoradiotherapy. Cox proportional hazards model revealed that lower mean HU, larger effective diameter and higher skewness turned out to be significantly poor prognostic parameters; mean HU (hazard ratio[HR] =0.465, p=0.009), effective diameter (HR=0.357, p=0.004) and skewness (HR=0.188, p=0.000).
Conclusion: Quantitative radiomics features of primary tumour were closely associated with poorer response to chemoradiotherapy in patients with primary esophageal cancer.

B-0624 14:08

Role of qualitative CT features in differential diagnosis of post-inflammatory oesophageal strictures (corrosive, peptic) from oesophageal cancer using two-phase dynamic MDCT

S.A. Buryakina, G.G. Karmazanovsky, D.V. Ruchkin, Q. Yang, A.V. Vishnevskaya; *Moscow/RU (sburyakina@yandex.ru)*

Purpose: To investigate qualitative features which allow to differentiate benign oesophageal strictures from oesophageal cancer.
Methods and Materials: CT scans of patients with histopathologically confirmed 26 corrosive oesophageal strictures, 12 peptic strictures, 31 oesophageal cancer in whom a two-phase dynamic MDCT was performed (arterial and venous phases at 10, 35 seconds, the delayed phase at 6-8 minutes after the injection of contrast media) were reviewed for qualitative features: "target sign", luminal mass, homogeneity of contrast medium uptake, concentric wall thickening, conically shaped suprastenotic dilatation, smooth upper boundaries of stenosis and smooth mucous membrane at the transition to stenosis, which were compared with a group of 31 patients with oesophageal cancer.
Results: The presence of a concentric oesophageal wall, conically shaped suprastenotic dilatation, smooth boundaries, "target sign" and smooth mucous membrane at the transition to stenosis were suggestive of a benign cause, with sensitivities of 92.31%, 87.17%, 94.87%, 76.92% and 82.05%, respectively, and specificities of 70.96%, 89.66%, 80.65%, 96.77% and 93.55%, respectively. The features that were most suggestive of a malignant cause were eccentric oesophageal wall thickening, tuberous upper and lower boundaries of stenosis, absence of mucous membrane visualisation, rupture of the mucous membrane at the upper boundary of stenosis, cup-shaped suprastenotic dilatation, luminal mass and enlarged regional lymph nodes with specificities of 92.31% 94.87%, 67.86%, 100%, 97.44%, 94.87% and 82.86%, respectively and sensitivities of 70.97%, 80.65%, 96.77%, 80.65%, 54.84%, 87.10% and 60%, respectively.
Conclusion: The described CT features reveal high diagnostic significance in the differentiation of benign strictures from oesophageal cancer.

B-0625 14:16

The efficacy of cine-magnetic resonance imaging in accurate evaluation of the invasion level of tumour tissue in esophageal carcinoma

M. Ozgokce[1], F. Alper[2], A. Yavuz[1], H. Ogul[2], Y. Aydin[2], A. Batur[1], A. Eroglu[2]; [1]*Van/TR*, [2]*Erzurum/TR (mozgokce@gmail.com)*

Purpose: To evaluate the contribution of cine imaging to conventional MRI in accurate determination of the invasion degree of tumour tissue in esophageal carcinoma.
Methods and Materials: This prospective study included 35 patients (21 males, 14 females; mean age 63 years; range 28 to 81 years) having esophageal carcinoma with suspected local invasion; patients without positive findings in conventional MRI (including T1W, T2W, STIR sequences) indicating peripheral invasion were excluded from the study. The dynamic properties of the lesions in 3D were revealed by cine-MRI; the morphological features and mobility of the lesions and the relationship with the peripheral adjacent tissues were noted regarding the potential of invasion.
Results: In contrast to conventional MRI, no supporting finding of invasion was determined by cine-MRI in 19 of 35 patients in whom the post-surgical findings had confirmed the lack of any adjacent tissue invasion. Suspected invasion was revealed in 9 patients by cine MRI and these patients were concluded as inoperable. In 7 patients; although cine-MRI could not determine any findings of invasion; patients were considered as inoperable by the final clinic-pathological consideration. Cine-MRI was concluded to be superior to conventional MRI in accurate determination of invasion level of esophageal carcinoma ($p < 0.001$).
Conclusion: The accurate determination of the peripheral invasion degree of tumour tissue in esophageal carcinoma has a significant role in preventing the unnecessary surgical procedures and estimating the survey precisely. In our study; cine-MRI investigation in such patients was concluded to have potential in making significant contribution to the issue.

B-0626 14:24

Pre-treatment contrast-enhanced CT texture analysis (CTTA) of gastric cancer to predict response to neoadjuvant chemotherapy: comparison with histological tumour regression grade (TRG)

P. Marra, A. Salerno, S. Antunes, F. Giganti, A. Esposito, F. De Cobelli, A. Del Maschio; *Milan/IT (marra.paolo@hsr.it)*

Purpose: CTTA consists in the study of voxel grey-level distribution and provides information about tissue heterogeneity. Amongst several quantitative parameters that we obtained from CTTA, we identified those able to predict the response to neoadjuvant chemotherapy (neo-CT) in gastric cancer.
Methods and Materials: We restrospectively investigated 35 patients with biopsy-proved gastric or gastro-oesophageal (Siewert II-III) tumours that underwent pre-treatment staging with MDCT, followed by a standard neo-CT protocol. A dedicated radiologist analysed all the images and drew ROIs on each slice to segment whole tumour volume. VOIs texture analysis was performed through an in-house-developed software using Matlab-R2014a, with and without different LoG-filterings (σ=1.0-2.5). All features were compared with histological TRG, distinguishing responders (TRG1-3) from non-responders (TRG4-5). Mann-Whitney U test was used to compare CTTA parameters distribution in the two populations and ROC curves to estimate cut-offs.
Results: The following parameters showed significant ($p < 0.05$) differences between responders and non-responders: entropy, uniformity and standard deviation without filters; cluster-prominence, cluster-tendency, sum-entropy and entropy of the gray-level co-occurrence matrix (GLCM). From Roc curves, we observed that sum-entropy and cluster-tendency of the GLCM presented higher AUC than other parameters, respectively 0.766 and 0.763 ($p < 0.01$), with moderate accuracy to detect responders for values higher than 2.0713 and 3.8851, respectively. Entropy and uniformity without filters showed both AUCs of 0.730 ($p < 0.05$): responders for values higher than 6.86485 and lower than 9.863E-03, respectively.
Conclusion: More heterogeneous tumours at CTTA (higher entropy, lower uniformity) seem to respond less to neo-CT. Pre-treatment evaluation of gastric cancer using second-order CTTA may help to predict responsiveness to neoCT.

B-0627 14:32

Usefulness of dynamic CT transmural sign to evaluate T staging of gastric cancer: histopathologic correlation

S. Lee, D. Chung; *Seoul/KR (sseung329@gmail.com)*

Purpose: Purpose of this study is evaluating retrospectively the diagnostic performance of dynamic CT transmural sign, for determining the depth of invasion in gastric cancer according to 7th edition of the American Joint Committee on Cancer staging manual.
Methods and Materials: Fifty-two patients, undergone three-phase dynamic CT with stomach CT protocol and diagnosed histologically as gastric cancer through surgery or endoscopy, from June 2014 to October 2015, were included. Pathologically confirmed T1a cancer patients were excluded. Definition of positive CT transmural sign (CT™) with two-layer model is newly designed diagnostic criteria for this study. Two radiologists reviewed CT images in consensus to divide 52 patients into four groups according to the pattern of CT™. Sm1/sm2 T1b cancer is expected to have negative CT™ (group 0). Sm3 T1b, T2 and over-T2 (T3 and T4a) cancer is considered to have positive CT™ only in delayed phase (group 1), in portal and delayed phase (group 2) and in all phases (group 3), respectively. CT staging was compared with histopathologic results.
Results: Overall diagnostic accuracy was 67.3% (35/52). Sensitivity, specificity and positive predictive value were 44.4%, 100%, 100% in sm1/sm2 T1b, 81.8%, 97.6%, 90.0% in sm3 T1b, 50.0%, 81.8%, 33.3% in T2, and 75.0%, 96.4%, 94.7% in over-T2 cancer, respectively. Of 21 patients with pathology of poorly cohesive type, 6 patients were considered to be downstaged in CT staging using CT™.
Conclusion: Dynamic CT™ showed a reasonable diagnostic performance for determining the T staging of gastric cancer, especially in sm3 T1b and over-T2 cancer.

B-0628 14:40

The prognostic significance of extramural venous invasion detected by multiple-row detector computed tomography in stage III gastric cancer

J. Cheng, J. Wu, Y. Ye, C. Zhang, Y. Zhang, Y. Wang; *Beijing/CN (chengjinhome@126.com)*

Purpose: To determine the 1-year progression-free survival (PFS) of EMVI, detected with contrast-enhanced multiple-row detector computed tomography (ceMDCT), in patients with stage III gastric cancer.
Methods and Materials: Between January 2009 and December 2013, patients with stage III gastric cancer were included in this retrospective study. All patients had been routinely monitored with the follow-up chest/abdomen/pelvis ceMDCT on 3, 6, and 12 months post-operation. Two radiologists reviewed all abdominal ceMDCT images and gave a consensus opinion regarding the presence of EMVI, categories of tumour and lymph node, tumour location and growth pattern. Histological type/tumour differentiation of each patient was confirmed by post-operative pathological analyses. Patients were divided into two groups: EMVI-positive and EMVI-negative. The primary end point was a PFS of one year was calculated using the Kaplan-Meier product limit. Hazard ratios for 1-year PFS were generated using a Cox proportional hazard regression on ceMDCT tumour characteristics.
Results: 117 patients were included in this study. The prevalence of EMVI detected with ceMDCT was 43.6% (51/117) in patients with stage III gastric cancer. The EMVI-positive patients had significantly lower 1-year PFS rates (45.1%), than the EMVI-negative patients (75.8%), (Logrank test, P=0.0008). In a Cox proportional hazards regression analysis, EMVI and tumour location/growth pattern were identified as independent prognostic factors of 1-year PFS with hazard ratio of 2.448 (95% CI 1.246-4.806, P=0.01) and 2.000 (95% CI 1.057-3.784, P=0.034), respectively.
Conclusion: EMVI status, detected with ceMDCT, may be used to counsel patients regarding ongoing risks of metastatic disease, implications for surveillance, and systemic chemotherapy.

B-0629 14:48

Gastric cancer: texture analysis from multidetector computed tomography as a potential prognostic biomarker

F. Giganti, S. Antunes, A. Salerno, A. Ambrosi, P. Marra, E. Orsenigo, A. Esposito, A. Del Maschio, F. De Cobelli; *Milan/IT (giganti.fra@gmail.com)*

Purpose: To investigate the association between texture-derived parameters from multidetector computed tomography (MDCT) and overall survival in patients with gastric cancer.
Methods and Materials: This retrospective study had institutional review board approval. Informed consent was obtained from all patients. Between October 2009 and October 2014 a total of 56 patients (36 men-20 women; median age 70 years) with biopsy-proved gastric cancer were examined on a 64-channel MDCT scanner and then directly treated with surgery. Images were analysed and 107 image features were quantified, with and without applying a filter for fine to coarse textures (filters 1.0-2.5). The association between texture parameters and survival time were assessed by using Cox regression and Kaplan-Meier analysis.
Results: The following texture parameters were significantly associated with a negative prognosis in our model: energy > 3.25 (p=0.046); entropy > 5.96 and > 3.54 (no filter and filter 1.5; p=0.002 and 0.027, respectively); maximum Hounsfield unit value > 3.44 (filter 1.5; p=0.027); skewness (filter 2) > 5.83 (p= 0.004). Dichotomised root mean square (filter 1) < - 2.66 (p=0.024) and mean absolute deviation (filter 2) < -4.22 (p=0.007) were associated with shorter survival time. Kaplan-Meier analysis confirmed that textural parameters were predictors of overall survival; specifically, energy, entropy (filter 1.5), maximum Hounsfield unit value (all with p < 0.001), mean absolute deviation (p=0.012) and root mean square (p=0.022).
Conclusion: Non-invasive texture features could increase the performance of a multivariate prognostic model for preoperative risk stratification in gastric cancer.

B-0631 14:56

Comparison between CT Net enhancement and PET/CT SUV for N staging of gastric cancer

A.A. Stabile Ianora, N.M. Lucarelli, M. Telegrafo, A. Scardapane, A.A. Niccoli, P. Pignataro, M. Moschetta, G. Angelelli; *Bari/IT (lucarelli.nico@gmail.com)*

Purpose: To compare 320-row CT Net enhancement and fluorine-18 fluoro-2-deoxy-D-glucose positron emission tomography/ computed tomography (F-FDG PET/CT) SUV for N staging of gastric cancer.
Methods and Materials: 45 patients with hystologically proven gastric cancer underwent CT and F-FDG PET/CT. Two radiologists in consensus evaluated all images and calculated the CT Net enhancement and F-FDG PET/CT SUV for N staging, having the histological findings as the reference standard. CT and F-FDG PET/CT sensitivity, specificity, diagnostica accuracy, positive and negative predictive values (PPV and NPV) were evaluated and compared by using the McNemar test.
Results: The histological examination revealed nodal metastases in 29/45 cases (64%). CT Net enhancement obtained sensitivity, specificity, accuracy, PPV and NPV of 90%, 81%, 87%, 90% and 81%, respectively. F-FDG PET/CT SUV obtained sensitivity, specificity, accuracy, PPV and NPV of 93%, 88%, 91%, 93% and 88%, respectively. No statistically significant difference between the two imaging modalities was found (p=0.56).
Conclusion: CT Net enhancement represents an accurate tool for N staging of gastric cancer and could be considered as the CT correspondent quantitative parameter of F-FDG PET/CT SUV. It could be applied in the clinical practice for differentiating reactive lymph nodes from mestastatic ones improving accuracy and specificity of CT.

B-0632 15:04

Can we identify the normal and abnormal radiological findings after laparoscopic, adjustable gastric banding (LAGB)?

M. Andronikou- Zouvani; *Paralimni/CY (demokritos@cytanet.com.cy)*

Purpose: To determine the frequency and spectrum of radiologically detectable complications of LAGB. To identify why the number of complications from these procedures appears to be increasing.
Methods and Materials: A total of 100 consecutive patients, who had benefited from LAGB between June 2007 and June 2014, were identified from the surgical lists at our hospital and their imaging procedures were evaluated retrospectively.
Results: As a small community, we had a very good rate of follow-up of 93%. Stomal obstruction was the most common radiologically visible complication (90% of patients). Slippage of the band occurred in 42% of our patients. Reflux oesophagitis was documented in 20% of the patients. Pouch dilatation occurred in 20% of our patients. Port complications occur relatively commonly (14%). Volvulus is a serious but rare complication (1%). (Gastric band erosion or migration into the gastric lumen did not occur in our series using the newer and wider silicon bands). Extra-gastric radiological complications of LAGB: • Aspiration pneumonia 4%, • Lung abscess 2%, • Pericardiac effusion 1%, • Cholelithiasis (?%).
Conclusion: The initial literature with regard to the gastric band promised a 25year survival rate of the band in the human body. However, in this long term study only 58% of the LAGB are shown to survive beyond 7 yrs. Comparison between long term and short term studies shows that as the experience grows, an increased rate of complications is detected, and a major reason for this is the increasing radiologist awareness about the procedure and its complications.

B-0633 15:12

Contribution of CT in management of acute abdominal pain after gastric bypass: correlation between radiological and surgical findings

F. Cuccioli, P. Karila Cohen, J. Laissy, J. Marmuse, K. Arapis; *Paris/FR (francesco.cuccioli@gmail.com)*

Purpose: To evaluate contribution of CT scan of abdomen and pelvis with IV contrast to management of acute abdominal pain (AAP) in patients with history of gastric bypass. To correlate readings of CT scans done urgently to surgical findings. To define CT signs of severity that could lead to urgent surgery.
Methods and Materials: Retrospective analysis of 102 patients with history of gastric bypass presenting at Emergency Department of Bichat Hospital with AAP from January 2009 until December 2014 that underwent exploratory surgery; CT scan of abdomen and pelvis with IV contrast was done in 64 patients before surgery. Analysis of 64 reports of CT scans was correlated to surgical findings. Additional reading of 64 CT scans was done separately by 2 radiologists specialised in gastrointestinal imaging focusing on the CT signs of pathological findings.
Results: CT signs of intestinal occlusions are presents in 84.3% of patients with internal hernias. Sign of "twisting" of intestinal loops and vessels called "whirlpool sign" has the highest sensitivity and specificity for internal hernias. "Sac-like" sign (agglomeration of intestinal loops) has the highest agreement amongst radiologists.
Conclusion: Interpretation of CT scans in patients with gastric bypass remains challenging due to reorganisation of digestive system. Reading of CT scans is optimal after 3D reconstructions. Radiological signs of severity should lead ER physicians to call for a surgical consult. Exploratory laparoscopy should be indicated if CT findings are not conclusive.

14:00 - 15:30 **Room E1**

Musculoskeletal

SS 710
Muscles

Moderators:
J. Oudeman; Amsterdam/NL
D.J. Wilson; Oxford/UK

B-0634 14:00

Diffusion tensor imaging-based tractography of the myopathic and dystrophic skeletal muscle

S. Keller[1], A. Golsari[1], M. Gelderblom[1], H. Kooijman-Kurfuerst[1], J. Wang[2], G. Adam[1], J. Yamamura[1]; [1]*Hamburg/DE*, [2]*Dallas, TX/US (s.keller@uke.de)*

Purpose: MRI-diffusion tensor imaging (DTI) tractography is an emerging tool for the evaluation of alterations in the skeletal muscle microstructure in dystrophic or inflammatory diseases. In this study, the impact of muscle fibre degeneration on the DTI apparent diffusion coefficient (ADC), fractional anisotrophy (FA) and the tractography was evaluated in patients with hereditary and inflammatory muscular dystrophies.
Methods and Materials: Nine patients (age 43±20 y) and controls with various muscular dystrophies and inflammatory myopathy were included. DTI-based alterations in FA and ADC values were assessed in the rectus femoris (RF), semi-tendinosus (ST) and gracilis (G) muscle. Tractography was conducted to evaluate structural changes. Two-point mDixon was used to measure the fat fraction (FF%) in distinct muscles.
Results: 2p-mDixon FF of the RF, ST and G muscle ranged from 15% to 89% in patients compared to controls with 3-9%. Mean±SD FA (0.53±0.04) and ADC (0.89± 0.16 mm2/s*10−3) values were significantly different in diseased muscle [control FA (0.31±0.03) and ADC (1.54±0.11 mm2/s 10-3)]. Corresponding to the amount of intermyocellular fat, the diminished ADC showed an inverse correlation to the FA in patients, similar to values of subcutaneous fat. Tractography revealed significant reduction of the muscle fibre length in the ST, RF and G muscles. Fibre count was diminished.
Conclusion: Fat-suppressed DTI-tractography of skeletal muscle generates information about the water diffusion in muscle without intramyocellular fat infiltration. High amounts of intermyocellular fat influence the ADC and FA due to high signal to noise ratio, thus not representing the diffusion values of the remaining muscle.

B-0635 14:08

Assessment of fatty degeneration of the gastrocnemius and soleus muscles in patients with achillodynia using MRI: reliability of the Goutallier classification system

B.C.S. Rabelo, R.R. Nobre, A.M.A. Lopes, E.J.S. Ribeiro, D.S. Baumfeld, R. Strecker; *Belo Horizonte/BR (brenorabelomed@gmail.com)*

Purpose: The purpose of this study was to quantify the reliability of the Goutallier classification for assessing fatty degeneration of the gastrocnemius and soleus muscles in patients with achillodynia from magnetic resonance images (MRI).
Methods and Materials: MRI of the calf of 25 patients (mean 42 years; range 28-61 years) with achillodynia was evaluated independently by 3 musculoskeletal radiologists. The degree of fatty infiltration was scored separately for the gastrocnemius and soleus muscles on both legs using the Goutallier classification system in two reading sessions with a four-week interval. This classification was compared with a gold standard qualitative method using ImageJ software for analysing intensity distribution. Interobserver reliability and intraobserver repeatability were determined and accuracy was assessed by comparing readers' scores with the gold standard method.
Results: Using the gold standard method (ImageJ software) to classify the fatty infiltration, the mean fat content was 11.4% (95% CI,+- 9.8%) for the affected leg and 6.5% (95% CI, +- 2.9%) for the asymptomatic leg. The agreement with the gold standard method and the Goutallier classification for readers 1, 2 and 3 was 0.79, 0.84 and 0.81, respectively for the affected leg and 0.86, 0.83 and 0.84 for the asymptomatic leg. For the Goutallier classification, the mean interobserver agreement was 0.81 ($p < 0.001$ for all) and the intraobserver repeatability was 0.82, 0.77 and 0.79 (weighted kappa).
Conclusion: Our results show that the Goutallier classification is a reliable method for quantifying fat infiltration in the gastrocnemius and soleus muscles.

B-0636 14:16

Characteristic MR signal intensity pattern of exercise-induced rhabdomyolysis in thigh muscle: differential point from other causes and its clinical significance

E. Yeon; *Seoul/KR (doorman38@naver.com)*

Purpose: To describe characteristic MR imaging appearance of overuse or exercise-induced rhabdomyolysis involving thigh and consider clinical significance of distinguishable MR features of them.
Methods and Materials: This study contains 10 cases which obtained at three institutions from 2005 to 2015. A retrospective review was performed of ten clinical informations and MRI scans for rhabdomyolysis. MR imaging was analysed by distribution and degree of muscle involvement of rhabdomyolysis. Degree was assessed and graded as normal, mild or prominent involvement.
Results: The mean age was 20.2 years (range, 15-24 years) and seven of ten patients were male. All patients had history of excessive squatting action, clinically suffered from both thigh pain and confirmed rhabdomyolysis by performing of serum creatine levels. All patient (10/10) showed diffuse mild to prominent involvement of anterior thigh muscles on fluid sensitivity MR sequences. Among anterior thigh muscles, spared rectus femoris was 8 patients (8/10) and mild involvement was 2 patients (2/10). There in no one of prominent involvement of rectus femoris.
Conclusion: Preservation of rectus femoris muscle on MRI in exercise-induced rhabdomyolysis can be a differential point from rhabdomyolysis with other etiology and other intramuscular edema diseases. This MR finding is thought to reflect and visualize functional anatomy of thigh muscles with repetitive physical movement.

B-0637 14:24

Can we diagnose piriformis muscle syndrome via sonoelastography: preliminary findings of twenty-one patients

M. Baykara, A. Demirel, E. Berk, B. Kızıldağ, M.A. Sarıca, N. Yurttutan; *Kahramanmaraş/TR (muratbaykara@hotmail.com)*

Purpose: Piriformis syndrome (PS), is a neuropathy which occurs from either compression or irritation of sciatic nerve by piriformis muscle spasm or contracture. Diagnosis of PS is difficult clinically and can be delayed. This will cause difficulties and more invasive procedures during management of patients. This study aimed to evaluate possibility of diagnosing PS with a fast, easy and simple method by comparing elasticity of piriformis and gluteus maximus muscles.
Methods and Materials: Twenty-one patients applied to Physical Therapy and Rehabilitation Clinic with a complaint of one side hip pain and diagnosed PS depending on routine clinical signs, were performed ultrasound elastography. The division of strain value obtained from subcutaneous fat tissue on the same level by piriformis and gluteus maximus muscles' strain value, calculated as strain ratio by elastography was compared bilaterally.

Results: There were 16 women and 5 men in the study group. Median age was 45.5 and 45 respectively (45 in whole group). On normal side, calculated strain ratios for piriformis muscle was 0.533±0.415 (median: 0.490) and gluteus maximus muscle was 0.410±0.324 (median: 0.350) while on sympthomatic side, 1.564±1.232 (median: 1.170) and 1.005±1.096 (median: 0.660) respectively. Strain ratios from symptomatic side were found higher in both muscles which was significant statistically ($p < 0.0001$).
Conclusion: The higher strain ratios obtained from symptomatic side than contralateral side in all of the patients, come up with that ultrasound elastography should be an imaging method for diagnosis and assessment of PS. As expected, values obtained from gluteus maximus muscle were less effective.

B-0638 14:32

From myocardial to skeletal muscle: late gadolinium enhancement as a new tool to reveal involvement in idiopathic inflammatory myopathies
G. Benedetti, A. Esposito, M. Cava, M. Colombo, D. Velardo, S. Previtali, P. Rovere Querini, A. Del Maschio, F. De Cobelli; *Milan/IT (benedetti.giulia@hsr.it)*

Purpose: Late Gadolinium Enhacement (LGE) is commonly used as a MRI marker of myocardial damage in inflammatory cardiomyopathies. Our aim was to verify whether LGE might be as informative in the study of skeletal muscle injury, specifically in inflammatory myopaties, like polymyosistis (PM) and dermatomyositis (DM).
Methods and Materials: Patients affected by inflammatory myopaties underwent upper-legs MRI at 1.5 T, including T1 and T2-STIR, to evaluate fibro-fatty infiltration and edema, and LGE for muscle viability. LGE were ECG-gated fat-suppressed axial-IR. Muscles were divided into 4anatomical compartments (quadriceps, adductors, posterior compartment, gluteus). LGE presence and distribution was visually assessed.
Results: 15 pts were enrolled: 5DM, 6PM, 4myositis of other type; 2clinical-onset, 13chronic-diseases. All pts with LGE had mild fatty infiltration at T1. Good quality LGE sequences were obtained. LGE was positive in 9 pts (60%): mainly quadriceps and adductors were involved. STIR was positive in 8 out of the 9 pts with late enhancement, with similar distribution. 6 out of 8 pts with LGE and STIR were symptomatic. The patient with LGE only had long disease history under remission. LGE findings were related to the duration of the disease, suggesting muscle fibrotic replacement. Six pts (40%) had negative STIR and LGE: 1new onset with treatment recently started, 2chronic pts under clinical stability, 3chronic pts under clinical remission.
Conclusion: LGE allowed muscle characterisation and the mismatch between edema and myocytolitic damage depicted various disease stages of the disease, that still need to be fully understood. The clinical use of LGE for myocytolitic damage characterisation in skeletal muscle appears promising.

B-0639 14:40

MRI of acute groin injury in athletes with a focus on the adductor muscles: reliability and patterns of injury
F.W. Roemer[1], A. Serner[2], P. Hölmich[3], K. Thorborg[3], A. Weir[2], J.L. Tol[2], A. Guermazi[4]; [1]*Erlangen/DE*, [2]*Doha/QA*, [3]*Amager-Hvidovre/DK*, [4]*Boston, MA/US (frank.roemer@uk-erlangen.de)*

Purpose: To develop a multi-dimensional MRI assessment system to evaluate acute groin injury in athletes, describe frequencies of structural injury in 75 athletes and to analyse inter- and intra-observer reliability.
Methods and Materials: Male athletes 18 to 40 years old who participated in competitive individual or team sports and who presented at the hospital's walk-in clinic within 7 days of an acute onset of sports-related groin pain were included. All patients underwent MRI within 7 days according to a standardized groin-centered protocol including T1-weighted and fluid-sensitive fat suppressed and non-fat suppressed sequences. In several interdisciplinary calibration sessions a system using ordinal and continuous measurements was developed taking into account grade, location and extent of muscle strains, perilesional hematoma, and pre-existing alterations commonly associated with longstanding groin pain and hip pathologies. Kappa statistics and intraclass correlation coefficients (ICCs) were used to describe inter- and intra-observer reliability.
Results: Mean age was 25.6 ± 4.7 years. 79 acute lesions in 61 patients (81.3% positive MRIs) were observed. Adductor longus strains were the most common injuries (38.3%) followed by rectus femoris lesions (19.2%) and iliopsoas lesions (13.8%). Reliability ranged between 0.74 and 1.00 for ordinal features and between 0.82 and 0.99 for continuous measures. Kappa values for pre-existing injuries associated with long standing groin pain were lower reflecting low prevalence but overall agreement was excellent.
Conclusion: Standardized MRI assessment of acute groin injury is feasible with good reliability. The most commonly affected muscles were the adductor longus, rectus femoris and iliopsoas.

B-0640 14:48

Do iliopsoas and gluteus maximus change with aging? A MRI investigation in healthy adult volunteers.
R. Crawford[1], S. Franckenberg[2], P. Kälin[2], M.A. Fischer[2], D. Nanz[2], E.J. Ulbrich[2]; [1] *Winterthur/CH*, [2]*Zurich/CH (sabine.franckenberg@usz.ch)*

Purpose: Evaluate changes to iliopsoas (IP) and gluteus maximus (GM) volume and fat content in healthy adult volunteers using mDIXON whole-body MRI.
Methods and Materials: IRB approved. Fat-signal fractions (FSF) and normalised volumes (Vi) of IP and GM were determined from two-point mDIXON sequences of 80 adults (Women/men n=40; age 20-62 yrs), using semi-automated segmentation of 3 T whole-body MRI. T-tests analysed sex, side and leg-dominance differences. ANOVA (Bonferroni) compared FSF and Vi between sub-groups. Pearson's and Spearman analysis described correlations ($p < 0.05$).
Results: FSF-IP increased with age for both sexes (Women/men: $p < 0.01$/$p < 0.001$) and for FSF-GM in men ($p < 0.01$). No sex-dependence was shown for FSF-IP (10.1±1.2/10.2±1.5). FSF-GM was higher in women (13.0±2.7/11.1±3.0;$p < 0.001$). IP- and GM-FSF correlated strongly on the dominant ($R=0.60$, $p < 0.001$) and non-dominant sides ($R=0.52$, $p < 0.01$) in men only. Women had lower muscle volumes ($p < 0.001$) and V_i-IP showed age-dependent decline in men ($p < 0.01$). Muscle volume showed strong correlation to each other on both sides in both sexes ($R > 0.45$, $p < 0.01$). BMI strongly correlated with FSF-IP for men ($R=0.48$, $p < 0.001$). Normalised TAT (MR-based total adipose tissue) moderately to strongly correlated with FSF-IP ($R=0.37/0.66$;$p < 0.001$) and FSF-GM ($R=0.48/0.64$;$p < 0.001$) for both women/men; normalised TLMT (MR-based total lean muscle tissue) inversely correlated with FSF-IP ($R=-0.42/-0.47$;$p < 0.001$) and FSF-GM ($R=-0.49/-0.59$;$p < 0.001$).
Conclusion: Age-dependent muscle decline in iliopsoas and gluteus maximus is stronger in men. Other adipose content relates to primary hip flexor and extensor muscle quality. The functional significance warrants investigation.

B-0641 14:56

Can echo intensity obtained from ultrasonography images reflect muscle strength in the frail elderly population?
R. Mirón Mombiela, C. Borrás, F. Facal de Castro, P. Moreno; *Valencia/ES (mirona@ufm.edu)*

Purpose: The aim of the present study was to investigate whether muscle quality based on echo intensity (EI) is associated with muscle strength and correlates with the risk of frailty among elderly outpatients.
Methods and Materials: We included subjects from 20 to 59 years old to participate as controls, and from 60 years old or older to participate in the experimental group. This later group was subdivided into robust, pre-frail and frail individuals. The EI, muscle thickness (MT) and subcutaneous fat (FT) of the anterior compartment of the thigh were obtained by ultrasonography images. The muscle strength values were measured using a hand dynamometer. Patients also responded to a questionnaire that included demographic data, physical characteristics, frailty criteria, and quality of life questions.
Results: A total of 112 subjects participated in the study, ranging from 20 to 90 years old. The EI showed a significant negative correlation with muscle strength ($r = - 0.229$, $p = < 0.05$). When analysed by gender, the correlation showed a stronger association (Women: $r = - 0.522$, $p = < 0.01$; Men: $r = - 0.355$, $p = < 0.01$). A similar trend was acknowledeged for MT, but not for FT. The data obtained from the study also showed statistical differences between EI values, muscle strength and the number of frailty criteria ($p = < 0.01$).
Conclusion: Higher levels of EI were associated with lower levels of strength, and greater frailty. These results suggest the possibility of using EI as an early biomarker for frailty in the elderly population.

B-0642 15:04

Comparison of T2* relaxation times of articular cartilage of the knee in elite professional soccer players and age-and BMI-matched volunteers
C. Behzadi, G.H. Welsch, F.O. Henes, A. Quitzke, G. Schoen, G. Adam, M. Regier; *Hamburg/DE (C.Behzadi@uke.de)*

Purpose: To quantitatively assess articular cartilage of the knee in elite professional soccer players by performing T2* relaxation measurements and to compare the results to age- and BMI-matched individuals.
Methods and Materials: 22 elite professional soccer players and 22 age-matched normal individuals were evaluated. All participants underwent knee MRI at 3 T with a qualitative and quantitative analysis. For quantitative analysis T2* (22 echoes ranging from 4.6-53.6 ms; image resolution 0.5x2x2 mm) measurements in 3D data acquisition were performed in sagittal orientation. Qualitative analysis included e.g. meniscal tears, joint effusion and bone edema. All data sets were postprocessed using a dedicated software tool

(qMapit) and quantitative maps were generated. The deep and superficials layer of 22 predefined cartilage segments were analysed. Statistical analysis included student t-test, confidence intervals and a random effects model.
Results: In both groups, T2* relaxation times were significantly higher in the superficial compared to the deep layers ($p < 0.001$). In total, a mean higher relaxation time of 2.5 ms was noted for professional compared to amateur athletes $p < 0.001$).
Conclusion: A trend towards elevated T2* values in cartilage layers of elite professional soccer players when compared to healthy individuals was found. The effects seem to predominate in superficial layers. Longitudinal studies have to show if these results represent early subtle cartilage leasions prior to clinical manifestation, or possible adaption of the superficial cartilage layer to increased load and shear forces in the joint.

B-0643 15:12

Association of physical activity measured by accelerometer with longitudinal changes of knee joint abnormalities and cartilage T2: data from the Osteoarthritis Initiative

A. Gersing[1], M. Kretzschmar[1], C. Claudi[1], B.J. Schwaiger[1], G.B. Joseph[1], D. Dunlop[2], M.C. Nevitt[1], C.E. McCulloch[1], T. Link[1]; [1]*San Francisco, CA/US*, [2]*Chicago, IL/US (alexandra.gersing@ucsf.edu)*

Purpose: To assess whether physical activity measured by accelerometer at baseline was associated with changes in structural knee abnormalities and cartilage composition over 24 months.
Methods and Materials: Right knees of 218 subjects at high risk for osteoarthritis (age 58.4±6.0y; 115 females) from the Osteoarthritis Initiative (OAI), without radiographic evidence for OA and with no or only mild pain, stiffness and disability (Western Ontario and McMaster Universities Osteoarthritis Index score 0-1), were selected. Physical activity was measured using an ActiGraph GT1M accelerometer over seven days and subjects were stratified by quartiles of average daily minutes of moderate/vigorous activity (ranges of mv-PA min/day for quartiles 1-4 were 0.7-10.3, 10.6-22.3, 23.1-41.4, 41.9-133.9, respectively). Using multivariate regression models, we analysed the association of physical activity with changes over 24 months in structural knee abnormalities assessed using Whole-Organ Magnetic Resonance Imaging Score (WORMS), and cartilage composition assessed using T2-maps, including texture analysis.
Results: Moderate mv-PA (2. and 3.quartile combined) was associated with slower progression of cartilage T2-values over 24 months in the medial tibia only compared to subjects with low (1.quartile) and high (4.quartile) mv-PA ($P < 0.001$ and P=0.021, respectively). Similar findings were seen for texture parameters contrast (P=0.047 and P=0.012, respectively) and variance (P=0.009 and P=0.014, respectively). Higher mv-PA was associated only with higher baseline medial meniscus WORMS (P=0.009), but mv-PA did not predict longitudinal WORMS changes.
Conclusion: Moderate physical activity was associated with slower cartilage degeneration in the medial tibia compared to low or high physical activity, in knees without OA.

B-0644 15:20

Application of a sub-set of skinfold sites for ultrasound measurement of subcutaneous adiposity and percentage body fat estimation in athletes

D.C. O'Neill, O. Cronin, S.B. O'Neill, D. Herlihy, D. Keohane, T. Woods, M. Molloy, E. Falvey; *Cork/IE (damienconeill@hotmail.com)*

Purpose: Body composition assessment is an integral feature of elite sport as optimisation facilitates successful performance. This study aims to refine the use of B-mode ultrasound in the assessment of athlete body composition by determining suitable sites for measurement.
Methods and Materials: Sixty-seven elite athletes recruited from the Human Performance Laboratory, University College Cork, Ireland, underwent dual measurement of body composition. Subcutaneous adipose tissue thickness at 7 anatomical sites were measured using ultrasound and compared to percentage body fat values determined using Dual-Energy X-ray Absorptiometry.
Results: Multiple linear regressions were performed and an equation to predict percentage body fat was derived. The present study found subcutaneous adipose tissue depths at the triceps, biceps, anterior thigh and supraspinale sites correlated significantly with percentage body fat by X-ray absorptiometry (all $p < 0.05$). Summation of the depths at these locations correlated strongly with percentage body fat by Dual- Energy X-ray Absorptiometry (R2 =0.879).
Conclusion: The triceps, biceps, anterior thigh and supraspinale sites are suitable anatomical landmarks for the estimation of %BF using B-mode ultrasound. Use of B-mode ultrasound in the assessment of athlete body composition confers many benefits including lack of ionising radiation and its potential to be used as a portable field tool.

14:00 - 15:30 **Room E2**

Neuro

SS 711

Cerebrovascular disease (2)

Moderators:
U. Lamot; Ljubljana/SI
Z. Merhemic; Sarajevo/BA

B-0645 14:00

Added value of morphologic characteristics of intracranial arteries to future stroke risk

N. Han, J. Jang, H. Byun, K. Lee, J. Koo, H. Choi, S.-L. Jung, K.-J. Ahn, B.-S. Kim; *Seoul/KR (nahyehan@gmail.com)*

Purpose: To assess added value of morphologic characteristics of intracranial artery to future ischemic stroke risk
Methods and Materials: This retrospective study consisted of 86 patients who met following criteria; (1)initial MRI including time-of-flight MR angiography (TOF-MRA), (2)no acute ischemic stroke on initial MRI, (3)follow-up MRI with diffusion-weighted images (DWI), and (4)follow-up interval ≥120 days. Patients' age, sex, presence of hypertension, diabetes, dyslipidemia, coronary heart disease, previous ischemic stroke, and proximal ICA stenosis degree (NASCET) were used for conventional stroke risk factors. On initial TOF-MRA, four morphologic characteristics were analysed in intracranial arteries; (1)mean diameter of both distal ICA and basilar artery, (2)number of stenotic segments, (3)tortuosity, and (4)contour irregularity. Tortuosity and irregularity were assessed using semi-quantitative scoring system. On follow-up DWI, presence of acute ischemic stroke was assessed. Using cox proportional hazard model, future stroke risk was assessed with two models; model1 with conventional risk factors, and model2 with conventional risk factors and morphologic characteristics of intracranial arteries. The added prognostic value was assessed by the Harrell concordance index.
Results: Thirteen patients (16%) had ischemic stroke on follow-up DWI. In univariate analysis, proximal ICA stenosis degree, hypertension, previous ischemic stroke, mean diameter, tortuosity, and stenotic segments number were chosen ($P < 0.2$). In multivariate analyses, model1 had C-index 0.678±0.09, and R2 was 0.125. Model2 had higher C-index (0.75±0.09), and R2 was 0.211. Two models were significantly different in likelihood ratio test (P=0.0313).
Conclusion: The morphologic characteristics of intracranial arteries have added prognostic value of ischemic stroke, in combination with conventional risk factors.

B-0646 14:08

Morphological characteristics of intracranial arteries: their association with atherosclerotic risk factors and white matter hyperintensities

H. Byun, J. Jang, N. Han, S. Lee, H. Choi, S. Jung, K. Ahn, B.-S. Kim; *Seoul/KR (hokyunbyun@gmail.com)*

Purpose: To evaluate the morphological characteristics of intracranial arteries including dilatation, tortousity and irregularity with ageing and atherosclerosis risk factors.
Methods and Materials: This study included 121 patients with (1) brain MR imaging including time-of-flight MR angiography (TOF-MRA) at 3 T, (2) no acute ischaemic stroke, (3) no stenosis > 50% of intracranial arteries. Their atherosclerosis risk factors were assessed. Three morphological characteristics of intracranial arteries were analysed on TOF-MRA: tortuosity, irregularity and mean diameter. For assessing tortuosity of intracranial arteries, M1 segments of both middle cerebral artery (MCA) and basilar artery (BA) were assessed. Mean diameter of both distal internal carotid artery (ICA) and BA was measured on TOF-MRA. Irregularity is assessed in pre-defined 7 segments [BA, V4 segments of vertebral arteries (VA), distal ICA, MCA M1 segments]. Modified Fazekas scale for white matter hyperintensity (WMH) was assessed. Linear regression analysis was done to assess associations between these morphological characteristics and clinical features.
Results: Irregular contour had significant correlation with older age (OR 1.03, 95% CI 1.00-1.05) and previous ischaemic stroke (OR 3.47, 1.57-7.65). Tortousity of intracranial artery was associated with older age (OR 1.02, 1.01-1.04). Mean diameter of was larger in male (OR 1.16, 1.02-1.31), in patients with hypertension (OR 1.17, 1.02-1.33) and without diabetes (OR 0.85, 0.74-0.98). WMH, which is a surrogate marker of small vessel disease, did not had association with morphological characteristics.
Conclusion: Morphological characteristics of intracranial artery, including irregularity, dilatation and tortuosity, show significant association with ageing and atherosclerosis, but not with small vessel disease.

B-0647 14:16

Intracranial atherosclerotic plaque enhancement: is it a predictive marker of ischaemic stroke?

A.H. Elmokadem[1], F. Sherazi[2], T.J. Carroll[2], A. Honarmand[2], A. Shaibania[2], M.C. Hurley[2], S.A. Ansari[2]; [1]*Mansoura/EG*, [2]*Chicago, IL/US (mokadem83@yahoo.com)*

Purpose: We studied plaque imaging with non-contrast- and contrast-enhanced (CE) high-resolution MRI to compare the intra-plaque enhancement (IPE) between symptomatic and asymptomatic plaques in patients with intracranial atherosclerotic disease (ICAD).
Methods and Materials: After IRB approval for prospective study, patients with ICAD were scanned on a 3-T MR machine using 3D high-resolution black-blood T1 sampling perfection with application-optimised contrast using different flip angle evolution (SPACE) sequences. We categorised the plaques in each patients into symptomatic and asymptomatic according to the presence of diffusion restriction or encephalomalacia in the supplied territory. Two neuroradiologists were asked to grade the plaque enhancement qualitatively on 3-point scale and draw manual ROIs to measure each plaque signal intensity (SI) and enhancement quantitatively. Individualised baseline values for each plaque were calculated using the pre-contrast SI and compared with post-contrast to estimate the IPE.
Results: Twenty-two patients (9 F/13M), mean age ± SD: (62.7 ± 10.1 years), with ICAD were studied. The total number of plaques was 39; 24 were symptomatic and 15 were asymptomatic. There was a significant difference between mean pre- and post-contrast SI values (p= 0.0001 /paired T test). There was no difference between the baseline and CE plaque quantitative values (P=0.8/Mann Whitney test) and qualitative grading (p = 0.88/Independent T test) amongst the symptomatic or asymptomatic plaques. Interobserver agreement was excellent (ICC=0.90).
Conclusion: Plaque enhancement is an index of the plaque inflammation and hence vulnerability in spite of that it is not specific marker of an impending stroke.

B-0648 14:24

Intracranial vascular findings in a large tri-ethnic cohort

A.J. Schmitt, L. Smith, A. Hughes, N. Chaturvedi, R.H. Jager; *London/UK (nnschmitt@gmail.com)*

Purpose: Stroke forms an increasing part of the cardiovascular disease burden in the UK. Ethnic minority groups, principally South Asian and African Caribbean, have around a 1.5-fold excess risk of stroke compared to the general population. The circle of Willis (CoW), a polygonal anastomotic channel at the base of the brain, maintains a steady and constant blood supply. The aim was to record anatomical variations of this network and incidental intracranial vascular findings.
Methods and Materials: A community-based sample of 5000 South Asian, African Caribbean and European men and women aged 40-69 years was recruited between 1988 and 1990 from London. This cohort is currently undergoing their third clinic investigation (2014-17). This includes a 3-T time-of-flight (TOF) MRI of the intracranial vasculature; pilot imaging data were visually assessed.
Results: TOFs of 108 European (31 F/77M, median: 71), 124 South Asian (52 F/72M, median:70) and 17 Afro Carribbean (6 F/11M, median: 72) were analysed. Incidental intracranial vascular stenosis of > 50% was found in 4/5/0 (European/South Asian/Afro Caribbean) subjects (3%/5%/0%), incidental intracranial aneurysms were demonstrated in 7/6/0 volunteers (6%/5%/0%). The incidence of an incomplete circle of Willis was 76%/83%/60%, with the most common anatomical variation being hypoplastic/aplastic posterior communicating arteries, followed by foetal posterior cerebral arteries (24%/17%/41%). Multiple rarer variations were demonstrated as well.
Conclusion: Differences in intracranial variations of the CoW between ethnic groups could lead to different brain perfusion and a difference in stroke risk. Further studies including brain perfusion mapping are planned to assess this in more detail.

B-0649 14:32

Is there any relationship between carotid artery plaque and cerebral micro bleed?

F. Mubarak; *Karachi/PK (mubarakfatima@hotmail.com)*

Purpose: To correlate the presence of chronic micro bleed and carotid plaque characteristics.
Methods and Materials: Seventy consecutive patients (50 men, 20 women; mean age 64.5; range 45-82 years) were selected for the study. Each patient underwent MRI brain stroke protocol and ultrasound carotid Doppler for suspected carotid pathology. Chronic micro bleeds were classified and carotid plaques were characterised based on their composition. Patients were classified as symptomatic and asymptomatic. ROCs were calculated.
Results: The prevalence of the chronic micro bleed was 42.8% (60/140) over all with prevalence of 61.53% in symptomatic side.A statistically significant difference between chronic micro bleeds presence was observed, with a P value of < 0.0001 and an Odds ratio of 4.4 with 95% confidence interval of range 2.15 to 8.99. Statistically significant direct correlation with the fatty/soft plaques (correlation coefficient = 0.177; P value = 0.018). No statistically significant association was detected between CMBs and mixed plaque type (correlation coefficient 0.090; P value 145). We also performed the ROC curve analysis for symptomatics (stroke and TIA) and asymptomatic and we obtained, respectively: 0.7849 and 0.6181 for symptomatic (stroke, TIA) and asymptomatic, confirming that there is an association between CMBs and symptomatic (stroke/TIA) but not between CMBs asymptomatic patients.
Conclusion: There is increasing trend of chronic micro bleeds with fatty plaques and chronic micro bleeds are prevalent in patients who have stroke or transient ischaemic attacks.

B-0650 14:40

Distinction of atherosclerotic intimal and non-intimal calcification in the intracranial carotid artery on CT: a histopathological comparison

R. Kockelkoren, A. Vos, W. van Hecke, A. Vink, W.P.T.M. Mali, J. Hendrikse, D.H. Koek, P.A. de Jong, J. de Vis; *Utrecht/NL (r.kockelkoren@umcutrecht.nl)*

Purpose: Calcification of the intracranial carotid artery (iCA) on CT is an independent predictor for stroke and is thought to be related to atherosclerosis of the intima. We recently showed histologically that these calcifications are predominantly non-atherosclerotic internal elastic lamina calcifications. The aim of this study was to develop a CT-based scoring method which can distinguish intimal and non-intimal calcification in the iCA.
Methods and Materials: The iCA was histopathologically assessed for calcifications in 16 neuro-autopsy patients (50% male, median age: 64 [41-90]years). All patients had a thin-slice (0.625-1 mm) unenhanced CT-brain examination within 6 months of the autopsy. Using histopathology as the reference standard a semiquantitative CT score was developed based on circularity, thickness and continuity of the calcifications. Reproducibility of the CT scoring system was assessed by two experienced readers in an independent cohort of 51 subjects with unenhanced CT examinations.
Results: The final semi-quantitative CT score contained circularity (absent, dot (s), < 90°, 90-270° or 270-360°), thickness (absent, ≥1.5 mm or < 1.5 mm), and morphology (indistinguishable, irregular/patchy or continuous). High degree of circularity, thin and continuous calcifications had a high likelihood of being non-intimal, while low degree of circularity, thick and patchy calcifications had a high likelihood of being intimal. The score was able to reliably separate dominant intimal (3/16) and dominant non-intimal calcifications (9/16) as defined by histology. Four patients showed no/indistinguishable calcifications. The inter-rater agreement (kappa) for the score was 0.806.
Conclusion: A semi-quantitative CT score was developed which can reproducibly differentiate between intimal and non-intimal calcification in the iCA.
Author Disclosures:
A. Vos: Grant Recipient; The researcher was supported by a grant of NWO/STW (Project 12726).

B-0651 14:48

The importance of interface irregularity between the tumour and brain parenchyma in differentiating between typical and atypical meningiomas: correlation with pathology

J. Lee, K. Ahn, B. Kim, S. Jung, H. Choi, J. Jang, S. Lee; *Seoul/KR (jmlee328@gmail.com)*

Purpose: Interface irregularity between the tumour and brain parenchyma is an important imaging finding for differentiating between typical and atypical meningiomas. However, the degree of correlation between the pathological results and exact diagnostic significance remains unknown. The purpose of this study is to define the "irregular interface" between the meningioma and adjacent brain parenchyma as well as to understand its significance in predicting the histological grading of a tumour, focusing on the correlation with brain parenchymal invasion.
Methods and Materials: Seventy-nine patients who had pathologically confirmed meningioma with any histological grade as well as a pathological report of parenchymal invasion by the mass were enrolled. We defined the presence of "irregularity" of the interface as spiculations and/or a confluent fuzzy margin. We analysed the correlation between the interface irregularity and presence of brain parenchymal invasion as well as the correlation between interface irregularity and the histological grade of the meningioma, with Mann-Whitney U test, ROC curve and Chi square test.
Results: In conventional MRI, the interface irregularity between the tumour and brain parenchyma was significantly correlated with pathological findings of brain parenchymal invasion, which increased the meningioma grade (p=0.012). Not only brain parenchymal invasion, but also histological grade of meningioma showed statistically significant correlation with irregular interface (p=0.00).

Conclusion: The interface irregularity between the tumour and brain parenchyma in preoperative conventional MRI can be a strong predictive factor of brain parenchymal invasion by the tumour and high-grade meningiomas.

B-0652 14:56

Diagnostic accuracy of 3D black blood MR imaging with high resolution T1 SPACE in the evaluation of intracranial arterial thrombosis

A.H. Elmokadem[1], T.J. Carroll[2], M.C. Hurley[2], A. Shaibani[2], S.A. Ansari[2]; [1]*Mansoura/EG*, [2]*Chicago, IL/US (mokadem83@yahoo.com)*

Purpose: 3D black blood (BB) MRI with T1 sampling perfection with application-optimized contrast using different flip angle evolutions (SPACE) sequence allows high resolution vessel wall imaging. We investigated its accuracy in intraluminal arterial thrombosis detection.
Methods and Materials: We retrospectively identified patients with intracranial arterial thrombosis that underwent BBMRI with non-enhanced and contrast enhanced T1 SPACE sequences. Findings were evaluated by 2 neuroradiologists blinded to angiographic, conventional MRI studies and imaging clinical indications. Seventeen total intracranial vessel segments (ICA terminus, A1/A2-ACA, M1/M2-MCA, vertebral, basilar and P1/P2-PCA) per patient were evaluated and graded on a three point scale (0-2) for intraluminal hyperintensity and enhancement. Arterial occlusion was confirmed by digital subtraction or computed tomographic angiography in combination with time of flight MR angiography (MRA).
Results: Seven patients (2M & 5 F) of mean age 58.5 years (range, 24-77 years) with 9 intracranial arterial occlusions were studied. Arterial thrombosis was clearly identified (grade 2) on 3D BBMR imaging as focal intraluminal T1 SPACE hyperintensity and/or enhancement. Excellent diagnostic specificity (100%) and high sensitivity for intracranial arterial thrombosis was observed with either intraluminal T1 hyperintensity (78% or 100%) or enhancement (78% or 94%) when clear visualisation (grade 2) or combined partial & clear visualisation (combined grades 1 and 2) suggested vessel occlusion respectively.
Conclusion: 3D BBMRI with T1 SPACE imaging is a valuable sensitive and specific technique for the evaluation of intracranial arterial thrombosis and provides a confident diagnose in the setting of low resolution MRI findings and/or poor/absent flow enhancement on TOF-MRA imaging.

B-0653 15:04

Added value of 3D proton-density weighted images in diagnosis of intracranial arterial dissection

W. Lee, J. Kim, N.-Y. Shin, Y. Kim, S. Lim, S.-K. Lee; *Seoul/KR (purity830@naver.com)*

Purpose: To assess the clinical usefulness of three-dimensional high-resolution MRI (3D-HR-MRI) including pre- and post-contrast T1-weighted volumetric isotropic turbo spin echo acquisition with improved motion-sensitized driven equilibrium preparation (3D-iMSDE-T1) and proton-density weighted image (3D-PD) in detecting dissection signs and to evaluate added value of 3D-PD in diagnosing intracranial arterial dissection.
Methods and Materials: We retrospectively recruited patients who underwent 3D-HR-MRI with clinical suspicion of arterial dissection. Among them, we selected patients who were diagnosed with "Definite dissection" according to the Spontaneous Cervicocephalic Arterial Dissections Study criteria. For each patient, the presence of intimal flap, intramural hematoma, and vessel dilatation were evaluated independently by two neuroradiologists on each sequence. Interobserver agreement was assessed.
Results: Total 17 patients (mean age: 41 ± 10 [SD] years; 13 men) were diagnosed with "Definite dissection". The intimal flaps were more frequently detected on 3D-PD (88.2%, 15/17) than 3D-iMSDE-T1 (29.4%, 5/17), and post-contrast-3D-iMSDE-T1 (35.3%, 6/17; P=0.006 and P=0.004, respectively). No significant difference was found in the detection rate of intramural hematomas (59-71%) and vascular dilatations (47%) on each sequence. Interobserver agreement for detection of dissection findings showed almost perfect agreement (k=0.84-1.00), except detection of intimal flap on pre-contrast 3D-iMSDE-T1 (k=0.62). After addition of 3D-PD to pre- and post-contrast 3D-iMSDE-T1, more patients were diagnosed with "Definite dissection" with the initial MRI (88.2% vs. 47.1%; P=0.004).
Conclusion: 3D-HR-MRI is useful for diagnosing intracranial arterial dissection, particularly when 3D-PD sequence is added, allowing detection of intimal flap that could be overlooked on 3D-iMSDE-T1 sequences alone.

B-0654 15:12

High-resolution magnetic resonance (HR-MR) findings of intracranial artery dissection based on quantitative analysis

N. Lee, S. Jung, H. Kim, C.-G. Choi, S. Kim, D. Lee, D. Suh; *Seoul/KR (njlee924@gmail.com)*

Purpose: High-resolution magnetic resonance (HR-MR) is reported to be helpful in the diagnosis of spontaneous intracranial artery dissection (SID). Quantitative radiologic findings and qualitative dissection findings using HR-MR were compared in patients with SID lesions in the anterior cerebral artery (ACA), middle cerebral artery (MCA), and vertebral artery (VA).
Methods and Materials: This study included 26 patients (17 males and nine females; mean age, 47 years; range, 32-74 years) presumptively diagnosed with SID based on clinical features, luminal angiography, and HR-MR. Lesions were located in the ACA (n = 6), MCA (n = 4), and VA (n = 16). HR-MR was performed within 1 month of SID onset. Radiological indices of aneurysmal dilatation, including maximal outer diameter/area, remodeling index/modified remodeling index, and wall thickness/area index, and signal intensities of intramural hematoma were assessed using HR-MR. Qualitative findings, including intimal flap, double lumen, intramural hematoma, and aneurysmal dilatation were assessed using HR-MR and luminal angiography. Results were compared among the cerebral arteries.
Results: Maximal outer diameter/area, remodeling index/modified remodeling index, wall thickness index, and length differed significantly in the anterior and posterior circulation ($p < 0.05$). Mean relative signal intensity of intramural hematomas on T1WI was was 146% of adjacent muscles and the values were not significantly different between cerebral arteries.
Conclusion: Radiological indices of aneurysmal dilatation differed between the anterior and posterior circulation. Signal intensities of intramural hematomas were varied but consistent regardless of the cerebral artery. Quantitative analysis may complement qualitative findings in the evaluation of SID.

14:00 - 15:30 **Room F1**

Oncologic Imaging

SS 716

Whole body imaging

Moderators:
J. Sosna; Jerusalem/IL
T.D. Westwood; Manchester/UK

K-19 14:00

Keynote lecture

J. Sosna; Jerusalem/IL

B-0655 14:09

Whole-body MRI with and without DWI: comparison of capability for recurrence assessment with PET/CT, PET/MRI and conventional radiological examination in NSCLC patients

Y. Ohno[1], Y. Kishida[1], S. Seki[1], H. Koyama[1], K. Aoyagi[2], H. Yamagata[2], K. Sugimura[1]; [1]*Kobe/JP*, [2]*Otawara/JP (yosirad@kobe-u.ac.jp)*

Purpose: To compare the capability for recurrence assessment among whole-body MRI with and without diffusion weighted imaging (DWI), PET/MRI, PET/CT and conventional radiological examinations in postoperative non-small cell lung cancer (NSCLC) patients.
Methods and Materials: 96 consecutive postoperative NSCLC patients (52 men, 44 women; mean age 72 years) prospectively underwent whole-body MRI, PET/CT and conventional radiological examinations as well as follow-up examinations. All patients were divided into recurrence (n=17) and non-recurrence (n=79) groups according to the results of radiological, pathological and follow-up examinations. All co-registered PET/MRIs were generated by means of our proprietary software. Then, probability postoperative recurrence in each patient was visually assessed on all methods by means of 5-point visual scoring system. To compare recurrence detection among all methods, ROC analyses were performed. Finally, sensitivity, specificity and accuracy were statistically compared each other by using McNemar's test.
Results: Area under the curves (Azs) of whole-body MRI with DWI (Az=0.99) and PET/MRI (Az=0.99) were significantly larger than that of PET/CT (Az=0.92, $p < 0.05$) and conventional examination (Az=0.91, $p < 0.05$). When applied feasible threshold values, specificities (SPs) and accuracies (ACs) of MRI with and without DWI (with DWI: SP, 100%, AC, 97.9%; without DWI: SP, 100%, AC, 94.8%) and PET/MRI (SP: 96.2%, AC: 96.9%) were significantly higher than those of PET/CT (SP: 81.0%, $p < 0.05$; AC: 84.4%, $p < 0.05$) and conventional radiological examination (SP: 87.3%, $p < 0.05$; AC: 84.4%, $p < 0.05$).
Conclusion: Whole-body MRI with and without DWI and PET/MRI have better potential for recurrence evaluation than PET/CT and conventional radiological examination in postoperative NSCLC patients.
Author Disclosures:
Y. Ohno: Research/Grant Support; Toshiba Medical Systems Corporation. **K. Aoyagi:** Employee; Toshiba Medical Systems Corporation. **H. Yamagata:** Employee; Toshiba Medical Systems Corporation. **K. Sugimura:** Research/Grant Support; Toshiba Medical systems Corporation.

B-0656 14:17

Comparative performance of 18 F-FDG PET/MRI and 18 F-FDG PET/CT regarding detection and characterisation of pulmonary lesions in 121 oncologic patients

L.M. Sawicki[1], J. Grueneisen[2], C. Buchbender[1], B.M. Schaarschmidt[1], V. Ruhlmann[2], A. Wetter[2], L. Umutlu[2], G. Antoch[1], P. Heusch[1]; [1]*Düsseldorf/DE*, [2]*Essen/DE*

Purpose: To compare positron emission tomography/magnetic resonance imaging (PET/MRI) using a contrast-enhanced T1-weighted (T1w) fat-suppressed (fs) volume-interpolated breath-hold examination (VIBE) with PET/computed tomography (PET/CT) regarding detection and characterisation of lung lesions.
Methods and Materials: 121 oncologic patients underwent PET/MRI following PET/CT in a single-injection protocol (260±58 MBq 18 F-FDG). Lung lesion detection rates of T1w fs VIBE, PET from PET/CT, and PET from PET/MRI were computed in relation to the CT component of PET/CT. Wilcoxon tests assessed differences in lesion contrast (four-point scale) and lesion size between morphologic datasets as well as image quality (four-point scale), mean and maximum standard uptake values (SUVmean, SUVmax), and dignity ratings (benign/malignant) between PET/MRI and PET/CT. Correlations were calculated using Pearson's coefficients (r) for SUV and size and Spearman's rank coefficient (ρ) for lesion contrast.
Results: Detection rates of T1w fs VIBE, PET from PET/CT and PET from PET/MRI regarding 241 lung lesions were 66.8%, 42.7%, and 42.3%, respectively. There was a strong correlation regarding size (r=0.98) and SUVs (r=0.91) and a moderate correlation regarding lesion contrast (ρ=0.48). Image quality of PET/MRI was inferior to PET/CT ($p < 0.001$). Corresponding lung lesions were measured smaller on T1w fs VIBE than on CT ($p < 0.001$). SUVmax and SUVmean from PET/MRI were significantly higher than from PET/CT ($p < 0.001$ each). There was no significant difference in lesion contrast or dignity ratings.
Conclusion: Lung lesion detection with PET/MRI is inferior to PET/CT due to the limited detectability on T1w fs VIBE. Thus, staging with PET/MRI bears a risk of missing lung metastases.

B-0657 14:25

Influence of staging differences between 18 F-FDG PET/CT and 18 F-FDG PET/MRI on therapeutic decisions in non-small cell lung cancer patients

B.M. Schaarschmidt[1], J. Grueneisen[2], M. Metzenmacher[2], B. Gomez[2], P. Heusch[1], V. Ruhlmann[2], L. Umutlu[2], G. Antoch[1], C. Buchbender[1]; [1]*Düsseldorf/DE*, [2]*Essen/DE*

Purpose: To evaluate how differences between 18 F-fluordeoxyglucose positron emission tomography / computed tomography (18 F-FDG PET/CT) and 18 F-FDG PET / magnetic resonance imaging (18 F-FDG PET/MRI) in thoracic tumour staging influence therapeutic decisions in non-small cell lung cancer (NSCLC).
Methods and Materials: In 77 patients (mean age 61y, 43 male, 34 female), thoracic NSCLC staging was performed by two radiologists in separate sessions for 18 F-FDG PET/CT and subsequently conducted 18 F-FDG PET/MRI examinations according to the 7th lung cancer TNM classification and staging system. In an interdisciplinary tumour board consisting of an oncologist, a radiologist, a radiation oncologist, and a thoracic surgeon, discrepant staging results between both hybrid imaging modalities were discussed in separate sessions for 18 F-FDG PET/CT and 18 F-FDG PET/MRI under consideration of all clinical information and extrathoracic metastases. Therapeutic decisions were recorded for each patient and differences between both modalities were investigated.
Results: In 35% (27 patients), differences between 18 F-FDG PET/CT and 18 F-FDG PET/MRI were found in thoracic tumour staging. T-staging differed in 18% (n= 14), N-staging in 23% (n = 18), and M-staging in 1% (n = 1). Still, staging differences only led to different therapeutic decisions in the interdisciplinary tumour board in six patients (8%).
Conclusion: Thoracic NSCLC staging in 18 F-FDG PET/CT and 18 F-FDG PET/MRI only leads to differences in therapeutic decisions in selected cases. Hence, 18 F-FDG PET/MRI can be used as an alternative to 18 F-FDG PET/CT in prospective studies evaluating the impact of primary 18 F-FDG PET/MRI in NSCLC evaluation.

B-0658 14:33

Osteonecrosis detected by whole body magnetic resonance (WB-MRI) in patients with Hodgkin lymphoma treated by BEACOPP

D. Albano, C. Patti, L. La Grutta, E. Grassedonio, A. Mulè, R. Lagalla, M. Midiri, M. Galia; *Palermo/IT (albanodomenico@me.com)*

Purpose: The purpose of our retrospective study was to assess the incidence of osteonecrosis in patients who received different chemotherapies.
Methods and Materials: We evaluated the Whole Body Magnetic Resonance (WB-MRI) scans performed on 42 patients with Hodgkin Lymphoma treated by three chemotherapy regimens (6 ABVD, 2 ABVD + 4 BEACOPP, 2 ABVD + 8 BEACOPP), excluding the patients with main risk factors for osteonecrosis.
Results: Six out of 7 patients (85.7%) who received 8 BEACOPP and 1 out of 5 patients (20%) treated by 4 BEACOPP presented osteonecrosis, with a statistically significant difference of frequency between the two groups of patients ($p < 0.05$); no injury has been reported in patients treated by only ABVD. Among a total of 48 osteonecrotic lesions observed, the 47.9% were detected in the knee; multifocal osteonecrosis were detected in 6 out of 7 patients (85.7%).
Conclusion: The development of osteonecrosis seems to be strictly related to the chemotherapy protocol adopted and the number of cycles received, strengthening the hypothesis of a correlation between the dose of corticosteroids included in the BEACOPP scheme and this complication. WB-MRI can be considered as a helpful tool that allows to early detect osteonecrotic lesions in patients treated with corticosteroids.

B-0659 14:41

Qualitative and quantitative evaluation of whole body MRI with DWI for bone marrow involvement in follicular lymphoma

A. Balbo Mussetto[1], C. Saviolo[1], M. Petracchini[1], E. Vietti[1], C. Lario[1], A. De Libero[1], D. Gottardi[1], C. Tarella[2], S. Cirillo[1]; [1]*Turin/IT*, [2]*Milan/IT (annalisa.balbomussetto@gmail.com)*

Purpose: Follicular lymphoma (FL) is a non-Hodgkin's lymphoma (NHL) characterised by a frequent Bone Marrow Involvement (BMI). In this histology, International Guidelines still recommend Bone Marrow Biopsy (BMB) as a standard approach for assessing BMI because sensitivity of FDG-PET is to low. Aim of our study was to investigate the role of qualitative and quantitative evaluation of whole body MRI with Diffusion-Weighted Imaging (Wb-MRI-DWI) for identifying BMI.
Methods and Materials: We retrospectively evaluated 20 patients with newly diagnosed FL who underwent random unilateral BMB, FDG-PET/CT and Wb-MRI-DWI for initial staging. In a patient-based analysis, sensitivity of Wb-MRI-DWI was calculated using BMB as reference standard and compared with FDG-PET. For quantitative analysis, mean ADC values of posterior iliac crest were correlated with BMI and bone marrow cellularity.
Results: BMB revealed BMI in 7 patients (35%). With respect to FDG-PET, Wb-MRI-DWI demonstrated a significantly higher sensitivity, 100% [95 %CI: 59.04-100 %] versus 42.86% [95 %CI: 9.90-81.59%] (p=0.003) and NPV 100% versus 69.23% (p=0.0239). Specificity was lower (69.23%) because both techniques identified focal BMI in 4 patients with negative BMB. On quantitative analysis no significant correlation between ADC mean value and BMI was found (p=0.0586).
Conclusion: Assessment of BMI is crucial in FL because it has both therapeutic and prognostic implications. Our preliminary data suggest that in FL Wb-MRI-DWI has a higher sensitivity with respect to FDG-PET, and after further investigations on larger patient groups, it could become an useful tool in the clinical work-up.

B-0660 14:49

Pre- and post-treatment relationship of glycolytic activity on [18 F]-FDG-PET and cell density on diffusion-weighted MRI: preliminary results of an [18 F]-FDG-PET/MR study

C. Giraudo, M. Weber, M. Raderer, D. Senn, G. Karanikas, M. Mayerhoefer; *Vienna/AT (chiara.giraudo@meduniwien.ac.at)*

Purpose: To determine, using [18 F]-FDG-PET/MR, whether glycolytic activity, expressed by SUV (standardized uptake values) on PET, and cell density, expressed by ADC (apparent diffusion coefficients) on diffusion-weighted MRI, correlate before or after therapy in patients with Hodgkin (HL) and Non-Hodgkin lymphoma (NHL).
Methods and Materials: Patients with histologically proven lymphoma were enrolled in this prospective, IRB-approved study and underwent [18 F]-FDG-PET/MR on a fully-integrated system before and after 3-6 cycles of chemo- or immuno-chemotherapy. Fourteen nodal and 12 extranodal regions were evaluated per patient.For each involved region, the largest lesion was defined as target lesion, provided that it showed focal tracer uptake and restricted diffusion. Maximum and mean SUVs (SUVmax, SUVmean), and minimum and mean ADCs (ADCmin, ADCmean) were recorded at baseline and after treatment, and their rates of change (Δ) were calculated.Pearson correlation

coefficients (p) were used to assess the relationship between SUVs and ADCs and ΔSUVs and ΔADCs.
Results: Eight HL and 14 NHL (6 mantle-cell, 5 diffuse-large-B-cell, 2 follicular, 1 marginal zone lymphoma) patients, with 122 untreated lesions and eight lesions after treatment, were analysed.Before treatment, the correlations between SUVmax and ADCmin and between SUVmean and ADCmean were, respectively, r=0.16 (P=0.07) and r=0.06 (P=0.51). After treatment, the correlation between ΔSUVmax and ΔADCmin was r= -0.45 (P=0.25) and between ΔSUVmean and ΔADCmean was r=-0.71 (P=0.047).
Conclusion: In lymphoma patients, no significant correlation emerged between pre-treatment SUVs and ADCs. However, the treatment-induced changes in glycolytic activity and cell density (ΔSUVmean and ΔADCmean) showed a substantial, negative correlation in these patients.
Author Disclosures:
C. Giraudo: Research/Grant Support; Austrian Science Fund (FWF), project KLIF 382.

B-0661 14:57

Assessing progressive disease in myeloma patients with whole-body diffusion-weighted imaging: a prospective study comparing whole body T1-WI, T2-STIR-WI and laboratory findings

S. Pans, V. Goosens, N. Noppe, F. De Keyzer, M. Delforge; *Leuven/BE (steven.pans@uzleuven.be)*

Purpose: We evaluated prospectively (1) WB-diffusion-weighted-MRI and (2) WB-T1-WI and WB-T2-STIR-WI in detection of progressive disease (PD). We compared these techniques with paraprotein evolution.
Methods and Materials: Newly diagnosed myeloma patients were included. They all underwent autologous stem cell transplant (AST). Scans were performed at 3 T, at baseline, pre-AST and post-AST. The protocol was a combination of WB-DWI-MRI, WB-T1-WI and WB-T2-STIR-WI. One radiologist had access to all images (group_1), 2 radiologists had only access to T1-WI and T2-STIR-WI images (group_2). PD was defined as increase in size and/or number of focal lesions or development of diffusely abnormal bone marrow. ADC of suspected lesions was calculated. All patients underwent routine biochemical tests.
Results: 45 patients were included; mean age 53 y; mean follow-up 30 months. 14 patients developed PD according to their paraprotein levels. In group_1, detection of PD was true-positive in 13 patients, false-negative in 1. In group_2 was PD detection true-positive in 10 patients, false-positive in 4 and false-negative in 4 patients. In 2 patients in group_1, PD was diagnosed 8 months earlier than biochemical tests. In 3 patients, group_ 1 and 2 diagnosed PD at the same time, 2 months earlier than the biochemical tests. In 7 patients, imaging and biochemical tests detected PD simultaneously. The mean ADC of the 52 bone lesions was significantly lower than ADC at baseline.
Conclusion: WB-DWI-MR may increase detection of PD in myeloma patients in comparison to T1-WI and T2-STIR-WI. In some patients, PD was detected earlier by WB-DW-MRI than by the routine biochemical follow-up.

B-0662 15:05

Efficacy of whole-body low-dose CT (WBLDCT) in the staging of patients with multiple myeloma (MM): comparison with whole-boby magnetic resonance imaging (WBMRI)

E.B. Orsini, D. Ippolito, C. Talei Franzesi, V. Besostri, S. Spiga, S. Sironi; *Monza/IT (eleonoraorsini@libero.it)*

Purpose: To compare whole-body low-dose CT (WBLDCT) with whole-body magnetic resonance imaging (WBMRI) in evaluation of bone marrow involvement and different infiltration patterns in patients with multiple myeloma (MM).
Methods and Materials: Thirty-five patients with histologically confirmed MM underwent WBLDCT and WBMRI. Unenhanced WBLDCT was performed on 256-slice scanner (iCT,Philips),with tube voltage 120 kV, tube current time product 40 mAs, collimation 128x0.65. WBMRI was performed on 1.5 T magnet (Achieva,Philips), acquiring T1-TSE and T2-STIR sequences on coronal and sagittal plane; DWIBS sequences were acquired on axial plane,with three b-values (0.500 and 1000 mm2/s). Whole skeleton was divided in five anatomic districts (skull,spine,sternum and ribs, pelvis, upper and lower limbs) and evaluated in terms of infiltration pattern and distribution of disease. All the patients were staged according to Durie-Salmon PLUS Staging System.
Results: On WBLDCT 12 patients showed no focal osteolysis and in 23/35 cases a total of 66 bone regions were affected by a total of 545 neoplastic focal lesions: 20 patients were stage I, 4 stage II and 10 stage III. On WBMRI 13 patients showed no focal osteolyses and in 22/35 cases 89 regions were affected by a total of 550 lesions focal lesions: 20 patients were stage I,6 stage II and 8 stage III.Infiltration patterns were concordant in both techniques: focal in 13 patients, diffuse in 7 patients and combined in 14 patients.One patient showed no bone marrow involvement.
Conclusion: WBLDCT offers useful information for MM staging, detecting even small osteolytic lesions. WBMRI should be considered to clarify ambiguous CT findings or in symptomatic patients with negative CT findings or in case of osteopenia MM related.

B-0663 15:13

A comparative study between whole body diffusion imaging with background signal suppression (DWIBS) and FDG PET/CT in assessment of lymphoma patients

A.M. Wafaie[1], M. Kotb[2], M. El-Azab[2], A. Abo El-Regal[2]; [1]*Giza/EG*, [2]*Cairo/EG (a_wafaie@yahoo.com)*

Purpose: To compare between the diagnostic value of F-18-FDG PET-CT and WB-MRI/DWIBS in detecting nodal and extra-nodal lymphomatous infiltrates.
Methods and Materials: Thirty two patients with pathologically proven lymphoma (HL or NHL) underwent both F-18-FDG PET-CT and WB-MRI/DWIBS, within a time frame not more than 7 days and without therapy in between. Both F-18-FDG PET-CT and WB-MRI/DWIBS were independently interpreted using visual (qualitative) and quantitative analysis in the term of SUV max and ADC mean respectively. Using pathological data and/or combined clinical/radiological follow-up as a reference standard, sensitivity, specificity, PPV, NPV and overall accuracy were estimated for both techniques.
Results: F-18 FDG PET-CT demonstrated clearly higher diagnostic parameters (in terms of sensitivity, specificity, PPV, NPV and overall accuracy) than WB-MRI/DWIBS. WB-MRI/DWIBS showed only a limited superiority in the context of bone marrow assessment.
Conclusion: F-18 FDG PET-CT is better than WB-MRI/DWIBS in evaluation of lymphomas. WB-MRI/DWIBS may play a complementary role especially in assessment of BM Infiltration.

B-0664 15:21

Generating evidence for clinical benefit of PET/CT based on the results of an oncologic PET/CT registry - filling the gap between diagnostic accuracy and patient outcome?

C. Pfannenberg, B. Gueckel, S.-C. Schuele, N. Schwenzer, S. Kaufmann, A.-C. Mueller, C. la Fougere, K. Nikolaou, P. Martus; *Tübingen/DE (christina.pfannenberg@med.uni-tuebingen.de)*

Purpose: To evaluate the impact of PET/CT on clinical management in daily routine based on a prospective data registry and to link these information with the expected benefit on patient outcome.
Methods and Materials: A prospective patient cohort (04/2013-04/2015) having a PET/CT for oncological reasons was evaluated based on questionnaires from referring physicians on intended management pre- and post-PET/CT. Primary endpoint: impact of PET/CT in different cancers and indications. Changes in management considered different categories of treatment and non-treatment. Secondary endpoint: assessment of clinical benefit of PET/CT via the "linked-evidence" approach.
Results: 2692 patients were evaluated (61.1±14.7 ys, 64% male). Lung, prostate, melanoma, NET and lymphoma accounted for 2/3 of cases. The most frequent PET/CT indication was staging (62.3%). Overall, physicians changed their intended management in 57.8% of patients (95% CI, 55.9%-59.7%) based on PET/CT results. In 24.1% of all cases (22.1% prostate, 33.9% melanoma) management changed from non-treatment (e.g. watching, additional imaging) to post-PET/CT treatment strategy. The impact of PET/CT was highest in reducing demands for additional testing. Uncertainties regarding curative vs palliative treatment were reduced by 35.8%. By linking the registry data with follow-up data first in melanoma the impact of PET/CT on outcome was demonstrated, i.e. realised RO surgery.
Conclusion: Registry data confirmed that physicians often change their intended management based on PET/CT due to the improved test accuracy and reduced uncertainty in decision making. The "linked evidence" approach could be used as a model to connect these results with expected benefit in patient outcome.

14:00 - 15:30 **Room F2**

Physics in Radiology

SS 713

Innovations in radiology

Moderators:
Y. Bouchareb; London/UK
R. Raupach; Forchheim/DE

B-0665 14:00

In vivo skin moisturizing measurement by high-resolution 3-T MR imaging

J. Mesrar, J. Ognard, S. Ghomadi, D. Chechin, L. Misery, D. Ben Salem;
Brest/FR (mesrar.jawad@gmail.com)

Purpose: Skin MR imaging has been existing since the 90's and has been the subject of several studies, particularly in cosmetology but not at 3-T using a dedicated commercial microscopic coil. The purpose of this study is to explore the different skin layers moisturizing.
Methods and Materials: An MRI of the heel's skin was performed on a 3 T scan using a 3D-T1 and a TSE calculation T2-weighed sequence (pixels size of respectively 60 and 70 µm), before and an hour after application of a moisturizer topic in 33 healthy volunteers. The coil has a diameter of 23 mm. Region of interest in the stratum corneum, the epidermis and the dermis were generated on the T2 mapping using ImageJ software. The thickness of each layer was measured. The cross-examination repositioning was done with the T1 sequence to ensure the comparability of measurements.
Results: Measurements before and after moisturizer topic application brought out a T2 increase of 48.94% ($p < 0.0001$) in the stratum corneum and 5.45% ($p < 0.0001$) in the epidermis without significant difference in the dermis. There was no significant relationship between the thickness of the stratum corneum and the T2 increase. However, there was a significant correlation between the thickness of the stratum corneum and the epidermis by a factor of 1.7 (r^2=0.5161).
Conclusion: High-resolution MRI allows exploring the anatomy and physiological properties of the skin and seems to be an interesting technique for skin hydration study.

B-0666 14:08

Cycled superselective pseudo-continuous Arterial Spin Labeling without the need for acquiring a control image

T. Lindner[1], O. Jansen[1], M. Helle[2]; [1]*Kiel/DE*, [2]*Hamburg/DE*
(Thomas.Lindner@uksh.de)

Purpose: Superselective Arterial Spin Labeling (ASL) is a technique to perform MR perfusion imaging of individual arteries. However, several pairs of "labeling" and "control" images which are subsequently subtracted have to be performed for each of the selected arteries, prolonging the scan time and increasing the possibility of patient movement. However, only a single artery can be labeled while the magnetization of remaining vessels is different (pseudo-randomised). A new approach is presented that use a linear combination of the selectively labeled acquisitions to generate a selective perfusion image without the need of acquiring corresponding control images.
Methods and Materials: Six volunteers underwent MR scanning under the general protocol for sequence development approved by the local ethics committee. Imaging was performed on a Philips 3 T Achieva (Philips, Best, The Netherlands) scanner. ASL parameters: were: 1800 ms labeling duration and 2000 ms post labeling delay. Image acquisition was: 2D EPI readout; 2.3x2.3x4 mm voxel size; 16 slices. Acquisition time was 4:49. The calculations were performed using Matlab R2013b (The Mathworks, Natick, MA). To obtain quantitative information, an algorithm was used.
Results: Images of all individual perfusion territories could be obtained. The pseudorandomised magnetization of the non-labeled arteries can be used as control condition for subsequent post-processing. However, the posterior circulation presented lower CBF values as compared to the nonselective perfusion images probably due to reduced labeling efficiency in the VA.
Conclusion: Superselective ASL can be performed without the need of acquiring an additional control image. Thereby, image acquisition time can be reduced.
Author Disclosures:
M. Helle: Employee; Philips GmbH Innovative Technologies.

B-0667 14:16

Whole-Body MRI: Inter- and Intra-Reproducibility of Quantitative, Organ-specific Measures across different 3 Tesla MR Scanners in the Pilot-Study of the German National Cohort

C.L. Schlett[1], T. Hendel[2], J. Hirsch[3], T. Ittermann[4], H.-U. Kauczor[1], M. Forsting[5], F. Bamberg[6], the German National Cohort[1]; [1]*Heidelberg/DE*, [2]*Munich/DE*, [3]*Bremen/DE*, [4]*Greifswald/DE*, [5]*Essen/DE*, [6]*Tübingen/DE*

Purpose: In population-based research and certain clinical settings, whole-body MRI is increasingly being implemented for accurate assessment of subclinical disease burden. However, reproducibility of organ-specific, quantitative measures is unknown, despite its high relevance for all scientific conclusions. Thus, we assessed the inter- and intra-reproducibility of phenotypic quantitative measures across different 3 Tesla Scanners representing four major vendors.
Methods and Materials: We scanned healthy volunteers (n=30) using a predefined whole-body MR protocol (including neurological, cardiovascular, thoracoabdominal and musculoskeletal sequences) at 9 different sites including 7 different Scanner system. A set of quantitative organ-specific measures (n=20; e.g. volume of brain's gray/white matter, LV endsystolic/-diastolic volume, pulmonary trunk diameter, vertebral body height, cartilage thickness, liver diameter) were yielded in a blinded fashion. Reproducibility was determined using mean weighted relative differences and interclass correlation coefficients (ICC).
Results: All volunteers (44±14years, 50% females) successfully underwent whole-body MRI within a mean scan time of 2:32hrs except for two scans due to technical issues. The scan time differed significantly across scanners (range: 1:59 to 3:12hrs). Overall, good reproducibility was achieved, which was significantly higher for intra- than for inter-scanner comparisons (mean ICC: 0.80±0.17 vs. 0.60±0.31, p=0.005, respectively). Accordingly, 45% of measurements demonstrating excellent reproducibility for the inter-scanner, while 65% for the intra-scanner comparison. The mean relative differences ranged from 1.0% to 53.2% for inter-scanner and from 0.1% to 15.6% for intra-scanner comparison.
Conclusion: Whole-body MRI using a different 3 Tesla Scanner yielded overall good reproducibility regarding phenotypic measures, which were significantly higher when using identical MR scanners.

B-0668 14:24

Application of MR-based joint estimation of attenuation and activity distributions to clinical non-TOF PET/MR

T. Heußer[1], C.M. Rank[1], M.T. Freitag[1], A. Dimitrakopoulou-Strauss[1], H.-P. Schlemmer[1], T. Beyer[2], M. Kachelrieß[1]; [1]*Heidelberg/DE*, [2]*Vienna/AT*
(thorsten.heusser@dkfz-heidelberg.de)

Purpose: To improve PET quantification by MR-based joint estimation of attenuation and activity distributions for clinical non-TOF PET/MR.
Methods and Materials: Current PET/MR systems make use of MR-based attenuation correction (MR-AC), resulting in an underestimation of the PET activity, in particular in the vicinity of bone. We recently proposed an algorithm to simultaneously estimate attenuation and activity distributions from non-TOF PET emission data using anatomical prior information provided by standard T1-weighted MR images. The MR images are used to obtain an initial attenuation map and to create a voxel-dependent prior representing expectations on the attenuation distribution. The prior favors pre-selected attenuation coefficients for air, soft tissue, and bone. We here present results of an on-going patient study, evaluating our algorithm using clinical 18 F-FDG-PET head patient data sets acquired with the Siemens Biograph mMR. Reconstruction of the emission data was performed using the proposed algorithm, MR-AC, and AC using a CT-based attenuation map for comparison (CT-AC).
Results: Due to the recovery of bone attenuation, the proposed algorithm improves PET quantification compared to MR-AC. For the data sets investigated to date, we found average errors in the brain activity of -7.5% for MR-AC, which were reduced to +1.9% when using the proposed algorithm. Regional analysis of, e.g., the occipital lobe showed activity errors of -10.6% for MR-AC and -1.7% for the proposed method.
Conclusion: The proposed MR-based joint estimation of attenuation and activity is directly applicable to current non-TOF PET/MR systems and allows for an improved quantification of clinical PET/MR data.

B-0669 14:32

Respiratory motion compensation for simultaneous PET/MR based on strongly undersampled MR data

C.M. Rank, T. Heußer, A. Wetscherek, H.-P. Schlemmer, M. Kachelrieß;
Heidelberg/DE (christopher.rank@dkfz.de)

Purpose: To allow for MR acquisition times as short as 60 s per bed position, we propose a new method for PET/MR respiratory motion compensation (MoCo) that employs strongly undersampled MR data.

Methods and Materials: Simultaneous 18 F-FDG PET/MR data covering the thorax of three free-breathing patients were acquired at a Siemens Biograph mMR system. We applied a radial stack-of-stars sequence with golden angle radial spacing and an acquisition time of 58 s corresponding to 360 spokes per slice. The PET acquisition time was 300 s. MR data and PET list-mode data were sorted retrospectively into 20 overlapping motion phase bins with a width of 10% employing intrinsic MR gating. 4D MoCo MR images and corresponding motion vector fields were generated using our newly developed method for joint motion estimation and image reconstruction. Reconstructions were performed for 3D PET, 4D gated PET, and 4D MoCo PET using the motion vector fields derived from MR.
Results: For quantitative evaluation, SUVmean values were measured for six lesions and the myocardium of the patients. Compared to 3D PET, SUVmean values of 4D gated PET and 4D MoCo PET were 11.1% and 12.5% larger on average while standard deviations were 88.4% and 9.9% larger on average, respectively. These findings demonstrate that 4D MoCo PET is able to reduce the underestimation of activity due to motion blurring compared to 3D PET and to increase signal-to-noise ratio compared to 4D gated PET.
Conclusion: The proposed respiratory PET/MR MoCo enables improved image quality and quantification of clinical PET/MR.

B-0670 14:40

Multi-purpose robotic x-ray system enabling 2D/3D imaging of standing patients: assessment of 3D imaging performance

A. Fieselmann, J. Steinbrener, A.K. Jerebko, T. Mertelmeier; *Erlangen/DE (thomas.mertelmeier@siemens.com)*

Purpose: To provide initial assessment of 3D imaging performance of a novel robotic x-ray system that enables imaging of standing patients.
Methods and Materials: The x-ray system (Multitom Rax, Siemens Healthcare) has two telescopic arms mounted on ceiling rails for the x-ray tube and detector. 2D radiographs are acquired at stationary tube and detector positions. Projection images for reconstruction are acquired by simultaneous movement of both arms along dedicated trajectories. The system allows 2D and 3D imaging with flexible patient positioning, e.g. standing patients under weight-bearing conditions. Geometrical reproducibility of scan trajectories, 3D image quality and dose is assessed based on reconstructions of a 3D image quality phantom (ConeBeam phantom, QRM, Germany) for typical protocols. Reconstructed images of human specimen and animal cadavers are evaluated in terms of visualisation of clinically relevant features.
Results: With current protocols scanning times are 16-25 seconds depending on scan trajectory. Detector entrance air kerma is 20-240 µGy/scan. The phantom evaluation shows a spatial resolution of 12-14 lp/cm and a low contrast resolution of up to 20 HU for an 8 mm object (2x2 detector binning, 200 projection images). Qualitative evaluation of specimen and cadaver images shows high image quality in particular for the visualisation of bones.
Conclusion: This system could lead to new 2D/3D imaging workflows in musculoskeletal imaging. In contrast to MDCT and dedicated extremity CT scanners this system can also scan the hip or spine of a standing patient. Initial assessment of 3D image quality shows excellent results in particular for bone imaging.
Author Disclosures:
A. Fieselmann: Employee; Siemens Healthcare. **J. Steinbrener:** Employee; Siemens Healthcare. **A.K. Jerebko:** Employee; Siemens Healthcare. **T. Mertelmeier:** Employee; Siemens Healthcare.

B-0671 14:48

Facilitated diagnosis of pneumothoraces in mice using x-ray dark-field radiography

K. Hellbach[1], A. Yaroshenko[2], K. Willer[2], S. Auweter[1], M. Reiser[1], A. Hilgendorff[3], O. Eickelberg[3], F. Pfeiffer[2], F.G. Meinel[1]; [1]*Munich/DE*, [2]*Garching/DE*, [3]*Neuherberg/DE (katharina.hellbach@med.uni-muenchen.de)*

Purpose: To evaluate the diagnostic value of x-ray dark-field imaging in projection radiography-based depiction of pneumothoraces.
Methods and Materials: Experiments were performed using 7-day-old C57Bl/6N mice. Mice either received mechanical ventilation (MV) for two or eight hours with oxygen rich gas (MV-O2; fiO2=0.4, n=24) or breathed spontaneously in hyperoxia (fiO2=0.4) for two or eight hours or room air (n=22). All mice were imaged with a prototype grating-based small animal scanner to acquire transmission and dark-field radiographs. Image contrast between lung tissue and the air-filled pleural cavity was quantified for transmission and dark-field radiograms. Readings were performed by two independent radiologists, scoring the absence and presence of pneumothoraces as well as their grade of diagnostic confidence.
Results: 8 mice receiving MV-O2 developed 10 pneumothoraces. The contrast ratio between the air-filled pleural space and lung tissue was significantly higher in the dark-field (8.4±3.5) than in the transmission images (5.1±2.8; $p < 0.05$). Accordingly, readers' diagnostic confidence for the diagnosis of pneumothoraces was scored significantly higher for dark-field compared to transmission images (p=0.001). Interreader agreement improved from moderate, when analyzing transmission images alone (κ=0.41), to very good when analyzing dark-field images alone (κ=0.90) or a combination of both (κ=0.88). Diagnostic accuracy significantly improved for one reader when dark-field images were assessed (p=0.04), primarily due to an increase in sensitivity up to 90%.
Conclusion: The strong contrast between lung parenchyma and air in the pleural space in dark-field images makes this technique a promising tool for facilitated detection of pneumothoraces.

B-0672 14:56

Novel x-ray detector technology for quantitative material information in digital radiography

J.J. Cowling[1], G. Gibson[1], N. Loxley[1], P. Scott[1], P. White[2], K.J. Robson[2], B. Lopez[3]; [1]*Sedgefield/UK*, [2]*Newcastle upon Tyne/UK*, [3]*Durham/UK (j.cowling@ibexinnovations.co.uk)*

Purpose: We present a novel X-ray technology which locally modulates the beam energy across a detector and allows for the recovery of energy information at minimal impact to image quality, dose and computation time. This can be used to give diagnostic information unachievable in standard X-ray measurements such as areal bone mineral density (aBMD).
Methods and Materials: DR measurements were performed on the wrist, lower arm, pelvis, and head of a cadaveric donor with appropriate kV and mAs for a clinical assessment. A multi-absorption-plate (MAP) was added to the detector between the anti-scatter grid and scintillator to modulate the X-ray beam. Image data was analysed in conjunction with a training data set relating soft-tissue and bone attenuations.
Results: Images have been generated demonstrating sensitivity to changes in material. Training data sets allow a comparative composition measurement. This information will map to standard clinical measures such as aBMD expanding the range of clinical information which can be extracted from DR. As an exemplar of this additional information, we select two regions with almost no contrast in our high quality X-ray image (Contrast to Noise Ratio, CNR=0.007) then transform the image into a material image enhancing contrast between tissue and bone such that these regions demonstrate a much higher contrast (CNR=5.148).
Conclusion: A novel technology is demonstrated which allows the recovery of information which is usually discarded from a DR detector. This technology returns high quality standard X-ray images as well as new energy-sensitive measurements for novel diagnostic use.
Author Disclosures:
J.J. Cowling: Employee; IBEX Innovations. **G. Gibson:** Employee; IBEX Innovations. **N. Loxley:** CEO; IBEX Innovations. **P. Scott:** Employee; IBEX Innovations. **P. White:** Consultant; Codman and MicroVention. Research/Grant Support; Institutional support in partnership with IBEX, MicroVention Terumo. **K.J. Robson:** Investigator; Project partner with IBEX Innovations. **B. Lopez:** Grant Recipient; PhD part funded by IBEX Innovations.

B-0673 15:04

Large volume data acquisition for intraoperative imaging with mobile C-Arm CT systems

J. Kuntz[1], M. Knaup[1], C. Fleischmann[2], M. Kachelrieß[1]; [1]*Heidelberg/DE*, [2]*Nürnberg/DE (j.kuntz@dkfz.de)*

Purpose: To increase the field of measurement (FOM) of mobile and fully motorized C-arm CT systems for interventional and surgical procedures.
Methods and Materials: A dynamic scan trajectory was developed and implemented into a prototype mobile C-arm CT. The new shifted detector rotate-plus-shift (SDRPS) trajectory is designed to almost double the FOM and to yield mathematically exact images even though the scanner's rotation range is limited to 165°. This is achieved by utilizing two additional motorized axes and an angle-dependent detector shift combined into a forward and a reverse scan with a smooth transition in-between. Datasets of anthropomorphic phantoms were acquired and reconstructed using a filtered backprojection algorithm with a dedicated redundancy weight.
Results: Within the increased FOM the images are of high fidelity and no limited angle artifacts are visible. The FOM laterally increased by a factor of 1.8 compared to standard rotate-plus-shift scans without shifted. The dynamic detector shift allows for a large variety of novel trajectories increasing the FOM, including asymmetric FOM data acquisition as well as efficient dose usage with compact and mobile C-arm systems. The reconstructed FOM acquired with the offset detector trajectory is sufficiently large to show e.g. spine and shoulder in a single reconstruction.
Conclusion: The SDRPS trajectory enables full sampling and increases the FOM although the scanner's mechanical range is limited to 165°. Intraoperative imaging of larger volumes may be used as an alternative to follow-up scans in a diagnostic CT system and thus may lead to an increase in patient safety.
Author Disclosures:
C. Fleischmann: Employee; Ziehm Imaging GmbH.

B-0674 15:12

CT thermometry for temperature monitoring in tumour hyperthermal treatments: influence of ROI size and scan setting

G. Frauenfelder[1], F. Giurazza[2], E. Schena[2], P. Saccomandi[2], C. Massaroni[2], B. Beomonte Zobel[2]; [1]*Naples/IT*, [2]*Rome/IT (giulia.frauenfelder@gmail.com)*

Purpose: CT thermometry belongs to the non-invasive temperature-monitoring techniques used in tumour hyperthermal ablation. Influence of CT scan parameters on CT number measurements is mandatory to establish the right trade-off between patient exposition levels and measurement precision. Aim of the study is to assess influence of kVp, mAs and ROI size on the CT thermometry performance, and moreover, to investigate the feasibility of CT thermometry to offer a good compromise between temperature precision and spatial detail.
Methods and Materials: A water-equivalent phantom was scanned at temperature ranging from 18 °C to 60 °C by an MDCT scanner (Somatom Sensation, Siemens®, Germany) with pitch=0.9 and rotation frequency=2 Hz with a 2-mm slice thickness reconstruction. Scanning was performed at 9 couples of configuration: three mAs values (100, 200, 300) and three kVp values (100; 120; 140). Thermal sensitivity of the techniques was calculated by performing a linear regression analysis between Hounsfield Unit (HU) and phantom's temperature. HU was calculated by selecting a circular ROI (diameter=1 mm).
Results: Results show that thermal sensitivity is almost independent from CT scan settings, since it varies in a narrow range of values (from -0.37 HU·°C-1 to -0.34 HU·°C-1). Thermal measurement precision depends on scan configurations: the higher the mAs and the kVp values, the better the accuracy. The best results were obtained at 140 kVp and 300 mAs (precision better than 2 °C).
Conclusion: CT thermometry fulfils the minimal requirements to be employed during tumour hyperthermal treatments. The best results in terms of precision (i.e. 2 °C) and spatial resolution (i.e. 1 mm) are achieved at 140 kVp and 300 mAs, and encourage further investigation in clinical settings.

B-0675 15:20

The impact of dual axis rotational coronary angiography (DARCA) on patient and staff exposure while using novel X-ray imaging technology

D. Buytaert, B. Drieghe, J. De Pooter, Y. Taeymans, K. Bacher; *Ghent/BE (dimitri.buytaert@ugent.be)*

Purpose: The use of dual axis rotational coronary angiography (DARCA) in interventional cardiology has the potential to minimize the amount of cinegraphy runs. This study aims to evaluate the effect of using DARCA during coronary angiography (CA) examinations on radiation exposure of patient and staff.
Methods and Materials: DARCA was applied during 20 adult coronary angiography examinations. All procedures were executed using an AlluraClarity modality (Philips Healthcare). Specific DARCA settings were implemented on this system (XperSwing, Philips Healthcare). Exposure parameters and staff doses were logged via DICOM SR. Staff dosimeters were positioned on the torso, collar and leg of the cardiologist (DoseAware Xtend, Philips Healthcare). Results were compared with data from a previous study which evaluated the impact of novel x-ray imaging technology on patient and operator exposure.
Results: Median (Q1-Q3) total DAP values with DARCA were merely 6.8 (5.2-8.9) Gycm². The number of cinegraphy acquisitions was equal to 3 (3-4). The cardiologists torso, collar and leg dose amounted 19.4 (14.2-27.3), 20 (14.7-39.3) and 43.5 (33.2-62.1) microSv respectively. Contrast medium consumption (CMC) was 70.5 (63.2-77.7) ml per procedure. Compared to standard practice CA total DAP, number of cine acquisitions, CMC, torso, collar and leg dose were reduced by 67% ($p < 0.001$), 75% ($p < 0.001$), 43% ($p < 0.001$), 55% (p=0.002), 5% (p=0.973) and 45% (p=0.005) respectively.
Conclusion: The use of DARCA further reduces patient and staff exposure significantly on a novel x-ray imaging technology modality which previously proved itself in successfully reducing patient and staff exposure during standard practice CA.
Author Disclosures:
B. Drieghe: Equipment Support Recipient; Philips Healthcare. **J. De Pooter:** Equipment Support Recipient; Philips Healthcare. **Y. Taeymans:** Equipment Support Recipient; Philips Healthcare.

14:00 - 15:30 **Room D1**

Chest

SS 704

Lung cancer

Moderators:
G. Aviram; Tel Aviv/IL
E. Jon; Vitoria/ES

K-16 14:00

Keynote lecture

C.J. Herold; Vienna/AT

B-0676 14:09

Preoperative CT predicting recurrence of surgically resected adenocardinoma of the lung

H. Lee[1], H. Koo[1], H. Xu[2], C.-M. Choi[1], J. Song[1], H. Kim[1], J. Lee[1], M. Kim[1]; [1]*Seoul/KR*, [2]*Nanjing/CN (mpbjk@hanmail.net)*

Purpose: Pathologic lymphovascular invasion (LVI) has been shown to relate tumour recurrence in lung adenocarcinoma (ADC). We investigated preoperative CT findings that may related to pathologic LVI and recurrence of surgically managed stage I-II ADC of the lung.
Methods and Materials: Consecutive patients (n=275) with ADC from January 2013 to December 2013 were retrospectively enrolled. Two independent chest radiologists analysed the CT findings. Clinical, CT (stage, margin, pleural tag, axial location, and peritumoural interstitial thickening), and pathologic findings (stage, %lepidic growth, and LVI) were reviewed. Cox proportional hazard regression analysis was used to estimate the hazard ratios (HRs) for patients with (n=34) and without (n=241) recurrence.
Results: The κ index for agreement on the CT findings between radiologists was 0.705 to 0.845. In univariate analysis, %lepidic growth (P=.006), LVI (P <.001), size (P <.001), and staging (P=.011) differentiated significantly between patients with and without recurrence. Long diameter (P <.001), marginal lobulation (P=.020), central location (P <.001), and peritumoural interstitial thickening (P <.001) were significantly related to recurrence. Peritumoural interstitial thickening was positively correlated with tumour size (P <.001), LVI (P <.001), N staging (P=.005), stage (P <.001), and recurrence (P=.003). In multivariate analysis, size (HR, 1.052; 95% CI 1.022-1.082; P <.001), central location (HR, 3.152; 1.387-7.166; P=.006) and LVI (HR, 2.153, 95% CI; 1.038-4.465; P=.039) were independent predictors of recurrence.
Conclusion: Large, centrally located tumours with LVI tend to recur after surgery. Peritumoural interstitial thickening on CT appears to predict pathologic LVI and recurrence.

B-0677 14:17

Role of delayed enhanced phase in the intra-thoracic staging of lung cancer: what does it add?

P. Franchi, A.R. Larici, A. del Ciello, A. Farchione, G. Cicchetti, M. Occhipinti, L. Bonomo; *Rome/IT (paegiodi@hotmail.com)*

Purpose: To investigate the role of a delayed enhanced phase (DEP) in the intra-thoracic staging of lung cancer on computed tomography (CT) and to evaluate the additional information provided by DEP when compared to the arterial phase (AP) alone.
Methods and Materials: 100 CT exams of patients with lung cancer at first staging were retrospectively reviewed by two independent, blinded readers (chest radiologists). All patients were studied after contrast material (CM) injection (concentration: 300-370 mgI/mL; flow rate: 3 to 4 mL/s) with a standard AP (35-40 seconds after CM injection), and with a DEP (50-60 seconds after CM injection). Image assessment was performed by the two radiologists in two different reading sessions: AP (session A) and AP+DEP (session B). Parameters analysed in both sessions were primary tumour dimensions, invasion of local anatomical structures, vascular involvement, lymph nodes characteristics (dimensions, necrosis, extranodal extension), and pleural/pericardial dissemination. The radiologists reported a CT-TNM stage for both sessions.
Results: Adding DEP to the AP allowed obtaining significant details for all parameters evaluated. DEP added information on dimensions of primary tumour, especially for central ones enabling distinction between pathological tissue and parenchymal atelectasis (15/100), conspicuity of local invasion (37/100), venous thrombosis (23/100), lymph nodes involvement (41/100) and pleural/pericardial dissemination (12/100). Readers changed their CT TNM stage in 25% of cases. An excellent interobserver agreement was obtained on both reading sessions.

Conclusion: In lung cancer staging CT, DEP of the chest after AP adds pivotal information that could change patient's clinical stage, thus further diagnostic and treatment plans.

B-0678 14:25

Inflammatory myofibroblastic tumour of the lung in adults: CT and 18 FDG PET characteristics with pathologic correlations in a single tertiary referral center

S. Lim, M. Kim; *Seoul/KR (sch102972@gmail.com)*

Purpose: The purpose of this retrospective analysis was to describe the detailed clinical features of inflammatory myofibroblastic tumours (IMTs) and their CT, 18 F-fluorodeoxyglucose positron emission tomography (FDG PET), and pathologic characteristics.
Methods and Materials: We retrospectively evaluated 19 consecutive patients between September 1998 and July 2015. All the patients underwent enhanced CT and 12 also underwent unenhanced CT. Six patients underwent FDG PET and all patients underwent immunohistochemical analysis.
Results: A majority of the patients were male (68.4%) and the median age was 54 (range, 16-76) Most of the patients were asymptomatic (68.4%), and most had a single round to oval lesion. The median size of the nodules was 28 (range, 6-86) mm. Internal low density foci (42.1%) and vascular structures (36.8%) were observed. Most of the IMTs had a juxtapleural location (78.9%); most were heterogeneously enhanced (73.7%) and the attenuations were hyperdense (68.4%). The median attenuation was 38 (range, 0-54) HU without contrast enhancement, and 92 (range, 38-176) HU with enhancement. The median maximum standardized uptake value of FDG PET was 9.6 (range, 3.9-14.5). Eight patients were followed up and in five of them the IMT decreased in size in response to antibiotics (80%) or without treatment (20%). All patients undergoing immunohistochemystry analysis six revealed ALK-positivity.
Conclusion: IMT should be considered in middle-aged male with incidentally-found solid nodules that are round-to-oval, circumscribed, peripherally located, heterogeneously enhanced, and with overlying or penetrating vessels on CT. IMT appears hypermetabolic on FDG PET despite being a low-grade malignancy, and ALK-positivity.

B-0679 14:33

Baseline results from an Italian CT lung cancer screening program compared to the NLST data

M. Occhipinti, P. Franchi, M. Ciliberto, L. Tonetti, G. Cicchetti, A.R. Larici, L. Bonomo; *Rome/IT (paegiodi@hotmail.com)*

Purpose: To analyse results from baseline screening in an Italian low-dose CT lung cancer screening program and to benchmark these results against those generated by NLST.
Methods and Materials: In a university teaching hospital in a large Italian urban area, we enrolled 272 eligible participants at high risk for lung cancer (55- to 74-year old, ≥30 smoking pack-years) from September 2013 to October 2014. Our program provides yearly screening low-dose CTs over 3 years. According to NCCN guidelines, positive nodules were those ≥6 mm if solid or > 5 mm if subsolid. Positive and negative nodule frequencies were determined, and $\chi 2$ tests were used to compare proportions, both within our program, and between our program and NLST data.
Results: 57/272 participants (20.9%) had a positive result that required a follow-up CT scan in 48 cases and a PET/CT scan in 9 cases. 3/9 (33.3%) PET/CT scans were reported as positive and these patients underwent surgery, confirming adenocarcinoma. So, lung cancer was found in 3/272 participants (1.1%), and all cases were stage I lung cancers. This compares to 27.3% of positive result and to 1% of detected lung cancers in the NLST. Differences between these proportions in the 2 programs were statistically significant for detection of positive results (p=0.02) and not significant for detection of lung cancer (p=0.9).
Conclusion: Our findings suggest that baseline screening results may be comparable between US and European programs. Definition of positive result is fundamental to reduce unnecessary diagnostic work-up and to maximise diagnosis and treatment.

B-0680 14:41

Gynecomastia seen on CT examinations in the general male population

N. Kanana, M. Amitai, S. Raskin, M. Yassin, M. Sklair, E. Konen, E. Klang; *Ramat Gan/IL (nayroz_kanana@yahoo.com)*

Purpose: To evaluate the incidence and diameters of gynecomastia seen on CT examinations from the general male population, and to investigate gynecomastia association with body fat.
Methods and Materials: This retrospective study included 506 males (ages 10 - 93 years) that underwent chest-abdominal CTs during 2012-2015. Included were consecutive examinations of patients that presented to the ER with trauma. Radiologist measured the long axis diameter of retroaleolar breast tissue in CTs. Gynecomastia was defined as diameter larger than 20 mm. Estimation of body fat was done using measurements of subcutaneous fat diameters at the height of the umbilicus. BMI values were taken from admission files. The incidence and size of gynecomastia for all the study population, and for each decade of age was calculated. Correlations between gynecomastia diameter, subcutaneous fat and BMI were calculated (Pearson's coefficient correlation).
Results: The incidence of gynecomastia was (15.8%, CI 12.6% ± 19.0%). The diameter of subareolar breast tissue was: 12.0±7.8 mm. The incidence of gynecomastia in the second to ninth decades was: 20.0%, 25.0%, 14.7%, 12.7%, 8.0%, 10.1%, 12.9%, 22.5%, respectively. No correlation was found between the subcutaneous fat diameter to the gynecomastia (r=-0.1). No correlation was found between gynecomastia and BMI (r=-0.1).
Conclusion: In contrast to clinical studies, there was no correlation between radiographically proven gynecomastia and body fat. The incidence and size of gynecomastia seen on CT examinations can help radiologists make clinical decisions, as gynecomastia can appear in different pathologies. This study can also serve as a reference for future research.

B-0681 14:49

Lung cancers in patients with fibrothorax and chronic empyema caused by tuberculosis

H. Xu[1], H.J. Koo[2], H.N. Lee[2], S. Lim[2], M.Y. Kim[2]; [1]*Nanjing/CN*, [2]*Seoul/KR (xuhai507@126.com)*

Purpose: To describe the clinical, pathological, CT and PET characteristics for the diagnosis of lung cancer combined with fibrothorax or chronic empyema caused by tuberculous in a single tertiary hospital.
Methods and Materials: We retrospectively evaluated 142 patients. On CT, we described the size, location, opacity, shape of cancers. The median values of maxSUV on PET were also obtained. Clinical and image findings were then compared between two groups: Group 1 and Group 2 with tumours on the ipsilateral and contralateral side of the pleural disease, respectively. The doubling time of the tumours were calculated in 40 patients who had available prior CT exams.
Results: The most common pathological type was squamous cell carcinoma (41.5%). Eighty tumours (56.3%) were located in the ipsilateral side of pleural disease (Group 1) and 62 (43.7%) were in contralateral lung (Group 2). Most of the tumours were in the peripheral of the lung (70.4%). The tumours had solid opacity (91.5%), and lobulated contours (83.8%). On PET (n=105), the median value of maxSUV was 8.9 (IQR, 6.1-13.3). The tumours in Group 1 showed significant larger size (P=0.033) and more advanced T staging (P=0.012) than Group 2. The median doubling time was 169 days (IQR, 62-280 days) and was not different between two groups.
Conclusion: Ipsilateral lung cancers combined with fibrothorax or chronic empyema tend to be presented with advanced T stages, and this may suggests the possible delayed diagnosis of the cancers by the pleural disease. The most common cell type was squamous cell carcinoma.

B-0682 14:57

Multi-detector computed tomography features of peripheral lung cancer associated with cystic airspace

Y. Wang, L. Fan, S. Liu; *Shanghai/CN (cziwangyun@163.com)*

Purpose: To evaluate MDCT features of lung cancer associated with cystic airspace,and try to find some specific signs in order to improve diagnostic accuracy.
Methods and Materials: 21 pathologically confirmed lung cancer associated with cystic airspace were retrospectively analysed with regard to SUMmax and MSCT features including density type,morphological type,shape,margin,number of cystic airspace,inner wall,internal characteristics,adjacent structure. For dynamic follow-up CT scans, the lesion dynamic change was evaluated.
Results: The lesion was predominant cysts in 2 cases (9.52%),cysts with GGO mixed lesions in 3 cases (14.29%),cysts with solid mixed lesions in 14 cases (66.67%),cysts with GGO and solid mixed lesions in 2 cases (9.52%).Four morphologic patterns were found solid nodule protruding externally (typeI,n=5.23.81%) or internally (typeII,n=1.4.76%)from the cyst wall, circumferential thickening of the cyst wall (typeIII,n=1.4.76%),and tissue intermixed within clusters of cysts (typeIV,n=14.66.67%).The frequency of following features account for more than 60% of all MDCT signs, including round shape (66.67%),lobulation (80.95%),blood vessel passing through the cyst (76.19%), pleural indentation (80.95%);while the frequency of multiple cysts, irregular inner wall and septum in cyst in 19 lesions (90.48%) was more than 90%.Average SUVmax was 6.05,indicating marked FDG uptake.Two lesions manifested as progressive wall thickening and increased size of the cyst, and one lesion showed decreased size of the cyst and enlarged nodules in follow-up CT.
Conclusion: The external wall of such cystic cancers has the typical signs of peripheral lung cancer on CT images.The irregular inner wall, septum in cyst and blood vessel passing through the cyst are the most three important signs for the diagnosis of malignant lesions.

B-0683 15:05

CT-guided core needle biopsy of pulmonary nodules smaller than 2 cm: analysis of 469 procedures

S. Gálvez García[1], A. Prieto Fernández[1], A. Muñoz Ruiz[1], E. Nava Tomás[1], H. Chung[2], J. Sanz Díaz[1], S. Sánchez García[1], M. Morán Hevia[1], M. Vicente Quílez[1]; [1]*Oviedo/ES*, [2]*Los Ángeles, CA/US (saragalgar_87@hotmail.com)*

Purpose: The purpose of this study was to retrospectively evaluate the diagnostic accuracy and complications of CT-guided core needle biopsy (CNB) of pulmonary nodules less than 2 cm and their influencing factors.
Methods and Materials: We analysed 469 CT-guided CNB performed in 415 patients with pulmonary nodules less than 2 cm from 2003 to 2015. The mean nodule size was 16 mm (SD= 3.6). We analysed factors with potential influence in obtaining a diagnosis (location, size of the lesion, length from the pleura and from the skin to the lesion), and the incidence of complications.
Results: Final diagnoses were established in 336 of the 469 procedures (76%). There were 265 malignant lesions (56.6%) and 98 benign (20.8%). Non diagnostic biopsies were obtained for 106 of the procedures (22.6%). Post-biopsy complications occurred in 154 procedures (32.8%). Prevalence of pneumothorax was 24.7%, of which 3.6% required a thoracostomy tube. In our study there were no risk factors that significantly decreased diagnostic accuracy. Significant risk factors for complications were the length from the pleura (p=0.01) and from the skin (p=0.001) to the lesion. A significant risk factor for pneumothorax (p=0.017) as for pneumothorax requiring drainage (p=0.013), was the location of the lesions in the LUL.
Conclusion: The use of CT-guided CNB resulted in a high diagnostic yield (76%) for pulmonary nodules smaller than 2 cm and has a low rate of complications (32.8%, only 3.6% needed specific treatment). Significant risk factors for development of complications were the lesion depth from skin and from pleura.

B-0684 15:13

Dynamic contrast-enhanced perfusion area-detector CT vs FDG-PET/CT: capability for therapeutic outcome prediction in non-small cell lung cancer patients with chemoradiotherapy

Y. Ohno[1], Y. Kishida[1], S. Seki[1], H. Koyama[1], Y. Fujisawa[2], N. Sugihara[2], T. Yoshikawa[1], K. Sugimura[1]; [1]*Kobe/JP*, [2]*Otawara/JP (yosirad@kobe-u.ac.jp)*

Purpose: To directly compare the capability for therapeutic outcome prediction between dynamic first-pass contrast-enhanced (CE-) perfusion area-detector CT (ADCT) and FDG-PET/CT in non-small cell lung cancer (NSCLC) patients treated with chemoradiotherapy.
Methods and Materials: 53 consecutive Stage IIIB NSCLC patients underwent PET/CT, dynamic CE-perfusion ADCT, chemoradiotherapy, and follow-up examination. All patients were divided into two groups as follows: 1) complete or partial response (CR+PR) and 2) stable and progressive diseases (SD+PD) groups. In this study, total tumour perfusion (TTPDMS) and tumour perfusions from pulmonary (PAPDMS) and systemic (SAPDMS) circulations by dual-input maximum slope method, extraction fraction (EFPP) and distribution volume (DVPP) by Patlak plot method, tumour perfusion (TPSMS) by single-input maximum slope method, and SUVmax were assessed at each targeted lesion, and averaged to determine final values in each patient. To compare the capability for distinguishing two groups, ROC analyses were performed. Finally, disease free and overall survivals between responders and non-responders were compared by Kaplan-Meier method followed by log-rank test.
Results: Area under the curves (Azs) of TTPDMS (Az=0.81), SAPDMS (Az=0.85) and SUVmax (Az=0.84) had significantly larger than that of PAPDMS (Az=0.69, $p < 0.05$). On disease free and overall survival assessments, responders had significant difference with non-responders on TTPDMS (disease free: p=0.03, overall: p=0.00009), SAPDMS (disease free: p=0.004, overall: $p < 0.001$), TPSMS (disease free: p=0.003, overall: p=0.007) and SUVmax (disease free: p=0.03, overall: p=0.003).
Conclusion: Dynamic first-pass CE-perfusion ADCT provide a few good predictors, and considered at least as valuable as PET/CT for therapeutic outcome prediction in NSCLC patients.
Author Disclosures:
Y. Ohno: Research/Grant Support; Toshiba Medical Systems Corporation. **Y. Fujisawa:** Employee; Toshiba Medical Systems Corporation. **N. Sugihara:** Employee; Toshiba Medical Systems Corporation. **T. Yoshikawa:** Research/Grant Support; Toshiba Medical Systems Corporation. **K. Sugimura:** Research/Grant Support; Toshiba Medical Systems Corporation.

B-0685 15:21

Dynamic CE-perfusion area-detector CT: comparison of capability for N-stage assessment with FDG-PET/CT in non-small cell lung cancer patients

Y. Ohno[1], Y. Kishida[1], S. Seki[1], H. Koyama[1], Y. Fujisawa[2], N. Sugihara[2], T. Yoshikawa[1], K. Sugimura[1]; [1]*Kobe/JP*, [2]*Otawara/JP (yosirad@kobe-u.ac.jp)*

Purpose: To compare the capability for N-stage assessment between dynamic contrast-enhanced (CE-) perfusion area-detector CT (ADCT) and FDG-PET/CT in non-small cell lung cancer (NSCLC) patients.
Methods and Materials: 44 consecutive NSCLC patients (26 males, 18 females; mean age 67 years) who were candidates for surgical treatment underwent dynamic CE-perfusion ADCT that were performed at two or three different positions as single examination, PET/CT, surgical treatment and pathological examination. From all ADCT data in each subject, whole chest perfusion map was computationally generated based on dual- and single-input maximum slope and Patlak plot methods. For quantitative N-stage assessment, perfusion parameters and SUVmax at each lymph node were evaluated by ROI measurement. Then, Student's t-test was performed to determine the difference between metastatic and non-metastatic lymph nodes. To compare the diagnostic capability on a per node basis, ROC analyses were performed among all indexes as having significant difference between two groups. Finally, diagnostic performance for N-stage assessment were compared among all indexes by means of McNemar's test.
Results: Systemic arterial perfusion (SAP) and SUVmax had significant difference between two groups (p0.05). Specificity (SP: 92.1%) and accuracy (AC: 92.8%) of SAP were significantly higher than those of SUVmax (SP: 88.3%, p=0.004; AC: 88.3%, p=0.005). When assessed N-stage, accuracy of SAP (75%) was also significantly higher than that of SUVmax (55.8%, p=0.008).
Conclusion: Dynamic CE-perfusion ADCT has better potential for N-stage assessment than PET/CT in NSCLC patients.
Author Disclosures:
Y. Ohno: Research/Grant Support; Toshiba Medical Systems Corporation. **Y. Fujisawa:** Employee; Toshiba Medical Systems Corporation. **N. Sugihara:** Employee; Toshiba Medical Systems Corporation. **T. Yoshikawa:** Research/Grant Support; Toshiba Medical Systems Corporation. **K. Sugimura:** Research/Grant Support; Toshiba Medical Systems Corporation.

14:00 - 15:30 **Room D2**

Emergency Radiology

SS 717

Trauma of the brain and body

Moderators:
J.M. Artigas; Zaragoza/ES
F. Mrakic Sposta; Milan/IT

B-0686 14:00

Excess use of minor head injury CT examinations in the emergency department (ER)

A. Beytelman[1], E. Klang[1], E. Konen[1], D. Greenberg[2], E. Zimlichman[1]; [1]*Ramat Gan/IL*, [2]*Beer Sheva/IL (arikbeytelman@gmail.com)*

Purpose: To evaluate the proportion of head CTs that are performed in the ER and do not meet the indications of the Canadian head CT rule (CCHR).
Methods and Materials: Adult ER patients that underwent head CT for the evaluation of head injury during 2014 were retrospectively retrieved. 571 patients were randomly selected. Patients' records were scanned to evaluate if they met the CCHR indications (GCS< 13, Age> 65, anti-coagulation, suspected skull fracture, vomiting> 2, signs of basal skull fracture, retrograde amnesia > 30 minutes, dangerous mechanism). Proportions of patients that did not meet the CCHR were calculated for all patients and for patients younger than 65 yr. CTs of patients who did not meet the CCHR indications were evaluated for the presence of brain hemorrhage or skull and face fractures and negative predictive value (NPV) was calculated.
Results: The proportion of patients that did not meet the CCHR was 52/571 (9.1%, CI 8.9-9.3%) among all patients and 52/171 (30.4%, CI 23.4-37.4%) in patients younger than 65yr. None 0/52 (0%) of the patients that underwent CT although not meeting the CCHR had either brain hemorrhage or fractures, thus CCHR had NPV of 100%.
Conclusion: Overuse of CT examinations for the investigation of minor head trauma in the ER has been shown, with higher proportion among younger patients. This creates a burden on the healthcare system and causes radiation exposure, which is riskier for the Young population. Educational programs for ER physicians should be contemplated.

B-0687 14:08

Head CT scans from Emergency Department: a misplaced screening?

A. Bernardini, S. Roiati, R. Lattanzi, M. Di Bartolomeo, F. Iannessi, F. Navarra, L.M. Gregori, E.G. Puglielli, V. Di Egidio; *Teramo/IT (silviaroiati@gmail.com)*

Purpose: Head CT scans are widely requested in the ED, frequently causing an heavy load on radiology depts. But how much of these scans are really worthwhile?
Methods and Materials: Reports of 1530 consecutive emergent non-contrast head CT scans requested by the local ED from October 2014 to May 2015 were reviewed and classified on the basis of eight main clinical scenarios (headache, trauma, syncope, confusion, stroke-like, posterior fossa symptoms, epilepsy, other) and on the basis of brain and skull bone findings as: Positive, Negative, False Negative (in case of positive subsequent CT or MR in the next 7 days), False Positive (in case of negative subsequent CT or MR), Collateral Finding (in case of findings not directly linked to the actual clinical status). Positive and Negative rate for each requesting physician were evaluated.
Results: 84% of all the examinations were negative or without actual clinically significant findings. Negative rates for clinical scenarios were 69.3% for stroke-like, 91.9% for confusion, 90.6% for posterior fossa symptoms, 88.2% for epilepsy, 89.7% for headache, 86.4% for trauma, 89.8% for syncope, 90% for other ($p < 0.001$). No significant difference was found between requesting physicians. In a logistic regression analysis only stroke-like symptoms and age correlated with a positive scan (OR: 3.62 and 1,016; $p < 0.001$).
Conclusion: Head CT scans from ED were frequently negative or without clinically significant findings. A more thorough evaluation or the use of clinical scores before requesting could help containing costs and avoiding unnecessary examinations and radiation exposure.

B-0688 14:16

Acute cervical traumatic spinal cord injury: MRI with diffusion-weighted imaging correlated with neurologic outcome

T. Nakagawa[1], J. Isogai[2], N. Harata[2], T. Miyazaki[2]; [1]*Kawasaki-city, Kanagawa/JP*, [2]*Asahi-city, Chiba/JP (tassei8@nifty.com)*

Purpose: To evaluate whether diffusion-weight imaging (DWI) and T2 weighted imaging (T2DW) assessments after spinal cord injury (SCI) correlate with patient neurologic status and are predictive of outcome.
Methods and Materials: This retrospective study included 27 patients with traumatic cervical SCI who underwent MRI including DWI between Oct 2009 and Oct 2014 after excluding patient who were transferred to another institution in acute period. The American Spinal Injury Association (ASIA) impairment grading (from grade A for complete to E for normal) was used as the outcome at admission and discharge. Length of high signal intensities (SI) in the cervical spinal cord on DWI and T2WI were measured according to the level of vertebra and intervertebral disc was counted as 1/2 vertebrae.
Results: 12 out of 13 patients (92.3%) with ASIA grade A-C at admission (severe injury) showed high SI on DWI (length of 0.8 vertebrae on average). On the other hand, 6 out of 14 patients (42.9%) with ASIA grade D (not severe injury) showed high SI on DWI. In a group with discrepancy between T2WI and DWI less than 1/2 vertebral length, 10 out of 15 patients (66.7%) showed recovery by ASIA grading. In a group with discrepancy between T2WI and DWI more than one vertebral length, 3 out of 12 patients (25.0%) showed recovery by ASIA grading.
Conclusion: High SI on DWI in the patients with acute cervical spinal cord injury correlated with severe injury but also might be predictor of neurologic recovery.

B-0689 14:24

Costal cartilage fractures: an overlooked injury in polytrauma patients? A review of 978 consecutive blunt trauma patients

M.T. Nummela[1], F.V. Bensch[1], S.K. Koskinen[2]; [1]*Helsinki/FI*, [2]*Stockholm/SE (mari.t.nummela@hus.fi)*

Purpose: To evaluate incidence, related injuries, trauma mechanism, and accuracy of reporting of costal cartilage fractures (CC-fx's) in blunt polytrauma. Poor healing of CC-fx's may cause posttraumatic pain and thoracic instability.
Methods and Materials: All whole-body CT (WBCT) studies of a level-I-trauma-center over a period of 24 months were reviewed retrospectively by a board-certified radiologist, and findings compared to initial reports. Injuries were categorised in consensus with an experienced trauma radiologist.
Results: Of 978 patients, 372 (38%) had thoracic injuries (M=277, mean age 54.5 (range 18-91), F=95, mean age 56 (range 18-94)). Of these, 71 patients had a total of 116 CC-fx's (M=60; 85%, mean age 51 (range 18-84), F=11; 15%, mean age 51 (range 20-82)). The incidence of CC-fx's was 7.3% (71/978) in all WBCT studies, and 19.0% (71/372) in thoracic trauma patients. Cartilages of ribs 7 (29/116; 25%) and 6 (20/116; 17%) were most commonly injured. Multiple CC-fx's were found in 62% (44/71). There was no correlation between cartilage calcification and occurrence of cartilage fractures. 83% (59/71) of cases had multiple bony rib fractures; 51% unilateral (30/59) and 49% bilateral (29/59). Most common associated intrathoracic injuries were pneumothorax (42/71; 59%), pulmonary contusion (37/71; 52%), and hemothorax (36/71; 51%). Intra-abdominal injuries (spleen, liver, kidneys) were found in 25% (18/71). Main trauma mechanisms were MVA (26/71; 37%) and fall (19/71; 27%). CC-fx's were accurately reported in 31% of initial on-call reports (22/71).
Conclusion: Costal cartilage fractures are more common than previously reported in high-energy blunt trauma, and remain often undetected.
Author Disclosures:
F.V. Bensch: Board Member; NORDTER. **S.K. Koskinen:** Board Member; NORDTER.

B-0690 14:32

Nontraumatic incidental findings in patients undergoing whole-body computed tomography at initial emergency admission

E. Kroczek[1], G. Wieners[1], I. Steffen[1], T. Lindner[1], F. Streitparth[1], B. Hamm[1], M.H. Maurer[2]; [1]*Berlin/DE*, [2]*Berne/CH (martin.maurer@insel.ch)*

Purpose: To evaluate the number, localization and importance of nontraumatic incidental findings in patients undergoing whole-body computed tomography (wbCT) for suspected multiple trauma or unclear unconsciousness.
Methods and Materials: The radiologic reports of all patients undergoing wbCT at admission to a level-1 trauma center between January 2009 and December 2013 were analysed with regard to non-trauma-associated incidental imaging findings. Four severity categories of incidental findings were distinguished (category 1: urgent treatment or further clarification needed, category 2: further examination and follow-up within 3-6 months, category 3: findings likely asymptomatic but potentially symptomatic in the future, category 4: harmless findings).
Results: Altogether, there were 6053 reported incidental findings in the 2571 patients (1823 male, 748 female; mean age 45.7 years) included in the study. 245 patients (9.5%) had 343 urgent category 1 findings, 840 patients (32.7%) 1418 category 2 findings, 1333 patients (51.9%) 2153 category 3 findings and another 1257 patients (48.9%) 2139 category 4 findings. Most incidental findings (42.2%) were detected in the abdomen and pelvis, and about one fifth each were seen in the head (1188, 19.6%) and in the chest (1276, 21.1%).
Conclusion: A high number of nontraumatic incidental findings are present in patients undergoing whole-body CT. More than 40% of all patients have at least one finding needing urgent therapy, direct workup or at least a follow-up, which is a significant challenge for the trauma center whose primary responsibility is to provide trauma care.

B-0691 14:40

Screening for blunt cerebrovascular injury (BCVI) by two-phased whole body CT (WBCT) after acute blunt trauma using modified Denver criteria: a review of 373 cases

E.A. Varjonen[1], F.V. Bensch[1], S.K. Koskinen[2]; [1]*Helsinki/FI*, [2]*Stockholm/SE (elina.a.varjonen@hus.fi)*

Purpose: To evaluate incidence and distribution of BCVI in blunt trauma patients WBCT screening according to modified Denver screening criteria. BCVI can have catastrophic consequences in a predominantly young population, and reliable exclusion is crucial.
Methods and Materials: All acute blunt trauma WBCT studies including arterial phase contrast in a level-one trauma centre over a period of 38 months (Oct 2011-Dec 2014) were reviewed retrospectively by two board-certified radiologists independently and blinded to initial results for distribution and grade of BCVI, final diagnosis was made by consensus. A modified Denver screening algorithm with the major addition of high-energy trauma, and major chest injury defined inclusion criteria for WBCT screening.
Results: Of 1544 WBCT studies, 373 included BCVI screening (m=271; f=103; mean age 41.5 years). We found 75 BCVI injuries in 58 patients (15.5%), with 14 cases of multiple (24.1%), and 8 of bilateral BCVI (13.8%). 49 BCVI (65.3%) were found in the ICA, and 26 in the vertebral arteries (34.7%), with G1 being the most common grade in ICA (n=19; 38.8%), and both G1 and G4 in the vertebral arteries (both n=8; 30.8%). Most common location was C2 for both ICA and vertebral arteries (n=15; 30.6%, and n=6; 23.1%). Intraobserver agreement was substantial (Kappa=0.674). Most common injury mechanisms were MVA (n=192; 51.5%) and falling from a height (n=83; 22.3%).
Conclusion: Modifying Denver screening criteria is an effective tool in screening for BCVI in conjunction with WBCT, raising the amount of positive findings to 15.5%.
Author Disclosures:
F.V. Bensch: Board Member; NORDTER Nordic forum for trauma and emergency radiology. **S.K. Koskinen:** Board Member; NORDTER Nordic forum for trauma and emergency radiology.

B-0692 14:48

"Concordance" revisited: a multi-disciplinary appraisal of concordant preliminary abdominopelvic CT reports

J.M. Brown, E. Dickerson, R. Kaza, R. Cohan, J. Ellis, M. Davenport;
Ann Arbor, MI/US (dickerse@med.umich.edu)

Purpose: To determine whether urgent preliminary abdominopelvic CT reports considered prospectively concordant with the final interpretation are also considered concordant by other medical specialties and uninvolved subspecialty radiologists.
Methods and Materials: IRB-approved retrospective cohort study. 120 randomly selected urgent abdominopelvic CT exams with a typed resident preliminary report deemed "concordant" by the signing faculty were identified. Six blinded specialists from Emergency Medicine, Internal Medicine, and Abdominal Radiology independently reviewed the reports and determined if reported urgent findings were: 1) concordant, 2) discordant with minor differences, 3) discordant with major differences that do not alter patient management, or 4) discordant with major differences that do alter patient management. The primary outcome was a comparison of blinded consensus scores of '4' to the null set (i.e., prospective score of '1' for all exams) using Fisher's Exact test.
Results: Consensus scores of '4' were assigned in 15% (18/120, $p < 0.0001$, Emergency Medicine), 3% (3/120, p=0.25, Hospitalists), and 14% (17/120, $p < 0.0001$, Abdominal Radiologists) of exams. Scores of '3' or '4' were assigned in 20% (24/120, $p < 0.0001$), 6% (7/120, p=0.01), and 19% (23/120, $p < 0.0001$). Predicted management alterations stratified by respective specialty included: 1) hospital status [n=2.0.3], 2) medical therapy [n=6.0.4], 3) imaging [n=9.0.1], 4) subspecialty consultation [n=11.1,4], 5) non-surgical procedure [n=5.3,2], 6) operation [n=4.0.1], and 7) other [1.0.3].
Conclusion: Urgent preliminary abdominopelvic CT reports deemed prospectively concordant are often viewed as containing major discrepancies when re-reviewed by other medical specialists and uninvolved abdominal radiologists.

B-0693 14:56

Use of IV-contrast versus IV-and oral-contrast in the evaluation of abdominal pain on CT in the emergency department

M. Wasserman[1], K. Melamud[2], J. Soto[1]; [1]*Boston, MA/US*, [2]*Philadelphia, PA/US (michael.wasserman@bmc.org)*

Purpose: Abdominal pain is one of the most common presenting complaints of patients in the Emergency Department (ED), often necessitating imaging with computed tomography of the abdomen and pelvis (CTAP). In 2008, Boston Medical Center (BMC) adopted a policy limiting the use of oral contrast in ED patients presenting with abdominal pain. The purpose of this study was to investigate the potential impacts of limiting the use of oral contrast.
Methods and Materials: A retrospective review of patients receiving CTAP from BMC's ED was assembled using electronic medical records, with pre- and post- policy implementation cohorts selected from two randomly chosen months, August 2008 and August 2012. 221 patients from August 2008 received oral- and IV-contrast enhanced CTAP. 248 patients from August 2012 received IV-contrast only CTAP examinations. Parameters assessed in this study included ED length of stay (LOS), time to CT scan from ED triage, time to first radiology read, time to disposition from the ED after the first radiology read, and radiation dose. Mann Whitney U-tests were used in data analysis.
Results: When comparing CT studies with IV-contrast only to CT studies with IV- and oral-contrast, there is a median decrease in ED LOS from 455 to 373 minutes ($p < 0.0001$), time to CT scanner from ED triage from 297 to 191 minutes ($p < 0.0001$), and time to first radiology read from 65 to 43 minutes ($p < 0.0001$).
Conclusion: Limiting the use of oral contrast has positive effects on the efficiency of diagnosis.

B-0694 15:04

Contribution of diffusion-weighted MR imaging to non-enhanced CT in evaluation of acute abdominopelvic pain

O. Ozdemir, Y. Metin, N. Orhan Metin, Ö. Yavaşi, Ö. Bilir, S. Kalcan; *Rize/TR (droguzrad@hotmail.com)*

Purpose: We aimed to evaluate the contribution of diffusion-weighted magnetic resonance (DWI) imaging to non-enhanced computed tomography (NECT) in patients with acute abdominopelvic pain admitted to the emergency department.
Methods and Materials: Between June 2014 and October 2015, a total of 293 patients with acute abdominopelvic pain admitted to the emergency department underwent NECT imaging. In these patients (mean age, 47.8 ± 15.5; range, 19-82 years: 160 females, 133 males) DW-MR imaging was performed just before or after CT scanning. The control group consisted of 197 patients with acute abdominopelvic pain who were scanned with contrast-enhanced tomography (CCT). The demography of the control group was as follows: mean age, 46.2 ± 15.3; range, 19-87 years: 110 females, 87 males. The strategy of imaging review was as follows: evaluation of NECT alone and combined evaluation of DWI and NECT. The prospective DWI and NECT imaging interpretations were checked with follow-up medical and surgical records.
Results: The causes of NECT scanning were as follows: 93 patients (32%) had renal failure, 53 (18%) had previous allergic reactions to contrast agents, and 147 (50%) did not give consent for contrast use. The sensitivity, specificity and accuracy of NECT, combined imaging (DWI and NECT) and CCT (control group) were as follows: 70.1, 76, 71.6; 96.7, 82.6, 92.8; 93, 79.4, 90.3, respectively.
Conclusion: DWI is a non-invasive technique that can be used to improve the accuracy of detection of many causes of acute abdominopelvic pain, when combined with NECT.

B-0695 15:12

Clinical relevance of consecutive CT scans for the evaluation and monitoring of geriatric pelvic fractures

C. Weber, T.H. Schroeder; *Hamburg/DE (c.weber@amalie.de)*

Purpose: To retrospectively evaluate consecutive computed tomography (CT) imaging in fragility fractures of the pelvis (FFP) in geriatric patients.
Methods and Materials: 60 CT Scans of 29 consecutive patients > 65y (mean age 83.8±7.8 y, 27 F, 2 M) with a history of low impact energy trauma and confirmed pelvic fracture, who had received CT for fracture evaluation and at least one consecutive CT for follow-up during the following month after pain adapted ambulation were evaluated. Pelvic fractures were classified according to the system established by Rommens/Hofmann for fragility fractures of the pelvis. The Barthel ADL index was used as a measure of physical disability after admittance.
Results: Follow-up CT was acquired 14±4.6 days after initial CT. Isolated fractures of the anterior pelvic ring (FFP Type Ia,b) were initially detected in 13.8% (n=4) of patients. Combined fractures of the anterior and posterior pelvic ring with moderate instability (FFP Type IIa,b,c) accounted for 65.5% (n=19), higher (FFP Type IIIa,b,c) for 3.4% (n=1) and highest instability (FFP Type IVa,b,c) for 17.2% (n=5). 10 patients (34.5%) deteriorated in fracture classification during follow-up (3 patients within one category, 4 patients deteriorated by one category, and 3 patients by two categories). There was no significant difference in age or physical disability between patients that showed fracture deterioration and those that did not.
Conclusion: Aggravation of fractures in over a third of patients may indicate that a more aggressive, surgical approach is needed in the management of FFP in the elderly.

14:00 - 15:30 **Room K**

Genitourinary

SS 707

Prostate cancer: routine and novel MRI techniques

Moderators:
D. Bonekamp; Hirschberg/DE
N.C. Cowan; Portsmouth/UK

B-0697 14:00

Correlation of prostate volume and cancer detection as assessed by MRI volumetry

M. Haas, H. Cash, B. Hamm, P. Asbach; *Berlin/DE (Matthias.Haas@charite.de)*

Purpose: Stating the prostate volume in multiparametric magnetic resonance imaging (mpMRI) of the prostate is of clinical importance, but for 3-Tesla MRI without endorectal coil there is no distinctive standard of volume calculation. In this study we investigated the accuracy of the ellipsoid formula calculation with planimetric volume measurements as reference standard. In addition we sought to correlate the gland volume to the cancer detection rate on prostate biopsy.
Methods and Materials: 143 patients with cancer suspicious findings on mpMRI followed by MRI/ultrasound fusion guided targeted biopsy were included into the analysis. Axial T2 weighted images were used for planimetric volume measurement by a segmentation software. Axial and coronal T2 weighted images were used to measure the diameters of the prostate.
Results: Mean prostate volume was 52.5 ml (s.d. 25.1 ml, range 16.1 - 157.5 ml). Volume calculated by the ellipsoid formula showed a strong concordance with planimetric volume, with a tendency to underestimate prostate volume (mean volume 48.4 ml, s.d. 25.4; $r = 0.903$, $p < 0.001$). Our analysis showed a moderate, yet significant inverse correlation of prostate

volume to a positive biopsy result (Spearman`s correlation coefficient [r] -0.24, p = 0.004), the correlation being lower in the systematic biopsy (r = -0.18, p = 0.032) and more pronounced in the targeted biopsy (r = -0.34, p < 0.001).
Conclusion: The ellipsoid formula gives accurate approximation of prostate volume on mpMRI. In large prostates, suspicious MRI findings might tend to be of lower predictive value.
Author Disclosures:
B. Hamm: Consultant; Toshiba.

B-0698 14:08

Comparison of image quality and patient discomfort in prostate MRI using a pelvic array or an endorectal coil
B.K. Barth[1], A. Cornelius[2], D. Nanz[1], D. Eberli[1], O.F. Donati[1]; [1]*Zurich/CH*, [2]*Aarau/CH (borna.barth@usz.ch)*

Purpose: To compare image quality (IQ) and patient discomfort in prostate-MRI using a pelvic-phased array (PPA) coil or an endorectal coil (ERC).
Methods and Materials: Ninety-eight patients (median age, 65.7; range 42.1-78.1) underwent prostate-MRI on a 3 T scanner including T2w and DWI acquired with a PPA coil and an ERC within the same exam. Acquisition time was kept similar for both acquisitions. Two radiologists evaluated aspects of IQ on a 5-point Likert scale and classified image artefacts. All patients completed a questionnaire on discomfort/pain regarding the ERC using a visual analogue scale from 1-10.
Results: There was no significant difference in overall IQ for T2w images for both readers (reader 1, 3.27±0.91 and 3.07±0.84, p=0.057; reader 2, 3.70±0.75 and 3.77±0.81, p=0.555) for PPA coil and ERC, respectively. Overall IQ for DWI images was similar for reader 1 and better using the ERC for reader 2 (reader 1, 3.03±1.10 and 3.08±0.80 (p=0.67); reader 2 3.27±0.81 and 3.66±0.85 (p < 0.05) for PPA coil and ERC). Susceptibility artefacts were frequent in more exams for ERC than for PPA coil acquisitions (109 vs. 75). Discomfort and pain experienced during insertion of the ERC was low altogether (VAS score, 3.5±2.1 for "discomfort" and 2.4±2.4 for "pain").
Conclusion: T2-weighted images may be acquired with comparable IQ using a PPA coil as compared to an ERC while DWI images showed better IQ using the ERC for one of two readers. The insertion of the ERC caused low to moderate discomfort and pain in patients.

B-0699 14:16

Apparent diffusion coefficient value is a strong predictor of unsuspected aggressiveness of prostate cancer before radical prostatectomy
R. Renard-Penna, G. Cancel-Tassin, E. Comperat, P. Mozer, P. Leon, M. Roupret, M.-O. Bitker, O. Lucidarme, O. Cussenot; *Paris/FR (raphaele.renardpenna@psl.aphp.fr)*

Purpose: To evaluate the use of multiparametric MRI (mp MRI) parameters in order to predict prostate cancer aggressiveness as defined by pathological Gleason score or molecular markers in a cohort of patients defined as low risk at biopsy.
Methods and Materials: 67 men treated by radical prostatectomy for a low grade (Gleason 6) on biopsy and mp MRI before biopsy were selected. A quantification of the CCP score and Ki-67/PTEN expression on the radical prostatectomy specimens was performed.
Results: 49.25 % of the cancers were undergraded on biopsy compared to the radical prostatectomy specimens. Apparent diffusion coefficient (ADC) 0.80 x 10-3 mm2/s (P value: 0.003), LIKERT score > 4 (P value: 0.003) and PSA density > 0.15 ng/ml/cc (P value: 0.035) were significantly associated with the final Gleason score. Regarding molecular markers of aggressiveness, ADC &lt than 0.80 x 10-3 mm2/s and LIKERT score &gt 4 were also significantly associated with a positive staining for Ki-67 (P value: 0.039 and P value: 0.01, respectively). No association was found between any MRI or clinical parameter and CCP score.
Conclusion: Decreasing ADC value is a stronger indicator of aggressive prostate cancer as defined by molecular markers or post-surgical histology than biopsy characteristics.

B-0700 14:24

Pre-active surveillance multiparametric MRI predicts short-term outcomes
F. Sanguedolce[1], G. Petralia[2], H. Sokhi[3], N. Anyamene[4], G. Hellawell[5], A.R. Padhani[4]; [1]*Northampton/UK*, [2]*Milan/IT*, [3]*Uxbridge/UK*, [4]*Northwood/UK*, [5]*Harrow/UK (anwar.padhani@stricklandscanner.org.uk)*

Purpose: To investigate the potential of multiparametric MRI (mpMRI) to identify low-risk patients suitable for Active Surveillance (AS).
Methods and Materials: 164 low-risk prostate cancer patients were selected for AS using clinical parameters and followed up clinically every 3 months, and repeated biopsies. Baseline mpMRI studies were reviewed by 2 radiologists with 4 and 1 years' experience. mpMRI features were recorded and classified using PI-RADS v1 and V2 systems. Univariate, multivariate analysis and Kaplan-Meier treatment-free survival curves were calculated. Interobserver agreements were evaluated.
Results: 153 patients were included in the final evaluation. Mean follow-up time was 30.7 months; 66 withdrew for AS. No differences were found between continued AS vs withdrew AS sub-groups in terms of age, baseline PSA and PSA density. On univariate analysis, index lesion size and type, ECE, T2W, DCE and MRSI sequence scores, and PI-RADS v1 and v2 scores were significantly correlated to outcome, for both radiologists (p < 0.01). Using logistic regressions, significant variables were ECE (odds ratio 11; 95% IC 1.3-92.0) and PI-RADS scores. ROC analysis showed a cut-off value of > 3 for PI-RADS scores. KM survival curves showed significant stratification by PI-RADS scores (v1 and v2) (log rank test p < 0.0001) for both radiologists. Inter-observer agreements were substantial for PI-RADS v1 and moderate for PI-RADS v2, ECE, T2W, DWI, DCE, and IL size.
Conclusion: mpMRI can refine the selection of low-risk prostate patients suitable for AS adding to the conventional clinical criteria. Lesser experience of radiologists does not have significant impact on AS patient selection.
Author Disclosures:
A. Padhani: Advisory Board; Siemens Healthcare. Research/Grant Support; Siemens Healthcare.

B-0701 14:32

Differences in quantitative perfusion parameters between normal transitional, normal peripheral and tumour regions from 3 T DCE-MR images of the prostate
R. Sanz-Requena, L. Marti-Bonmati, R. Perez, G. Garcia-Marti, A. Mañas-Garcia; *Valencia/ES (roberto.sanz@quironsalud.es)*

Purpose: To compare normality and disease values of several perfusion parameters obtained from morphologic curve analysis and kinetic modeling of 3 T DCE-MR images of the prostate.
Methods and Materials: The Ethics Committee approved this study. Sixty patients were included (30 histologically confirmed prostate cancer and 30 negative biopsy and at least one year follow-up without lesions). All of them underwent a 3 T MR study including morphologic T2-weighted, variable flip angle T1-weighted, and T1-weighted DCE (gadoteric acid -Dotarem-, 3.4 s/dynamic) sequences. An expert radiologist manually placed tumour ROIs in peripheral areas with PI-RADS>= 4 (approximately correlated with histological findings). Normal ROIs were placed in areas with PI-RADS=1 (approximately correlated with negative biopsy at the central and peripheral gland). Voxel-by-voxel quantitative parameters were calculated: DCE two-compartment pharmacokinetic modeling (Ktrans, kep, ve and vp), DCE curve morphology (upslope, time-to-maximum, curve type 1-2-3 and area under curve at 60 seconds AUC60), T1 relaxation values and T2-weighted signal intensity (normalized by muscle signal intensity). Mean values were calculated as ROI descriptors. ANOVA tests were performed to study statistical differences.
Results: There were statistically significant differences between the three regions for normalized T2 signal intensity, curve type, Ktrans, ve, upslope and AUC60 (4.8±1.2.7.7±2.0.4.2±1.1,p < 0.001; 2.0±0.5.1.7±0.8.1.8±0.7,p=0.013; 0.4±0.2.0.2±0.1.0.3±0.3,p=0.013; 0.6±0.5.0.3±0.2.0.4±0.2,p < 0.001; 1.1±0.7.0.6±0.4.0.9±0.9,p < 0.001 and 3.7±1.9.2.3±1.2.2.9±1.7,p < 0.001, respectively). When comparing normal peripheral and tumour regions, significant differences were found for T2 intensity, Ktrans, ve, upslope and AUC60 (p < 0.001,p=0.005,p=0.004,p=0.016 and p=0.018, respectively).
Conclusion: Quantitative parameters obtained from 3 T DCE-MRI are useful to discriminate between healthy transitional, normal peripheral and tumour regions in prostate cancer.
Author Disclosures:
R. Sanz-Requena: Research/Grant Support; Part of this work was supported by a research grant from Guerbet. **L. Marti-Bonmati:** Research/Grant Support; Part of this work was supported by a research grant from Guerbet. **R. Perez:** Research/Grant Support; Part of this work was supported by a research grant from Guerbet.

B-0702 14:40

Index lesion detection with diffusion-weighted imaging at 3 Tesla MRI and its correlation with choline kinase-Alfa-α overexpression in primary prostate carcinoma
M.D. Hernández-Argüello, J. Solorzano, A. Benito, M. Collantes, M. Rodríguez-Fraile, I. Pascual, J. Madrid, J. Pardo, J. Richter; *Pamplona/ES (mharguello@unav.es)*

Purpose: Choline kinase α overexpression (CKα+) emerges as a potentially important enzyme in primary prostate carcinoma (PPC) carcinogenesis. The aim of this study was to evaluate the correlation amongst CKα+ and data obtained from diffusion-weighted imaging (DWI) and minimum apparent diffusion coefficient (ADCmin) maps in patients with PPC.
Methods and Materials: 24 patients were prospectively studied with 3 Tesla DWI and ADC maps prior to undergoing a radical prostatectomy. Index MRI was defined as the largest sized lesion observed on b 1000 images and/or with

reduced ADC. Index H, defined as the largest sized tumour on biopsy, was used as the standard of reference. Index MRI and Index H correlation were analysed. CKα+, Gleason score (GS) and DWI-ADCmin data were also analysed on the Index H and benign control tissue (BCT). Kappa statistic and Mann-Whitney U tests were performed.
Results: Index H presented CKα+ in 18 cases (75%). Index MRI correctly identified 19 Index H (79.1%) of which 15 presented CKα+ (78.5%). DWI failed to detect 12% of Index H that presented CKα+ prior to prostatectomy. ADCmin values were not predictors of CKα+ status. GS > 6 correlated with CKα+ (p=0.034) but not with DWI-ADCmin data.
Conclusion: Combined data from DWI, ADC maps and CKα+ were better predictors of high-risk Index H than data provided by individual techniques. DWI and ADC maps are reliable techniques in identifying the Index Lesion in PPC.

B-0703 14:48

Diagnostic performance of the monoexponential model and diffusion kurtosis imaging in the analysis of prostate cancer
N. Adubeiro[1], L. Nogueira[1], E. Ribeiro[1], J.M. La Fuente[1], H.A. Ferreira[2]; [1]*Porto/PT*, [2]*Lisbon/PT (nca.estsp@gmail.com)*

Purpose: To investigate the performance of two diffusion models in prostate cancer (PCa) diagnosis.
Methods and Materials: 43 patients with histological results of PCa performed pelvic MRI including a DWI sequence with 11 b-values (0-2000 s/mm2). Signal intensities (SI) for each lesion and normal tissues (peripheral (PZ) and central gland (CG)) were measured from DW images. SI data were fitted using two models: a monoexponential model and the diffusion kurtosis imaging (DKI) model. For that purpose a fitting script was prepared in-house in MATLAB using the Levenberg- Marquardt algorithm. Apparent Diffusion Coefficient (ADC), mean diffusivity (MD) and mean kurtosis (MK) parameters were estimated from lesions and normal tissue. The Mann-Whitney test was use to evaluate differences between the lesions and the normal tissue and ROC analysis was generated to assess the diagnostic performance of the models.
Results: Mean ADC, MD and MK of the lesions were: 1.091, 1.415 (×10-³ mm²/s) and 1.103, respectively. Normal tissue mean ADC, MD and MK, for PZ were 1.708×10-³ mm²/s, 2.135×10-³ mm²/s and 0.726, respectively. For normal GC mean ADC, MD and MK were 1.531, 1.929 (×10-³ mm²/s) and 0.794, respectively. We found significant differences between normal tissue and malignant tissue, as well as between normal PZ and normal GC tissue, for the two models. MK achieved the highest AUC with 96.7%(lesion vs normal peripheral tissue). A cutoff of 0.820 achieved a sensitivity and specificity of 95.3% and 88.4%.
Conclusion: The DKI model showed higher diagnostic performance than the conventional DWI model in PCa characterisation.

B-0704 14:56

Effect of temporal resolution on diagnostic performance of DCE-MRI of the prostate
A. Othman, F. Falkner, J. Weiss, S. Kruck, P. Martirosian, K. Nikolaou, M. Notohamiprodjo; *Tübingen/DE (ahmed.e.othman@googlemail.com)*

Purpose: To assess the effect of temporal resolution (TR) on dynamic contrast-enhanced MRI (DCE-MRI) and its diagnostic accuracy regarding the detection of potentially malignant prostate lesions.
Methods and Materials: 60 consecutive male patients (64.5±7.0y) with suspected prostate cancer were included. Patients underwent multi-parametric prostate MRI on 3 T MRI and were divided into 2 groups depending on PI-RADS score (group A: PI-RADS ≤3, n=30; group B: PI-RADS > 3, n=30). DCE-MRI was performed with a TR=5s. 6 DCE-MRI series with different TRs ranging from 5s to 30s/timepoint were retrospectively generated. Semi-quantitative parameters (i.e. Wash-In, Wash-Out, TTP) and pharmacokinetic parameters (i.e. Ktrans, Kep, ve) were calculated. Both groups and all 6 DCE-MRI series were compared regarding perfusion parameters and their diagnostic accuracy.
Results: Significant effects of temporal resolution were found on Wash-In: Series with TR< 10s/timepoint showed significantly lower Wash-In values (p <.001). For 30s series, differences between both groups diminished reaching insignificant levels (p=.052), resulting in significant decrease of diagnostic accuracy of Wash-In (AUC:.609, 95%-CI.451-.766;p <.015). No significant effects were detected on Wash-Out. For TTP, significant effects of temporal resolution were detected (p <.001) with significantly increasing TTP levels for all down-sampled series compared to the original 5s series. These effects did not impact the diagnostic accuracy of TTP. No significant effects of temporal resolution were detected on pharmacokinetic parameters (p <.112).
Conclusion: In DCE-MRI of the prostate, temporal resolution affects the diagnostic performance of semi-quantitative parameters. For sufficient detection of malignant lesions, a temporal resolution of at least 10 s/timepoint or higher is recommended.

B-0705 15:04

Potential role of diffusion weighted MRI for predicting extracapsular extension of prostate cancer
P. Pricolo, S. Alessi, P. Summers, E. Tagliabue, G. Petralia; *Milan/IT*

Purpose: To evaluate the potential of apparent diffusion coefficient (ADC) values in predicting extracapsular extension (ECE) of prostate cancer (PCa).
Methods and Materials: We retrospectively analysed 295 PCa patients (136 low-risk and 159 intermediate/high-risk according to EAU) who underwent pre-surgical multiparametric magnetic resonance imaging (mpMRI). ADC maps were generated from diffusion-weighted images with b-values of 0, 500, 1000 s/mm2 and the ADC measured for each lesion. Receiver Operating Characteristic (ROC) curves for prediction of ECE based on ADC value of the intraprostatic dominant lesion (IDL) were generated, and the ADC cut-off which maximized the area under the curve (AUC) identified. The sensitivity (SE), specificity (SP), and negative and positive predictive values (NPV and PPV) of IDL ADC for prediction of ECE based on the identified ADC cut-off were then derived for the whole patient group, and separately for the low- and intermediate/high-risk subgroups.
Results: 116 patients had ECE (39.3%) and 179 patients had organ-confined disease at final histology. The maximum AUC (=0.73) was obtained for an ADC cut-off value of 1032 µm2/s. Using this ADC cut-off value, the overall performance for the ruling-out (SE, NPV, LR-) and ruling-in (SP, PPV, LR+) of ECE was 84%/86%/0.26 and 62%/59%/2.21 respectively. In low-risk patients the corresponding values were 75%/92%/0.33 and 76%/45%/3.12; and for intermediate/high-risk patients 88%/73%/0.29 and 41%/65%/1.49 respectively.
Conclusion: In our cohort, IDL ADC values > 1032 µm2/s confidently ruled out ECE in low-risk patients and may contribute to the assessment of ECE in intermediate/high-risk patients.

B-0706 15:12

Prostate DCE-MRI: improved SNR with 32-element receiver arrays
S. Riederer, E. Borisch, A. Froemming, R. Grimm, A. Kawashima, J. Trzasko; *Rochester, MN/US (riederer@mayo.edu)*

Purpose: Describe how use of a receiver coil array with high coil count (32 elements) can provide improved performance in prostate DCE-MRI.
Methods and Materials: Dynamic contrast-enhanced (DCE) sequence is an important part of multi-parametric prostate MRI but can be limited by poor signal-to-noise ratio (SNR) if acceleration is used. With vendor-recommended acquisition a receiver array is used with four anterior and eight posterior elements. To study SNR improvement the number of elements used was expanded. Fifty consecutive prostate MRI patients were studied with a DCE-MRI sequence with parameters: axial slab; acquired spatial resolution 0.86 x 1.40 x 3.70 mm3; frame time 6.6 sec. Acquisition used 32 channels: 16 coils from an anterior array and 16 coils from a posterior array within the table. Both arrays encompassed the pelvis S/I and L/R. Images were reconstructed with all 32 channels and with the vendor-recommended subset of 12 channels. Results were evaluated qualitatively on a five-point scale (-2 to +2) by two experienced radiologists for perceived SNR, sharpness, artifact, and overall preference. Quantitative analysis determined the g-factor, a measure of SNR degradation, for the 12 and 32-channel reconstructions across the prostate volume.
Results: With the five-point scale SNR (mean +1.02; p < 0.001) and overall preference (+0.98, p < 0.001) were significantly superior for the 32- vs. 12-channel reconstruction. Artifact level and sharpness were equivalent. The median g-factor was 12% lower for the 32-element case.
Conclusion: High count (in this case, 32 elements) coil arrays can help retain SNR in prostate DCE-MRI.

B-0707 15:20

Image quality evaluation of a high-resolution 3D SPACE T2-weighted sequence (SPACE) in prostate multiparametric MRI (mp-MRI)
E. Armando, L. Capitolo, F. Cesarani; *Asti/IT (enrico.armando@gmail.com)*

Purpose: As mp-MRI is becoming widely used for detection and staging of prostate cancer (PCa), faster sequences are needed to face the increased number of mpMRI requests; SPACE sequences are about 5 minutes faster than conventional T2 2D sequences (2DT2) acquired in three planes. The aim of this study is to evaluate image quality of a high-resolution SPACE in mp-MRI.
Methods and Materials: 41 patients underwent mp-MRI in a 1.5-T scanner (Magnetom Avanto Fit) using a 16-minute protocol including a high-resolution 3d T2 SPACE sequence (voxel size 0.7 x 0.7 x 1 mm). As control group 26 patients examined with 2DT2 were included. Image quality was retrospectively assessed by two radiologists who traced regions of interest within healthy peripheral zone (PZ) and PCa areas, identified at fusion biopsy. Mean signal intensity (MSI) and standard deviation values were recorded; signal-noise ratio (SNR) and relative tumour contrast were calculated. Statistical analyses were performed using Student t test.

Results: MSI of PZ and PCA was lower using SPACE (324 ±81 vs 504 ±117, p> 0.001 and 83.2±25 vs 146.67±47, p> 0.001. There was no difference in SNR in both PZ and PCA.(13.82± 7.4 vs 12.13± 4.74, p=0.3 and 7.21± 3.42 vs 7.22± 3.4, p=0.99). Relative tumour contrast was higher in SPACE than in conventional 2DT2 (0.59 ± 0.1 vs 0.51 ± 0.1, p=0.03).
Conclusion: Using SPACE good-quality images are obtained; an mp-MRI protocol including SPACE and calculated high b-value DWI sequence may last less than 15 minutes.

14:00 - 15:30 **Room G**

Radiographers

SS 714

Quality issues in ultrasound and CT

Moderators:
C. Beardmore; London/UK
N.N.

B-0708 14:00

Abdominal CT for obese patients: investigating optimal scan parameters
A.A. Qurashi[1], L.A. Rainford[1], A. Ajlan[2], K. Khashoggi[2], L. Ashkar[2], M. Alraddadi[3], M. Alghamdi[2], M. Althubaiti[2], S.J. Foley[1]; [1]*Dublin/IE*, [2]*Jeddah/SA*, [3]*Madinah/SA (qetharah@hotmail.com)*

Purpose: To investigate optimal CT parameters when scanning obese patients.
Methods and Materials: With ethical permission, abdominal CT scans for 45 obese patients (BMI> 30 kgm-2) were prospectively collected from 3 different CT Siemens scanners (Single source 128MDCT, Dual source 64 and 128MDCT) over three-month period. Patients were scanned using 9 different protocols, due to various settings used locally (kV: 100/120, mAs: ATCM reference mA: 150, 190, 218, 250, 300 and Fixed 400 mA and pitch: 0.6, 0.8 and 1). When available, images were retrospectively reconstructed using various SAFIRE strengths (2.3,4 and 5) as well as using FBP. Objective image quality was determined by noise (SD) measurements within 2 cm2 ROI on three consecutive slices for the Liver, psoas muscle and peripheral subcutaneous fat. Comparison between dose length product (DLP) and image quality was performed using Kruskall-Wallis test.
Results: Patients ranged in weight from 65-190 kg with DLP ranging from 345-1525 mGy.cm and noise from 4.4 -27.9). Mean doses were highest for the protocols using either reference mA:300 or a fixed mA:400 with statistical differences noted between protocols which used reference mA:218 and 100 kVp (1400 vs. 515 mGycm, P < 0.05). Use of either fixed mA or 100 kVp led to statistically significantly higher noise. Similarly using SAFIRE 4 and 5 recorded significantly lower noise and higher signal-noise and contrast-noise ratio compared to FBP and SAFIRE 2.
Conclusion: Numerous CT protocols are in clinical use for scanning obese patients, with wide variations in patient dose and image noise. Further work is encouraged to standardize acceptable image noise.

B-0709 14:08

Body composition changes in obese population
S.J.M. Alqahtani, K.M. Knapp, R.M. Palfrey, S.J. Hopkins, J.R. Meakin, J. Fulford; *Exeter/UK (sa512@exeter.ac.uk)*

Purpose: Increased prevalence of overweight and obesity globally has brought new challenges to imaging departments including high delivered radiation doses, reduced image quality and non-diagnostic radiographs. This current study investigated the body composition and size changes in obesity. These data will inform the development of accurate obesity phantom construction and radiography practice.
Methods and Materials: Total body DXA data (GE Lunar Prodigy, GE Healthcare, Bedford, UK) from 264 participants were analysed. All participants were female aged 18-85 years with a BMI range of 18.3-45.9 kg/m^2 who were scanned using the machine-selected scan mode for their size. All participants were healthy with no ongoing medication or current illness that might affect their fat or lean mass. Fat mass (FM) and lean body mass (LBM) were determined from the DXA scan. Using STATA (SE13), correlations were performed between FM and LBM across multiple regions.
Results: There was a positive correlation between FM & LBM which appeared to be non-linear. The FM showed a good association with LBM in android, gynoid, trunk and total body (r= 0.63, 0.57, 0.56 and 0.50) respectively. BMI showed an increase with FM (R= 0.94) but also with LBM (R=0.56).
Conclusion: Fat mass and LBM increases in an obese population with increasing BMI. The attenuation coefficients for fat and lean differ in the lower kVp range, but merge in the higher kVp range. Developing accurate phantoms for dose optimisation, underpinned by body composition data, will enable consideration of optimising projection radiography in obese populations.

B-0710 14:16

Manual vs automated visceral adipose tissue quantification in paedatric CT: which is best?
M. O'Connor, S. Foley; *Dublin/IE (michelle.oconnor@ucd.ie)*

Purpose: Excessive visceral adipose tissue (VAT) is a significant risk factor for many obesity-related metabolic diseases. This research investigates the consistency and time efficiency of VAT quantification on paediatric abdomen CT scans using manual and automated methods.
Methods and Materials: With ethical permission, 60 abdomen CT scans were retrieved from paediatric hospitals, via random sampling stratified according to age (0-5, 5-10 and 10-15 years). VAT was measured at each intervertebral level between T12 and S1 using ImageJ software by thresholding (-190 to -30 HU) and manual segmentation. VAT was automatically quantified using Terarecon software (Acquarius iNtuition) and then manually edited to correct segmentation errors (semi-automated method). All measurements were performed by two experienced observers. Inter- and intra-viewer reliability were tested using Spearmans correlation. VAT measurements were correlated using Spearmans correlation. The mean time taken to perform each method was recorded.
Results: Inter- and intra-viewer reliability was excellent for all three methods (rho> 0.97, p0.96, p < 0.01). Automatic VAT quantification did not correlate to the other methods and almost always overestimated VAT on average by 11.69% (96.67% of cases). Numerous learning points to avoid commonly encountered errors associated with automatic VAT quantification have been developed. The mean time taken to quantify VAT automatically was 16 seconds, semi-automatically 68 seconds and manually 243 seconds.
Conclusion: Semi-automated VAT quantification is the recommended method of VAT quantification in paediatric CT due to its high accuracy, reproducibility and time efficiency.

B-0711 14:24

An analysis of the validity and reliability of a handheld ultrasound device for measuring rectus femoris muscle size
W. Nijholt[1], A. Bakker[1], A. Bennet[2], M. Borgen[3], A. Ellermann[1], P. Hogg[2], P. Gamboa[4], L. Vorster[5], I.-J. Aandahl[3]; [1]*Groningen/NL*, [2]*Salford/UK*, [3]*Oslo/NO*, [4]*Lisbon/PT*, [5]*Bloemfontein/ZA (a.ellermann@st.hanze.nl)*

Purpose: Previous studies show that ultrasound is valid and reliable when measuring muscle size. A Philips handheld ultrasound device was released in April 2015. The aim of this study was to investigate the validity and reliability of the handheld ultrasound device compared to a regular ultrasound device, when measuring the size of the rectus femoris (RF).
Methods and Materials: Two sonographers scanned 39 volunteers (mean age=29.3y,26 female), once with the Toshiba SSA-660 A ultrasound device and twice with the Philips VISIQ device. The size of the RF (expressed in cross sectional area (CSA) was measured two ways; using the trackball on the Toshiba device and an automatic region of interest on the VISIQ device (method 1), and an ellipse on both devices using the formula π*half width*half length (method 2).
Results: Method 1 resulted in an ICC of.811 with a 95% CI of.773-.837 (inter-rater reliability) and.907 with a 95% CI of.822-.951 (validity). The ICCs of method 2 were.787 with a 95% CI of.593-.888 (inter-rater reliability) and.867 with a 95 % CI of.746-.930 (validity).
Conclusion: VISIQ is a valid and reliable device for measuring RF-CSA. In clinical practice VISIQ could be used for measuring RF-CSA, consequently it could be an economical and easily portable technology for use in both clinical and residential settings.

B-0712 14:32

Reproducibility of ultrasound parameters (echo-intensity and thickness) of quadriceps muscle
R.A. Santos, P. Armada-da-Silva; *Coimbra/PT (rutemartinssantos@gmail.com)*

Purpose: The aim is to evaluate the reproducibility of ultrasound measures of echo-intensity and thickness of the four heads of the quadriceps muscle.
Methods and Materials: Nineteen healthy subjects (10 females and 9 males; age: 20.0±2.3 years) were submitted to two one-week apart ultrasound examinations (GE, Logiq e; linear probe 7-10MHZ) to evaluate the four muscles of quadriceps during two separate sessions. Three consecutive scans were acquired in transverse and longitudinal scan bilaterally. Image parameters were maintained during all examinations. The muscles thickness and echo-intensity were measured, by ImageJ software. All three images acquired for each muscle were analysed and the mean of three measurements was considered. Two ROIs (region of interest) with different sizes were chosen. The mean echo-intensity was determined for each ROI. Echo-intensity and muscle thickness measurements were considered for comparison between sides, ROIs, genders and muscles. Echo-intensity and thickness reliability across the three scans acquired in the same session and inter-session

reliability of echo-intensity measures were assessed using the intraclass correlation coefficient (ICC) and 95% confidence interval (by SPSS 20.0 software package).
Results: The ICC values for thickness measures were very high (ICC:0.944-0.997). The echo-intensity consistency between rectangular ROI ranged from moderate correlation (ICC:0.866) to very high (ICC:0.988) and between the maximum ROI ranged from moderate correlation (ICC:0.728) to very high (ICC:0.991).
Conclusion: There is high evidence that thickness and echo-intensity have a good reproducibility for evaluating the quadriceps muscle in healthy population. Ultrasound demonstrated to be capable of offering reference values for thickness and echo-intensity.

B-0713 14:40

Assessment of musculoskeletal ultrasound pathologies by radiographers and undergraduated radiography students
A.F.C.L. Abrantes, I. Rodrigues, R.P.P. Almeida, J.P. Pinheiro, O. Lesyuk;
Faro/PT (jppinheiro@ualg.pt)

Purpose: To develop an ultrasound assessment tool and to evaluate the performance of radiographers and undergraduated radiography students on the identification of musculoskeletal (MSK) pathologies.
Methods and Materials: 45 participants, including radiographers and undergraduated radiography students from 4th year, were invited to participate in this study. A questionnaire was developed for gathering sociodemographic, professional skills and complementary education and addressed to the participants. Each participant examined several ultrasound images of the musculoskeletal system with the purpose to identify the anatomical region and the pathological changes. ViewDEX software was used to display all images and record the answers.
Results: Questionnaire internal consistency yielded a Cronbach alpha value of 0.9. Sensitivity, specificity and accuracy are higher for radiographers and individuals with complementary education. However, sensitivity and accuracy have higher values for participants with less professional experience and specificity is higher for professionals with more professional experience.
Conclusion: Radiographers showed a good performance identifying pathologies as well as radiography students. This tool can be used to assess performance when evaluating pathologies helping healthcare professionals to improve their skills.

B-0714 14:48

Do radiologists agree when reviewing ultrasound examinations performed by a sonographer and a radiologist?
C. Stenman[1], R. Glavas[1], K. Jansson[1], A.-L. Enlund[1], L. Thorelius[2], Ö. Smedby[3]; [1]*Linköping/SE*, [2]*Barcelona/ES*, [3]*Stockholm/SE*
(carina.stenman@liu.se)

Purpose: To study the diagnostic variability in standardised ultrasound examinations of the kidney by comparing inter-reader agreement between two radiologists who reviewed examinations acquired by a sonographer and a radiologist, as well as inter-operator agreement between the sonographer and the radiologist.
Methods and Materials: 98 adult patients, aged from 18 to 92, referred for diagnostic renal sonographic examination, were prospectively enrolled. Both kidneys were imaged using standardised scanning protocols, and the entire examination was documented with cine-loops. Two radiologists reviewed the examinations for different types of pathology, including tumours, cysts, decreased cortical thickness, increased echogenicity and hydronephrosis. Inter-reader and inter-operator agreement was evaluated with kappa coefficient and intra-class correlation.
Results: The most common finding was cysts, which were found in 32 to 40 cases. Tumours were found in 3 to 10 cases. With one exception, the kappa values for inter-operator agreement (0.65-1.00) were higher than those for inter-reader agreement (0.31-1.00). With two exceptions, no systematic differences between operators or between observers were found.
Conclusion: Using a standardised cine-loop technique, we found slightly better inter-operator agreement than inter-reader agreement. This suggests that it may be easier to exchange an operator than to exchange a reader.

B-0715 14:56

Quality assurance in Irish ultrasound departments
A.M. Ward, M.T. Stanton; *Dublin/IE (amymarieward@hotmail.com)*

Purpose: There are no legal obligations requiring the practice of QA in ultrasound as there are for all other modalities using ionising radiation. In a modality that is user dependent it is important to make every effort to ensure consistency. QA contributes to accuracy of diagnosis, patient safety and equipment efficacy. This study was carried out to investigate quality assurance practices in Irish ultrasound departments.
Methods and Materials: A postal survey was administered to sonographers in public hospitals under the governance of the health service executive in Ireland. The survey contained questions regarding frequency of quality assurance practices, equipment, documentation, protocol and the opinion of the value of QA in US.
Results: Equipment infection control had high practice rates in departments. Physical QA inspection rates varied from 59-91%. Rates of practices relating to monitor & control checks were lower ranging from 27-59% for different parameters. Transducer tests & electrical safety checks had the lowest overall level of practice with reported rates ranging from of 5-23%. Low levels of QA protocol and documentation were reported, 23% and 18% respectively. The majority of sonographers do not carry out equipment tests in accordance with the 2014 BMUS guidelines which were used for comparison. The most commonly identified barrier was lack of protected time followed by lack of training, appropriate equipment and resources.
Conclusion: Strengths and weaknesses were identified in Irish ultrasound quality assurance practices. Currently there are low rates of sonographer involvement in equipment QA. There was an overall poor adherence to a widely accepted best practice guideline, the 2014 BMUS guidelines, on all levels apart from infection control. The majority of sonographers valued the importance of quality assurance testing in ultrasound.

B-0716 15:04

Are physical measures good indicators of clinical image quality at low dose levels? A pilot study
L. Lanca[1], E.N. Andersen[2], G. Carvalho[1], M. van Gerwen[3], J. Jorge[4], M. Kleiker[5], B. Markali[2], P. Nightingale[6], P. Hogg[6]; [1]*Lisbon/PT*, [2]*Oslo/NO*, [3]*Eindhoven/NL*, [4]*Lausanne/CH*, [5]*Groningen/NL*, [6]*Manchester/UK*
(luis.lanca@estesl.ipl.pt)

Purpose: To determine whether physical measures of noise predict visual (clinical) image quality at low noise levels.
Methods and Materials: Twenty-four images were acquired on a DR system using a Pehamed DIGRAD phantom contained within 14 cm of PMMA at three kVp settings (60, 70 and 81) across a range of mAs values (2.9-159.9). Signal-to-noise ratio (SNR) and Contrast-to-noise ratio (CNR) were calculated for each image. Fourteen observers, blinded to acquisition conditions, scored the images by assessing visibility of objects within the phantom to produce an Objective Visibility Score (OVS).
Results: A non-linear (quadratic) relationship between physical and visual measures was observed. R^2 values for the quadratic relationships, between OVS and CNR (60 kVp R^2 = 0.902; 70 kVp R^2 = 0.913; 80 kVp R^2 = 0.757), demonstrate a better curve fitting for all 3 kVp settings than linear R^2 values. As CNR increases OVS increases. The largest increase for SNR at low exposure values (up to 2 mGy) was observed at 60 kVp. CNR response to exposure is similar. Pearson r was calculated to assess the correlation between OVS, SNR and CNR. None of the correlations reached statistical significance ($p > 0.05$).
Conclusion: At low dose physical measures of image quality do not appear to have a linear relationship with visual / clinical measures, suggesting that a complex relationship exists between the two. Further research is needed to explore these findings.

B-0717 15:12

Effectiveness of the American Association of Physics in Medicine criteria to assess diagnostic monitors
K.B. Azevedo, N. Messias, L.P. Ribeiro, J.P. Pinheiro, R.P.P. Almeida, P. Sousa, A.M. Ribeiro, A.F.C.L. Abrantes; *Faro/PT (kbazevedo@ualg.pt)*

Purpose: To assess if the criteria presented by the American Association of Physics in Medicine (AAPM) are an effective tool to evaluate the quality parameters of diagnostic monitors.
Methods and Materials: In this quantitative descriptive research 42 diagnostic monitors (31 primary monitors and 11 secondary monitors) were selected, by convenience sampling, from several public radiology facilities. A RaySave Xi Light and a Xi Light detector were used as long as the TG18 standards of the AAPM.
Results: From the 12 criteria assessed, the luminance uniformity and contrast and the diffuse reflexion scored 90% and 93% of conformity, whilst the internal reflexion (internal) and the illuminance were the lowest scores, presenting 14% and 33% of conformity, respectively. Also, the percentage of conformity was higher in the primary monitors, despite there were no statistically significant difference between primary and secondary diagnostic monitors.
Conclusion: Despite the AAPM are used worldwide as a quality control tool for diagnostic monitors, the results achieved line out some limitations in what concern to quantify results. The conformity is considered equivalent in monitors that are near the limit and others that are far from conformity, many evaluations are qualitative instead of quantitative and the anatomical patterns checklist should be more precise.

B-0718 15:20

Use of anatomical side markers (ASMs) during planar x-ray imaging

S. Attard, J.G. Couto, F. Zarb; *Msida/MT (stephanie.attard.11@um.edu.mt)*

Purpose: To evaluate the perception and use of anatomical side markers (ASMs) by radiographers working in a general hospital in Malta.
Methods and Materials: Phase 1 involved a retrospective observation of radiographs over 5 years, using a self-designed data record sheet. Phase 2 consisted of the distribution of a self-designed questionnaire to radiographers evaluating their perception of the use of ASMs.
Results: In phase 1, 430 radiographs (86%) had evidence of ASM, of which 110 (25.6%) had a pre-exposure ASM and 320 (74.4%) had a post-processed ASM. The remaining 14% had no evidence of either a pre- or post-exposure ASM. Two hundred and eighty two (282) (56.4%) of the radiographs having either pre- or post- exposure ASMs were placed according to recommended guidelines by Ballinger, Frank and Merrill. In phase 2, 15.4% of respondents stated that they prefer using pre-exposure ASM during practice, while 84.6% of the respondents stated that they prefer using post-processing ASMs. While, 76.6% of radiographers find it often or occasionally time consuming when applying pre-exposure ASMs. The average percentage score of correct answers by radiographers about the correct use of ASMs as recommended in the guidelines was 60.5%.
Conclusion: The study showed non-use and incorrect use of ASMs by radiographers. Preference in using post-processing ASMs was shown and the use of pre-exposure ASMs was seen to be influenced by factors such as time of examination, projection executed, and patient positioning.

14:00 - 15:30 **Room M 1**

Head and Neck

SS 708

Temporal bone

Moderators:
S. Kösling; Halle a.d. Saale/DE
K. Markiet; Gdansk/PL

K-17 14:00

Keynote lecture

F. Veillon; *Strasbourg/FR*

B-0719 14:09

Structured reporting of the petrous bone: potential effects on surgical planning

M. Armbruster, S. Gassenmaier, M. Haack, W. Sommer, F. Braun; *Munich/DE (marco.armbruster@med.uni-muenchen.de)*

Purpose: The aim of the current study was to compare structured reports vs. standard free text reports of MRI examinations of the petrous bone and to evaluate quality criteria and referring physician's satisfaction.
Methods and Materials: We acquired 20 structured reports of the petrous bone with an online software with dedicated templates and clickable decision trees with concomitant generation of semantic structured reports. Corresponding freetext reports were taken from the hospitals radiology information system. Both structured and freetext reports were reviewed by surgeons using a questionaire.
Results: Clinical decision-making regarding surgery vs. conservative therapy was possible without further radiologic consultations in 90% of structured and 35% of freetext reports. In case of surgery the provided information was considered to be sufficient for surgical planning in 85% of structured and 65% of freetext reports. The effort of information extraction from the reports was considered to be time-consuming in 10% of structured and 50% of free text reports ($p < 0.001$). The linguistic quality was rated better ($p < 0.0001$) in standardized (5.5+0.7 in a licart scale of 6) than in and freetext reports (3.2+0.9).
Conclusion: Structured reporting of MRI examinations of the petrous bone with dedicated and specific templates is a valuable tool to provide high quality templates and provide standardized information to referring physicians.
Author Disclosures:
M. Armbruster: Founder; Co-Founder of QMedify. **W. Sommer:** Founder; Co-Founder of QMedify.

B-0720 14:17

Fractures of the temporal bone: an easier way to read your CT

A. Venkatasamy[1], F. Veillon[1], B. Rock[1], S. Riehm[1], P. Meriot[2], P. Baur[1], A. Charpiot[1]; [1]*Strasbourg/FR*, [2]*Brest/FR (aina.v@hotmail.fr)*

Purpose: We propose a simpler approach to traumatic lesions of the temporal bone that differs from the traditionnal approach described by Ghorayeb and al in Fractures of the petrous bone.
Methods and Materials: We analysed 712 patients presenting fractures of the temporal bone. Clinical findings were otorrhagia, hearing loss, vertigo and peripheric facial palsy. All patients underwent a non-contrast CT of the temporal bone. The image reading was done by cavity : external, middle ear and inner ear.
Results: 774 fractures of the temporal bone were analysed. 320 patients (50%) had an external ear fracture. 79% (n=611) had a middle ear fracture. 352 of these were re-analized and divided in 6 types. Type A fracture (16%, n=56) had an entry point anterior to the external auditory meatus (EAM). Type B fracture (27%, n=95) had with an entry point through the roof of the EAM. Type C fractures (40%, n=143) had an entry point behind the EAM. Type D fractures (6%, n=20) had an entry point through the superior-posterior petrosquamous fissure. Type E fractures had an entry point close to the lateral sinus (6%, n=20). Type F fractures (5%, n=18) ran through the postero-internal part of the temporal bone. There was 8% (n=63) of isolated inner ear fractures, and 5% (n=39) associated with a middle ear fracture.
Conclusion: This new classification of temporal bone fractures, makes the reading of posterior skull base trauma much easier. We separated the middle ear fractures in 6 types based on the orientation of the fracture.

B-0721 14:25

Anatomy of the posterior membranous labyrinth on 3-T MRI without gadolinium

A. Venkatasamy, F. Veillon, H. Sick, M. Eliezer, M. Abu-Eid, A. Charpiot; *Strasbourg/FR (aina.v@hotmail.fr)*

Purpose: The visualisation of the posterior membranous labyrinth on MRI is challenging. We developed a HRT2 sequence (FIESTA) non-injected on 3-T MRI to analyse the anatomy of the normal posterior membranous labyrinth.
Methods and Materials: Analysis of histological sections performed in our department of anatomy allows key levels in each section which constitutes references for imaging. We analysed the shape and size of the posterior membranous in 64 healthy volunteers (research protocol) from reference's cut selected by histology. Four patients were excluded because of significant motion artefacts.
Results: The saccule, utricle and the utricular macula are visible in 100% cases. The saccular macula is not visible because it merges with the surrounding otic capsule. The saccule has an oval shape (rugby balloon) in 100% of cases. It measures an average of 1.4 mm in height and 1.2 mm in width with standard deviations of 0.125 and 0.13. The analysis of the utricle focused on five sections to analyse its relationship with the surrounding perilymphatic structures. The visualisation of the utricle on the axial section, the perilymph above it, and the linear aspect of the floor was visible in 119/120, 118/120, 117/120 cases, respectively. Diameter ratio (utricle/bony vestibule) was carried out on coronal section with an average of 64.4% with a standard deviation of 5.2.
Conclusion: Analysis of the posterior membranous labyrinth is possible with a HRT2 sequence (FIESTA) leading to an easy diagnosis of labyrinthine diseases (particularly Ménière's disease).

B-0722 14:33

Determination of cochlea length via flat panel CT is reliable and safe

C. Loberg, J. Ilgner, M. Westhofen, C. Kuhl; *Aachen/DE (cloberg@ukaachen.de)*

Purpose: Cochlear implantation (CI) is a common procedure for rehabilitation of people with impaired sensory neural hearing. Preoperative determination of cochlea length and anatomy of inner ear can help to reduce intraoperative cochlear trauma and facilitate choosing length of cochlear electrode. Flat panel CT (FPCT) with its excellent contrast and high spatial resolution is an excellent tool in temporal bone imaging. Our aim was to evaluate accuracy and reliability of FPCT in preoperative determination of cochlea length and anatomy in comparison to MRI and Multislice-CT (MSCT).
Methods and Materials: 220 patients who underwent CI were retrospectively evaluated. 180 patients underwent MSCT, 40 patients FPCT and 167 MRI of temporal bone. Cochlea length was assessed after linear reconstruction using 3D-curved multiplanar reconstruction analysis. Calculated length of cochlea was compared to length of inserted electrode documented in operative report.
Results: Mean deviation of length measurement MS CT vs MRI was 0.5 mm (+/ - 0.3 mm). Mean deviation from the inserted length of CI to MSCT/ MRI was 0.8 (± 0.4 mm). Mean deviation in FPCT to MRI was 2.6 (+/ 1.4 mm). FPCT identified 12 patients with aberrant inner ear anatomy where MRI was found

normal. In all patients undergoing FPCT chosen length of CI accorded to determinated cochlea length. In 174 patients undergoing MSCT chosen length of CI according to determinated cochlea length.
Conclusion: FPCT is a reliable and safe technique in patients undergoing CI and superior to MSCT and MRI.

B-0723 14:41

Reduction of cochlear implant metal artifact in 1024 high-resolution CT: value of orthopedic metal artifact reduction (O-MAR) algorithm
C. Ding, X. Lu, Q. Wang; *Shenyang/CN*

Purpose: To clinically evaluate the capacity of orthopedic metal artifact reduction (O-MAR) technique for cochlear implant to mitigate metal artifacts in 1024 high-Resolution CT.
Methods and Materials: 1024 high-resolution CT scans were obtained using a 256-slice CT scanner in 11 cochlear implant patients. This protocol was approved by the Hospital ethics committee and written informed consent was obtained from each patient. Filtered back projection algorithm (FBP; FBP group) and FBP algorithm combined with O-MAR (O-MAR group) were employed for data reconstitution, respectively. Cochlear implant artifacts, membranous labyrinth, bony labyrinth, as well as visualisation of individual electrode contacts shown on CT images were compared and scored (1 to 5: poor to excellent) between the two groups. Rank-sum test was utilized for intergroup comparison, and a value of $P < 0.05$ was considered significant.
Results: Compared with the FBP group, the metal artifacts was reduced significantly, and the membranous labyrinth and bony labyrinth were clearer in the O-MAR group ($P < 0.05$); the individual electrode contacts was also more distinct in the O-MAR group than the FBP group, but no significant difference was found between the two groups ($P > 0.05$).
Conclusion: O-MAR can minimize the cochlear implant artifacts in 1024 high-Resolution CT images, clearly display the cochlea structure around the electrode array, and enormously improve the quality of images, laying a solid foundation for further assessment of cochlear implantation.
Author Disclosures:
C. Ding: Author; Xiaomei Lu.

B-0724 14:49

Flat panel computed tomography versus multislice computed tomography in diagnosis of superior canal dehinscence
C. Loberg, J. Ilgner, C.K. Kuhl; *Aachen/DE (cloberg@ukaachen.de)*

Purpose: Superior canal dehiscence (SCDS) is a rare defect, caused by a thinning or complete absence of temporal bone overlying the superior semicircular canal of vestibular system. Treatment of choice is covering the defect with ceramic implant. Flat panel CT is an innovative tecnique that permits visualisation of the complex anatomy of temporal bone with high spatial resolution. Therefore, preoperative planning is optimized and manufacturing of implant is improved.
Methods and Materials: 30 patients (m = 18/ f = 12) age 36 - 63 (m= 48.2) with symptoms of SCDS underwent flat panel CT examination between January 2013 and January 2015. 13 patient underwent MSCT imaging before, these images were assessed as normal. Flat panel Ct was performed at Siemens Axiom Artis, rotation 220°. Reconstructions were performed in bone window in 3D projection and according to superior canal. Dose length product between flat panel CT and MSCT was compared.
Results: In 4/ 17 patients who underwent flat panel CT imaging SCDS was confirmed. In 8/ 13 patients who underwent MSCT and flat panel CT imaging temboral bone defect was found and SCDS was confirmed. Applied radiation dose was nearly equal (flat panel CT 276, 5 mGy/ cm / MSCT 277.4 mGy/ cm).
Conclusion: Flat panel CT is a new and reliable diagnostic approach in diagnosis of SCDS and allows exact preoperative planning.

B-0725 14:57

Multiplanar reconstruction of the internal auditory canal using high resolution MR-imaging: effect of constitutional differences on the size of the cochlear and facial nerves
N.N.N. Naguib, N.-E. Nour-Eldin, T. Gruber-Rouh, M. Harth, T.J. Vogl; *Frankfurt a. Main/DE (nagynnn@yahoo.com)*

Purpose: To test whether the size of the cochlear and facial nerves measured in the internal auditory canal using Multiplanar reconstruction (MPR) of the high-resolution MRI sequence is affected by the patient age, sex and weight.
Methods and Materials: The study was retrospectively performed on 40 patients without hearing loss. MPR reconstruction was performed perpendicular to the nerves in the internal auditory canal. The cross sectional surface area of the nerves was measured by drawing a region of interest around the circumference of each nerve. The correlation between the age, sex and weight of the patient and the size of the nerves were tested using the Spearman's rank-correlation-test and the two-sample t-test.
Results: The mean cross sectional surface area of the cochlear and facial nerves were 1.52 mm2 ±0.33 (Range:1.00-2.50) and 1.30 mm2 ±0.37 (Range:1.08-2.50) respectively. The mean weight of the patients was 79 Kg ±10.89 (Range:58-98). There was no statistically significant difference between males and females regarding the size of the cochlear (p=0.13) or facial nerve (p=0.13). There were no significant differences at different ages regarding the size of the cochlear (p=0.14) or facial nerve (p=0.18). The patient's weight showed a significantly positive correlation with the size of the cochlear (p=0.004, rho=0.35) and the size of the facial nerve ($p < 0.0001$, rho=0.47).
Conclusion: The cross-sectional size of the cochlear and facial nerves measured using MPR of the internal auditory canal is affected by the patient's weight but not by the patient's age or sex.

B-0726 15:05

Diagnostic accuracy of TSE diffusion weighted MR imaging for the diagnosis of cholesteatoma
B. Ozgen Mocan, E. Bulut, A. Dolgun, D. Bajin, L. Sennaroglu; *Ankara/TR (drelifbulut@yahoo.com)*

Purpose: Non-echo-planar DW MR imaging has been shown to be highly sensitive and specific for cholesteatomas. The purpose of this study in was to determine the diagnostic accuracy of TSE-DWI for the diagnosis of cholesteatoma with quantitative signal intensity (SI) measurements.
Methods and Materials: 3 T temporal bone MR imaging with TSE diffusion studies of 20 pathology proven cholesteatoma cases were retrospectively evaluated. The control group (22 cases imaged for possible cholesteatoma) included pathologies other than cholesteatoma (chronic granulation tissue, cholesterol granuloma…). Lesions were assessed qualitatively in comparison to the SI of the cortex. ROI measurements were performed from the lesions both on trace images and on ADC maps. Pons ADC values and SI measurements were also obtained for the calculation of DWI-SI lesion /DWI-SI pons and ADClesion/ADCpons ratios. Significance of the difference between groups was studied with Mann Whitney U test. The diagnostic property of the specific threshold levels was evaluated by the ROC curves.
Results: The mean DW-SI of cholesteatomas (140.80±24) was significantly higher compared to controls (51.41±14.53; $p < 0.001$). Mean DWI-SIlesion /DWI-SIpons ratio of the cholesteatomas (1.71±0.33) was also significantly higher than controls (0.65±0.21; $p < 0.001$). The mean cholesteatoma ADC value (1±0.15 x 10-3 mm2/s) was statistically lower than the control group (2.05±0.6 x 10-3 mm2/s; $p < 0.001$). ROC analysis showed that DW-SI and DWI-SIlesion /DWI-SIpons cut-off values of 98 and 1.326 respectively, had 100% sensitivity, specificity and accuracy for the diagnosis of cholesteatoma.
Conclusion: The TSE-DWI with quantitative SI measurements is a highly accurate technique for the diagnosis of cholesteatoma.

B-0727 15:13

Repeated postoperative follow-up DWI to detect residual or recurrent cholesteatoma
W. Venderink, S. Steens, D. Kunst, A. Meijer, E. Mylanus; *Nijmegen/NL (wulphert.venderink@radboudumc.nl)*

Purpose: In many hospitals a follow-up DWI is performed at least twice after successful cholesteatoma surgery. Aim of this study was to determine the yield of the second follow-up DWI (DW2) after successful cholesteatoma surgery in patients with a negative first follow-up DWI (DW1) and an absence of clinical suspicion of recurrence or residual cholesteatoma.
Methods and Materials: Between 2006 and 2013 we retrospectively included 45 ears in 44 patients which underwent a successful cholesteatoma surgery, had a negative DW1 performed 6-24 months after surgery, an DW2 performed at least 6 months after DW1 and an absence of clinical suspicion of recurrence or residual cholesteatoma between surgery and DW2. Two observers noted the absence or presence of cholesteatoma on DW2. Descriptive analysis were used for determining the yield of DW2. Interobserver agreement was calculated using Cohen's kappa statistics.
Results: In 14 of 45 patients (31%) DW2 was positive (n=8, 18%) or equivocal (n=6, 13%). Interobserver agreement indicated substantial agreement ƙ = 0.75). Patients with a positive DW2 were of younger age compared to patients with an equivocal or negative DW2 and had more recurrences of cholesteatoma in the past.
Conclusion: The most important finding of this study is that up to 31% of DW2 may show evidence of cholesteatoma despite successful cholesteatoma surgery and clinical and DW1 examination without any sign of residue or recurrence. This may influence the follow-up strategy in cholesteatoma patients.

B-0728 15:21

Follow-up MRI of vestibular schwannoma: is it worthy to measure volume?

J. Lisý, M. Chovanec, L. Mikšík, J. Betka, R. Pipková, E. Zvěřina; *Prague/CZ (jilisy@yahoo.com)*

Purpose: Some authors advocate measuring of volume in MRI follow-up of patients with vestibular schwannoma. Authors compared planimetric and volumetric measurements of vestibular schwannoma in patients who were included to wait and scan strategy and their influence on therapeutic approach.
Methods and Materials: Authors compared planimetric and volumetric measurements in 78 patients (49 females, 29 males) with vestibular schwannoma (age range 13-87 years, mean 59.8 years). Patients underwent 280 MRI (mean 3.6 per patient), everyone at least 2 follow-up MRI, which were done every year for 2-8 years. Measurements were performed on isometric 3D-T1/MPRAGE sequence with 1-mm-thick slices on 1.5 T Avanto MRI scanner.
Results: In all cases, planimetric measurements were sufficient for evaluation of schwannoma behaviour. Volumetric results differ in same cases of stable schwannoma with unchanged size on planimetric measurements, but the difference was not significant in every of these cases without any influence on therapy strategy. Four patients underwent surgery and 12 patients Leksell gamma knife therapy because of size progression.
Conclusion: Volume measurement is not worthy in follow-up of vestibular schwannoma. Planimentric measurements are sufficient for evaluation of size changes of vestibular schwannoma.
Author Disclosures:
J. Lisý: Advisory Board; Biogen (Czech Republic) s.r.o.

14:00 - 15:30 **Room M 2**

Abdominal Viscera

SS 701c

Advances in CT

Moderators:
E. Akchurina; Moscow/RU
H. Ringl; Vienna/AT

B-0729 14:00

Image quality - cutting through noise

D.M. Jackson, K.K. Lau, A. Borsaru; *Clayton/AU (dana.jackson@monashhealth.org)*

Purpose: Dose modulation via control of standard deviation (SD) of the image noise is used to maintain a constant image quality through a scanned volume by adjusting mA. The purpose of this paper is to determine any effect of abdominal fat type on the performance of dose modulation in the liver in terms of the general diagnostic utility of the scan at a set standard deviation (SD) of noise.
Methods and Materials: 100 consecutive patients undergoing routine imaging of the abdomen were assessed. Fat distribution, determined from the axial images, was graded as paucity, subcutaneous, intra-abdominal or combination in type. Standard dose metrics (CTDIvol, DLP) were recorded. Two radiologists assessed the image quality of the liver using a 4-point scale: 0:High Noise, Non-Diagnostic; 1:Low Noise, Non-Diagnostic; 2:High Noise, Diagnostic; 3:Low Noise, Diagnostic. SD measurements in the liver were performed.
Results: Reader agreement in image quality was variable. One reader was more sensitive to the noise despite SD remaining fairly consistent throughout all scans and fat types. One patient with a paucity of fat was determined to have a scan of non-diagnostic quality. Overall, patients with a combination type fat distribution had the highest percentage of non-diagnostic studies across both readers.
Conclusion: Paucity of fat can have a small negative effect on the diagnostic utility of an image. The effects of SD maintenance on the noise power spectrum in terms of high and low frequency noise was shown to be reasonably consistent across other fat subtypes, as reported by both readers.

B-0730 14:08

Image quality and radiation dose warrants routine use of abdominal dual energy CT

D. Schmidt, M. Söderberg, C. Lee Christoffersen, H. Lindvall, M. Nilsson, P. Leander; *Malmö/SE (david.schmidt@med.lu.se)*

Purpose: Dual-energy CT (DECT) offers benefits over traditional single-energy CT (SECT), such as virtual non-contrast imaging. However, DECT has rarely been implemented in routine protocols due to concerns of radiation dose and/or image quality. This study compares image quality and radiation doses of singular contrast-enhanced abdominal acquisitions from newly implemented DECT protocols with acquisitions from corresponding SECT protocols.
Methods and Materials: In this regional review board-approved retrospective study, 496 patients (mean age 71) underwent either DECT (80/Sn 140 kVp) or SECT (120 kVp) on a second-generation 128 slice dual-source CT. Patients were either referred from the emergency department or scheduled for oncological follow-ups. Radiation doses were registered and analysed using Mann-Whitney U test. Image quality was evaluated both objectively, by measuring noise in the right liver lobe, and subjectively, by using a visual grading characteristics analysis, in which three radiologists rated the fulfillment of seven image quality criteria (adapted from European Guidelines for Multislice CT) in 100 patients.
Results: Noise levels were significantly lower ($p < 0.05$) in DECT (mean 13.9 HU) compared with SECT (mean 14.7 HU). No significant differences in subjective image quality were found between DECT and SECT acquisitions. The mean effective dose of DECT (5.6 mSv, SD = 1.9) was significantly lower ($p < 0.05$) than that of SECT (7.7 mSv, SD = 3.0).
Conclusion: Abdominal DECT imaging can be used routinely while lowering the radiation dose to the patient without negatively impacting image quality compared with SECT.

B-0731 14:16

Dilute concentration or reduce injection rate? Optimisation of reducing iodine delivery rate for low-energy contrast enhanced body CT

S. Takahashi, N. Negi, K. Kagawa, E. Suehiro, T. Nishii, Y. Ueno, A. Kono, H. Kawamitsu, K. Sugimura; *Kobe/JP (satorutakahashi2@mac.com)*

Purpose: On low-energy CT iodine contrast medium (CM) dosage can be reduced to achieve the same degree of contrat enhancement. As injection duration influences the timing of organ enhancement, iodine delivery rate (IDR) should be reduced to maintain identical injection duration and decrease total iodine dosage. The purpose of this study was to investigate appropriate method to reduce IDR; 1) decreasing injection rate using original concentration of CM, or 2) using diluted CM with maintaining injection rate.
Methods and Materials: We retrospectively reviewed 143 consecutive patients who underwent post-contrast body CT (thorax to pelvis) on 192-slice 3rd generation dual-source CT scanner at 70 kV. All patients were given 270 mgI/Kg CM (51±9 mL) with injection duration of 45 seconds. 43 patients were given original concentration of CM with a reduced injection rate (protocol A), while 100 patients were given 60% diluted CM with a standard injection rate (protocol B). CT values of the vessels and the abdominal organs were compared between the groups. Subjective assessment of image quality, severity of beam hardening artifact was scored.
Results: Mean injection rate of protocol A was significantly lower than protocol B. There were no significant differences in CT values of the abdominal organs between the protocol A and B, except the pancreas. CT value of the subclavian vein was significantly greater in protocol A and caused severer streak artifact.
Conclusion: In order to reduce IDR for low-kV contrast enhanced CT, concentration of CM should be diluted, instead of reducing injection rate.
Author Disclosures:
S. Takahashi: Research/Grant Support; Siemens, Bayer, Fuji RI Pharma, Eizai. **K. Sugimura:** Research/Grant Support; Bayer, Fuji RI pharma, Daiichi Sankyo, Eizai.

B-0732 14:24

Preserving image quality in low contrast media and radiation dose abdominal MDCT using iterative reconstruction algorithm in normal-weight patients

E. Belousova, E. Kondratyev, G. Karmazanovsky; *Moscow/RU (mestre@inbox.ru)*

Purpose: To evaluate the potential of iterative reconstruction algorithm (IR) and high-concentrated contrast media (CM) (400 mgI/ml) administration to reduce radiation dose and CM volume at low-dose abdominal MDCT.
Methods and Materials: 60 patients with BMI ≤25 were enrolled in the study. Group A (n=30) underwent MDCT using 100 kVp, current modulation (150-450 mAs) and decreased CM volume (1 ml/kg). MDCT in group B (n=30) was performed using standard protocol: 120 kVp; 1.4 ml/kg CM. Images were reconstructed using FBP and three levels of IR (iDose 3-5). Quantitative parameters (mean image noise (NI), contrast-to-noise ratio (CNR) for the aorta, liver and pancreas), qualitative parameters and effective doses were compared between groups.
Results: There was no significant difference in BMI between two groups (p=0.41). Effective dose was 18.6 (3.1) mSv and 27.3 (5.4) mSv in groups A and B respectively ($p < 0.0001$). Attenuation value in aorta was 25% higher in low dose protocol (421 (33) HU vs. 322 (29) HU, $p < 0.001$). No difference in attenuation value or CNR of pancreas and liver was achieved among two protocols in arterial and portal phases. Up to 40% of noise reduction in low dose protocol was achieved using IR (iDose4, iDose5) ($p < 0.0001$). No significant difference in NI and visual quality was found between full-dose FBP and low-dose IR image sets. Low dose protocol required lower volume of CM for injection (56 (6.3) ml vs. 83 (10.1) ml).

Conclusion: Low-tube-voltage protocol with IR may provide an image quality, comparable with that of the standard protocol, with up to 30% decrease in radiation and CM dose.

B-0733 14:32

Virtual monochromatic spectral CT in small feeding arteries of abdominal tumours: can spectral image fusion optimise the image quality?

Y. Zhou, J.B. Gao; *Zhengzhou/CN (zhouyue779@163.com)*

Purpose: To assess the effect of image fusion of virtual monochromatic spectral (VMS) on image quality in small feeding arteries of abdominal tumours.
Methods and Materials: Thirty patients (56.3±8.9years) with abdominal malignant tumour underwent enhanced spectral CT were analysed retrospectively. Conventional 140 kVp polychromatic images (group A) and monochromatic images with energy levels from 40 to 140 keV were reconstructed. Monochromatic images with highest CNR (group B) and 70 keV images (group C) were fused to generate fused images (group D) with image fusion software. Comparative parameters (CNR and SNR) and subjective scores[image noise score (INS), anatomical details score (ADS), overall image quality score (OQS) and lesion conspicuity score (LCS)] of small feeding arteries CTA quality were compared.
Results: CNR (21.70±9.74.16.63±7.60, 9.85±6.76 and 19.4±6.32, respectively) and SNR (35.05±17.75.26.77±11.51.16.32±9.5 and 31.22±9.8, respectively) among group A,B,C and D had statistical differences ($P < 0.01$ for all). CNR in group D was higher compared with group A and C (P0.05). INS[(3.7±0.7), (3.5±0.6), (3.8±0.7) and (3.7±0.6), respectively], ADS [(3.8±0.4), (3.6±0.3), (3.7±0.5) and (3.9±0.4), respectively], OQS [(3.4±0.6), (3.5±0.5), (3.3±0.5) and (3.9±0.6) respectively] and LCS [(3.4+0.6), (4.1+0.6), (3.6±0.6) and (3.9+0.6), respectively] among four groups had statistical differences ($P < 0.05$ for all). Group D was higher than group B in INS, higher than the other three groups in ADS and OQS, higher than group A in LCS ($P < 0.05$ for all).
Conclusion: Combined use of spectral CT monochromatic imaging fusion can effectively ensuring the CT image quality while maintaining or increasing CNR in in small feeding arteries of abdominal tumours.

B-0734 14:40

Dose performance of virtual monochromatic spectral CT protocol optimised for "double low scanning" on oesophageal cancer?

Y. Zhou, J.B. Gao; *Zhengzhou/CN (zhouyue779@163.com)*

Purpose: Radiation dose is a major concern with spectral CT scans in the world. We analysed the performance of a new CT protocol designed for "double low scanning" with respect to possible radiation dose reduction and contrast-to-noise ratio (CNR) maintenance for virtual monochromatic spectral (VMS) imaging on oesophageal cancer.
Methods and Materials: Forty patients (BMI: 18.8~24.2) underwent spectral contrast-enhanced chest CT were randomly divided into study group and control group. 20 patients in study group with 370 mgI/mL iopromide injection: 70 mL; 2.5 mL/s; FBP reconstruction (group A) and adaptive statistical iterative reconstruction (ASIR) (group B), respectively; 20 patients in control group with 270 mgI/mL iodixanol injection: 1.5 mL/kg; 1.5 mL/s; FBP reconstruction (group C) and ASIR (group D), respectively. The image noise and tumour-to-oesophagus CNR were calculated in late arterial phase (LAP). The lesion conspicuity scores (LCS) and overall image quality scores (OQS) were recorded.
Results: The image noise of group A, B, C and D was 10.53±1.13; 8.10±0.71; 6.10±0.60 and 5.87±0.87 HU ($P < 0.001$). SNR and CNR in group B and group D were higher than that of group A and group C (P0.05). OQS in group B and group D were higher than that of group A and group C [(4.45±0.28) vs. (3.97±0.28) vs. (3.55±0.21) vs. (3.12±0.31) ($P < 0.001$)]. Control group reduced by 27% effective radiation dose whereas decreased by 28% iodine load in terms of study group on average.
Conclusion: VMS-ASIR images associated with low-concentration contrast medium during LAP can reduce both radiation dose and iodine load, and further improve the image quality of oesophageal cancer.

B-0735 14:48

Optimal monochromatic spectral computed tomography with low iodine concentration contrast medium in a rabbit VX2 liver model: investigation of image quality and detection

Y. Zhou, J.B. Gao; *Zhengzhou/CN (zhouyue779@163.com)*

Purpose: To validate the feasibility of using optimal monochromatic spectral CT with isotonic low iodine concentration contrast medium in VX2 hepatic tumours.
Methods and Materials: Sixty planted VX2 hepatic tumours in rabbits underwent contrast enhancement spectral CT at 14 day after planting.They were randomly divided into three groups (group A:270 mgI/ml, optimal monochromatic spectral images; group B:370 mgI/ml,120 kVp images, 100%FBP; group C:270 mg I/ml,120 kVp images, 100%FBP).Group A were divided into two sub-groups (sub-group A1:100%FBP;sub-group A2:50%FBP+50%ASIR).Objective evaluation (SNR,CNR and image noise), subjective rating score (image noise, anatomical details, overall image quality and lesion conspicuity), CTDIvol and DLP were compared. Detection rate were calculated in form of percentage.
Results: Image noises, SNRs, CNRs among groups showed statistically difference ($P < 0.05$).Image noise in group A2 were lower than that in group A1, but higher than group B and C ($P < 0.05$).SNRs and CNRs in group A2 were the highest, followed by group A1, group C were the lowest ($P < 0.05$ for all).In terms of subjective rating score, group A2 were superior to other groups. For tumours with $d < 1.0$ cm and $1.0 \le d < 3.0$, group A achieved higher detection rate than group B and C.CTDIvol, DLP and ED in group A were lower than that in group B and C ($P < 0.05$).Group A reduced by 27.2% ED in terms of group B whereas decreased by 28% with regard to group C.Group A reduced the iodine load by 22.86%compared to group B.
Conclusion: Use of optimal monochromatic image combined 50%ASiR with low concentration contrast medium may optimize image quality and decrease radiation dose and iodine load during hepatic CT.

B-0736 14:56

Comparison of iterative model reconstruction (IMR) and hybrid iterative reconstruction (iDose^4) in lymph nodes evaluation and diagnostic confidence with 40% radiation dose reduction

Y. Gao, X. Lu, P. Wang; *Shenyang/CN*

Purpose: To compare the efficacy of iterative model reconstruction (IMR) and hybrid iterative reconstruction (iDose^4) of a 256-scilce CT in delineating intra- and retro-peritoneal compartment lymph nodes, with focus on sharpness and texture of the nodes and overall diagnostic confidence.
Methods and Materials: Thirty-one patients that performed Tri-phase abdominal CT were enrolled in our study, with totally 147 suspected lymph nodes (around celiac, mesenteric and retro-peritoneal compartment), which were classified into two groups (group 1: n=112 diameter of node< 1 cm; group 2: n=35 diameter of node≥1 cm). All of the nodes were evaluated at portal venous images, which were obtained using a 40% radiation dose reduction scanning protocol (120 kVp, 150 mAs). Both IMR and iDose^4 reformatted methods were performed on each patient. Each node was evaluated including the sharpness (interface and contour), texture (homogeneity, necrosis) and overall diagnostic confidence (1 [poor] to 5 [excellent]).
Results: In group 1, IMR was better than iDose^4 in nodes sharpness and diagnostic confidence ($P < 0.01$). There was no difference of texture between IMR and iDose^4 (sharpness 4.61±0.49, 3.62±0.93, $P < 0.01$; texture 4.51±0.66, 4.59±0.50, $P > 0.05$; diagnostic confidence 4.68±0.49, 4.04±0.58, $P < 0.05$). In group 2, IMR was better than iDose^4 in all aspects, $P < 0.01$ (sharpness 4.74±0.51, 3.46±0.58, $P < 0.01$; texture 4.72±0.51, 3.65±0.45; diagnostic confidence 4.86±0.41, 3.69±0.33).
Conclusion: IMR was comprehensive than iDose^4 in evaluation of mesenteric and retro-peritoneal compartment lymph nodes on 40% radiation dose reduction CT, especially those ones≥1 cm, IMR was superior in delineation of the coarse contour and heterogeneous texture of lymph nodes than iDose^4, thus improving the diagnostic confidence of radiologists.

B-0737 15:04

Efficacy of water-equivalent diameter for radiation dose optimisation

K.K. Lau, O. Wong, R. Evans, A. Kuganesan, K. Buchan; *Melbourne/AU (kenkplau@gmail.com)*

Purpose: CT radiation dose (RD) should ideally be individualised to achieve optimal images for different body habitus. Water-equivalent diameter (WED) is a novel type of automated measurement obtained from CT scanogram that refers body size to a circular water phantom. It then allows appropriate dose index and tube current modulation. The aim of this retrospective study was to assess the efficacy of WED in RD and image quality (IQ) optimisation.
Methods and Materials: 2 groups of 50 consecutive adult patients for contrast CT of abdomen were included. Each group was scanned with 128-multidetector CT at similar parameters, except using WED in one group and conventional weight-based protocol in the other. Weights, heights and radiation doses were recorded. Quantitative noise analysis based on standard deviation (SD) of attenuation values and qualitative analysis by 2 radiologists using 5-point ranking on multiple abdominal organs were undertaken. Results were compared using Wilcoxon-signed rank test.
Results: Patients' demographics were similar between 2-groups. There was a significant reduction of radiation dose of WED-CT (mean CTDI: 9.32) compared to non-WED-CT (mean CTDI: 11.11) ($p < 0.005$), with a strong logarithmic correlation between RD and WED (r2 of 0.9702). Quantitative image noise of abdominal organs was significantly less in WED-CT (SD: 8.79) than non-WED-CT (SD: 9.03) whilst IQ significantly improves on WED-CT (mean rank: 3.37) than non-WED-CT (mean rank: 2.61) (p values of < 0.05).

Conclusion: WED is superior in RD and IQ optimisation in CT scanning than conventional weight-based protocol that accounts patients' varying body sizes and shapes.

B-0738 15:12

Why have we adopted 120 kVp in abdominal CT for decades? 100 kVp is enough

J. Choi, S. Jung, M. Choi; *Seoul/KR (comicluv@hotmail.com)*

Purpose: To assess the image quality and radiation dose in CT using automatically selected tube voltage (kV) and suggest proper kV for abdomen and pelvis CT scans in adults.
Methods and Materials: All CT examinations were performed in April 2015 with automatic tube voltage selection. We reviewed recorded mAs, kV, and CTDIvol in dose reports. We collected patients' information about height, weight, and BMI. We selected 81 patients who underwent another CT scan with the same protocol by the same CT scanner in 2014 without the use of automatic kV selection. Two radiologists who were blind to kV and mAs randomly reviewed 162 sequential examinations in 81 patients.
Results: Most examinations (99.7%) used lower voltage; 100 kV in 815 and 80 kV in 89 examinations in a total 907 CT examinations. Only three were performed using 120 kV and they were all male and heavier than 110 kg. There were significant differences in mean height, weight, BMI, mAs, and CTDIvol. Mean values of CTDIvol were 5.32, 5.99, and 15.54 mGy in 80, 100, and 120 kVp, respectively. Image quality of 162 examinations in 81 patients revealed that contrast and noise were higher in lower kVs; however there was no significant difference in artifact and overall image quality if 120 kVp was applied or not.
Conclusion: We suggest that 100 kVp rather than 120 kVp should be applied routinely in all adults under 100 kg even in CT scanners that cannot provide a function of automatic kV selection.

B-0739 15:20

Quantitative response evaluation of hepatocellular carcinoma after transarterial chemoembolisation using 70 kVp 4D volume perfusion CT of the liver

X. Wang[1], T. Henzler[2], S. Diehl[2], S.O. Schönberg[2], Z.-Y. Jin[1], H.-D. Xue[1], A. Smakic[2]; [1]*Beijing/CN*, [2]*Mannheim/DE*
(arman.smakic@medma.uni-heidelberg.de)

Purpose: To prospectively evaluate the value of low tube voltage 4D dynamic volume perfusion CT (dVPCT) for response evaluation after transarterial chemoembolisation (TACE) in patients with hepatocellular carcinoma (HCC).
Methods and Materials: 14 patients with histologically proven HCC and a clinically indication for TACE therapy underwent dVPCT one day before and one day after TACE on a 3rd generation 2 x 192 slice DSCT system using 70 kVp tube voltage. All dVPCT scans were performed for 60s with 70 kV and 220 mAs. Portal venous liver perfusion (PVP), arterial liver perfusion (ALP) and the hepatic perfusion index (HPI) were determined for a total of 22 HCC lesions and normal liver tissue.
Results: Perfusion analysis showed a significant ($p < 0.05$) decrease of the ALP of the HCC lesions after TACE (mean ALP before TACE: 34.9 ml/100 cm3/min; mean ALP after TACE: 17.8 ml/100 cm3/min). HPI was decreased slightly but significantly (mean HPI before TACE: 77.8; mean HPI after TACE : 68.4). Portal venous perfusion decreased from 17.6 ml/100 cm3/min before TACE to 10.3 ml/100 cm3/min after TACE. Normal liver parenchyma showed a slight increase of ALP after TACE therapy potentially a response due to less HCC perfusion (ALP before TACE: 10.2 ml/100 cm3/min, mean ALP after TACE: 15.7 ml/100 cm3/min). Mean dose length product (DLP) was 1460 ±396 mGy×cm leading to an effective dose of 21.9 ± 12.8 mSv.
Conclusion: dVPCT allows for early quantitative therapy response evaluation in patients with HCC undergoing TACE therapy with an acceptable radiation dose when compared to dose values reported in previous studies.

14:00 - 15:30 **Room M 3**

Cardiac

SS 703

Epidemiology, prognosis and trials

Moderators:
K. Gruszczynska; Katowice/PL
N.N.

B-0740 14:00

The most powerful high-risk coronary plaque criteria by coronary CTA for prediction of major cardiac events (MACE): a long term follow-up study

G. Feuchtner, J. Kerber, P. Burghard, A. Klauser, A. Mayr, F. Plank;
Innsbruck/AT (Gudrun.Feuchtner@i-med.ac.at)

Purpose: High-risk plaque (HRP) criteria by coronary CTA may improve coronary risk stratification. Objective was to assess which HRP-criteria predict major adverse cardiac events (MACE).
Methods and Materials: 1469 consecutive patients (65.9y, 44.2% females) with low-to-intermediate risk were included (prospective cohort study).CTA was evaluated for 1)Stenosis severity (mild/moderate/severe) 2)Plaque types (T1=calcifying/T2=mixed (dominant calcifying)/T3=mixed (dominant noncalcifying)/T4=non-calcifying) 3)HRP-criteria: • Low attenuation plaque (LAP) (HU) • Napkin-ring (NR) sign • spotty Calcification< 3 mm • Remodelling index (RI) was measured. MACE (ACS/NSTEMI, STEMI, cardiac death) data were collected.
Results: MACE occured in 41 (2.8%). MACE rate was 0% in negative CTA (F/U mean=7.8 years). MACE rate was higher in T3/T4 plaques than in T2/T1 (7.8% vs 1.9%, $p < 0.0001$). LAP density was lower in MACE (35.2 vs 108.8 HU) ($p < 0.001$) and NR-sign prevalence was higher with 26 vs 40 (73.6% vs 28%) ($p < 0.001$), resp. In univariable and multivariable proportional Hazards model, LAP < 60 HU and NR were the highest risk factors for MACE (HR 4.9 and 3.8, $p < 0.0001$), while spotty calcification (HR 2.2), LAP < 30 and< 90 HU; stenosis severity and plaque types (HR 1.5 and 1.7, $p < 0.001$) were less powerful. After adjusting for conventional risk factors, stenosis severity and plaque type; LAP < 60 and NR remained significant ($p < 0.001$) while the effect for NR-sign was even enhancing.Calcium Score was not different in MACE vs non-MACE group (195.2 ±335 vs 140.1±352;p= 0.335).
Conclusion: Coronary low attenuation plaque (LAP)< 60 HU and the Napkin Ring sign are the strongest predictors of MACE, while stenosis severity and plaque type are less powerful. An increasing non-calcifying plaque burden raises MACE risk.

B-0741 14:08

Impact of computed tomography coronary angiography on clinical management and outcomes in patients with suspected angina due to coronary heart disease

M.C. Williams[1], A. Hunter[1], A. Shah[1], V. Assi[1], S. Lewis[1], G. Roditi[2], E.J.R. van Beek[1], A. Timmis[3], D.E. Newby[1]; [1]*Edinburgh/UK*, [2]*Glasgow/UK*, [3]*London/UK*

Purpose: Computed tomography coronary angiography (CTCA) may improve clinical outcomes by altering management. This study explores consequences of CTCA-assisted diagnosis on invasive coronary angiography (ICA), preventative treatments and clinical outcomes. On behalf of SCOT-HEART Trialists.
Methods and Materials: SCOT-HEART (prospective open-label parallel group multicentre randomised controlled trial) recruited 4146 patients ≤75 years with suspected angina due to coronary heart disease. Participants were randomised 1:1 to standard care±CTCA. Post-hoc analyses were performed using national electronic health records and prescribing data.
Results: Of 2073 patients randomised to CTCA, 1778 underwent CTCA a median of 12 [interquartile range, 7-18] days after clinic attendance. Despite similar rates (409 versus 401; hazard ratios (HR) 1.06 [95% CI, 0.92-1.22], P=0.451), ICA was less likely to demonstrate normal arteries (20 versus 56; HR 0.39 [0.23-0.68], $P < 0.001$) but more likely to show obstructive disease (283 versus 230; HR 1.29 [1.08-1.55], P=0.005) in the CTCA group. CTCA-guided new requests for ICA (94 versus 8; HR 13.34 [5.81-30.65], $P < 0.001$) and led to 46 additional revascularisations, median 74 days after clinic attendance. More preventative therapies (283 versus 74; HR 4.03 [3.12-5.20], $P < 0.001$) were initiated after CTCA. From the median time for preventative therapy initiation (50 days), fatal and non-fatal myocardial infarction was halved in patients allocated to CTCA versus standard care (17 versus 34; HR 0.50 [0.28-0.88], P=0.020).
Conclusion: In patients with suspected angina due to coronary heart disease, CTCA leads to more appropriate use of ICA, alterations in preventative therapies, and a halving of fatal and non-fatal myocardial infarction.

Author Disclosures:
M.C. Williams: Speaker; MCW has received honoraria from Toshiba Medical Systems. **G. Roditi:** Other; Received honoraria and consultancy from Toshiba Medical Systems. Received honoraria from companies (Bracco, Bayer-Schering, GE Healthcare and Guerbet) producing contrast media. **E.J.R. van Beek:** Speaker; received honoraria and consultancy from Toshiba Medical Systems. **D.E. Newby:** Speaker; received honoraria and consultancy from Toshiba Medical Systems.

B-0742 14:16

Coronary atherosclerosis features for the prediction of ischaemic events (CAFÉ-PIE study): a CT scan integrated score from a bi-center registry

A. Guaricci[1], N. Brunetti[1], F. De Rosa[1], M. Guglielmo[2], S. Mushtaq[2], L. Mascarini[1], D. Andreini[2], M. Pepi[2], G. Pontone[2]; [1]*Foggia/IT*, [2]*Milan/IT (gianluca.pontone@ccfm.it)*

Purpose: To date it is unclear how to implement the information on coronary artery disease (CAD) features as evaluated by coronary computed tomography angiography (CCTA) in order to better predict the occurrence of major adverse cardiac events (MACE). The aim of this study is to validate the prognostic role of a comprehensive CCTA - derived score in consecutive symptomatic patients evaluated for suspected CAD.
Methods and Materials: Bi-centre prospective registry including 477 consecutive symptomatic intermediate-risk patients without history of known CAD undergoing CCTA for clinical indications. For each patient we evaluated in primary prevention a score based on CCTA findings (plaque remodeling and plaque type) correlated with outcomes. All patients were followed-up for 49±15 months. The endpoint was the occurrence of MACE defined as the composite endpoint including non-fatal myocardial infarction and cardiac death.
Results: The mean CT score was 10.5±10.8 and the prevalence of MACE was 11.3% in overall population. CT score was significantly related to the incidence of MACE at univariate and multivariate analysis (HR: 2.90; CI 95%: 2.19-3.85). At ROC curve analysis, CT-score was the best predictor of incidence of MACE (AUC: 0.81, CI 95%: 0.78-0.84) as compared to Diamond and Forrester score ($p < 0.001$), segment stenosis score ($p < 0.05$) or segment involved score ($p < 0.001$).
Conclusion: The use of an integrated score considering coronary plaque characterisation at CCTA may improve the prediction of MACE in symptomatic intermediate-risk patients beyond the standard clinical and CCTA scores.

B-0743 14:24

Performance of cardiac CT compared to functional testing in women and men with suspected coronary artery disease: the multicenter, randomised CRESCENT trial

M.M. Lubbers, A. Dedic, A. Coenen, T. Galema, M. Ouhlous, A. Niezen, M.G.M. Hunink, G. Krestin, K. Nieman; *Rotterdam/NL (m.m.lubbers@erasmusmc.nl)*

Purpose: To evaluate sex-based differences in the effectiveness and safety of a cardiac CT strategy versus standard functional testing in patients with symptoms suggestive of coronary artery disease (CAD).
Methods and Materials: 350patients (55% women) were prospectively randomised between cardiac CT and functional testing.
Results: In both men and women CAD could be ruled out more frequently by cardiac CT (women 80% vs 44%,$p < 0.001$; men 67% vs 47%,p=0.017) and resulted less often in inconclusive results compared to functional testing (women 9% vs 41%,$p < 0.001$, men 16% vs 39%,p=0.002). Seattle angina questionnaire (SAQ) scores improved significantly over one year both in men and women, both for the CT group and the functional group (all $p < 0.001$). Quality of life, measured with the SF-36 questionnaire, also improved significantly over one year both in men and women, both for the CT and functional group (all $p < 0.009$). However, the EQ-5D VAS score improved for all groups, except the functional testing group. For both men and women randomised to CT the diagnosis was reached faster, with less frequently required additional diagnostic testing in women in the CT group (16% versus 57%, $p < 0.001$). For men this difference did just not reach statistical significance (27% vs 41%,p=0.057). This resulted in lower cumulative diagnostic costs for women (€270 versus € 211,$p < 0.001$). In men there was no difference in overall diagnostic costs.
Conclusion: In women with stable chest pain, a tiered cardiac CT protocol is as effective and safe as standard functional diagnostic testing, but with clear benefits in terms of cost-efficiency.
Author Disclosures:
M. Hunink: Grant Recipient; ESR, Eur Institute for Biomedical Imaging Research. **K. Nieman:** Grant Recipient; Dutch Heart Foundation, Siemens Medical Solutions, GE Healthcare, Bayer Healthcare.

B-0744 14:32

Quantitative coronary plaque analysis predicts high-risk plaque morphology on coronary computed tomography: the results from the ROMICAT II trial

T. Liu[1], P. Maurovich-Horvat[2], T. Mayrhofer[2], S. Puchner[2], M. Lu[2], K. Ghemigian[2], P. Kitslaar[2], U. Hoffmann[2], M. Ferencik[2]; [1]*Shenyang/CN*, [2]*Boston, MA/US (cmuliuting@sina.cn)*

Purpose: Automated software tools have been developed to provide quantitative assessment of atherosclerotic plaques on coronary CT angiography (CTA). However, the relationship between established qualitative high-risk plaque features and quantitative plaque metrics has not been studied. We studied the association between quantitative plaque metrics and qualitative high-risk plaque features on coronary CTA.
Methods and Materials: We included 260 patients with coronary plaque who underwent coronary CTA in the ROMICAT II trial. Quantitative plaque assessment and qualitative plaque characterisation were performed on a per coronary segment basis. Quantitative coronary plaque measurements included plaque volume, plaque burden, remodelling index, and diameter stenosis. Qualitative plaque characterisation included the presence of high-risk plaque features (positive remodelling, low CT attenuation plaque, napkin-ring sign and spotty calcification). Multivariable logistic regression analysis was performed to assess the association between quantitative measurements and qualitative high-risk plaque characteristics.
Results: We analysed 888 coronary segments with plaque. High-risk plaque was present by qualitative analysis in 391 (44.0 %) segments. Segments with high-risk plaque in qualitative analysis had higher total plaque volume, low CT attenuation plaque volume, plaque burden and remodelling index in quantitative analysis (p50%).
Conclusion: Quantitative coronary plaque characteristics (low CT attenuation plaque volume, positive remodelling and plaque burden) measured by automated software correlate with qualitative assessment of high-risk plaque features.

B-0745 14:40

Prognostic value of CT coronary angiography in asymptomatic patients with suspected coronary artery disease: meta-analysis of observational studies

M. Fusaro, G. Balestriero, L. La torre, C. Bortolanza, G. Morana; *Treviso/IT (fusaro341@gmail.com)*

Purpose: To assess the prognostic value of CCTA as a screening tool in asymptomatic patients with suspected coronary artery disease (CAD).
Methods and Materials: A meta-analysis of observational coronary computed tomographic angiography (CCTA) imaging studies was conducted, by means of search in electronic scientific databases for studies investigating the use of CCTA in asymptomatic patients with suspected CAD. The endpoints were the incidence of acute coronary syndrome (ACS) requiring hospitalisation, revascularisation and cardiac death. Exclusion criteria were composite outcomes and duplicated data. Odds ratio (OR) with 95% confidence interval [CI 95%] was used as summary statistic.
Results: A total of 7,931 asymptomatic patients from 6 studies received a CCTA for suspected CAD. The proportion of patients without CAD, with CAD50% was 78%, 14% and 8%, respectively. After a median follow-up of 27.1 months [22.0-31.2], Patients without CAD did not show any of the endpoints. Compared to patients with CAD> 50%, patients with CAD< 50% showed a similar risk of ACS (0.16 [0.02-1.50]; P=0.11) but a lower risk of revascularisation (0.04 [0.02-0.10]; $P < 0.001$) and death (0.05 [0.01-0.44]; P=0.007).
Conclusion: Two-third of asymptomatic patients receiving CCTA for suspected CAD had no evidence of disease and no events at follow-up. The presence of CAD> 50% significantly increases the risk of revascularisation and death as compared to CAD50% have a risk of ACS comparable to those with CAD< 50%.
Author Disclosures:
M. Fusaro: Author; Salvatore Cassese, Massimiliano Fusaro, Giovanni Balestriero, Leonardo Ermanno La Torre, Giovanni Morana. Speaker; Michele Fusaro.

B-0746 14:48

Assessment of semi-automatic plaque quantification of non-calcified plaque as a predictor of outcome for acute chest pain patients at coronary CT angiography

A.M. Bucher[1], R. Wang[2], J.L. Wichman[1], F.G. Meinel[3], C.N. De Cecco[4], T.J. Vogl[1], U.J. Schoepf[4]; [1]*Frankfurt a. Main/DE*, [2]*Beijing/CN*, [3]*Munich/DE*, [4]*Charleston, SC/US*

Purpose: Semi-automated measurements of coronary plaque burden from coronary CT angiography (CTA) have shown independent prognostic value for prediction of acute coronary syndrome. The purpose of this study was to

assess the predictive value of quantified plaque volume on clinical outcome in acute chest pain patients.
Methods and Materials: Total plaque volume was analysed using semi-automated segmentation software from CTA data sets of 151 acute chest pain patients (90 female; age 59.1±11.0 years). CT series was acquired on a 64-detector row dual-source CT system and reconstructed in 0.75 mm slice thickness. Non-calcified plaque volume (ncPV) was sub-categorised by density: necrotic plaque volume (nPV): -30-75 HU; fibrous fatty plaque volume (ffPV): 76-130 HU; fibrous plaque volume (fPV): 131-350 HU. As primary endpoint, major adverse cardiac events (MACE) were recorded on follow-up. Total plaque burden (TPB) was calculated as sum of all quantified segments. Cox proportional-hazards regression, correlation coefficient and Student t tests were used for statistical evaluation.
Results: 21 MACE (14.4% of cases) occurred on follow-up (mean follow-up: 12.1±6.2 months). In patients that experienced MACE, ncPV was significantly elevated (median: 760.5 mm^3; inter-quartile range: 535.7-873.2 mm^3) when compared to those without MACE (median: 607.2 mm^3; inter-quartile range: 448.8-760.5 mm^3; P=0.024), whilst TPB was comparable (P=0.220). ffPV was a statistically significant predictor of the primary endpoint (P=0.001). nPV and fPV did not have significant predictive value (P> 0.05).
Conclusion: Non-calcified plaque volume in the density range of ffPV was a significant predictor of MACE events in acute chest pain patients.
Author Disclosures:
U.J. Schoepf: Consultant; Bayer, Bracco, GE, Medrad, and Siemens. Research/Grant Support; Bayer, Bracco, GE, Medrad, and Siemens.

B-0747 14:56

Semmelweis cardiac CT registry: the feasibility of automated data collection with a structured reporting tool

P. Maurovich-Horvat, J. Karady, M. Kolossvary, A.L. Jermendy, A. Bartykowszki, M. Karolyi, A. Panajotu, Z. Bagyura, B. Merkely; *Budapest/HU (p.maurovich-horvat@cirg.hu)*

Purpose: Routine clinical cardiac CT reporting and research data collection both require detailed data acquisition and robust data management. We sought to test the feasibility of automated registry generation regarding the indications, image acquisition parameters and clinical findings of cardiac CT in a single centre.
Methods and Materials: The Semmelweis Cardiac CT Registry (SCCTR) is a database generated by an in-house-developed structured reporting tool that automatically stores all relevant data points, such as anamnestic data, indications, premedication, CT acquisition parameters, segment-based coronary evaluation and clinical recommendation.
Results: In total, 2866 consecutive patients (age 59.5±11.9 years, 41.3% males) were included in the SCCTR between August 2014 and September 2015. All examinations were performed with a 256-slice CT. Suspected coronary artery disease (CAD) was the main indication (60.1%) followed by left atrial angiography (20.3%). During the scan, 90.6% of the patients had sinus rhythm (heart rate: 61.6±12.6 bpm) and 8.3% had atrial fibrillation. We used prospective ECG triggering in 98.5% of the cases. The average effective radiation dose of the coronary CTA was 4.0±1.4 mSv and 0.5±0.2 mSv for Ca-score scans (conversion factor 0.014). For premedication, 68.3% of the patients received metoprolol, 4.1% ivabradine and 98.5% nitroglycerin. Invasive coronary angiography was recommended in 14.3% and secondary prevention (statin therapy) in 47% of the cases.
Conclusion: Automatic collection of descriptive data is feasible using a structured reporting-registry tool. The main indication for cardiac CTA was to rule out obstructive CAD. Invasive coronary angiography could be avoided in the majority of patients.

B-0748 15:04

Atherosclerotic burden and cardiac remodelling in healthy South Asian and European adults: a cohort comparison study

J. Weir-McCall, D. Cassidy, J.J.F. Belch, S. Gandy, G. Houston, M. Lambert, R. Littleford, A.D. Struthers, F. Khan; *Dundee/UK (jweirmccall@doctors.net.uk)*

Purpose: South Asians (SA) have higher risk of cardiovascular disease (CVD), but paradoxically lower prevalence of peripheral arterial disease (PAD) than Western Europeans (WE). The aim of the current study was to evaluate systemic atherosclerotic burden and cardiac remodelling in SA compared with WE using whole body angiogram (WBA) and cardiac magnetic resonance (CMR).
Methods and Materials: 19 SA and 38 age, gender and BMI matched WE were recruited. All were ≥40 years, free from CVD and with a 10-year risk of CVD < 20% as assessed by the ATPIII risk score. WBA and CMR were performed on a 3 T MRI scanner using whole body coils following dual phase injection of gadoteric acid. Global and regional standardised atherosclerotic score (SAS) was calculated from the WBA, while indexed left ventricular mass and volumes were calculated from the CMR.
Results: SAs exhibited a significantly lower iliofemoral atheroma burden (regional SAS SA 0.0±0.0;WE 1.9±6.9:p=0.048) and a trend towards lower overall atheroma burden (WBSAS SA 0.7±0.8;WE 1.8±2.3:p=0.1). They had significantly lower indexed left ventricular mass (SA 46.9±11.8; WE 56.9±13.4 ml/m2:p=0.008), end diastolic volume (SA 63.9±10.4; WE 75.2±11.4 ml/m2:p=0.001), end systolic volume (SA 20.5±6.1; WE 24.6±6.8 ml/m2:p=0.03) and stroke volume (SA 43.4±6.6; WE 50.6±7.9 ml/m2:p=0.001). These differences persisted after accounting for CVD risk factors.
Conclusion: South Asians have a lower peripheral atherosclerotic burden and smaller hearts than Western Europeans even in a healthy low risk population, thus the paradoxical high risk of CVD compared with PVD risk may be due to an adverse cardiac haemodynamic status incurred by the smaller heart rather than atherosclerosis.

B-0749 15:12

Cystatin C is associated with non-obstructive coronary artery disease determined by coronary computed tomography angiography

E.B. Brolin[1], S. Agewall[2], K. Cederlund[1], C. Ekenbäck[1], L. Henareh[1], K. Malmqvist[1], A. Rück[1], A. Svensson[1], P. Tornvall[1]; [1]*Stockholm/SE*, [2]*Oslo/NO (elin.bacsovics.brolin@ki.se)*

Purpose: In order to identify individuals at increased risk of cardiovascular disease (CVD), a number of circulating biomarkers have been proposed, in addition to classical risk factors and risk scores. Coronary computed tomography angiography (CTA) and several circulating biomarkers have a prognostic value regarding CVD events, but the association between coronary CTA plaque burden and circulating biomarkers is incompletely studied. We aimed to investigate whether markers of lipid metabolism, inflammation and kidney function could predict non-obstructive CAD at coronary CTA, in a low-to-intermediate risk group.
Methods and Materials: One hundred fifteen subjects between 45 and 70 years underwent coronary CTA and laboratory testing. A majority (70%) were women. The prevalence of classical CVD risk factors was low and 94% had normal or mildly reduced kidney function. The Framingham risk score classified 79% as low-to-intermediate risk.
Results: Forty-nine (43%) had no CAD at coronary CTA and 66 (57%) had CAD in ≥1 segment. The groups without and with CAD differed with regard to adiponectin, lipoprotein (a) and cystatin C. The medians (interquartile ranges) were: adiponectin 10.5 (7.8-18.3) versus 7.9 (6.0-13.0), p=0.048; lipoprotein (a) 16.5 (5.0-37.0) versus 24.0 (14.0-76.0), p=0.027; cystatin C 0.79 (0.72-0.88) versus 0.86 (0.77-0.95), p=0.012. In a stepwise multivariable logistic regression model adjusted for confounders, including glomerular filtration rate (GFR), cystatin C remained an independent predictor of CAD (OR 2.50, 95% CI 1.12-5.59).
Conclusion: Plasma levels of cystatin C were associated with non-obstructive CAD at coronary CTA, independently of GFR, in subjects with low-to-intermediate CVD risk and normal to mildly reduced kidney function.

B-0750 15:20

Intravascular ultrasound in pulmonary arterial hypertension vasoreactivity testing

O. Sagaydak, N. Danilov, Y. Matchin, T. Martinuk, I. Chazova; *Moscow/RU (olesyasagaydak@gmail.com)*

Purpose: The aim of the present study is to find relationships between haemodynamic and ultrasound parameters during acute vasoreactivity testing.
Methods and Materials: Seventeen patients were enrolled in our study with mean age 38.8 ± 11.5y. All analysed patients had a diagnosis of idiopathic pulmonary hypertension (PAH). Vasoreactivity testing was performed with NO or iloprost. Before and after testing in all our patients, intravascular ultrasound examination was performed. We analysed the following parameters: mean external diameter of the artery (Dex), mean diameter of the lumen (Dl), the thickness of the artery wall (mean T and relative Tr), the lumen area (LA), the external outlined area (EA) and the area of the wall (Sw). All parameters were analysed before and after testing.
Results: We found out that difference between relative wall thickness before and after test positively correlates with difference in systolic pulmonary artery pressure (delta Tr and delta sPAP, r=0.483, p 0.05). The difference of lumen area changes depending on cardiac output increase (delta LA and delta CO, r=-501, p 0.05) and pulmonary vascular resistance decrease (delta LA and delta PVR, r=0.529, p 0.05). We also demonstrated that pulmonary artery wall area changes depending on the functional class of the patient (delta Sw and FC, r=-0.523, p 0.05).
Conclusion: In our study, we demonstrated that there is a high correlation between haemodynamic and ultrasound changes in patients with idiopathic pulmonary hypertension during vasoreactivity test.

Friday, March 4

10:30 - 12:00 **Room C**

Breast

SS 1002

Breast MRI-DWI (2) and various MRI applications

Moderators:
M. Di Matteo; Rome/IT
N.N.

B-0751 10:30

Potential of intravoxel incoherent motion and diffusion in MR imaging of ductal carcinoma of breast: new vistas

R. Balaji, D. Arivudainambi; *Chennai/IN (ravikanthbalaji@gmail.com)*

Purpose: To evaluate use of intravoxel incoherent motion (IVIM) and diffusion imaging (DWI) for diagnosis of invasive ductal carcinomas by biexponential analysis of multiple b-value diffusion-weighted imaging (DWI) and compare these parameters to apparent diffusion coefficient (ADC) obtained with monoexponential analysis.
Methods and Materials: 42 patients with biopsy proven invasive ductal carcinomas were imaged at 1.5 T using regular breast imaging protocol of T1 T2 and dynamic contrast-enhanced magnetic resonance imaging (MRI). In addition diffusion imaging using 12 b values (range 0-1000 s/mm2) was also performed. Tissue diffusivity (D), perfusion fraction (f) and pseudo-diffusion coefficient (D*) were calculated using segmented biexponential analysis. ADC (b = 0 and 1000 s/mm2) was calculated with monoexponential fitting of the DWI data. True diffusion (D), pseudo-diffusion (D*) and perfusion fraction (PF) were obtained for normal breast tissues and enhancing ducts. Receiver operating characteristic analysis was performed for all DWI parameters.
Results: D and ADC values of malignant tumours were significantly smaller than those of normal breast tissues while f value of malignant tumours was significantly higher. No significant difference was found in D*.
Conclusion: IVIM and DWI provide distinctive quantitative measurement of vascularity and perfusion as well as cellularity and are helpful for differentiation between benign and malignant breast lesions.

B-0752 10:38

Monoexponential, Biexponential and Stretched-exponential diffusion-weighted MR imaging in the differentiation of benign and malignant breast lesions

Y. Jin; *Zhengzhou/CN (jinyananzd@163.com)*

Purpose: To investigate the value of various parameters obtained from Monoexponential, Biexponential and Stretched-exponential diffusion-weighted imaging models in the differential diagnosis of breast lesions.
Methods and Materials: All subjects in this prospective institutional review board-approved study provided written informed consent.Fifty-four patients (all of them are females,age range, 12-70years; mean age, 43 years)with 30 malignant tumours,36 benign tumours and 30 normal breast tissues underwent diffusion-weighted imaging (DWI) with fourteen b values (0.20.50,100,150,200,400,800.1200,1600.2000,2500.3000and4000s/mm2) at a 3.0 T magnetic resonance imaging unit.Apparent diffusion coefficient (ADC)was calculated using monoexponential analysis (b=0.800sec/mm2).Diffusion coefficient (ADC-slow), pseudodiffusion coefficient (ADC-fast), and perfusion fraction (f) were calculated by using the biexponential model. Distributed diffusion coefficient (DDC) and water molecular diffusion heterogeneity index (α)were obtained by using the stretched exponential model.All parameters were statistically compared among normal breast tissues,benign and malignant tumours.Receiver operating characteristic curve was used to analysis and compare the ability of these parameters in differentiation of benign and malignant breast lesions.
Results: The ADC,ADC-slow,f,DDC values were significantly different among the normal breast tissues,benign tumours and malignant tumours (P=0.000,P=0.000,P=0.000,P=0.000,respectively).Further differential comparisons between each pair showed that the ADC,ADC-slow,f,DDC values were significantly lower in malignant tumours than both in normal breast tissues and benign tumours. The f and DDC had higher AUC (area under the receiver operating characteristic curve)values than the other parameters (0.688.0.657,respectively).The f value had higher sensitivity (0.829)and the DDC value showed higher specificity (0.636).
Conclusion: The parameters derived from Biexponential and Stretched-exponential DWI could be helpful for differentiation between benign and malignant breast tumours.

B-0753 10:46

The influence of regions of interest demarcation approaches on apparent diffusion coefficient in breast lesions

L. Nogueira[1], S. Brandão[1], R.G. Nunes[2], H.A. Ferreira[2], J. Loureiro[1], I. Ramos[1]; [1]*Porto/PT*, [2]*Lisbon/PT (mlpnogueira@gmail.com)*

Purpose: To evaluate two methods of region-of-interest (ROI) demarcation, and also, the inter-observer variability and correlation on apparent diffusion coefficient (ADC) in breast lesions.
Methods and Materials: Thirty-two patients with 39 lesions (27 malignant and 12 benign) were evaluated using a 3 T scanner and a diffusion-weighted sequence with sev¬eral b-values (50-3000 s/mm2). Two observers performed independent ADC measurements using: 1) a ROI with a small fixed area (10 mm2) within the region showing highest restriction; 2) a larger ROI so as to include the whole lesion. Differences were assessed with the Wilcoxon-rank test. For inter-observer variability and correlation analysis, the Bland Altman method and Spearman coefficient were applied.
Results: For both observers, there were significant differences between ADC estimated from different ROI demarcations (p=0.026; p=0.033). Comparing ADC values between observers, when the same method of ROI demarcation was used, no differences were seen for either method (small ROI: p=0.64; large ROI: p=0.21). For malignant lesions, ADC was significantly different between small and large ROI ($p < 0.001$). Variability in ADC was ≤0.008×10-3 mm2/s for both methods. When the same method was used, there was a high correlation in the ADC values between observers (small ROI r=0.990, $p < 0.001$; large ROI r=0.985, $p < 0.001$).
Conclusion: The method of ROI demarcation influences ADC quantification. Small ROI showed less overlap in ADC values and higher reproducibility, which may improve lesion discrimination. Inter-observer variability was low for both methods. This variability must be considered in the clinical practice when ADC values are used for lesion characterisation.

B-0754 10:54

Diagnostic performance of DWI and DCE-MR for evaluating residual breast cancer after local excision

I. Youn, S. Choi, Y. Choi, S. Kook; *Seoul/KR (yuki0486@naver.com)*

Purpose: To compare diagnostic performance of diffusion weighted imaging (DWI) and dynamic contrast enhanced-magnetic resonance imaging (DCE-MR) for evaluating residual malignancy in breast cancer patients after excisional biopsy or stereotatic biopsy.
Methods and Materials: This study included 56 patients (mean age, 51.7±11.5 yrs) who were diagnosed with breast cancer by local excision or stereotactic biopsy and underwent 3.0-T DCE-MR with DWI before additional mastectomy from January 2011 to December 2014. We retrospectively reviewed pathologic results after mastectomy and compared them with mean apparent diffusion coefficient (ADC) values on DWI and three DCE features using a computer-aided diagnosis system: percentage of peak enhancement, initial peak type, and delayed enhancement pattern in the selected area of mostly possible existed residual malignancy.
Results: The residual breast cancer was found in 23 patients (mean age, 53.2±10.2 yrs), and not in 33 patients (mean age, 50.7±12.3 yrs). The mean ADC value was different (p=0.002) in those with residual malignancy (0.905±0.370x10^{-3} mm^2/sec) or without (0.582±0.369 x10^{-3} mm^2/sec). The percentage of DCE was not significant (p=0.732) between residual group (102.78±63.82%) and no residual group (109.42±75.64%). However, the characteristics of initial peak (p=0.280) and delayed kinetics (p=0.636) were not noticeably different between two groups. Regarding diagnostic accuracy, both of mean enhancement (Az=0.487) and ADC value (Az=0.256) showed no reliability for predicting residual malignancy.
Conclusion: ADC value on DWI was different in the residual malignancy group but it was not reliable for predicting residual malignancy and DCE-MR was also not helpful in patients who were diagnosed with breast cancer by excision.

B-0755 11:02

Diagnostic performance of diffusion-weighted imaging in breast lesions: comparison among diffusion-weighted imaging, dynamic contrast enhanced MRI and combined MRI

K. Kim[1], Y. Kim[1], J. Seo[1], C. Hwang[1], H. Han[1], C.M. Kuzmiak[2]; [1]*Daejeon/KR*, [2]*Chapel Hill, NC/US*

Purpose: To compare the accuracy and diagnostic values among diffusion-weighted imaging (DWI), dynamic contrast enhanced (DCE) MRI, and combined MRI of DWI and DCE MRI with suspicious breast lesions
Methods and Materials: 65 breast lesions of 45 patients who underwent subsequent biopsy or operation, were enrolled. They underwent DCE-MRI and DWI. Morphologic and kinetic analyses on DCE-MRI were classified according to BIRADS lexicon. The ADC values were calculated from the DWI. On DWI set, we were sorted according to the confidence grades for lesion characterisation into five grades by comparing DWI and T2WI. For combined

analysis, morphologic, kinetic features and DWI set confidence grades were evaluated together. Diagnostic values of DCE-MRI assessment, DWI set and combined analysis were calculated.
Results: Of the 65 breast lesions, 27 were benign and 38 were malignant (8 DCIS, and 30 IDC). The mean ADCs of IDC ($0.86\pm0.19 \times 10^{-3}$ mm^2/s) and DCIS ($1.04 \pm 0.27 \times 10^{-3}$ mm^2/s) were significantly lower than those of the benign lesions ($1.35\pm 0.23 \times 10^{-3}$ mm^2/s). An ADC cutoff value of 1.1875×10^{-3} mm^2/s allowed discrimination between malignant and benign lesions. DCE-MRI assessment showed 93.93% sensitivity, 55.55% specificity and 72.09% PPV. DWI set showed 87.87% sensitivity, 81.48% specificity and 85.29% PPV. Combined analysis provided 93.93% sensitivity, 85.18% specificity and 88.57% PPV. The specificity and PPV of combined analysis improved significantly ($p < 0.05$). The characterisation accuracy on combined analysis (Az=0.896) and the DWI set (Az=0.847) were higher than that on the DCE-MRI assessment (Az=0.747) for breast lesions ($p < 0.05$).
Conclusion: The combined MRI of DWI and DCE-MRI has the potential to increased specificity and accuracy of breast MRI.

B-0756 11:10

Single screening breast MR imaging for early surveillance after breast conservation therapy: pilot study
S. Kim, B.-M. Gil, B. Kang; *Seoul/KR (xhxhh@hanmail.net)*

Purpose: To prospectively investigate for early surveillance (12 months or less) using breast magnetic resonance (MR) imaging in women who underwent breast conservation therapy (BCT) for breast cancers.
Methods and Materials: Between April 2014 and April 2015, 237 consecutive women (mean age, 51.3±9.7 years) with 240 breast cancers, who underwent breast MR imaging for early surveillance (mean, 8.2±2.9 months) after BCT for breast cancer, were enrolled. Of the study population, 225 (94.9 %) patients underwent preoperative MR examinations. We assessed cancer detection rate, positive predictive value (PPV), sensitivity, and specificity and evaluated the clinicopathological characteristics of the detected cancer including pathologic subtype of breast cancer and surgical margin status. In addition, we assessed the cancer detection ability in other imaging modalities such as ultrasound and mammography at the same time.
Results: 1.7 % (4/240) cancers (1 invasive ductal carcinoma (IDC), 3 ductal carcinoma in situ (DCIS); mean size; 3 ±3.1 cm; range 0.4-8 cm; all node negative) were detected with MR imaging. PPV for recall (4/15), PPV for biopsy (4/13), sensitivity, and specificity were 27 %, 31 %, 80 %, and 95 %, respectively. 3 patients among entire 51 patients with DCIS were recurred (5.9 %), and only one patient among entire 153 patients with IDC was recurred (0.1 %). None of the recurred cases was detected on ultrasound and mammography.
Conclusion: Preliminary data suggest that single-screening MR imaging can be used for early surveillance after BCT. Early surveillance using MR imaging could be more useful for patients with DCIS.

B-0757 11:18

Motion artefacts in breast MRI: impact on diagnostic performance
P. Clauser[1], M. Dietzel[2], C.G. Kaiser[3], M.A. Marino[1], P. Kapetas[1], R. Woitek[1], P.A.T. Baltzer[1]; [1]*Vienna/AT*, [2]*Erlangen/DE*, [3]*Mannheim/DE (clauser.p@hotmail.it)*

Purpose: To evaluate the effect of motion artefacts, lesion type, breast fibro-glandular tissue (FGT) and background enhancement (BPE) on the characterisation of breast lesions with MRI.
Methods and Materials: This IRB-approved retrospective cross-sectional single-centre study included 312 patients (mean age: 55.1 years) with 348 histologically verified breast lesions (122 benign, 226 malignant). Two expert breast radiologists in consensus classified motion artefacts (1=absent; 2=mild; 3=severe) and further BI-RADS features: FGT, BPE, lesion type (mass ME, non-mass NME, focus), and BI-RADS score. Sensitivity and specificity were calculated, considering positive the examinations classified as BI-RADS≥4, overall and for the classifiers, and differences were tested using Chi-square; logistic regression coefficients were calculated.
Results: Lesions were 251 ME (72.1%) and 59 NME (16.9%), none of the lesion was visible as a focus; 38 lesions (10.9%) were visible only at conventional imaging, but not on MRI. Overall sensitivity was 91.1% and specificity was 83.6%. Sensitivity significantly decreased with increased motion artefacts, from 95.7% to 82.3% ($P < 0.013$), whilst specificity did not ($P > 0.183$). Sensitivity was lower in NME ($P < 0.001$) irrespectively of motion; no specificity differences were detected (P=0.838). Specificity was significantly lower in BPE c and d compared to a and b ($P < 0.04$). Sensitivity was neither affected by BPE nor FGT. At multivariate analysis, only lesion type was an independent predictor of diagnostic performance (P=0.001).
Conclusion: Motion artefacts and BPE can impair lesion characterisation with breast MRI, but lesion type is the strongest independent predictor of diagnostic performance.

B-0758 11:26

A simple scoring system for breast MRI interpretation: does it compensate for reader experience?
M.A. Marino, P. Clauser, R. Woitek, G.J. Wengert, P. Kapetas, M. Bernathova, K. Pinker-Domenig, T.H. Helbich, P.A.T. Baltzer; *Vienna/AT (mariaadele.marino@gmail.com)*

Purpose: To investigate the impact of a scoring system (Tree) on inter-reader agreement and diagnostic performance in breast MRI reading.
Methods and Materials: This IRB-approved, single-centre study included 100 patients with 121 consecutive histopathologically verified lesions (52 malignant, 68 benign). Four breast radiologists with different levels of MRI experience, and blinded to histopathology, retrospectively evaluated all examinations. Readers independently applied two methods to classify breast lesions: BI-RADS and Tree. BI-RADS provides a reporting lexicon that is empirically translated into likelihoods of malignancy; Tree is a scoring system that results in a diagnostic category. Readings were compared by ROC analysis and kappa statistics.
Results: Inter-reader agreement was substantial to almost perfect (kappa=0.643-0.896) for Tree and moderate (kappa 0.455-0.657) for BI-RADS. Diagnostic performance using Tree (AUC 0.889-0.943) was similar to BI-RADS (AUC 0.872-0.953). Less experienced radiologists achieved AUC improvements up to 4.7% using Tree (P-values: 0.042-0.698); an expert's performance did not change (P=0.526). The least experienced reader improved in specificity using Tree (16%, P=0.001). No further sensitivity and specificity differences were found ($P > 0.1$).
Conclusion: The Tree scoring system improves inter-reader agreement and achieves a diagnostic performance similar to that of BI-RADS. Less experienced radiologists, in particular, benefit from Tree.

B-0759 11:34

Recall rates in surveillance breast MRIs performed in women at high risk of developing breast cancer
S. O'Keeffe, C. Longman, T. Suaris; *London/UK (charlottefreya.longman@bartshealth.nhs.uk)*

Purpose: In 2012, the NHS Breast Screening Programme published guidelines for the MR screening of women at high risk of developing breast cancer. It stated that "recall rate and biopsy should be kept to a minimum" with a recall rate of < 10% advised. This aim of this study was to evaluate recall rates and influences in our institution.
Methods and Materials: All surveillance breast MRIs performed in a 3 year period in women deemed high risk of developing breast cancer were reviewed. For each MRI, the BIRADS score and round of screening was recorded. Recall rates for additional imaging, the number of subsequent investigations and biopsies were recorded.
Results: In 3 years, 148 high risk patients had a total of 285 MRIs. Of these, 111 MRIs (39%) were baseline studies. MRI Scores: 172 BIRADS-MRI1, 66 MRI2, 41 MRI3 and 6 MRI4. 54 patients (30 baseline) underwent further imaging (7 MRI2 studies and 47 MRI3 or greater). Overall recall rate was 18.9%. Recall rates for baseline and subsequent screening rounds were 27% and13.8% respectively. Of the recalled patients 12% of population required biopsy. Cancer was diagnosed in 2% of patients during the 3 years.
Conclusion: Our recall rate of 18.9% is substantially higher than NHS guidelines. However, in high risk patients (lifetime risk of breast cancer of ≤80%), the key purpose of screening is to detect all cancers. 12% of all patients required breast biopsy during the study period likely reflecting the young age group and the sensitivity of MRI.

B-0760 11:42

Incidental breast lesions detected on body-MRI: frequency, clinical relevance, and patient outcomes
B. Bignotti, F. Nosenzo, L. Gristina, M. Perinetti, S. Barbagallo, L. Secondini, G. Succio, M. Calabrese, A. Tagliafico; *Genoa/IT (bignottibianca@gmail.com)*

Purpose: To evaluate incidental breast lesions detected on body MRI, recommendations for further imaging work-up, and the effect on patient outcomes and health care costs.
Methods and Materials: Review of the institutional database identified 1441 body (abdominal and chest) MRI performed in our centre between December 2014 and June 2015, in which the breast was possible to be assessed totally or in part even with non-dedicated sequences. Body MRI were reviewed by five radiologists for incidental mammary findings. Breast findings on body MRI were classified with a modified Breast Imaging Reporting and Data System (BI-RADS) MRI lexicon. Standard statistic, costs of additional imaging and impact on patient outcome were used to describe MRI findings.
Results: 290/1441 body MRI of 290 women (mean age: 46 ± 18 years) included breast tissue in the field-of-view. In 133 patients, MRI showed more than 50% of breast tissue, whereas in 157 MRI showed less than 50% of breast tissue. N=35 incidental breast findings were identified in 35 patients.

N=30 of them were identified during abdominal MRI, N=5 during chest MRI. Lesions were classified BI-RADS 2 N=18, BI-RADS 3 N=13, BI-RADS 4 or 5 N=4. After work-up, three invasive cancers (ductal carcinoma) and one pre-invaisie lesions (ductal in-situ) were detected. Averaged across the entire cohort, further imaging evaluation of incidental findings contributed additional Euro 800 to each patient with an incidental breast MRI finding.
Conclusion: Clinically important disease can be detected on body MRI in 1.4% of women. Further dedicated work-up increases costs per patient.

B-0761 11:50

MR spectroscopy evaluation of breast cancer using Signal-to-Noise Ratio (SNR) as a prognostic indicator
S.B. Grover, P. Jain, S.K. Jain, A. Mandal; *New Delhi/IN (shabnamgrover@yahoo.com)*

Purpose: Prognosis of newly diagnosed breast cancer is currently being evaluated by estrogen receptor (ER) status and histological grade. Imaging studies using choline detection are also being explored as an alternative non-invasive technique for similar prognosis prediction.
Methods and Materials: Twenty three female patients with newly diagnosed (biopsy proven) breast cancer larger than 2 cm were included in the study. MR proton spectroscopy was obtained and choline detection with its signal-to-noise (SNR) was recorded. Choline detection was considered positive when the peak was obtained at 3.2 ppm with an SNR$>$ 2.5. The findings were correlated with ER status and histological grade obtained from biopsy specimens. Choline SNR was compared between the ER positive and negative tumours using Mann-Whitney U test. The correlation between choline SNR and histological grade was estimated using the Spearmans rank correlation coefficient, in view of the skewed data distribution.
Results: The choline SNR was found to be significantly higher for ER negative tumours with $p < 0.05$. Positive correlation was obtained between choline SNR and histological grade giving a correlation coefficient of 0.78 with $p < 0.05$.
Conclusion: MR spectroscopy using choline SNR appears to correlate well with gold standard prognostic markers ER status and histological grade. Additional research in this direction will further validate our results, thereby enabling the future introduction of this technique as an additional non-invasive modality for breast cancer prognostication.

10:30 - 12:00 **Room Z**

Vascular

SS 1015

Thoracic aorta: novel imaging and interventions

Moderators:
A. Contegiacomo; Rome/IT
N.N.

B-0762 10:30

Percutaneous valvuloplasty: minimal-invasive restoration of vein valve function using cross-linked hyaluronan
J. Ragg; *Berlin/DE (jcr@gmx.eu)*

Purpose: Today's treatment of saphenous vein insufficiency is predominantly destructive, focusing on endovenous closure. However, decrease of vein diameters could be feasible by injection of viscous fluids or gels. A first series of cases was performed to determine (1) effectivity and safety, (2) patient comfort and (3) long-term behaviour.
Methods and Materials: In a pilot study, 23 patients (15 w, 8 m; 38 - 67 J). with proximal GSV valve incompetence (diameter 7.0 - 11.5 mm, mean 8.6) received a diameter reduction by circumferential injection of a cross-linked NASHA gel. Injections were performed with a safety system (IntraShape®) under continuous ultrasound monitoring until absence of reflux. Clinical and ultrasound examinations were performed after 2, 12, 26 and 52 weeks.
Results: An orthograde flow could be established in 22/23 cases (95.6%) using gel volumina of 12 - 35 ml (mean: 19.4 ml). After 12 weeks, orthograde flow was present in 19/22 cases (86.4%), and after 26 weeks in 18/22 cases (81.8%) and after 52 weeks in 15/22 cases (68.2%). All cases with remaining reflux (n = 7) received a second gel injection of 4 - 7 ml with haemodynamic success up to week 52 or beyond. There were no adverse reactions or complications.
Conclusion: Percutaneous valvuloplasty by ultrasound-monitored hyaluronan injection is feasible, safe and effective. If case selection, placement technique and gel durability can be further improved, clinical applications with low rates of supplementary injections seem to be achievable. Even treatment of deep vein insufficiency may be an option.
Author Disclosures:
J. Ragg: Advisory Board; Valvuloplasty study 2016. Patent Holder; J. C. Ragg.

B-0763 10:38

Reduced strain and distensibility of the ascending aorta in human STAT3 deficiency patients with frequent medium-size-artery aneurysms
A.A. Azarine, O. Chandesris, E. Mousseaux, Z. Mallat, N. Kachenoura, C. Picard, O. Clément, A. Redheuil; *Paris/FR (arshid.azarine@egp.aphp.fr)*

Purpose: To prospectively evaluate aortic stiffness using MRI in patients with STAT3 deficiency (the autosomal-dominant hyper-IgE syndrome) responsible for widespread vascular abnormalities.
Methods and Materials: We prospectively screened 21 adult STAT3-deficient patients (median age: 26 years; range 17 - 44) for vascular abnormalities. They were explored with 4-step contrast enhanced whole body magnetic resonance angiography (MRA) (1.5 T). To study aortic function, ECG-gated high resolution steady state free precession (SSFP) cine sequence was applied perpendicular to the aorta at the level of pulmonary artery bifurcation. Aortic geometry was measured in 3D MRA images. Central blood pressures measured during MRI were used to calculate aortic distensibility and strain using ARTFUN (C) software. Patients were compared to a group of 21 age-, gender- and arterial blood pressure-matched healthy controls.
Results: Arterial abnormalities were reported in 85% of patients. The most frequent vascular abnormalities were ectasia and aneurysm (65%) occurring mostly in medium-sized vessels (90%). Ascending (AA) and descending (DA) aortic strain and ascending aortic distensibility were significantly reduced in patients compared to healthy controls, respectively measured 21±8% vs 33±12% (p=0.001), 25±6% vs 18±6% (p=0.002) and 65±31 mmHg-1 vs 90±36 mmHg-1 (p=0.04).
Conclusion: We demonstrate a significant alteration in thoracic aortic function, particularly ascending aortic distensibility and strain in STAT3-deficient patients previously known to be mostly affected by small- and medium-sized artery aneurysms.

B-0764 10:46

Noninvasive 4D pressure difference mapping derived from 4D flow MRI in patients with syndromic aortic root aneurysm
T.A.U. Leidenberger[1], M. Farag[1], C. Weis[1], M. Müller-Eschner[1], K. Kallenbach[1], R. Dillmann[2], H.-U. Kauczor[1], C. Beller[1], F. Rengier[1]; [1]*Heidelberg/DE*, [2]*Karlsruhe/DE (tilman.leidenberger@med.uni-heidelberg.de)*

Purpose: Aortic root aneurysms frequently occur in patients with connective tissue disorders. Purpose of this study was to assess spatial and temporal pressure changes in patients with syndromic aortic root aneurysms in comparison with age- and sex-matched controls using 4D flow MRI and derived 4D pressure difference maps.
Methods and Materials: 4D flow MRI of the thoracic aorta was performed at 1.5 T in 7 patients with syndromic aortic root aneurysm (mean age 32, 3 females) and 7 age- and sex-matched healthy controls (mean age 32). 4D pressure difference maps based on the Navier-Stokes equation were computed using previously validated algorithms. Pressure difference amplitudes over the cardiac cycle were assessed at eight positions: P1, Sinus of Valsalva; P2/P3, proximal/distal ascending aorta; P4, aortic arch; P5-P8, equidistant levels in descending aorta. Maximum aortic root diameters were measured and correlated with the pressure difference amplitude at P1.
Results: Mean pressure difference amplitude (in mmHg/cm) for patients/controls was: P1 129.1/186.4 (p=0.017), P2 122.5/198.9 (p=0.005), P3 134.0/129.6 (p=0.79), P4 133/114.3 (p=0.38), P5 107.2/124.2 (p=0.35), P6 139.0/151.5 (p=0.45), P7 140.3/159.5 (p=0.39), P8 168.3/169.2 (p=0.97). Mean pressure difference amplitude at P1 was significantly negatively correlated with aortic root diameter in patients (r=0.90), but not in controls (r=0.34).
Conclusion: Noninvasive 4D pressure difference mapping derived from 4D flow MRI showed significant decrease of pressure difference amplitudes in the aortic root and proximal ascending aorta in patients with aortic root aneurysms. This technique might contribute to a more comprehensive understanding of the underlying pathophysiological processes.

B-0765 10:54

Aortic coarctation: assessment of stent patency with computed tomography vs magnetic resonance imaging

R.W. van Hamersvelt[1], A.M. den Harder[1], D. Sucha[1], J.P.J. Martens[1], A.M.R. Schilham[1], C. Bos[1], R.P.J. Budde[2], J.M.P.J. Breur[1], T. Leiner[1]; [1]*Utrecht/NL*, [2]*Rotterdam/NL (R.w.vanhamersvelt-3@umcutrecht.nl)*

Purpose: To investigate the optimal image modality for peadiatric great vessel stents, commonly used to treat aortic coarctation in children.
Methods and Materials: Aortic stents were expanded to the maximal vendor recommended diameter (20 mm; n=4 or 10 mm; n=1), and placed in an anthropomorphic chest phantom and imaged with a 256-slice CT-scanner. MRI images were acquired at 1.5 T and 3.0 T using six different sequences. Two blinded observers assessed stent lumen visibility (measured diameter/true diameter) and subjective image quality at the center and outlets of the stent. The MRI sequence which provided the best subjective image quality was compared to CT image quality.
Results: Stent lumen visibility was 0.87-0.93 with CT for all stents at both the center and outlets, except for the stent with a 10 mm diameter in which stent lumen visibility was 0.77-0.80. Stent lumen visibility was lower with MRI for all stents. Three stents, made of stainless steel, 316L stainless steel and platinum/iridium respectively, reached diagnostic image quality with MRI (maximal score 3). The diagnostic image quality of the remaining two stents, made of stainless steel and 316L stainless steel (diameter 10 mm) was limited (score 2.5 or lower) with MRI on all sequences. All CT acquisitions were of diagnostic quality (score 4) except for the stent made of platinum/iridium (score 2.5).
Conclusion: This in-vitro study showed that stents made of platinum/iridium reach superior image quality when imaged with MRI while stents of stainless steel can be better evaluated with CT. Both image modalities can be used for cobalt-chromium stents.

B-0766 11:02

Heritability estimates of aortic root geometry based on computed tomography and echocardiography

C. Celeng[1], M. Kolossváry[1], A. Kovács[1], A. Molnár[1], Á. Jermendy[1], D. Tárnoki[1], S. Voros[2], B. Merkely[1], P. Maurovich-Horvat[1]; [1]*Budapest/HU*, [2]*Richmond, VA/US (celengcsilla@gmail.com)*

Purpose: Aortic root dimensions are influenced by genetic and environmental factors. Transthoracic echocardiography (TTE) demonstrated moderate genetic effects. Computed tomography angiography (CTA) might provide more accurate heritability estimates. Our aim was to assess the heritability of aortic root dimensions measured by CTA versus TTE.
Methods and Materials: In the BUDAPEST-GLOBAL (Burden of atherosclerotic plaques study in twins-Genetic Loci and the Burden of Atherosclerotic Lesions) study 198 twins (118 monozygotic; age: 56.1 ± 9.4 years; 126 female) were recruited from the Hungarian Twin Registry who underwent CTA and TTE. We assessed the diameter of the left ventricular outflow tract (LVOT), annulus (An), sinus of Valsalva (SV), sinotubular junction (STJ) and ascending aorta (AA). Heritability was assessed by ACDE model (A: additive genetic, C: common environmental, D: dominant genetic, E: unique environmental factor). Reproducibility was assessed using intraclass correlation coefficient (ICC).
Results: Based on the CTA measurements additive genetic effects were dominant (LVOT: A=0.67, E=0.33; An: A=0.76, E=0.24; SVV: A=0.83, E=0.17; STJ: A=0.82, E=0.18; AA: A=0.75, E=0.25), whereas TTE based metrics showed a strong environmental influence (LVOT: A=0.38, E=0.62; An: C=0.47, E=0.53; SVV: C=0.63, E=0.37; STJ: C=0.45, E=0.55; AA: A=0.67, E=0.33). Intra and inter-reader reproducibility of CTA (ICC≥0.94) was superior compared to TTE (ICC≥0.58).
Conclusion: The CTA measurements suggest that aortic root dimensions are predominantly determined by genetic factors, whereas TTE based measurements indicate strong environmental influence. The choice of measurement method has a substantial impact on heritability estimates.

B-0767 11:10

Diagnostic value of Low kV MDCT angiography protocol with low contrast medium volume in transcatheter aortic valve implantation (TAVI) planning

C.R.G.L. Talei Franzesi, D. Ippolito, P.A. Bonaffini, F. Del Buono, L. Riva, S. Sironi; *Monza/IT (ctfdoc@hotmail.com)*

Purpose: To evaluate the diagnostic quality,in terms of radiation dose and image quality,of low-kV CT angiography (CTA) protocol with low contrast medium volume in Transcatheter Aortic Valve Implantation (TAVI)planning,in comparison with standard CTA protocol.
Methods and Materials: Fifty-two patients (23women;mean age 84.1years,range 72-90years),candidate for TAVI,were prospectively enrolled and examined with 256-MDCT scanner (Brilliance iCT,Philips).Twenty-seven patients (12women;mean age 85.4years,range 72-88years) were evaluated using low-KV (100 kV; retrospective ECG-gated; automated tube current modulation) protocol,with 60 mL of iso-osmolar contrast medium volume (350 mgI/mL). A control group of 25 patients (11women;mean age 83.3 years,range 73-90years) underwent standard CTA study (120 kV;retrospective ECG-gated protocol;automated tube current modulation) with standard contrast medium volume (120 mL).The diagnostic image quality was evaluated using a 4-point scale (4 excellent,3 good,2 acceptable,1 low);vascular attenuation (HU) was assessed in each patient by manually drawing on axial native images the regions of interest (ROIs)in lumen of aortic root,ascending aorta, arch,descending and abdominal aorta,common and external iliac arteries.The radiation dose exposure (dose-length product,DLP mGy*cm)was calculated and the obtained data were compared and statistically analysed.
Results: Significant higher mean lumen attenuation values were obtained for all the measurements in low-kV protocol (aortic root 474+18.34 HU;external iliac arteries 507+18.49 HU) as compared with standard protocol (aortic root 365+23.11 HU;external iliac arteries 389+16.32 HU).No significant difference in the image quality evaluation was observed between study (mean 3.6) and control group (3.8).Mean DLP of low-kV group was significantly lower (mean DLP 1585 mGy*cm) than in control group (mean DLP 2044 mGy*cm),with an overall radiation dose reduction of 22%.
Conclusion: Low-kV CTA protocol with low contrast medium volume allows to obtain an high diagnostic quality TAVI planning,as compared with standard CTA protocol, reducing the overall radiation dose exposure and the risk of renal damage.

B-0768 11:18

3D black-blood VISTA magnetic resonance vessel wall imaging of the thoracic aorta in healthy, young adults: reproducibility and indications for sample sizes in therapeutic trials

A.L.M. Eikendal[1], B.A. Blomberg[1], C. Haaring[1], T. Saam[2], R.J. van der Geest[3], M.L. Bots[1], H.M. den Ruijter[1], I.E. Hoefer[1], T. Leiner[1]; [1]*Utrecht/NL*, [2]*Munich/DE*, [3]*Leiden/NL (a.l.m.eikendal@umcutrecht.nl)*

Purpose: Magnetic resonance imaging (MRI) is an attractive modality for studying aortic atherosclerosis in vivo. Yet, most aortic MRI studies have been performed at 1.5 T using 2D techniques and a large slice thickness. Here, we evaluate the reproducibility of the promising isotropic 3-dimensional, black-blood, T1-weighted, turbo-spin-echo sequence with variable flip angles (3D-T1-BB-VISTA) for quantification of aortic wall characteristics in healthy, young adults.
Methods and Materials: In 20 healthy, young adults (mean age 31 years, 10 females) of the Atherosclerosis-Monitoring-and-Biomarker-measurements-In-The-YOuNg (AMBITYON) study, we imaged the descending thoracic aorta using a 3.0 Tesla MRI system and the 3D-T1-BB-VISTA sequence. We assessed inter-scan, inter-rater and intra-rater reproducibility of aortic lumen, total vessel and wall area and mean and maximum wall thickness using Bland-Altman analyses and intraclass correlation coefficients (ICC). Additionally, sample sizes for detecting differences in aortic wall characteristics between groups were calculated.
Results: The inter-scan, inter-rater and intra-rater reproducibility were excellent for all characteristics as demonstrated by small limits of agreement and high ICCs (0.76-0.99). To detect a 5% difference in aortic wall characteristics between two groups, the necessary sample sizes were 203, 126, 136, 68 and 153 per group for aortic lumen, total vessel and wall area and mean and maximum wall thickness, respectively.
Conclusion: The 3D-T1-BB-VISTA sequence is highly reproducible for quantification of aortic wall characteristics and can detect differences of 5% in aortic wall characteristics between groups with reasonable sample sizes. Hence, it may be a valuable tool for assessment of the subtle arterial wall changes of early atherosclerosis.

B-0769 11:26

Aortic tortuosity: a new finding in patients with Mucopolysaccharidosis type IVa (MPS IVa)

Y. Tanyildizi, S. Gökce, E. Mengel, C. Kampmann, W. Müller-Forell, J. Hennermann; *Mainz/DE*

Purpose: MPS IVa is a lysosomal storage disorder caused by a deficiency of N-acetylgalactosamine-sulfatase. Main symptom is a systemic skeletal dysplasia. Affection of the vascular system has not been described yet. Our goal is the analysis of the vascular system in patients with MPS IVa, based on the example of the aorta.
Methods and Materials: In a retrospective study, 32 patients with MPS IVa were included. The aorta in its course from 4th thoracic vertebrae to 10th was analysed on the basis of 49 craniospinal MR and 4 CT examinations. To describe the course of the aorta, the area around the vertebral body was devided into 5 equal parts. High buckled arteries in relation to the length of the affected oral part where indicated as retail kinking, and a moderate twist in relation to the length of the affected aortal part as aortal coiling.

Results: 12 of 32 patients had an aortal kinking, 10 of 32 patients an aortal coiling, 4 of these had moderate and 3 strongly coiled aortae. 7 patients had a normal aortal course, 4 couldn't be analysed. One patient revealed both, aortal kinking and coiling.
Conclusion: This study reveals for the first time the occurrence of aortic tortuosity in patients with MPS IVa. We suggest that this complication could be due to glycosaminoglycane deposition in the aortic intima, which may be associated with an increased vulnerability of the vascular wall. We conclude that the examination of the vascular system should be included in regular follow-up protocols.

B-0770 11:34

Contrast-enhanced T1 free-breathing gradient echo sequences in comparison with standard T1 breath-hold gradient echo sequences in the evaluation of thoraco-abdominal aortic disease
C.R.G.L. Talei Franzesi, D. Ippolito, S. Drago, S. Lombardi, S. Spiga, S. Sironi; *Monza/IT (ctfdoc@hotmail.com)*

Purpose: To compare the diagnostic efficacy of contrast-enhanced T1 free-breathing gradient-echo sequences with standard breath-hold MR-angiographic sequences in the evaluation of aortic disease.
Methods and Materials: From January 2012 to July 2015 sixty-two patients (39men;mean age60.2years) with aortic disease were examined with a 1.5 T magnet (Achieva,Philips),using a phased array multi-coil,after the intravenous injection of 0.1 mL*Kg of gadobutrol. The standard thoraco-abdominal MR angiography (MRA) protocol included 3D-angiographic T1 gradient-echo fat-suppressed (3D-HR) sequences and T1 breath-hold gradient-echo fat-suppressed sequences (THRIVE).Multiplanar T1 free-breathing gradient-echo fat-suppressed (THRIVE-FB) sequences were additionally performed in all the examinations. Two radiologists independently evaluated and compared the diagnostic quality of the different angiographic sequences,in terms of visualisation of aortic wall and lumen and main arterial branches. The vascular calipers at different aortic levels were calculated,compared and statistically analysed among the different sequences.The interobserver agreement was then evaluated using the Intraclass Correlation Coefficient (ICC).
Results: THRIVE-FB sequences showed high diagnostic accuracy in the assessment of vascular calipers and walls,with no significant differences in comparison with standard breath-hold sequences. THRIVE-FB demonstrated also high sensitivity and specificity in the evaluation of vascular plaques, thrombus and adjacent structures. No significant difference was observed in terms of overall diagnostic quality between THRIVE-FB sequences and standard angiographic sequences, obtaining an ICC of 0.92.
Conclusion: Contrast-enhanced T1 free-breathing gradient-echo fat-suppressed sequences combined with high relaxivity contrast agent showed high diagnostic quality images, permitting to correctly visualize and evaluate the aorta and its major branches, with no significant difference with standard breath-hold angiographic sequences, thus representing a useful tool also in not compliant patients.

B-0771 11:42

The aortic mechanical properties in patients with the essential hypertension environmentally exposed to cigarette smoke
P. Gac, M. Poreba, G. Mazur, R. Poreba; *Wroclaw/PL (pawelgac@interia.pl)*

Purpose: The determination of the influence of the environmental exposure to cigarette smoke on the aortic mechanical properties, namely the stiffness and elasticity of aorta, in patients with hypertension.
Methods and Materials: The research has covered 128 people with essential hypertension: 64 non-smokers, declaring the environmental exposure to cigarette smoke (group A, mean age: 54.45±5.27 years) and 64 non-smokers declaring the lack of environmental exposure to cigarette smoke selected on the case to case basis (group B, mean age: 55.75±4.71 years). Aortic mechanical properties have been evaluated with the use of ultrasound imaging on the basis of the parameters: aortic stiffness index (AoSI), aortic strain (AoS) and aortic distensibility (AoD).
Results: In group A the average values of AoSI were significantly higher, and the average values of AoS and AoD significantly lower than in group B (AoSI- A: 3.63±0.45, B: 3.00±0.44; AoS- A: 4.88±2.81%, B: 8.77±3.18%; AoD- A: 0.18±0.11 cm2/dyn, B: 0.33±0.14 cm2/dyn; $p < 0.05$). It has been documented that the older age and environmental exposure to cigarette smoke form independent risk factors of increasing the aortic stiffness expressed by higher values of AoSI, whereas the older age, higher pulse pressure (PP) values and environmental exposure to cigarette smoke - independent risk factors of aortic elasticity reduction expressed for the age and "passive smoking" by lower values of AoS and AoD and for PP - lower values of AoD.
Conclusion: In patients with essential hypertension the environmental exposure to cigarette smoke seems to result in impairment of the aortic mechanical properties.

B-0772 11:50

Thoracic endovascular aortic repair for complicated type B intramural hematoma (IMH) and penetranting ulcers (PAU): endoleak, follow-up and long term survival
F. Barbosa, E. De Febis, P. Brambillasca, M. Solcia, C. Migliorisi, M. Nichelatti, A. Lista, F. Romani, A. Rampoldi; *Milan/IT*

Purpose: Aortic intramural hematoma (IMH) is an acute aortic disease, defined by the presence of hemorrhage within the aortic wall while penetrating aortic ulcer (PAU) is a chronic aortic condition, defined by an ulcer-like disruption of the intima maturing within the aortic lumen. ComplicatedIMH and PAU increase the cardiovascular mortality. The aim of this study is to assess TEVAR in complicated type B IMH and PAU.
Methods and Materials: Between January 2005 and August 2015, 123 consecutive patients underwent TEVAR, of these,18 patients presented complicated type B IMH and/or PAU. Complicated was defined as haemodynamic instability, persistent pain, signs of impending rupture and progressive periaortichaemorrhage in two successive imaging studies. 15patients were male, mean age was 66 years (range 55-84). The devices used were Relay-Bolton (3), Talent-Medtronic (3) and TAG-Gore (12) stent grafts.
Results: Technical success was achieved in all cases. After a mean follow-up of 35.69 months, no deaths related to the procedure or neurologic complications (paraplegia or stroke) were observed. In three patients a second surgery was required for PSA or blister correction. During the follow-up only one patient died, due to cirrhotic complications. All computed tomography scans performed during the follow-up revealed no evidence of endoleak, migration or alteration of the stent grafts.
Conclusion: In complicated typeBaortic PAU and IMH, endovascular repair is an alternative treatment option in the presence of suitable anatomy.

10:30 - 12:00 **Room O**

GI Tract

SS 1001a

Rectal cancer: staging and restaging

Moderators:
L. Curvo-Semedo; Coimbra/PT
A. Plumb; London/UK

K-20 10:30

Keynote lecture
C. Stoupis; *Männedorf/CH*

B-0773 10:39

Iodine quantification to distinguish T stage in rectal cancer by computed tomographic gemstone spectral imaging: initial experience
X. Li, Y. Li, Z. Ye; *Tianjin/CN (lixb@bjmu.edu.cn)*

Purpose: To investigate whether computed tomographic gemstone spectral imaging (GSI) with iodine quantification can distinguish T stage in rectal cancer.
Methods and Materials: Fifty-one patients with rectal cancers confirmed by pathology who had undergone pelvic enhanced CT imaging with GSI mode. According to the pathological results, the iodine concentrations (ICs) of primary lesion, perirectal fat adjacent to primary lesion and subcutaneous normal fat were measured, respectively and their spectral curves were also obtained. The normalized iodine concentration (NIC) values against iliac artery were calculated. The differences of NIC values between primary lesion, perirectal fat and subcutaneous fat in rectal cancers with different T stage were assessed.
Results: There were 34 patients with rectal cancers of stage T3 and 17 with rectal cancers of stage T2. For rectal cancers with stage T3, the differentiations of NCIs between rectal cancer, perirectal fat tissue and normal fat tissue were significant ($P < 0.05$). For rectal cancers with stage T2, the differentiations of NCIs between rectal cancer and perirectal fat tissue, the lesion and normal fat tissue were significant ($P < 0.05$),while no significant difference existed between perirectal fat and normal fat tissue ($P > 0.05$). The shape of spectral curve of infiltrated perirectal fat was parabolic, while the shape of spectral curve of normal fat tissue was anti-parabolic. Thirty parabolic curves of infiltrated perirectal fat in advanced rectal cancers and 14 anti-parabolic curves of perirectal fat in non-advanced rectal cancers were seen.
Conclusion: Spectral CT with iodine quantification can be potentially used to differentiate T stage in rectal cancer.

B-0774 10:47

Diagnostic accuracy of MDCT imaging in assessment of mesorectal fascia invasion in rectal cancer: comparison study with standard magnetic resonance imaging

S.G. Drago, D. Ippolito, C. Talei Franzesi, D. Fior, S. Sironi; *Monza/IT (silvia.drago@hotmail.it)*

Purpose: To assess the diagnostic accuracy of CT images with multiplanar reconstructions (MPR) in comparison with conventional MRI, in identifying mesorectal fascia (MRF) invasion in rectal cancer patients.
Methods and Materials: Ninety-one patients with biopsy proven primary rectal adenocarcinoma referred for thoracic and abdominal CT staging were enrolled in this study. The contrast-enhanced MDCT scans were performed on a 256 (ICT, Philips) row scanner with the following acquisition parameters: tube voltage 120 KV and tube current 150-300 mAs. Multiplanar CT reconstructions were performed and imaging data were reviewed as axial and as MPR images: along with rectal tumour axis. MR study, performed on 1.5 T magnet included standard multiplanar T2 weighted and axial T1 weighted sequences. The MRF involvement was assessed on axial and MPR images independently and compared with MRI imaging finding. Diagnostic accuracy of both modalities was compared and statistically analysed.
Results: All CT scan studies were diagnostic in terms of rectal cancer detection and local tumour staging. Multidetector-row CT images agreed with those of MRI, obtaining for CT axial images sensitivity and specificity of 80.4% and 75%, PPV of 80.4%, NPV 75% and accuracy of 78%. By using MPR the sensitivity increased up to 88% and specificity to 87%, PPV was 90%, NPV 85.36% and accuracy of 88%.
Conclusion: New generation CT scanner, using high-resolution MPR images along tumour axis, can be considered a complementary technique for loco-regional and whole body staging in rectal cancer patients, especially in those with MRI contraindications.

B-0775 10:55

Diagnostic value of 4th generation iterative reconstruction algorithm with low dose CT-protocol in assessment of mesorectal fascia in rectal cancer: comparison with magnetic resonance

S.G. Drago, D. Ippolito, C. Talei Franzesi, A. Casiraghi, S. Sironi; *Monza/IT (silvia.drago@hotmail.it)*

Purpose: To determine the diagnostic efficacy in terms of radiation dose and image quality of low dose CT protocol combined with iterative reconstruction algorithm (iDose4)in the assessment of mesorectal fascia (MRF)invasion in rectal cancer patients in comparison with standard dose CT.
Methods and Materials: Ninety-one patients with biopsy proven primary rectal adenocarcinoma underwent CT whole-body staging: 42 of them underwent low-dose CT while 49 underwent standard CT protocol. Low dose contrast-enhanced MDCT scans were performed on a 256 (ICT, Philips) scanner with tube voltage 120 KV, automated mAs modulation and slice thickness 2 mm, using iDose4 iterative reconstruction algorithm. The control group of 49 patients underwent standard dose (120 KV, 200-300 mAs) CTE examination on the same scanner. All patients were also evaluated with standard lower abdomen MR study, performed on 1.5 T magnet, including standard multiplanar sequences, considered as reference standard. Diagnostic accuracy in terms of MRF assessment was determined on CT images in portal-venous phase for both CT protocol and compared with MRI imaging. Dose length product (DLP) calculated for both groups was compared and statistically analysed.
Results: Low-dose protocol combined with iDose4 showed high diagnostic quality in assessment of MRF with significant reduction (23%; p=0.0081)of radiation dose (DLP 2453.47) compared to standard dose examination (DLP 3194.32). Noise resulted slightly higher in iDose4 but the difference was not statistically significant.
Conclusion: Low-dose protocol combined with iDose reconstruction algorithm offers high quality images with significant reduction of radiation dose, being a useful tool in evaluation of MRF involvement in rectal cancer patients.

B-0776 11:03

Prediction of sphincter preserving by MRI: accuracy and reproducibility between a radiologist and a surgeon

J. Krdzalic, M. Maas, S. Engelen, J. van Griethuysen, D.M. Lambregts, G. Beets, R.G.H. Beets-Tan; *Maastricht/NL (jasenkokrdzalic@hotmail.com)*

Purpose: Feasibility of sphincter-preserving surgery in low rectal tumours (< 5 cm from anorectal junction) is based on the exact distance from the anorectal junction (ARJ), rigidity upon digital rectal examination and presence of sphincter invasion. Aim was to evaluate whether a radiologist and a surgeon can predict feasibility of sphincter-preserving surgery at T2W-MRI.
Methods and Materials: 44 patients with a rectal tumour < 5 cm from the ARJ that did not undergo CRT were included. T2W-MRI in 3 directions was evaluated by a specialised radiologist and a specialised surgeon for feasibility of sphincter-preservation. Distance from ARJ (mm) and confidence level scores for sphincter-preserving surgery and sphincter invasion were scored. Reference standard was type of surgery combined radicality of the resection.
Results: Both the radiologist and surgeon could predict sphincter preservation accurately with AUC 0.81 (radiologist) and 0.82 (surgeon). Sensitivity and specificity are 75% and 83% (radiologist) and 50% and 87% (surgeon), respectively. Height was predictive of sphincter preservation for both readers with AUC of 0.90 (radiologist) and 0.88 (surgeon), with optimal cut-off at 18 and 26 mm, respectively. Interobserver reproducibility of height was ICC 0.70 (0.51-0.82) and of confidence level scores for sphincter preservation was Kappa 0.53 (0.31-0.76).
Conclusion: Sphincter preservation can accurately be predicted with T2W-MRI by both specialised radiologists as well as specialised surgeons. Height is the most accurate predictor with a cut-off of approximately 18-26 mm.

B-0777 11:11

Diagnostic accuracy of dynamic contrast-enhanced MRI for locoregionar staging of rectal cancer

M. Armbruster, W. Sommer, M.F. Reiser, M. Brandlhuber; *Munich/DE (marco.armbruster@med.uni-muenchen.de)*

Purpose: To evaluate the diagnostic performance of dynamic contrast-enhanced (DCE) MRI for locoregionar staging of rectal cancer.
Methods and Materials: 17 patients with rectal cancer underwent DCE-MRI in addition to our standard MRI protocol containing sagital, coronar and axial T2 weighted sequences as well as axial T1 weighted sequences before and after application of Gd-DTPA for locoregionar staging and surgical planning. DCE-MRI was performed at 1.5 Tesla acquiring 19 slices every 3.0 sec for 6 min. T-stage as well as N-stage was assessed on morphologic images and on semiquantitiative DCE-MRI maps. Postoperative pathological TNM-staging served as gold-standard. Area under the curve (AUC) was calculated for the radiologic assessment of malignant lymph nodes (N0 vs. N+) and infiltrations to the mesorectal facia (MRF+ vs. MRF-). Quantitative perfusion parameters were obtained for the primary tumour and for normal appearing rectal tissue using a dedicated two-compartment uptake model.
Results: The addition of semiquantitative DCE-MRI maps to morphological T1 and T2 sequences increased the AUC for the detection of malignant lymph nodes (N+ vs. N0) from 0.750 to 0.813 (95%-CI: 0.533-0.98, 0.633-0.992 respectively). The addition of DCE-MRI maps increased the AUC for the detection of tumour infiltration to the mesorectal facia (MRF+ vs. MRF-) from 0.718 to 0.756 (95%-CI: 0.37-1.00, 0.414-1.00 respectively).
Conclusion: The additional acquisition of dynamic contrast-enhanced MRI sequences supports the detection of malignant mesorectal lymph nodes and the assessment of tumour infiltration to the mesorectal fascia.

B-0778 11:19

The value of tumoural volume change measured on MR images to identify responders after neoadjuvant chemo-radiation therapy in patient with locally advanced rectal cancer

E. Quaia, A. Gennari, V. Ulcigrai, M. Cova; *Trieste/IT (quaia@units.it)*

Purpose: To evaluate the change in the volume of rectal carcinoma measured on MR images to identify patients responders to neoadjuvant chemo- and radiation therapy (CRT).
Methods and Materials: Forty-five consecutive patients (mean age ± SD: 72 years ± 9.7; range 37 - 89; male/female = 24/21) with locally advanced rectal carcinoma underwent CRT followed by surgery. Each patient underwent MR imaging including TSE T2-weighted sequences and DWI sequences before and 6 weeks after the completion of CRT. Tumour volume was measured by manually tracing the outer edge of the lesion on each image. The tumoural volume percent variation (ADCpost - ADCpre) x 100 / ADCpre) and was compared in patients classified as responders and non-responders according to rectal cancer regression grade.
Results: Twenty-five patients were classified as responders due to partial (n=20) or complete response (n=5), while 20 patients were classified as non-responders due to stable disease (n=18) or disease progression (n=2). Responders vs non-responders differed in the tumoural volume variation measured on T2-weighted (- 67 ± 26 vs - 29 ± 26; $P < 0.05$) and DWI images (- 72 ± 24 vs - 33 ± 28%; $P < 0.05$). Cut-off value according to ROC analysis was ≤ -0.7 for T2-w images and ≤ - 0.66 for DWI. Intraclass correlation coefficient between T2 and DWI sequences was 0.92 (95% C.I., 0.86 - 0.95).
Conclusion: Tumoural volume change measured on MR images can differentiate responders from non-responders in patients with locally advanced rectal carcinoma after neoadjuvant CRT.

B-0779 11:27

T2 weighted-MRI volumetry at different time points for prediction of pathological response to neoadjuvant chemoradiation therapy (CRT) in locally advanced rectal cancer

A. Di Chiara, A. Palmisano, A. Esposito, P. Passoni, N. Slim, C. Fiorino, N. Di Muzio, A. Del Maschio, F. De Cobelli; *Milan/IT (dichiara.alessandra@hsr.it)*

Purpose: MRI has a pivotal role in the assessment of response to CRT in patients with locally advanced rectal cancer (LARC). Aim of this study was to assess the role of MRI volumetry in the prediction of response to CRT.
Methods and Materials: Forty-six patients with LARC underwent 1.5 T MRI before the beginning of CRT (preMRI), after 6 weeks of treatment (midMRI) and at the end of CRT (postMRI). High-resolution axial-T2w sequences were acquired oriented perpendicularly to the major axis of the tumour; cancer volume was manually segmented and the percentage of volume modification evaluated (ΔV). After surgical resection, histopatological percentage of neoplastic cells (%NC) and tumour regression grade (TRG) were evaluated. Patients with TRG=0-2 were considered non-responder (NR), TRG=3 partial responder (PR) and TRG=4 complete responder (CR).
Results: In relation to TRG, 23 patients were considered PR (50%),13 CR (28%) and 10 NR (22%). ΔV was significantly higher in responders both at midMRI (CR+PR -65±18% vs NR -28±21%, $p < 0.01$) and postMRI (CR+PR -84±10% vs NR -53±24%, $p < 0.01$). At midMRI ΔV (ΔVmid) was higher in CR than in PR (-80±10% vs -57±17%; p=0.002), whilst ΔV at postMRI (ΔVpost) was not different between CR and PR. ΔVmid correlated better than ΔVpost both with TRG (R: -0.720, $p < 0.001$ vs R: -0.630, $p < 0.001$) and with %NC (R: -0.698, $p < 0.001$ vs R: -0.544, $p < 0.001$). ΔVmid < -30% seems to predict NR with a sensitivity of 97%, whilst a ΔVmid > -80% seems to predict TRG3-4 with a sensitivity of 83%.
Conclusion: Volume modifications obtained at midMRI during CRT represent a sensitive and effective tool for early assessment of tumour response to therapy.

B-0780 11:35

Evaluation of rectal cancer response to therapy: role of magnetic resonance tumour regression grade (MR-TRG) to predict pathological complete response

S. Picchia, M. Rengo, D. De Santis, M. Zerunian, T. Biondi, S. Badia, A. Laghi; *Latina/IT (lisiva@alice.it)*

Purpose: To determine if a pathological complete response to therapy in rectal cancer can be predicted by tumour regression grade evaluated by MR (MR-TRG).
Methods and Materials: 65 patients, diagnosed with locally advanced rectal cancer were prospectively enrolled in the study. All patients underwent MRI on a 3-Tesla before, during and after chemoradiotherapy (CRT). All patients underwent total mesorectal excision (TME). MR-TRG was evaluated on T2-weighted fast spin-echo (FSE) multi-planar imaging. The MR-TRG was determined by the fibrosis/tumour ratio and was divided into 4 grades based on the percentage of fibrosis (< 25%, < 50%, < 75%, 100%). Measurements were performed on all axial images including the tumour. MR-TRG evaluated on the second examination (during therapy) was correlated to the pathological finding after surgery, defined as partial response or complete response.
Results: A complete pathological response was observed only in patients with MR-TRG 4 (100% fibrosis) with a negative predictive value of 100%. In lower MR-TRG groups (1, 2 and 3), a partial response was observed.
Conclusion: MR-TRG 4 is a accurate predictor of complete response after CRT. When a lower MR-TRG is observed the persistence of disease should be suspected. This method, applied during therapy, may reduce the time to surgery.

B-0781 11:43

Multiparametric MRI for prediction of pathological complete response (pCR) to neoadjuvant chemoradiation therapy (CRT) in locally advanced rectal cancer (LARC)

A. Palmisano, A. Esposito, A. Di Chiara, P. Passoni, N. Slim, L. Albarello, A. Del Maschio, F. De Cobelli; *Milan/IT (palmisano.anna@hsr.it)*

Purpose: A non-invasive accurate assessment of response to neoadjuvant chemoradiation may modify the management of patients with LARC. Aim of the study was to assess the role of multiparametric MRI in the prediction of pCR after CRT in LARC.
Methods and Materials: 21 patients with LARC underwent 1.5 T MRI before CRT (preMRI), after 6 weeks of treatment (midMRI), and at the end of CRT (postMRI). High-resolution axial-T2w sequences, DWI (b: 0-200-600-1000) and DCE-MRI were acquired. Cancer volume was segmented both on T2w images (VT2) and semi-automatically on b:1000 DWI images; the percentage of volume changes was calculated (ΔV). Mean ADC and Ktrans values were assessed at each time point. After surgical resection, the percentage of persistent neoplastic cells (%NC) and the tumour regression grade (TRG) were histopathologically assessed. Patients with TRG=0-2 were considered non-responder (NR), TRG=3 partial responder (PR), TRG=4 complete responder (CR).
Results: 38% (8/21), 38% (8/21) and 24% (5/21) of patients resulted CR, PR and NR. CR had larger decrease in tumour volume (CR: ΔVT2-87% and ΔVb:1000-87%; PR: ΔVT2-75% and ΔVb:1000- 65%; NR:ΔVT2-67% and ΔVb:1000-68%) and higher preCRT ADC values (R: 1.321, PR:1.117, NR: 1.063). Vb:1000 at mid and postMRI correlated with TRG slightly better than VT2 (Vb:1000mid: R 0.632 vs VT2: R 0.598, $p < 0.05$; Vb:1000post: R 0.654 vs VT2: R 0.589; $p < 0.05$). Vb:1000mid and Vb:1000post correlated also with the %NC (respectively R 0.613 and R 0.575, $p < 0.05$). Moreover, preCRT ADC showed a good correlation both with TRG (R 0.691, p 0.001) and %NC (R 0.572, p 0.007). No correlations between Ktrans, TRG and %NC were found.
Conclusion: Combined assessment of cancer volume on morphological and functional sequences seems to be more effective than only morphological evaluation in the prediction of pCR.

B-0782 11:51

Local nodal metastasis in rectal cancer in patients with and without neoadjuvant therapy: correlation of MRI findings with histopathological results in an Irish tertiary referral centre

C. Fenelon, N. Sheehy; *Dublin/IE (cgcfenelon@gmail.com)*

Purpose: Rectal cancer is primarily treated with surgery; outcomes may be improved both with neo-adjuvant chemoradiotherapy and adjuvant chemotherapy. Nodal status at baseline is a key determinant in deciding if adjuvant chemotherapy is appropriate after surgery. Histopathology is the gold standard but may be inaccurate after neo-adjuvant therapy. The aim of this study was to assess the accuracy of pre-treatment staging MRI by correlating preoperative stage with pathology findings.
Methods and Materials: We carried out a retrospective study of 100 consecutive patients with proven rectal adenocarcinoma who underwent surgery between 2012 and 2015 (Male 67%, median age 67). We included all patients with and without neo-adjuvant radiotherapy (NAR). All patients had a dedicated 1.5 T MRI prior to neo-adjuvant treatment and surgery. Lymph node status was determined by MERCURY criteria. Pre-treatment MRI nodal assessment was compared with histopathology.
Results: For patients who did not have NAR (n=33), sensitivity, specificity and accuracy of MRI in detecting pathological nodal involvement were 75%, 82.8% and 81.8%, respectively. For those that did have NAR (n=67), sensitivity, specificity and accuracy of MRI in detecting pathological nodal involvement were 92%, 9.5% and 40.3%, respectively.
Conclusion: Tumour response is likely to be responsible for the poor correlation in our study between baseline MRI and postoperative histology findings in those who have had NAR. Our study showed a significant correlation between MRI and histopathology in those who went straight to surgery, implying that decisions on which patients should receive adjuvant chemotherapy based on nodal status should give significant weight to baseline MRI findings over histopathology.

10:30 - 12:00 **Room N**

Cardiac

SS 1003

CT of the coronary arteries

Moderators:
D. Brisbois; Liège/BE
J.M. Kerl; Darmstadt/DE

K-21 10:30

Keynote lecture

C.N. De Cecco; *Charleston, SC/US*

B-0783 10:39

An optimised correction factor for calcium scoring using advanced modeled iterative reconstruction in 3rd generation dual-source CT: in vitro and in vivo analysis

D. Caruso[1], J.L. Wichmann[1], C.N. De Cecco[1], S. Mangold[1], C. Tesche[1], C. Canstein[1], A. Varga-Szemes[1], A. Laghi[2], U.J. Schoepf[1]; [1]*Charleston, SC/US*, [2]*Rome/IT (dcaruso85@gmail.com)*

Purpose: Novel iterative reconstruction (IR) algorithms allow radiation dose reduction while maintaining high image quality; however, calcium scoring results may be affected by IR applications. We sought to determine a correction factor to increase the accuracy of calcium scoring results from IR datasets.

Methods and Materials: A phantom with 9 calcification inserts was used to determine a correction factor (CF) for CAC score and volume when using advanced modeled iterative reconstruction (ADMIRE) strength 3 (ADM3) vs. filtered back projection (FBP). Then, 40 patients were retrospectively analysed and CAC score and volume were obtained with FBP and ADM3. The phantom-based CF was applied and results were compared. Repeated measures of variance were used to assess the differences among groups and inter-reader agreement in risk stratification was performed.
Results: The inferred correction factor for CAC scoring with ADM3 was 1.1424. The original CAC scores for FBP (907.18±1425.68) were significantly higher compared to ADM3 (746.78±1184.39, p≤0.001). After the application of the CF, no significant differences were found between the CAC score from FBP (907.18±1425.68) and the corrected CAC score from ADM3 (862.31±1367.62, p=0.07). Inter-reader agreement in risk stratification was excellent (k=0.91).
Conclusion: ADM3 can be applied to CAC scoring in the context of CCTA if a correction factor is applied. More specifically, multiplying the ADM3-based value by a CF of 1.1424 leads to excellent agreement with standard FBP for both CAC score and VOL.
Author Disclosures:
C. Canstein: Employee; Siemens. **U.J. Schoepf:** Consultant; Bayer, Bracco, GE, Medrad, Siemens.

B-0784 10:47

CT calcium score of coronary artery calcification progression in rheumatoid arthritis over a 10-year period and risk factors for progression

M.-Y. Ng, J.-H. Liu, K.-F. Mak, C.-S. Lau, H.-F. Tse, K.-H. Yiu; *Hong Kong/CN (myng2@hku.hk)*

Purpose: Rheumatoid arthritis (RA) patients are at increased risk of arterial calcification resulting in higher cardiovascular mortality. Computed tomography coronary calcium score (CTCCS) is a well-established modality for calculating coronary arterial calcification (CAC) and prognostication of major adverse cardiovascular events. The study's aims were to: (i) assess the rate of CAC progression in RA patients compared to predicted calculations; (ii) investigate independent risk factors of CAC Progression.
Methods and Materials: 85 RA patients with no history of cardiovascular disease were enrolled. CTCCS was measured on enrolment, and on average 9.8 ± 0.2 years later. Patients' predicted CTCCS was calculated using a CAC calculation software and compared with the actual CTCCS. Coronary CTCCS progression was defned by the "SQRT method". Variables such as disease duration, drugs used, lipids, hypertension and diabetes mellitus were included in a multivariate regression analysis to determine risk factors of CAC progression.
Results: 49 patients (mean age 54 years, 89.8% female, mean RA duration of 13 years) had a complete data set at the end of follow-up. The absolute increase of CTCCS and the percentage of RA patients with CTCCS progression were all significantly higher than predicted (110.2 ± 165.3 Agatston units vs 62.9 ± 209.7 Agatston units, p= 0.01; 61.1% vs 13.9%, $p < 0.01$). After multivariate analysis, age and systolic blood pressure (SBP) were shown to be independent risk factors for progression (p=0.04, p=0.01 respectively).
Conclusion: RA patients had a significantly greater rate of CAC progression than predicted. Age and SBP were independent risk factors of progression.

B-0785 10:55

Cardiac CT and coronary angiography evaluation in an NSTEMI population

S.R. Fuller, D. Caruso, J. Rames, J.L. Wichmann, C.N. De Cecco, S. Mangold, C. Tesche, A. Varga-Szemes, U.J. Schoepf; *Charleston, SC/US (fullerst@musc.edu)*

Purpose: To correlate the plaque composition of culprit coronary plaques and other risk factors in a NSTEMI population evaluated with both coronary CTA and invasive coronary angiography (ICA).
Methods and Materials: Fifty-nine patients who underwent both CCTA and ICA were included in this study. Risk factors for cardiac events were assessed by chart review. Plaque composition was recorded by a reader and plaque severity was scored from 0 to 3, with a plaque score of 2 or greater considered to indicate a culprit lesion. Culprit lesion composition was assessed and compared. The diagnostic performance of CCTA was also determined in comparison to ICA.
Results: 944 vessels segments were analysed and 170 plaques were evaluated. 93 plaques were calcified, while only 8 plaques were classified as non-calcified; 69 plaques were classified as mixed. The percentage of plaques rated as culprit plaques was significantly higher for non-calcified plaques compared to calcified and mixed plaques (63% vs. 20% and 21%, $p < 0.001$ for both). This plaque scoring approach had a sensitivity of 60% and a specificity of 88% for identifying the culprit lesion using ICA as a gold standard; CCTA had a PPV of 100% and a NPV of 87%. An increased prevalence of hypertension, diabetes, and smoking was found in our population compared to other risk factors.
Conclusion: A diversity of risk factors is significantly associated with the development of NSTEMI. Moreover, 63% of non-calcified plaques were rated as culprit plaques.
Author Disclosures:
U.J. Schoepf: Research/Grant Support; Bayer, Bracco, GE Healthcare, Medrad, Siemens Healthcare.

B-0786 11:03

Morphological features of left atrial appendage in 748 consecutive coronary computed tomography angiography patients without atrial fibrillation

M. Korhonen[1], J. Parkkonen[1], M. Hedman[1], A.T. Muuronen[1], J. Onatsu[1], P. Mustonen[2], R. Vanninen[1], M. Taina[1]; [1]*Kuopio/FI*, [2]*Jyväskylä/FI (Miika.Korhonen@kuh.fi)*

Purpose: A majority of intracardiac thrombi are formed in left atrial appendage (LAA). Previous literature suggests that LAA volume and morphological features may predispose to formation of thrombi and consequent cardioembolic stroke. To better understand the variability in LAA morphology a vast population without a history of atrial fibrillation (AF) undergoing coronary artery computed tomography angiography (CCTA) was investigated.
Methods and Materials: Altogether 810 consecutive patients undergoing CCTA were evaluated, of those 748 patients (498 females; mean age 52.3±9.8 years) had no history of AF. The length, number of lobes and morphological classification (WindSock, ChickenWing, Cauliflower, Cactus) of LAA were assessed. Demographic information and medical history of patients were collected from medical records and evaluated in relation to LAA morphology.
Results: Prevalence of LAA morphological classes for non-AF population was: WindSock 61.5%, Cactus 18.9%, ChickenWing 10.0% and Cauliflower 9.6%. LAA morphological features were not affected by age. Male patients had more multiple lobed (p=0.006) and longer ($p < 0.001$) LAAs. Overweight patients (BMI> 25) had more windsock and cactus type morphologies compared to normal-weighted patients (p=0.022). Patients without atherosclerotic changes in coronary arteries had shorter LAAs (p=0.037). Diabetes, hypertension, dyslipidemia, smoking, non-ischemic coronary arteries or history of myocardial infarction did not influence the morphological features of LAA.
Conclusion: Morphological modifications in LAA seem to be a result of overweight and underlying diseases. In a population of 748 non-AF patients gender, overweight and coronary artery atherosclerosis significantly influenced LAA morphology, but age, as an independent factor, did not.

B-0787 11:11

Prognostic value of coronary CT angiography: a meta-analysis

R.A.P. Takx[1], B. Szilveszter[2], H. Emami[2], T. Mayrhofer[3], T. Leiner[1], U. Hoffmann[2]; [1]*Utrecht/NL*, [2]*Boston, MA/US*, [3]*Stralsund/DE (r.a.p.takx@umcutrecht.nl)*

Purpose: We sought to evaluate the prognostic value of coronary computed tomography angiography (CCTA) for obstructive, non-obstructive coronary artery disease (CAD), high-risk plaque features and 1-2-3 vessel disease.
Methods and Materials: This meta-analysis was conducted in accordance with MOOSE guidelines. The protocol was published in the PROSPERO database. PubMed and EMBASE were systematically searched. The quality assessment was done using QUIPS. Results were pooled using generic inverse-variance method to obtain hazard ratios. Analyses were performed on patient levels.
Results: Overall study quality was good with low risk of bias. Pooled hazard ratio for obstructive CAD on CCTA was 8 and for non-obstructive CAD the hazard ratio was 3 for all events. The presence of high-risk plaque features was associated with a substantial increase in hazard ratio (hazard ratio of 13). We observed a gradual increase in hazard ratios with increasing number of vessels involved.
Conclusion: CCTA findings of CAD are associated with an increased risk for all events. High-risk plaque features are associated with an even higher risk for events and the number of affected vessels is accompanied with an incremental increase in hazard ratio.
Author Disclosures:
R.A.P. Takx: Grant Recipient; Van Leersum Grant of the Royal Netherlands Academy of Arts and Sciences.

B-0788 11:19

The effect of sleep duration on the presence of coronary artery disease

G. Marosi, Z. Drobni, B. Szilveszter, M. Kolossváry, T. Csűry, M. Vecsey-Nagy, A. Molnár, B. Merkely, P. Maurovich-Horvat; *Budapest/HU (gmarosi.tfg@gmail.com)*

Purpose: Sleeping time has a variety of effects on metabolic, endocrine and immune pathways. Recent studies have suggested an association between

sleep duration and coronary artery disease (CAD). The mechanisms that underlie these associations are not fully understood. We sought to investigate the relationship between sleep duration and the presence of CAD as assessed by coronary computed tomography angiography (CTA).
Methods and Materials: We included patients over the age of 18 years from the Semmelweis Cardiac CT Registry, who were referred to coronary CTA and filled out a questionnaire regarding sleep habits. We excluded the patients with history of stroke, acute myocardial infarction and coronary revascularisation. CAD was defined as the presence of any plaque on coronary CTA.
Results: Overall, n=1829 patients were included in the analysis (mean age 57.1±16.0 years; 43.4% female), of whom 62.3% had hypertension (HT), 13.9% diabetes mellitus (DM) and 41.2% dyslipidaemia (DLP). The mean sleep duration was 7.01 ± 1.16 hours. CAD was present in 1351 (73.9%) patients. Univariate analysis showed a significant difference between CAD-positive and CAD-negative patient groups regarding age, gender, HT, DM, DLP (all $p < 0.001$) and sleep duration (p=0.04). However, after adjusting for age, gender and risk factors using logistic regression, we did not find any association between sleep duration and presence of CAD (1.07 95% CI: 0.97-1.19, p=0.16).
Conclusion: In patients with suspected CAD, the length of self-reported sleep duration did not show an independent association with the presence of coronary plaque.

B-0789 11:27

Dose reduction with high-pitch spiral mode coronary calcium scanning in high and irregular heart rates

M. Vonder[1], R. Vliegenthart[1], P.M.A. van Ooijen[1], J.W. Gratama[2], D. Kuijpers[3], C.M. van der Aalst[4], M. van Aerde[4], H.J. de Koning[4], M. Oudkerk[1];
[1]*Groningen/NL*, [2]*Apeldoorn/NL*, [3]*Den Haag/NL*, [4]*Rotterdam/NL*
(m.vonder@umcg.nl)

Purpose: In the Robinsca study we analysed the impact of two scan modes on dose and calcium scoring in irregular or high heart rate.
Methods and Materials: The current study included 885 asymptomatic participants of the Robinsca study (www.robinsca.nl) with an irregular (red Flash check) heart rate and/or heart rate > 65 beats per minute during the CT examination. Individuals were scanned with dual-source CT (Definition Flash, Siemens, Erlangen, Germany) in sequential (reference) and high-pitch spiral mode, at 120 kV and 80 ref mAs. Images were reconstructed with slice thickness/increment of 3.0 mm/1.5 mm, using filtered back projection. Calcifications were evaluated with dedicated software (CT CaScoring, Syngo.via, Siemens, Erlangen, Germany). Participants were stratified in the Agatston score categories: 0, 1-99, 100-399 and 400+. McNemar testing was applied to analyse differences in number of positive scores, and paired sampled T-testing was performed to analyse differences in dose between scan modes.
Results: The number of positive calcium scores was similar for sequential mode (59.3%) and high-pitch spiral (59.8%), p=0.405. The percentage of participants in risk category 0, 1-99, 100-399 and 400+ was for sequential mode 40.7%, 35.7%, 16.2%, and 7.5%, respectively. In case of the high-pitch spiral mode, reclassification occurred in 5.3% in total, spread over all categories. Mean CTDIvol of the sequential and high-pitch spiral mode scan was 3.37 and 1.85 (0.94 and 0.52mSv), p=< 0.001.
Conclusion: Calcium scoring at high and irregular heart rates can be performed with high-pitch spiral mode associated with 45% dose reduction, with very low impact on cardiovascular risk stratification.

B-0790 11:35

Dual source cardiac CT angiography (CCTA) in the preparticipation screening of competitive athletes

C. Rutigliano, C. Santangelo, C. Grippo, B. Merlino, G. Savino, R. Marano, L. Bonomo; *Rome/IT (claruty@hotmail.it)*

Purpose: To assess clinical impact of CCTA with minimal dose exposure in managing athletes with suspected coronary conditions (CAD or coronary anomalies) potentially at risk for sudden cardiac death.
Methods and Materials: 116 sportsmen (mean age 45.6 years) were referred for CCTA examination after cardiological evaluation during the pre-participation screening for their eligibility for competitive sport. All subjects were investigated by 128-slice Dual Source system (Somatom Definition Flash, Siemens Healthcare), with prospectively ECG-gating, either using a sequential or a high-pitch spiral acquisition, during contrast medium administration (50-70 mL, Iomeron 400, Bracco). Phi Coefficient (Rφ) was used to assess correlations between clinical/electrocardiographical and CCTA findings as well as between TTE and CCTA findings. Strongest associations between final eligibility or disqualification decision and disease, as found by CCTA, were investigated using Rφ and Fisher exact test.
Results: CCTA results significantly guided the medical decision making. A significant correlation (R=0.6; $p < 0.001$) was found between coronary anomalies as found by CCTA and eligibility/disqualification decision. Coronary anomalies were identified in 15 athletes (4 malignant). Significant atherosclerotic CAD was found in 6 athletes. A significant but weak correlation for coronary anomalies was found between CCTA and TTE findings (R=0.3; $p < 0.05$) and between CCTA and all clinical/EKG findings combined (R=0.33; p=0.016). High-pitch spiral CCTA effective radiation dose was 1.08±0.41 mSv, significantly ($p < 0.001$) lower than sequential mode (3.45±1.67 mSv).
Conclusion: CCTA represents an important tool in pre-participation screening for competitive sport due to its ability in identifying life-threatening conditions, with minimal dose exposure.

B-0791 11:43

Aortic valve stenosis evaluation: differences in estimated aortic valve area and aortic stenosis severity comparing echocardiography and CTA results

B. Horehledova, M. Kok, N.G. Eijsvoogel, B.M.F. Hendriks, B.L.J.H. Kietselaer, J.E. Wildberger, M. Das; *Maastricht/NL (barbora.horehledova@mumc.nl)*

Purpose: Echocardiography is the current standard in aortic stenosis (AS) evaluation. CT angiography (CTA) offers direct aortic valve area (AVA) visualisation in different phases of the cardiac cycle. The aim was to compare AVA and its severity from echocardiography and CTA in TAVI candidates.
Methods and Materials: 90 pre-TAVI candidates (42 females, 48 males) who underwent diagnostic echocardiography, and retrospectively ECG-gated CT (2nd gen. Dual Source CT) were evaluated. AVA was manually measured using dedicated post-processing software at maximum opening during endsystolic phase, measuring the smallest orifice within the selected phase. In echocardiography, the continuity equation estimated AVA. AVA measurements were compared using paired samples T test. Chi-square test crosstabulation compared AS severity from both methods.
Results: Mean AVA on echocardiography was 0.7833 cm^2, SD 0.2018 cm^2 (range 0.3 cm^2 - 1.4 cm^2). Mean AVA on CT was 1.6580 cm^2, SD 0.4737 cm (range 1.05 cm^2 - 4.42 cm^2). AVA on CT was significantly different compared to echocardiography $p < 0.001$. From 16 moderate AS cases on echocardiography, 1 was confirmed, 13 re-evaluated as mild AS and 2 as normal AVA with direct visualisation on CTA. 36 severe AS on echocardiography were re-evaluated on CTA: 24 mild AS, 12 moderate AS; 38 critical AS on echocardiography were reassessed on CTA: 16 mild AS, 22 moderate AS.
Conclusion: Using pre-TAVI CTA for AVA evaluation results in different mostly larger AVA measurements, potentially resulting in lower severity. Potentially AVA measurements on CT might be more reliable, but severity grading needs to be reassessed.

B-0792 11:51

Prevalence and clinical impact of incidental CTA findings in the work-up for transcatheter aortic valve implantation

F. van Kesteren, E.M.A. Wiegerinck, J. Stoker, J. Baan Jr., R.N. Planken; *Amsterdam/NL (nilsplanken@gmail.com)*

Purpose: Computed Tomography Angiography (CTA) in the work-up for transcatheter aortic valve implantation (TAVI) frequently reveals incidental findings that potentially change patient management and prognosis in this elderly population. We aim to determine the prevalence and effect of incidental findings on the clinical course in these patients.
Methods and Materials: This study is a retrospective analysis of TAVI work-up CTAs between 2009 and 2014. Incidental findings were classified as (1) clinical significant findings limiting eligibility for TAVI due to poor prognosis or requiring immediate action, (2) findings requiring follow-up after TAVI and (3) findings without consequences.
Results: 623 patients were included (n=354, 56.8% female, mean age 79.8 ± 8.8 years). Class 1 findings reported in 60 patients (9.6%) included suspected malignancy (n=41, 6.6%), aortic aneurysms (n=13, 2.1%), diverticulitis (n=2, 0.3%), cardiac thrombi (n=2, 0.3%), suspected colitis (n=1, 0.2%) and a suspected aortic root abscess (n=1, 0.2%). Malignancy and diverticulitis were confirmed in 13 and 2 patients (31.7% and 100%), respectively. Class 2 findings reported in 153 patients (24.6%) included probably benign tumours (n=122, 19.6%) and aneurysms requiring follow-up (n=40, 6.4%). Class 3 findings were reported in 581 patients (93.3%). Patients with class 1 findings were more frequently rejected for TAVI treatment (n=14, 23.3% vs n=49, 8.7%; p=<.001). Class 1 findings resulted in a significant delay between CTA and TAVI (median 48.0 [19.3-84.0] vs 28.0 [15.0-58.0] days; p=.04).
Conclusion: The prevalence of incidental findings is high in elderly TAVI patients. Incidental findings may alter patient management and may lead to substantial treatment delay.

10:30 - 12:00 **Studio 2016**

Neuro

SS 1011a

Neurovascular interventions (2)

Moderators:
T. Kau; Klagenfurt/AT
N.N.

B-0793 10:30

Prediction of stent-retriever thrombectomy outcomes by dynamic CT angiography in patients with acute carotid T or MCA occlusions

K.M. Thierfelder, W.H. Sommer, B. Ertl-Wagner, S.E. Beyer, F.G. Meinel, W.G. Kunz, M.F. Reiser, H. Janssen; *Munich/DE*
(kolja.thierfelder@med.uni-muenchen.de)

Purpose: To determine the predictive value of three different dynamic CT angiography (dynCTA) parameters - occlusion length, collateralization extent, and time delay to maximum enhancement - for latest generation stent-retriever thrombectomy recanalisation outcome in patients with acute ischemic stroke.
Methods and Materials: In this IRB-approved study, subjects were selected from an initial cohort of 2059 consecutive patients who had undergone multiparametric CT including whole-brain CT perfusion (WB-CTP). We included all patients with (a) a complete occlusion of the M1-segment of the MCA or the carotid T and (b) subsequent intraarterial stent-retriever thrombectomy. dynCTA was reconstructed from WB-CTP raw datasets. Angiographic outcome was scored using the modified Thrombolysis in Cerebral Infarction Scale (mTICI), clinical outcome using the modified Rankin Scale (mRS). Logistic regression analyses were performed to determine independent predictors of a favorable angiographic (mTICI=3) and clinical outcome (mRS≤2).
Results: Sixty-nine patients (mean age 68±14 yrs, 46% male) were included for statistical analysis. In the regression analysis, a short occlusion length was an independent predictor of favorable angiographic outcome (OR: 0.41, p0.05) and time delay to peak enhancement (OR: 0.90, p> 0.05) failed to predict a favorable angiographic outcome. None of the dynCTA predictors was significantly associated with clinical outcome on discharge (OR: 0.664-1.011; p: 0.330-0.953) or at 90 days (OR: 0.779-1.016; p: 0.130-0.845).
Conclusion: A short occlusion length as determined by dynCTA is an independent predictor of a favorable angiographic outcome of stent-retriever thrombectomy in patients with ischemic stroke.

B-0794 10:38

Endovascular therapy of low and intermediate grade lateral intracranial dural arteriovenous fistulas: results and complications of different technical approaches

L.M. Ertl, H. Brückmann, M. Kunz, A. Crispin, G. Fesl; *Munich/DE*
(lorenz.ertl@med.uni-muenchen.de)

Purpose: Sinus preserving (SP) embolisation techniques augmented endovascular treatment options of lateral intracranial dural AV-fistulas (LDAVF). We aim for a retrospective comparison of their primary success rates, complication rates and long term follow-up compared to sinus occluding (SO) treatment variants in the collective of low and intermediate grade LDAVF (Cognard °I - IIb).
Methods and Materials: We retrospectively analysed clinical symptoms, complication rate and Cognard grading prior to and after endovascular fistula treatment with different technical approaches in 36 patients with LDAVF Cognard °I - IIb. Long-term success rate was determined by a standardized questionnaire.
Results: SO approaches offer a higher rate of definite fistula occlusion (93% SO vs. 71% SP) but come up with a significantly higher complication rate (33%, 20% resp. SO vs. 0% SP). Interviewed patients reported on a very good health satisfaction in the long term follow-up in both groups.
Conclusion: Higher rate of definitive fistula occlusion in the SO group was attained by the price of a significantly higher complication rate. SP approaches offer a good primary success rate in combination with a very low complication rate. SO approaches should be restricted to cases in which SP treatment doesn't achieve a downgrading to < Cognard ° IIa.

B-0795 10:46

Experience and outcomes in the use of a pipeline embolisation device (PED) for the treatment of intracranial aneurysms: a single-centre study

K. James, P. Nicholson, J. Murphy, G. Wyse, N. Fanning; *Cork/IE*
(karl.james@hse.ie)

Purpose: To assess the effectiveness of treatment of intracranial aneurysm with pipeline embolisation devices in our department and to compare compilation rates with those in the reported literature.
Methods and Materials: All pipeline embolisation devices used in our department over a 4.5-year period were included. Data collected included patient demographics, aneurysm types, indication for use, rates of successful aneurysm occlusion and rates/severity of complications.
Results: 54 pipeline embolisation devices were placed into 44 patients. Complete aneurysm occlusion on follow-up angiography was 85%, partial occlusion 10% and non-occlusion 5%. Peri-procedural mortality was 4.5% and severe neurological morbidity rate was 4.5%.
Conclusion: Occlusion and complication rates encountered in our department are similar to those seen in other studies. This is further evidence that whilst pipeline embolisation devices are useful in certain circumstances, they should be regarded as a second-line treatment and careful preoperative patient consultation is required.

B-0796 10:54

Cost-effectiveness of mechanical thrombectomy in acute ischaemic stroke: an independent study of a UK centre

S. Gargalas[1], J. Jones[2]; [1]*Oxford/UK*, [2]*Cambridge/UK (s@gargalas.org)*

Purpose: To conduct an independent evaluation of cost-effectiveness of mechanical thrombectomy in a large tertiary centre in the United Kingdom.
Methods and Materials: A model-based cost-effectiveness analysis of mechanical thrombectomy versus intravenous thrombolysis was conducted from the perspective of the UK National Health Service. Outcomes were measured in terms of incremental costs and effects (measured as quality-adjusted life years); reduction of disability, deaths prevented and net economic benefit were also considered. Data were utilised from previously published positive studies of mechanical thrombectomy, supplemented by site-specific data. Special attention was given to cost data and accuracy of cost estimation.
Results: Mechanical thrombectomy was proven to be a cost-effective method for treatment of acute ischaemic stroke, with incremental cost per QALY approx. £7800.
Conclusion: Mechanical thrombectomy is cost-effective in the United Kingdom and should be considered for standard of care from economic perspective.

B-0797 11:02

Cerebral aneurysms: accuracy of 256-MDCT non-subtracted and subtracted volumetric CT angiography in diagnosis

A.K. Sharma, N.S. Sharma; *Delhi/IN (shokie10@hotmail.com)*

Purpose: To assess the accuracy of 256-detector row non-subtracted and subtracted volumetric CT angiography for detection of cerebral aneurysms.
Methods and Materials: After institutional review board approval and informed consent was obtained. 141 consecutive patients suspected of having cerebral aneurysms underwent CT angiography.The sensitivity and specificity of CT angiography for detection of aneurysms were analysed. P values less than.05 were considered to indicate a significant difference.
Results: 70.2% had aneurysms that were detected on the basis of DSA. Non-subtracted CT shows 96.7%.The primary reason for missed aneurysms was close proximity to bone tissue. Sensitivity, specificity and accuracy for non-subtracted images was 96.7%,100% and 97.5% on per aneurysm basis respectively and for subtracted images-99.2%, 100% and 99.4%.
Conclusion: Subtracted 256 MDCT angiography should be the first line technique for cerebral aneurysms.

B-0798 11:10

Manual aspiration thrombectomy using penumbra catheter in patients with acute M1 occlusion: a single center study

Y. Kim, H. Kwak, G. Chung, S. Hwang; *Jeonju-si/KR*
(yongseek.kim@gmail.com)

Purpose: Efficacy and safety of aspiration thrombectomy using Penumbra in acute occlusion of intracranial artery has been proved in many previous studies. Our study aimed to retrospectively assess the efficacy and safety of a manual aspiration thrombectomy using Penumbra in patients with M1 occlusion.
Methods and Materials: We conducted a retrospective review of 70 patients who underwent manual aspiration thrombectomy using Penumbra catheters for treatment of M1 occlusion between January 2012 and December 2014. We evaluated immediate angiographic results and clinical outcomes through reviewing of patient's electrical medical records.
Results: Male was dominant sex in this study (M:F = 38:32) and median age was 72 (age range, 36-91). The rate of successful recanalisation (TICI grade ≥ 2b) was 91.4% (64/70). The successful recanalisation rate by single Penumbra was 82.9% (58/70). Six patients were treated in combination with Solitaire stent. Median NIHSS score was 11 (range, 4-20) at admission and was 3 (range 0-23) at discharge. Favorable clinical outcomes (mRS score at 3 months ≤ 2) were seen in 42 patients (60%). Two patients were observed subarachnoid hemorrhage after procedure. Another two patients were died to related massive symptomatic hemorrhage, brain edema, and herniation in hospital.

Conclusion: Manual aspiration thrombectomy appears to be safe and is capable of achieving high rate of successful recanalisation and favorable clinical outcomes in patients with M1 occlusion.

B-0799 11:18

The use of practice parameters for quality assurance of diagnostic craniocervical catheter angiographic procedures

A. Lai, T. Lee, B. Lai, K. Tang, W. Leung, S. Lo, J. Khoo; *Hong Kong/HK (aytlai7@gmail.com)*

Purpose: Cerebral digital subtraction angiography (DSA) is indicated when non-invasive studies yield inconclusive results, or for treatment planning and evaluation. However, it is a procedure with inherent risks, rendering patient selection and quality assurance crucial. Performance measurement by the use of practice parameters defined by professional organisations such as ACR-ASNR-SIR-SNIS Practice Parameter can help ensure the delivery of safe and effective medical care.
Methods and Materials: A total of 33 patients underwent cerebral DSA over 6 months in our institution. The radiology examination records and electronic patient records of 33 patients were retrospectively reviewed for the indications and complications arising from a total of 37 procedures and 65 vessels cannulated.
Results: Most of the procedures were performed for definition of aneurysms or vascular malformations, and for treatment planning or evaluation. About 24.3% were performed to define the aetiology of subarachnoid haemorrhage, and 10.8% for the diagnosis and evaluation of the extent of Moyamoya disease. All were within the list of indications presented in ACR-ASNR-SIR-SNIS Practice Parameter. All procedures yielded a successful examination. None of the patients experienced any major complications. Out of the 65 vessels cannulated, there was one case of non-flow limiting focal dissection at the cervical internal carotid artery (1.5%). Overall, our performance is better than the reported rates and suggested thresholds in ACR-ASNR-SIR-SNIS Practice Parameter.
Conclusion: The performance of cerebral DSA in our institution is better than the reported rates and suggested thresholds in the ACR-ASNR-SIR-SNIS Practice Parameter.

B-0800 11:26

Role of CT-angiography and digital subtractional angiography in cerebral aneurysm volume estimation

A. Navichenka, A. Beimanov, P. Konovalov, B. Piskun, A. Gontchar; *Minsk/BY (sanyok@tut.by)*

Purpose: to define evaluation of aneurysmal sack size, angel between aneurysm and parent vessel and coil types on quality of brain arterial aneurysm embolisation by coils.
Methods and Materials: CTA and DSA images were acquired in 28 patient before and post embolisation by bare metal and hydrogel polymer coated platinum coils. Aspect ratio (H/N), dom- to-neck ratio (D/N), angel between sack and parent vessel, volume of coils needed to embolisation were calculated.
Results: Statistically significant increasing of aneurysmal sack up to 48.4% (p1.6 embolisation percentage was 29.9% (22%; 57.7%), in opposite group - 41.2% (35%; 50.6%), p=0.6. In patients group with H/N> 2 embolisation percentage was 42.2% (24.4%; 67.9%) and for opposite group - 35% (24.1%; 48.1%) correspondingly, p=0.55. Mean angel between aneurysm and parent vessel was 132.25±20° and there were no difference in percentage embolisation in groups, randomised due to this characteristic - 47.9±30.3% and 44.5±19.4%.
Conclusion: In according to increasing of H/N ratio increasing embolisation percentage of brain aneurysm sack. Greater D/N index needs less coils for total embolisation. Coated coils are preffered due to their higher embolisation ability. Angel between aneurysm and parent vessel doesn't influence on embolisation quality.

B-0801 11:34

Automated detection of coiled aneurysm recurrence using 3D TOF MRA

A.S. Tuan, R.W. Hurst, M. Bilello; *Philadelphia, PA/US (august.tuan@uphs.upenn.edu)*

Purpose: 3D TOF MRA is becoming an increasing popular modality to assess coiled aneurysm recurrence. Interpreting serial MRA studies can be a tedious and error-prone task for the neuroradiologist, primarily in quantitative assessment of aneurysmal recurrence. In particular, studies have reported different inter-observer agreement. These limitations highlight a need for the development of an automated system to detect and quantify aneurysm recurrence.
Methods and Materials: 3D TOF MRA images were acquired from 11 patients. Acquired baseline and follow-up images were postprocessed including coregistration, skull-stripping, intensity normalization, and bias correction. Vessels were automatically segmented on a volume wise basis by intensity thresholding. Changes were computed and displayed with subtraction maps. Performance was assessed by comparison with a human expert.
Results: Following accurate registration and establishment of consistency with respect to vessel detection, forward and backward difference images across pairs of serial scans were created, using image subtraction that permit detection of aneurysmal change. The two-way subtraction allows tracking of both progressing and regressing aneurysms. Preliminary data demonstrate increased accuracy for aneurysmal recurrence or growth by 27%. False positives occur mainly at the edges of volumes. We are working on recruiting more cases, and are planning to perform ROC analysis.
Conclusion: This system will aid not only neuroradiologists in everyday clinical care of aneurysmal patients through increased reproducibility and accuracy than current tedious methods, but also in research areas, as a large amount of imaging data can be analysed reliably, accurately, and objectively for aneurysmal change.

B-0802 11:42

Acute ischemic stroke (AIS), outcome predictors after intra-arterial thrombectomy

E. Puglielli, R. Lattanzi, L. Gregori, V. Di Mizio, V. Di Egidio; *Teramo/IT (edopug@hotmail.com)*

Purpose: Aim of this work is to point out about others outcome predictors after thrombectomy in AIS.
Methods and Materials: 193 consecutive patients with AIS (mean age 55.7y, from April 2009 to September 2015), with classic on-set, undergoing to endovascular therapy using retrievable stents or multimodal approaches, thromboaspiration, i.v. and/or intra-arterial thrombolysis and PTA/permanent stent. CTP/CTA and DSA were used for the imaging. Patient's age, sex, aetiology of occlusion, on-set time, median NIHSS score at presentation and mRS, recanalisation and complications were recorded and correlated using a multiple logistic regression analysis. 6months good functional outcome (mRS 0-2) was observed in 81.86% (158/193) under 300 min on-set time.
Results: Sites of arterial occlusion before treatment were: M1 118/193 patients (61.13%), intracranial carotid 23/193 patients (11.91%), M2 16/193 (8.29%), tandem occlusion 10/193 (5.18%), extracranial internal carotid isolated occlusion 9/193 (4.66%), P1 8/193 (4.14%), basilar trunk 9/193 (4.66%). Therapeutic interventions: thrombectomy 89/193 (46.11%), multimodal therapy 59/193 (30.56%), bridging 42/193 (21.76%), aspiration 3/193 (1.55%). Median NIHSS score at presentation was 23 (range 2-37). Successfully recanalisation (TICI 3 or 2b) was achieved in all patients (TICI III in 130/193 [67.35%]), with high rate of recanalisation for mechanical thrombectomy, compared to multimodal (TICI III 76/193 [39.37%]) or aspiration (TICI III 3/2 [66.33%]), $p < 0.005$.
Conclusion: Knowledge about the individual vascular pathology that influence stability of recanalisation, collaterals and on-set time has been identified as major prognostic factor for good outcome in AIS.

B-0803 11:50

Thrombo-aspiration in acute ischemic cerebral stroke: first results

M. Voormolen, T. van der Zijden, O. d'Archambeau, F. De Belder, J. Maes, L. Yperzeele, I. Baar, P.M. Parizel; *Edegem/BE (maurits.voormolen@uza.be)*

Purpose: Evaluation of endovascular mechanical thrombo-aspiration results in patients with acute ischemic stroke.
Methods and Materials: Thrombo-embolic acute ischemic events are the most frequent neurological event. If applicable, intra-venous thrombolysis (IVT) can be administered. Beyond the time window for IVT or when contra-indicated, mechanical thrombectomy (MT) with stent retrievers shows promising results on recent trials. Alternatively to MT, local catheter thrombo-aspiration (TA) may be used. We retrospectively evaluated the first results of catheter TA in our hospital in patients with acute ischemic stroke.
Results: From December 2014 until September 2015, TA was performed in 12 patients (6 men, 6 women; mean age 63 years, range 39-88). Thrombo-occlusion site was: 9 middle cerebral artery, 2 carotid tip and 1 complete internal carotid artery. There were no procedure related complications. In 8 cases TA alone and in 4 cases combined TA and stent retriever was used after incomplete recanalisation with TA alone. In 9 cases bridging with IVT was applied. Overall, complete recananalisation rate (TICI 2b and 3) was 83%, good clinical outcome (mRS 0-2) was 58%, 3 patients died (25%) and 2 (17%) had permanent severe neurological deficits. No significant intracranial haemorrhages occurred. Mean time from onset to recanalisation was 4 hours; mean time from puncture to recanalisation was 48 minutes (range 16 - 90 min).
Conclusion: First results of thrombo-aspiration (TA) in acute ischemic cerebral stroke patients provides excellent recanalisation rates. The procedure seems fast and safe. If catheter TA alone doesn't recanalise, combined stent retriever thrombectomy generally provides recanalisation.

10:30 - 12:00 **Room E1**

Musculoskeletal

SS 1010a

Oncology

Moderators:
S. Boudabbous; Geneva/CH
K. Wörtler; Munich/DE

K-24 10:30

Keynote lecture
K. Wörtler; *Munich/DE*

B-0804 10:39

Differentiation of benign and malignant marrow infiltration with multiparametric MR imaging: pilot study
J. Baik, J.-Y. Jung, W.-H. Jee; *Seoul/KR (bailla114@gmail.com)*

Purpose: To explore the useful MR parameters derived from intravoxel incoherent motion diffusion-weighted imaging (IVIM-DWI), multi-echo Dixon imaging (M-Dixon), and dynamic contrast-enhanced imaging (DCE) for differentiating benign hypercellular marrow and trabecular-preserving marrow metastasis
Methods and Materials: Included were forty-five patients with 15 benign and 30 malignant marrow infiltration, who underwent 3 T MRI including IVIM-DWI, M-Dixon and DCE-MRI. Following lesion characteristics and parameters were analysed: signal intensity, contour and margin on conventional MR images; signal intensity on *b*-800 images ($SI_{b\text{-}800}$), apparent diffusion coefficient (ADC), true diffusion coefficient (Dslow), pseudodiffusion coefficient (Dfast), and perfusion fraction (Pf) from IVIM-DWI; fat fraction (Ff) from M-Dixon; time-to-signal intensity curve (TIC) pattern, volume transfer constant (Ktrans), rate constant (Kep), and extravascular extracellular volume fraction (Ve) from DCE. Pearson's chi-squared test, Fisher's exact test, and Mann-Whitney U test were performed for comparison.
Results: Malignant marrow infiltrative lesion tends to have convex contour and relatively well-defined margin (p=0.021, p=0.025, respectively). ADC, Dslow, Ff demonstrated a significant difference between the two groups ($p < 0.001$). Mean±standard deviation of benign vs. malignant marrow infiltrations were 415.7±176.3 μm^2/sec vs. 1023.6±485.2 μm^2/sec in ADC, 422.3±167.2 μm^2/sec vs. 1022.4±487.6 μm^2/sec in Dslow, and 53.9±23.0% vs. 10.6±10.8% in Ff. However, the signal intensity on conventional images, $SI_{b\text{-}800,}$ and perfusion-related parameters from IVIM-DWI and DCE were not significantly different between the two groups ($p > 0.05$).
Conclusion: Contour and margin, ADC, Dslow and Ff may provide significant information, whereas signal intensity, and perfusion-related parameters from IVIM-DWI and DCE have little value for differentiation of benign and malignant marrow infiltration.

B-0805 10:47

Staging multiple myeloma patients: quantitative analysis of apparent diffusion coefficient (ADC) maps as potential marker for bone marrow involvement characterisation
P.A. Bonaffini, D. Ippolito, A. Casiraghi, A. Nasatti, C. Talei Franzesi, S. Sironi; *Monza/IT (pa.bonaffini@gmail.com)*

Purpose: To evaluate the added value of quantitative analysis of ADC maps for the characterisation of bone marrow involvement at staging in multiple myeloma (MM) patients.
Methods and Materials: Fifteen patients undergoing a baseline 1.5 T Whole Body MRI study (Achieva, Philips) were evaluated. The scanning protocol included coronal (skull vertex to ankle) and sagittal (axial skeleton) short-tau inversion recovery (STIR) T2 and T1 TSE and axial DWIBS (b: 0-500-1000 mm2/sec) sequences. According to their visual and qualitative analysis, up to 3 target lesions per patient were selected, with focal (6), diffuse (6) and combined (3) disease. ROI was manually drawn on ADC maps; mean ADC values of focal (ADC1) and diffuse (ADC3) localizations were calculated and compared each other and with ADC of normal bone marrow (ADC2).
Results: Twenty-two neoplastic bone lesions (10 focal, 12 diffuse), characterised by high signal intensity on DWIBS as compared to normal bone marrow, were retrospectively analysed. The mean ADC values were 1.06±0.27x10-3 mm²/sec in focal lesions (ADC1), 0.75±0.19x10-3 mm²/sec in diffuse involvement (ADC3) and 0.34±0.07x10-3 mm²/sec in normal bone marrow (ADC2). The whole bone localizations (ADC1-ADC3) demonstrated significantly higher (p=0.001) ADC values as compared to normal bone marrow (ADC2). ADC values were significantly lower (p=0.003) in cases of diffuse involvement than those of focal pattern.
Conclusion: In MM patients ADC maps analysis provides quantitative data potentially useful for non-invasive characterisation of bone marrow at staging, both in terms of differentiation between lesions and normal marrow and also for distinguishing the pattern of neoplastic involvement.

B-0806 10:55

Differentiation of multiple myeloma and metastases of the spine using diffusion-weighted MR imaging including ADC histogram moments at 3 T
G. Park, W.-H. Jee, S.-Y. Lee, J.-Y. Jung, K.-Y. Ha, C.-K. Min, Y. Son, M. Paek; *Seoul/KR (hoonhoony@naver.com)*

Purpose: To determine the diagnostic performance of diffusion-weighted imaging (DWI) including apparent diffusion coefficient (ADC) histogram moments for differentiating multiple myeloma from metastases of the spine at 3 T.
Methods and Materials: IRB approved this retrospective study and informed consent was waived. MRI including DWI with high b values was analysed in 38 pathologically confirmed patients with multiple myeloma (n=18) and metastases (n=20) of the spine at 3 T. Average ADC (ADCaverage) and minimum ADC (ADCmin) were measured in 66 lesions of multiple myeloma or metastases by two independent musculoskeletal radiologists. Another reviewer performed ADC histogram analysis in 46 lesions of multiple myeloma or metastases and obtained the histogram moments [mean (ADCvolume), standard deviation (SD), skewness, and kurtosis] of ADC for whole tumour volume.
Results: ADCaverage, ADCmin, and ADCvolume of multiple myeloma were significantly lower than those of metastases:716±135 µm2/sec, 666±132 µm2/sec, and 702±92 µm2/sec for multiple myeloma, 1060±321 µm2/sec, 873±246 µm2/sec, and 1100±334 µm2/sec for metastasis ($P < 0.05$). SD of multiple myeloma was significantly lower than those of metastases; 153±49, 236±105, respectively (P=0.001). Skewness and kurtosis were not significantly different. Area under the ROC curve of ADCvolume, ADCaverage, ADCmin, and SD were 0.978, 0.934, 0.875, and 0.839, respectively. Cutoff values of ADCvolume and ADCaverage for differentiating multiple myeloma from metastases were 882 µm2/sec (sensitivity 96.4%, specificity 88.9%) and 846 µm2/sec (sensitivity 83.7%, specificity 84.5%).
Conclusion: DWI including ADC histogram moments is reliable and accurate for differentiating multiple myeloma from metastases of the spine, especially ADCvolume, ADCaverage, and SD at 3 T.

B-0807 11:03

Usefulness of computer-aided detection (CADe) using temporal subtraction and 3D non-rigid registration for detecting bone metastasis on whole body thin-slice CT
D. Hasegawa[1], Y. Ichikawa[1], R. Nakayama[1], Y. Kurobe[1], S. Chino[1], M. Ishida[1], K. Kitagawa[1], S. Murashima[2], H. Sakuma[1]; [1]*Tsu/JP*, [2]*Matsusaka/JP (h-daisuke@clin.medic.mie-u.ac.jp)*

Purpose: To develop a new CADe method that utilizes temporal subtraction and 3D non-rid registration, and to determine the value of this approach for the detection of bone metastases on whole body thin-slice CT.
Methods and Materials: A pair of serial whole body CT acquired with slice-thickness of 1.25 mm were analysed in 28 patients. All subjects underwent the third follow-up CT to determine the presence and absence of bone metastases. Three-dimensional non-rigid registration was performed by analyzing pixel velocities by edge and gradient of the objects, which was followed by temporal subtraction between the first and second CT examinations. Three experienced radiologists (≧10 years of experience) and 3 radiology residents independently evaluated the presence or absence of bone metastasis with and without use of CADe.
Results: 3D non-rigid registration and temporal subtraction were successfully performed in all patients by using our algorithm. A total of 22 metastatic foci (mean size, 16±9 mm in diameter) of the bones were confirmed in 11 patients on the third follow-up CT. The number of bone metastases detected by CT was 9.5±3.9 with CADe (range 8-14 by experienced radiologists and 3-12 by residents), being significantly higher than that without CADe (7.5±3.1, $p < 0.05$, range 6-11 by experienced radiologists and 3-8 by residents).
Conclusion: Our new CADe method employing 3D non-rigid registration and temporal subtraction can be successfully applied for the interpretation of serial whole body thin-slice CT studies, and provides improve detection of bone metastases.

B-0808 11:11

Chondrogenic tumours: role of advanced magnetic resonance imaging

W.M. Amin, H.T. Kotb, A.A. Farahat, M.S. Barakat, A.E. Rafallah, S.H. Fadel; *Alexandria/EG (wmgamin@yahoo.co.uk)*

Purpose: To highlight the role of diffusion imaging, chemical shift and perfusion imaging in characterisation of chondrogenic tumours.
Methods and Materials: The study was carried on 16 patients of clinical and radiographic findings suggestive of chondrogenic lesions at one-year duration. Examination was done using 1.5 T. Examination included: Routine MRI sequences in addition to: in-opposed phase: gradient-based FFE dual-echo sequence: TR/2 TE= 130/ (4.6 and 2.3) ms. Diffusion-weighted sequence: TR/TE=4000/90, b values 2 (0, 1000), no of directions (including b=0) = 4. Dynamic contrast-enhanced perfusion sequence (T1-FFE) of TR/TE: 12/ 4 ms, 8 measurements. Contrast media injection using automatic power injector, with a rate of 0.1 mmol/kg gadolinium-DTPA at a rate of 2 ml/sec. Post-processing analysis was for calculation of in-opposed signal intensity ratio (SIR), diffusion restriction and ADC value calculation as well as dynamic perfusion curve assessment.
Results: Sixteen patients (10 males and 6 females) with age range of 14-46 years were evaluated. Final pathological diagnosis was osteochondroma (n=8), chondroblastoma (n=2), chondromyxoid fibroma (n=1), enchondroma (n=3) and chondrosarcoma (n=2). SIR ranged 0.2-0.7 for benign lesions. SIR was 0.8 in both chondrosarcomas. No diffusion restriction was found in benign lesions ADC value ranging 1.6-3.2 X 10-3 mm2/sec. Chondrosarcoma showed diffusion restriction with low ADC value of 0.8 X 10-3 mm2/sec. The perfusion dynamic curve revealed type II benign curve for benign lesions and type IV malignant curve chondrosarcoma.
Conclusion: Advanced MRI sequences can help in characterisation of chondrogenic tumours when used on a wider randomised clinical trial.

B-0809 11:19

Dynamic contrast-enhanced MR imaging in osteoid osteoma: relationships with clinical and CT characteristics

P. Pottecher[1], E. Sibileau[2], L. Emerich[2], S. Touraine[2], B. Hamze[2], C. Parlier[2], D. Petrover[2], J. Laredo[2], V. Bousson[2]; [1]*Dijon/FR*, [2]*Paris/FR (pierre.pottecher@gmail.com)*

Purpose: Describe the enhancement parameters of time-signal intensity curves of osteoid osteoma (OO) obtained in DCE-MRI and look for relationships between those parameters and clinical data and morphological CT characteristics.
Methods and Materials: From January 2008 to November 2013,259 patients with clinical/radiological characteristics of OO,were treated with interstitial laser ablation at our institution.Among this population,patients who met the following criteria were included: pathologically proven OO,available clinical files,and DCE-MRI and CT obtained at our institution.The following variables were recorded: gender,age,pain duration (PainD),at DCE MRI:pattern of time enhancement-curve and the rising slope (Sloperise), and at CT:type and segment of bone involved (OOlocation and OOsegment),location of OO relative to cortex (OOlocationcortex), nidus area,presence or absence of a neighboring vessel,maximal diameter of neighboring vessels (Dmaxvessel).
Results: Agreement for quantitative measurements was assessed.The study sample consisted in 102 patients.Mean age was 22.63 years and PainD was 15.99 months.Interobserver reproducibility was very good for Sloperise and Dmaxvessel.In DCE-MRI,an early arterial peak enhancement was observed in 93% with a mean Sloperise at 9.30.A vessel was seen in 82% of cases with a mean Dmaxvessel at 1.10 mm.In univariate analysis,Sloperise was significantly correlated with PainD and Dmaxvessel (r=0.30; P=0.003 and r=0.22; P=0.03 respectively).In multivariate analysis, Dmaxvessel and OOlocation were at the limit of significance with respectively P=0.064 and P=0.075 compared to PainD (P=0.126)
Conclusion: With a frequent early arterial peak enhancement and a correlation between Sloperise and Dmaxvessel,this study highlights the arteriolar blood supply of OOs.OOs with a longer pain duration and located on short and flat bones, appeared highly vascular

B-0810 11:27

Multivariate data analysis as a clinical tool for differentiating intraarticular synovial sarcomas from localised pigmented villonodular synovitis

D. Nordemar[1], J. Öberg[2], O. Brosjö[2], M. Skorpil[2]; [1]*Stockholm/SE*, [2]*Solna/SE (mikael.skorpil@ki.se)*

Purpose: Differentiating intraarticular synovial sarcomas from the much more common localised (unifocal) pigmented villonodular synovitis (PVNS) is difficult. This study aimed to investigate if multivariate data analysis (MVA) could be used as a complementary clinical tool.
Methods and Materials: MRI and radiographs of 7 cases of intraarticular synovial sarcomas (although few cases, it is a large material of these very rare tumours) and 14 cases of localised PVNS were blindedly reviewed. Variables analysed were size, extraarticular growth, tumour border, blooming, calcification, contrast media enhancement, fluid levels, effusion, synovial low signal intensity, synovitis, age and gender. The method partial least squares - discriminant analysis (PLS-DA), which relates data matrices to each other by a linear multivariate model, was used. PLS-DA creates a predictive model that best separates the groups, i.e. sarcomas and PVNS. The variable influence on projection (VIP) parameters reflect the importance of each variable for separating the groups. Terms with VIP > 1 are the most relevant.
Results: VIP > 1: age (1.32), effusion (1.32), size (1.22) and gender (1.16). No sarcomas were misclassified as PVNS, while 3/14 PVNS were misclassified as sarcomas. Calcification and blooming were excluded in the analysis due to the number of cases with missing radiographs or GRE sequences.
Conclusion: The most important variables in differentiating intraarticular sarcomas from localised PVNS were age, effusion, size and gender. MVA could be helpful as a clinical guiding tool to avoid a biopsy, if the tumour is classified as most likely being PVNS.

B-0811 11:35

Enchondroma vs low-grade chondrosarcoma: the role of dynamic contrast MRI

D. Costachescu; *Timisoara/RO (dan_costachescu@yahoo.com)*

Purpose: The objective of the study is to determine whether the use of dynamic contrast MRI can make a differentiation between benign and malignant low-grade cartilaginous tumours.
Methods and Materials: Retrospective study started January 2013. 45 patients were included in the study, all having cartilaginous tumours larger than 5 cm. At the time of diagnosis, patients underwent MRI and dynamic contrast enhanced MRI. 41 patients had the tumours resected. Following hystopathologic examination, 32 tumours were considered enchondromas and 9 tumours chondrosarcomas.
Results: Using a cut-off value of twice the normal muscle vascularisation, DCE MRI managed to differentiate between enchondroma and low grade chondrosarcoma with a sensitivity of 95.1%.The accuracy of the method in the diagnosis of chondrosarcoma was 88.8%.
Conclusion: DCE MRI and Standard MRI play an important role in the differentiation of benign and cartilaginous bone tumours. Further studies are required for a more standardized approach of these tumours.

B-0812 11:43

Diagnostic performance of conventional MRI and apparent diffusion coefficient values in differentiating benign and malignant soft tissue tumours

Y. Yoon, D. Oh, Y. Song; *Seoul/KR (odk6464@hanmail.net)*

Purpose: To compare the abilities of conventional magnetic resonance imaging (MRI) parameters and apparent diffusion coefficient (ADC) values in differentiating between benign and malignant soft tissue tumours (STTs).
Methods and Materials: A total of 123 patients with STTs (70 malignant, 53 benign; 66 myxoid STTs, 6 STTs with hemosiderin deposition, 51 non-myxoid non-hemosiderin STTs) who underwent pre-operative MRI, including diffusion weighted imaging were enrolled. Two musculoskeletal radiologists analysed conventional MRI findings, including maximum tumour diameter, deep compartment involvement, central necrosis, and T1 heterogeneity. Mean and minimum ADC values were also measured. Differences in the frequency of parameters and odds ratios (OR) were calculated. Cut-off values and diagnostic performance for continuous variables were also examined.
Results: Significant differences in the frequency of conventional MRI parameters and mean and minimum ADC values were identified, but deep compartment involvement between benign and malignant STTs was the same. The OR was 9.29 for maximum diameter, 5.68 for minimum ADC, 4.33 for mean ADC, 3.58 for T1 heterogeneity, and 5.36 for central necrosis. The MRI parameters in subjects with non-myxoid, non-hemosiderin STTs had significant differences in mean ADC, minimum ADC, and T1 heterogeneity, with an OR of 21.25 for mean ADC, 10.51 for minimum ADC, and 4.38 for T1 heterogeneity.
Conclusion: Both ADC values and conventional MRI findings (e.g., maximum diameter, T1 heterogeneity, and presence of central necrosis) were useful in differentiating between malignant and benign STTs. The ADC values and T1 heterogeneity were the most powerful diagnostic parameters in non-myxoid non-hemosiderin STTs.

10:30 - 12:00 **Room E2**

Neuro

SS 1011b

Cerebrovascular disease (3)

Moderators:
M. Buruian; Targu-Mures/RO
T. Rostovtseva; St. Petersburg/RU

B-0813 10:30

Predictive value of perfusional CT parameters in evaluating reperfusional effectiveness in acute ischemic stroke patients

A. Bernardoni, E. Raimondi, A. Clarizia, M. Padroni, E. Groppo, C. Tamborino, A. Saletti, M. Giganti, E. Fainardi; *Ferrara/IT*
(dr.edoardo.raimondi@gmail.com)

Purpose: To identify CT perfusion (CTP) parameters at stroke onset and at follow-up associated with reperfusion at 24 hours and good clinical outcome at 90 days.
Methods and Materials: We retrospectively investigated 80 patients with acute ischemic stroke (11 untreated and 69 treated with either intravenous thrombolysis or endovascular therapy) who were imaged < 6 hours from stroke symptom onset with non-enhanced CT, CT Angiography (CTA) and CTP at admission and at 24 hours. Cerebral blood flow (CBF), cerebral blood volume (CBV) and Tmax were measured in total hypoperfused area as outlined on baseline Tmax maps. Recanalisation was assessed on 24 hour CTA according to TICI criteria modified for CTA. Successful reperfusion was defined as ≥ 59% reduction in size of baseline Tmax lesion at follow-up CTP. Good outcome was defined as 90 day-modified Rankin scale (mRS)≤2.
Results: Recanalisation and reperfusion occurred in 82.5% and 51.2% of cases, respectively. A good outcome was present in 68.3% of reperfusers. Admission CBF, CBV and Tmax were similar between reperfused and nonreperfused patients and between good and poor outcome reperfusers. 24-hour CBF was higher ($p < 0.01$) and Tmax was lower ($p < 0.00001$) in reperfused than nonreperfused patients but 24-hour CBF and CBV were higher ($p < 0.05$ and $p < 0.01$, respectively) in poor than good outcome reperfusers. Successful recanalisation was equally distributed between good and poor outcome reperfusers.
Conclusion: Our findings suggest that CBF and CBV values detected in ischemic brain at 24 hours after stroke may be determinants of the efficacy of reperfusion.

B-0814 10:38

Relationship of acute brain lesions on MRI after cardiac arrest treated with hypothermia to neurological outcome 6 months later

E. Wallin, S. Rubertsson, I.-M. Larsson, M.-L. Kristofferzon, E.-M.B. Larsson, R. Raininko; *Uppsala/SE (elna-marie.larsson@radiol.uu.se)*

Purpose: To document the acute MRI findings in the brain of post-cardiac arrest (CA) patients treated with therapeutic hypothermia and their relationship to patient outcome after 6 months.
Methods and Materials: MRI was performed prospectively 3-13 days (median 4) after CA in 56 patients regardless of the level of consciousness in three hospitals. The images were interpreted visually by two neuroradiologists. Apparent diffusion coefficient (ADC) was measured in predetermined areas in cerebral white matter, deep grey matter, cerebellar grey and white matter and the brainstem. Outcome was assessed using the Cerebral Performance Categories Scale (CPC) and dichotomized into good and poor outcome.
Results: Acute hypoxic lesions on diffusion-weighted MRI (DWI) were more common in patients with poor outcome (p=0.006) and affected mostly grey matter, deep or cortical, with or without involvement of underlying white matter. Pure white matter lesions were very few. Lesions in the occipital and temporal lobes, deep white matter and cerebellum were most associated with poor outcome. Reductions in the ADC, particularly in the occipital lobes, were more common in patients with poor outcome. None of the patients with an ADC below 604-678 x10-6 mm2/s (variation depending on the equipment and technique) in any region survived to 6 months.
Conclusion: Extensive acute lesions in cortical regions and deep grey matter in visual analysis and regions with an ADC under the level 600-680 x10-6 mm2/s are associated with poor outcome. Lesions are fewer and mainly situated in the frontal and parietal lobes in patients with good outcome.

B-0815 10:46

Susceptibility-diffusion mismatch in hyperacute stroke: correlation with perfusion-diffusion mismatch and clinical outcome

M. Dejobert, X. Cazals, M. Annan, S. Debiais, J.-P. Cottier; *Tours/FR (maelle.d@hotmail.fr)*

Purpose: To compare the utility of SWI and PWI sequences for the evaluation of the penumbra in hyperacute middle cerebral artery (MCA) stroke, and to determine whether SWI-DWI mismatch is a neuroimaging marker of clinical outcome.
Methods and Materials: A total of 149 consecutive patients with MCA stroke were prospectively enrolled. MRI was performed within 6 hours of the onset of stroke. The ASPECTS values on DWI, PWI (delayed MTT) and SWI (visualisation of PV) were calculated by two independents raters. Correlation between PWI-ASPECTS and SWI-ASPECTS was calculated with the Pearson coefficient. Reliability of the PV rating system was calculated by an intraclass coefficient correlation (ICC). Favorable outcome was defined as an mRs of 0-2 at 3 months for the 88 patients who received thrombolytic therapy.
Results: The ASPECTS-SWI and ASPECTS-PWI scores showed a good correlation (Pearson coefficient of 0.69, $p < 0.001$). The reproducibility between the junior and the senior radiologist was excellent with an ICC of 0.89 (IC95: 0.85-0.92, $p < 0.001$). However, neither SWI-DWI mismatch nor PWI-SWI mismatch were associated with clinical outcome.
Conclusion: SWI and PWI are complementary but not commutable for the assessment of the penumbra. Susceptibility-Diffusion mismatch could not predict the outcome of stroke.

B-0816 10:54

Large vessel acute ischemic stroke active reperfusion therapy comparison

A. Balodis, M. Radzina, M. Preinbergs, K. Kupcs, E. Miglāne, J. Savlovskis, H. Kidikas, A. Veiss; *Riga/LV (arturs.balodis7@gmail.com)*

Purpose: The aim of our study was to compare efficacy of combined therapy: intravenous thrombolysis-(ITL) followed by mechanical thrombectomy-(TE), with solo therapy-intravenous thrombolysis or endovascular therapy in patients with acute ischemic stroke due to large vessel occlusion.
Methods and Materials: The prospective study included 105 patients hospitalized within time window of-4.5 and-6 hours. Thirty of them received ITL followed by TE, 37-ITL only and-38 solely-TE. NIHSS score was used to evaluate early therapy results and mRS for late results at 90 days. Lesion size was defined using ASPECTS on admission and after treatment CT imaging.
Results: There were Sixty-four (65%) women and 35 (35%) men, mean age was 72.18±11 (SD) years and the mean time window was 240.0±73.5 (SD)-minutes. Median baseline NIHSS was lower in ITL-group 13 (8-13) vs.16 (12-19)-TE and combined group (p=0.013). During discharge NIHSS was higher in ITL-groups with no difference between TE and combined group-(p=0.008). Occurrence of symptomatic intracerebral hemorrhage was in ITL- 10 (27%) vs 5 (13.2%) in TE-group or 7 (23.2%) in combined group (p=0.313). Recanalisation rate was almost equal between TE and combined group, 92% and-90%. Final lesion size by ASPECTS showed difference among groups: 8-TE, 6-TL vs. 7-in combined group (p=0.031). 90 days favourable outcome (mRS 0-2) was achieved in 21 (63%) for TE group and 15 (57%) combined group vs. 9 (30%) in ITL group-(p=0.044).
Conclusion: Mechanical thrombectomy and combined therapy can achieve better early and late functional outcome than intravenous- thrombolysis solely in large vessel stroke. Thrombectomy and combined therapy show high recanalisation rate with lower symptomatic intracerebral hemorrhage rate than thrombolysis group.

B-0817 11:02

Comparison of high-resolution magnetic resonance with digital subtraction angiography in intracranial artery disease

N. Lee, S. Jung, H. Kim, C.-G. Choi, S. Kim, D. Lee, D. Suh; *Seoul/KR (njlee924@gmail.com)*

Purpose: To compare high-resolution magnetic resonance (HR-MR) with digital subtraction angiography (DSA) in the characterisation and diagnosis of various intracranial artery diseases (ICAD).
Methods and Materials: From March 2011 to April 2014, 37 patients with HR-MR and DSA for ICAD were retrospectively enrolled. The time interval between HR-MR and DSA was within 1 month. The degree of stenosis and minimal luminal diameter were measured in both DSA and HR-MR and compared between two modalities. Two observers respectively diagnosed various ICAD on DSA and HR-MR. The time interval between diagnoses on DSA and HR-MR was 2-week interval. Inter-observer agreement was acquired in each modality respectively. In each observer, agreement and disagreement were analysed in the diagnoses.
Results: HR-MR did not show significant differences in the degree of stenosis, minimal luminal diameter ($p > 0.05$) and presented significant correlations

(R=0.805, 0.611) with DSA. Inter-observer agreement was moderate for DSA (k= 0.549; 95% CI, 0.260-0.884) and good agreement for HRMR (k= 0.608; 95% CI, 0.424-0.774). In observer 1, DSA and HRMR showed agreement in 27 patients (73.0 %) and disagreement in 10 patients (27.0 %). In observer 2, 22 patients (59.5%) were in agreement and 15 patients (40.5%) in disagreement. And it showed good and moderate agreement between two modalities with k value of 0.611 (95% CI, 0.447-0.777) and 0.418 (95% CI, 0.226-0.611), respectively.
Conclusion: HR-MR may be a comparable or alternative imaging method to DSA in the characterisation and diagnosis of various ICAD.

B-0818 11:10

Subdural and convexity subarachnoid haemorrhage are more frequently associated with acute spontaneous lobar haematoma in cerebral amyloid angiopathy

A. Viguier, S. Patsoura, N. Raposo, V. Cazzola, L. Claviere, J.F. Albucher, F. Chollet, V. Larrue, F. Bonneville; *Toulouse/FR (sofia.patsoura@yahoo.gr)*

Purpose: To determine the prevalence of acute subdural haematoma (SDH) and convexity subarachnoid haemorrhage (cSAH) in case of acute spontaneous lobar haematoma (aSLH) and the aetiologic significance of this association. Our main hypothesis was that this association is more frequently encountered in cerebral amyloid angiopathy (CCA)-related SLH.
Methods and Materials: A retrospective analysis of brain MRI of 165 consecutive patients admitted for acute SLH was performed by two neuroradiologists. Mean age was 70 ± 13 years. Only MRI scans performed within 10 days after SLH onset were included. The presence of SDH and convexity SAH and their characteristics were assessed.
Results: SDH and cSAH were present in 28.5 and 54.5% of patients with aSLH, respectively. The frequency of SDH (37%, 27/72) and cSAH (73%, 53/72) was significantly higher amongst patients with aSLH meeting the Boston criteria for probable CAA comparing with other causes of SLH (21.5% and 39.8% respectively; p=0.03 and $p < 0.001$). This association of SDH and aSAH with aSLH remained significant considering patients meeting the Boston criteria for probable or possible CAA versus other causes.
Conclusion: Acute SLH is frequently associated with SDH and acute SAH in cases of CAA. This is consistent with the involvement of leptomeningeal arteries in this disease. The presence of SAH and SDH should be systematically assessed in MRI evaluation of acute SLH and could be used as a marker of CAA.

B-0819 11:18

Dual-energy CT of the brain: comparison between virtual unenhanced images and true unenhanced ones in the detection of intracranial hemorrhage

M. Bonatti[1], F. Lombardo[2], G. Zamboni[2], A. Cipriani[1], R. Pozzi Mucelli[2], G. Bonatti[1]; [1]*Bolzano/IT*, [2]*Verona/IT (matteobonatti@hotmail.com)*

Purpose: To evaluate the diagnostic performance of virtual unenhanced (VNC) images in detecting and characterizing intracranial hemorrhages (ICH).
Methods and Materials: IRB-approved retrospective study; need for informed consent was waived. 67 consecutive patients with ICH and 67 without ICH who underwent unenhanced brain CT followed by DECT angiography were included. Two radiologists, unaware of patients' clinical data, independently and randomly evaluated VNC images of each patient assessing ICH presence and location. Subsequently, they evaluated in consensus true non-contrast (TNC) images of each patient, which were considered the reference standard. Sensitivity and specificity of VNC images for ICH detection were calculated using Fisher's exact test. Inter-observer agreement was calculated with the weighted kappa-statistics. Finally, VNC and TNC images were compared side-by-side for ICH conspicuity (ICH attenuation-brain parenchyma attenuation) and extension assessment.
Results: On TNC images, 67 patients showed ICH: 47 subarachnoid hemorrhages, 33 intraparenchymal hemorrhages, 21 intraventricular hemorrhages, 14 subdural hemorrhages and 1 epidural hemorrhage. 67/67 (100%) patients with ICH were correctly identified on VNC images (100% sensitivity and specificity). Inter-observer agreement in the evaluation of VNC images ranged from 0.86 to 1.00 for all considered parameters. Mean hemorrhage conspicuity was 33±10 HU on TNC images and 28±10 HU on VNC ones (p=0.0028). In 59/67 (88.1%) cases hemorrhage extension was similar on TNC and VNC images, whereas in 8/67 (11.9%) it was underestimated on VNC images.
Conclusion: VNC images are reliable both in detection and in characterisation of ICH; anyway, hemorrhages are less conspicuous on VNC images and their extension may be underestimated.

B-0820 11:26

Crossed cerebellar diaschisis in patients with acute MCA infarction: analysis of CT perfusion characteristics

W.H. Sommer, K. Thierfelder, H. Janssen, L. von Baumgarten; *Munich/DE (kolja.thierfelder@med.uni-muenchen.de)*

Purpose: Crossed cerebellar diaschisis (CCD) is a combined hypoperfusion and hypometabolism in the contralateral cerebellar hemisphere caused by dysfunction of functionally related supratentorial region. The aim is to investigate the overall prevalence of CCD after middle cerebral artery (MCA) infarction in whole brain CT perfusion (WB-CTP) and to determine possible factors influencing the occurrence of CCD.
Methods and Materials: 1644 consecutive patients who underwent WB-CTP for suspected stroke were included in the analysis. Patients with acute occlusion of the carotid artery (ICA) or the MCA resulting in subsequent infarction of the MCA-territory were included in the study. We performed blinded reading of different perfusion maps of the cerebellum in these patients and controls without MCA-infarction (ratio 1:2) for the presence of CCD. We further assessed imaging patterns and clinical factors resulting in CCD.
Results: Our final study population comprised 156 patients and 312 controls. Perfusion asymmetries indicating CCD were detected in 35.3 % of the patients with MCA infarction. CCD was significantly associated with infarctions involving the frontal lobe (ASPECTS region M 1, P = 0.0175; ASPECTS region M 4, P = 0.0036), the internal capsule (P = 0.0109) and the thalamus ($P < 0.0001$). The infarct volume did not have a significant impact on the incidence of CCD (P = 0.1297).
Conclusion: Crossed cerebellar diaschisis is a common feature after MCA-infarction which can be frequently observed in CT perfusion datasets. Our data indicate that CCD is influenced by location of supratentorial infarction rather than the infarct volume.
Author Disclosures:
W.H. Sommer: Founder; QMedify GmbH.

B-0821 11:34

Raw arterial spin labelling data can help identify arterial occlusion in acute ischaemic stroke

M. Majer, M. Mejdoubi, M. Schertz, S. Colombani, A. Arrigo; *Fort De France/FR (majer.michael@gmail.com)*

Purpose: In patients in acute phase of ischaemic stroke (IS), thrombus assessment is of major clinical relevance since the location of the thrombus may determine therapeutic strategy. Thrombus assessment is usually done using CT-scan and conventional MRI sequences. An arterial bright signal (ABS) can be observed within arteries (at an occlusion location), on raw data of Arterial Spin Labeling (ASL) sequence, in patients in acute phase of IS. We aimed to assess the relevance of this signal.
Methods and Materials: We retrospectively analysed Magnetic Resonance Imaging (MRI) sequences of patients with an IS suspicion admitted in our institution. Two radiologists evaluated separately ASL data as well as other usual MRI sequences (DWI, Willis TOF, FLAIR, T2*). Inter-observer agreement, sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) were determined.
Results: 90 patients were analysed, among whom 57 had an ongoing ischaemic stroke. ABS sensitivity, specificity, PPV and NPV were respectively of 89%, 97%, 98% and 84% in case of IS. In case of TOF occlusion, these values were of respectively 100%, 35%, 78% and 100 %. A substantial inter-observer agreement was established with a Cohen's kappa at 0.80 (CI95% = 0.56-1, $p < 0.001$). Two subtypes of ABS were described (spot like and vessel like).
Conclusion: We describe an intravascular signal upstream of a hypoperfused territory on ASL sequence in IS patients, related to intra-arterial occlusion with a high sensitivity and a substantial inter observer agreement. It could increase ASL sequence value in MRI protocols during acute IS.

B-0822 11:42

Quantifying intracranial plaque permeability with dynamic contrast enhanced MRI

P. Vakil[1], A.H. Elmokadem[2], F. Sherazi[1], C.G. Cantrell[1], T.J. Carroll[1], S. Ansari[1]; [1]*Chicago, IL/US*, [2]*Mansoura/EG (mokadem83@yahoo.com)*

Purpose: The purpose of this study was to quantify contrast permeability of intracranial atherosclerotic disease (ICAD) plaques in symptomatic patients and compare these parameters against existing markers of plaque volatility using black blood MRI (BBMRI) sequences.
Methods and Materials: We received IRB approval and informed consent for a prospective study of contrast uptake dynamics in the major intracranial vessels using dynamic contrast enhanced (DCE) MRI, specifically in patients with symptomatic ICAD. Using the standard Tofts model we extracted transfer constant (ktrans) and fractional plasma volume (vp) from plaque enhancement curves. We compared these parameters against time from symptom onset as

well as intraplaque hyperintensity (IPH) and post-contrast enhancement (IPE) derived from T1 SPACE, a specific BBMRI vessel wall imaging sequence, using regression analyses.
Results: We completed this analysis in 10 patients. Ktrans and vp measurements were higher in plaques versus healthy white matter and similar or less than values in the choroid plexus. Only ktrans correlated significantly with time from symptom onset (p=0.02). DCE-MRI parameters were not found to correlate significantly with IPE or IPH (p=0.4 and p=0.17 respectively).
Conclusion: The elevated ktrans and vp values found in ICAD lesions versus healthy white matter suggest that DCE-MRI is a feasible technique for studying plaque characteristics in the intracranial vessels proximal and immediately distal to the circle of Willis. The significant correlations between ktrans and symptom onset which was not observed on T1 SPACE- derived metrics suggest that ktrans may be sensitive to acute and symptom-associated pathological changes in ICAD plaques.

B-0823 11:50

Acute/subacute small ischaemic lesions on DWI in patients with cerebral amyloid angiopathy and cortical superficial siderosis
E. Gangemi[1], A. Charidimou[2], D. Werring[2], R. Jäger[2]; [1]*Rome/IT*, [2]*London/UK (emma_gan86@yahoo.it)*

Purpose: To investigate the prevalence and incidence of acute/subacute subclinical ischaemic brain lesions in patients with diagnosis of probable cerebral amyloid angiopathy (CAA) and cortical superficial siderosis (cSS) on imaging, with or without brain haemorrhage at clinical presentation.
Methods and Materials: We retrospectively analysed MRI scans of 65 patients seen at our Institution between April 2005 and April 2014 with a diagnosis of probable CAA, according to the modified Boston criteria, and cSS. We examined DWI sequences for small cortical/subcortical hyperintense foci (< 5 mm), consistent with acute/subacute small ischaemic lesions (ASIL).
Results: Of 65 patients with probable CAA, 35 had follow-up MRI studies between 4 to 79 months (median 24.2). Overall ASIL were found in 27 (41.5%) of CAA patients. 15 patients had ASIL at initial presentation, 9 developed ASIL on follow-up MRI and 3 showed lesions at initial presentation and on follow-up. Amongst patients presenting with brain haemorrhage (N=28) 15 had ASIL: 1 close to the haemorrhage, 11 remote from the haemorrhage (close to cSS or microbleeds), 3 close and remote from the haemorrhage. In patients with non-haemorrhagic presentation, 12 had ASIL. There was no significant difference in number of patients with ASIL between the groups with haemorrhagic and non-haemorrhagic presentations.
Conclusion: Subclinical acute/subacute ischaemic brain lesions have a high prevalence in CAA patients. Diffusion weighted imaging should be included in the overall MRI assessment of these patients, regardless of the clinical symptoms.

10:30 - 12:00 **Room F1**

Oncologic Imaging

SS 1016

Prostate and renal tract cancers: advanced detection methods

Moderators:
J. Rørvik; Bergen/NO
W.H. Sommer; Munich/DE

B-0824 10:30

Sensitivity of a biparametric (T2 and diffusion-weighted) 3 T magnetic resonance imaging protocol for prostate cancer imaging
A. Stanzione, V. Chianca, N. Longo, F. Fusco, R. Liuzzi, M. Imbriaco, A. Brunetti; *Naples/IT (arnaldostanzione@yahoo.it)*

Purpose: To prospectively determine the diagnostic yield of a biparametric (T2 and diffusion-weighted) 3 T magnetic resonance imaging (BP-MRI) protocol for prostate cancer detection, compared to a standard multiparametric MRI protocol (MP-MRI).
Methods and Materials: Twenty-four untreated patients (mean age 65 years, age range: 53-75) with clinical suspicion of prostate cancer underwent MP-MRI at 3 T, including T2-weighted imaging, ADC maps obtained from diffusion weighted imaging, magnetic resonance spectroscopy and dynamic contrast enhanced sequence. Patients demographics and PSA levels were determined. Expert radiologists reviewed the BP-MRI protocol first to establish a diagnosis. Only thereafter, was the regular full MP-MRI protocol analysed. Receiver operating characteristics curves were obtained to determine the diagnostic performance of the BP-MRI compared to the standard MP-MRI protocol.
Results: The mean PSA level was 9.3 (range 1.8-19) ng/ml. A total of 17 prostatic tumours were identified in 24 patients. Pathological analysis of the prostatic specimens showed pT3 disease in 10/17 (58.8%) patients. Gleason score varied from 2+2 to 3+4. BP-MRI performed well for the detection of prostate cancer with an area under the curve of 0.974 compared with 0.982 for MP-MRI (p: n.s). BP-MRI, correctly predicted all patients with T3 disease. Total acquisition time for the BP-MRI protocol was 9 minutes and 47 seconds compared to 36 minutes and 37 seconds for MP-MRI standard protocol.
Conclusion: A BP-MRI prostate protocol is feasible for prostate cancer detection compared to a standard MP-MRI protocol requiring a shorter acquisition and interpretation time and with comparable diagnostic accuracy to the conventional standardised protocol.

B-0825 10:38

The feasibility of k-means clustering of dynamic contrast-enhanced MRI pharmacokinetic parameters in predicting prostate cancer risk stratification
S.N. Elias[1], F.G. Petros[1], G. Jia[2], H. Nguyen[1], Z. Shah[1], D. Zynger[1], R. Abaza[3], M.V. Knopp[1]; [1]*Columbus, OH/US*, [2]*Baton Rouge, LA/US*, [3]*Dublin, OH/US (elias.57@osu.edu)*

Purpose: To facilitate accurate assessment of prostate cancer (PCa) risk stratification using k-means clustering of Dynamic Contrast-Enhanced (DCE)-MRI pharmacokinetic parameters to classify microcirculatory characteristics at the voxel level and correlate those findings with Gleason Score (GS) and pathologic (P)-stage.
Methods and Materials: A total of 25 patients underwent 3-Tesla multi-parametric MRI prior to robot-assisted laparoscopic prostatectomy (RALP) and final p-staging. Tumour localisation and regions of interest (ROI) were reviewed by radiologist and pathologist. DCE data were processed using in house software written in Interactive Data Language (IDL). Modified Brix's linear two compartment model was used to estimate voxel-wise pharmacokinetic parameters; amplitude of signal enhancement (Amp) and kep. The kep defined as the exchange rate of contrast between extracellular-extravascular space and plasma.
Results: The k-means clustering differentiated tumours into cluster 1 (low kep-low Amp), cluster 2 (low kep-high Amp), and cluster 3 (high kep-low Amp). Tumour volume fractions (VF) of cluster 1, 2 and 3 had mean values of 41±11%, 34±15%, and 25±10%, respectively. Negative correlations of high Amp-p-stage (r=-0.5), high Amp-VF2 (r=-0.7) were founds in cluster 2 and high kep-low Amp with VF3 (r=-0.6, r=-0.5) were found in cluster 3. Cluster 3 Amp-kep values were higher in p-stage3 than p-stage2.
Conclusion: K-means clustering appears to be a feasible approach to better classify pharmacokinetic characteristics of PCa in correlation with p-stage and VF. It may assist in the prediction of GS of the biopsy, p-stage and support the therapeutic treatment plan expanding the potential of functional MRI in PCa.

B-0826 10:46

TRUS-MRI image navigation for prostate cancer recurrence targeted biopsy: initial experience
V. Kapustin, A. Gromov, V. Shirokorad, D. Koshurnikov; *Moscow/RU (wwkapustin@yandex.ru)*

Purpose: The reliable detection and localisation of prostate cancer local recurrence (PCLR) presents a rather difficult diagnostic problem and has a dramatic influence upon the choice of salvage treatment. Several studies about TRUS-MR Fusion technology value for prostate cancer biopsies and local treatment navigation appeared recently. The aim of our study was to determine a possibility of using transrectal ultrasound and MR images superposition technology (TRUS-MRI Fusion) for biopsy guidance in patients with biochemical recurrences (BR) after radical prostatectomy when presence of PCLRs was suspected.
Methods and Materials: 24 patients with BR and clinical findings of PCLR after radical prostatectomy were included in this study. Multiparametric 1.5 T MRI with a torso phased-array surface coil were performed (T2WI, DWI and DCE-MRI). These MRI showed suspicious focuses in perianastomotic tissues in 19 cases and in seminal vesicles remnants (SVR) in 5 cases. Simultaneous MR and TRUS "on-line" image registration were performed. High accuracy level (0.3-0.4 cm) of images superposition was achieved in every case. Thus, targeted core-needle biopsies (16-18G) of suspicious foci were performed.
Results: Use of MRI/TRUS-Fusion technique allowed us to verify prostate cancer recurrences in perianastomotic tissues in 14 of 19 cases and in SVR in 3 of 5 cases. Fragments of urinary bladder wall as well as fibrotic tissues with no histological evidence of tumour growth were revealed in the 7 cases.
Conclusion: MRI/TRUS-Fusion proved to be a promising technique for precise core-needle biopsy guidance in cases when a PCLR is suspected.

B-0827 10:54

Multidetector computed tomographic urography (MDCTU): its practical role in the diagnosis of upper tract urothelial cancer in high-risk patients

S. Kravchick[1], E. Cherniavsky[2], R. Topopolsky[2], L. Linov[2]; [1]*Tzrefin/IL*, [2]*Ashkelon/IL (kravchick.sergey@gmail.com)*

Purpose: In this study we evaluated the role of MDCTU in patients older than 50 years who presented with different types of haematuria.
Methods and Materials: We assessed the radiologic reports of 173 patients ≥50- year-old who underwent MDCTU as a part of the haematuria evaluation. To estimate the accuracy of MDCTU in upper tract urothelial carcinoma (UTUC) we compared MDCTU findings with the results of ureteroscopy. We also evaluated which factors can predict ureteroscopic confirmation of MDCTU-based diagnosis.
Results: As a result, 140 patients met the inclusion criteria. Mean patients' age was 69.7±16.98. Most of our patients underwent MDCTU for microscopic haematuria (n-124; 88.6%). Smokers and passive smokers comprised 38.6% and 26.4 % of our patients.In 17% (n=24) of our patients MDCTU suspected UTUC (n-8) and bladder cancer (n-16). Among patients with suspected UTUC 5 had one sign (soft tissue mass/wall thickening) and three ≥2 signs (different compositions of 2 previouse and ureterohydronephrosis). Ureteroscopy had diagnosed UTUC (with/without concurrent TCC of bladder) in 9 patients. MDCTU had a sensitivity of 66.7% and specificity - 98.5% Logistic regression model revealed five strong predictors for UTUC. Finally a source of haematuria was diagnosed in 57% of patients, while MDCTU individual accuracy reached 42%.
Conclusion: In this high-risk group we found that MDCTU can effectively identified patients in whom further endoscopy is unnecessary. Otherwise, elder patients with positive/atypical cytology and recurrent haematuria, who have MDCTU signs and take anticoagulant medicines, should undergo endoscopic evaluation.

B-0828 11:02

Diffusion tensor imaging of the prostate: assessing response following cyber knife therapy

R. Balaji; *Chennai/IN (ravikanthbalaji@gmail.com)*

Purpose: To study Diffusion Tensor Imaging (DTI) in assessing response of peripheral prostate cancers to treatment with CyberKnife system.
Methods and Materials: Pre-and post-therapy MRI examinations were performed in 24 patients with prostate cancers on Philips 1.5 T scanner (Achieva, Philips Medical Systems) using sixteen-channel phased array pelvic coil. Imaging was performed 3 months after completion of treatment. DTI was performed using single-shot echo-planar-imaging (EPI) technique, diffusion gradients applied in 32 directions and b-values ranging from 0-800. Pre and post treatment ADC and FA values were computed using software provided by the manufacturer using 4-pixel ROI.
Results: The study showed increased FA and decreased ADC values within tumour nodules compared to normal prostate values. FA values (0.25 to 0.45) were significantly higher in tumour compared to normal peripheral gland (0.15). Mean ADC values were lower in tumour affected area (0.8 to 1.24×10 -3 mm2/sec) when compared to normal parenchyma (1.62). Mean PSA values were also obtained. This study showed an increase in ADC values and decrease in FA values within tumour nodules after treatment in 22 patients. Mean FA values in treated nodules dropped to 0.17 to 0.20 while ADC values increased to 1.40±0.22×10 -3 mm2/sec. In 2 patients the nodules did not show any change in FA and ADC values which corroborated with persistently high PSA levels.
Conclusion: DTI can prove to be an innovative imaging tool in follow-up of patients with prostate cancers treated with precision radiotherapy techniques like CyberKnife to assess response and also identify non response or residual tumour.

B-0829 11:10

Detection of prostate cancer lesions with multiparametric MRI (mp-MRI): what is the difference between pelvic phased-array of 32 channels and endorectal-pelvic phased-array coils

N. Dervishi[1], A. Fornari[2], M. Petracchini[2], M. Manfredi[1], A. Tribunella[2], D. Gned[1], A. De Pascale[1], A. Veltri[1], S. Cirillo[2]; [1]*Orbassano/IT*, [2]*Turin/IT (najadadervishi@yahoo.it)*

Purpose: The aim of the study was to compare mp-MRI pelvic phased-array of 32 channels with mp-MRI endorectal-pelvic phased-array coils to detection of prostate cancer lesions.
Methods and Materials: This was a multicentric and prospective study using whole-mount histological sections after prostatectomy as the reference standard. Twenty-nine consecutive patients were included (mean age, 69 years; range, 46-74 years). All patients underwent two mp-MRI 1.5 T (the first with pelvic phased-array digital 32 channels and the second with endorectal-pelvic phased-array coils) performed using T2-weighted, diffusion-weighted and dynamic contrast-enhanced imagings. The comparison of results from pelvic phased-array and endorectal-pelvic phased-array coils was performed with the McNemar test.
Results: A total of 44 lesions were detected with whole-mount histological sections, only 34 lesions were detected with MRI pelvic phased-array to 32 channels and 33 lesions with MRI endorectal-pelvic phased-array coils. Both methods have not been seen eight lesions. This one were with volume less than 1% of prostate gland and Gleason Score predominant 3+3. Positive predictive value and sensitivity for the detection of malignant lesions were 87.2 % and 77.2% for mp-MRI pelvic phased-array coil and 86.8% and 75% for the mp-MR endorectal-pelvic phased-array coils. Accuracy was similar for pelvic phased-array and endorectal-pelvic phased-array coils. The agreement between two different methods for the detection of prostate cancer was significant with Cohen's Kappa coefficient 0.38 (C.I was 0.10-0.65).
Conclusion: The use of pelvic mp-MRI phased-array coil to 32 channels resulted almost the same of mp-MRI endorectal-pelvic phased-array coils to detection of prostate cancer.

B-0830 11:18

Diagnostic efficacy of MRI-guided in-bore prostate biopsy in patients with inconclusive results of transrectal ultrasound (TRUS) or TRUS-guided biopsy

V. Kuplevatsky, M. Cherkashin, D. Roschin, N. Berezina, N. Vorobyov; *St. Petersburg/RU (mikhail.a.cherkashin@gmail.com)*

Purpose: To study diagnostic value of MRI-guided in-bore biopsy in patients with high probability of prostate cancer (PC) with inconclusive results of TRUS or TRUS-guided biopsy.
Methods and Materials: We included in the prospective study 36 patients (43-64 years old, mean age 61 years) with high suspicion to PC based on increased PSA level (mean, 11.45 ng/ml) having inconclusive (n=22) or negative (n=14) results of TRUS and negative results of previous prostate biopsy in some patients (n=3). In all cases, multiparametric prostate MRI (mpMRI) with 3 T scanner (Magnetom Verio) were performed before biopsy. Patients with obvious foci of PC detected with mpMRI graded as PIRADS 4 or 5 were referred to the standard 12-core TRUS-guided biopsy. Patients with PIRADS categories < 4 were referred to MR-guided in-bore prostate biopsy using transrectal biopsy coil.
Results: In 18 patients, mpMRI detected lesions of 4-5 PIRADS categories and following TRUS-guided biopsy confirmed diagnosis of PC in them. In other 18 patients, MR-guided in-bore biopsy was successfully performed with mean biopsy time of 30 min. Mean core number was 3. Total number of PC-positive cores was 42 (77.7%). Mean cancer tissue core volume was 40%. 3 patients had Gleason score 4+4, 2 patients 4+3, 7 patients 3+4, 6 patients 3+3.
Conclusion: Results of the study show that in patients with elevated PSA, negative TRUS or negative TRUS-guided biopsies MR-guided in-bore prostate biopsy has potential to improve further cancer localization and sampling. This advantage may influence the therapeutic decision-making.

B-0831 11:26

Our experience with whole body MRI for metastatic prostate cancer detection

E. Kvyatkovskaya, V. Kuplevatsky, M. Cherkashin, N. Berezina, D. Roschin; *St. Petersburg/RU (kvk@ldc.ru)*

Purpose: To asses diagnostic value of MRI whole body protocol in patients with metastatic prostate cancer, previously examined with conventional nuclear medicine imaging methods (osteoscintigraphy and\or PET-CT).
Methods and Materials: We included in the prospective study 27 metastatic prostate cancer patients (52 - 74 years old, mean age 64 years) (TRUS and in-bore MR-biopsy verified) previously assessed by PET-CT with choline (n=8) and/or osteoscintigraphy (n=27). Mean PSA was 47.5 ng/ml. All patients underwent whole body MRI with 1.5 T scanner (Magnetom Avanta) includes coronal T2 Stir (slice 3 mm), 3D T1 (slice 1 mm), saggital T2 and axial DWI ADC followed with coronal reconstruction and image inversion.
Results: Based on osteoscintigraphy 7 patients has pelvic bone metastasis, 10 - vertebral, 6 - both pelvic and vertebral, 4 - without pathology. In PET-CT group 6 patients has paraaortal and iliac lymphatic nodes involvement. For all cases primary nuclear methods' findings were confirmed by whole body MRI. But in 6 patients we've detected underdiagnosed by PET-CT small lymphatic nodes involvement (0.5 - 0.8 cm diameter) and metastatic foci in chest spine (not detected by primary scintigraphy).
Conclusion: Results of the study show that whole body MRI in prostate cancer patients for come cases provide physicians the opportunity to re-asses PET-CT and osteoscintigraphy results and to detect underdiagnosed lymphatic nodes involvement. In general, MRI-based imaging algorithm (mpMRI, MR-guided biopsy, whole body) potentially may create a new diagnostic paradigm.

B-0832 11:34

Comparison between Likert scale, prostate imaging reporting and data system (PIRADS) v1 and v2 in detection and characterisation of prostate cancer using multiparametric (mp) MRI

L. Zantedeschi, D. Cenzi, M. Motton, G. Schenal, A. Borsato, S. Montemezzi; *Verona/IT (lisazantedeschi@yahoo.it)*

Purpose: To compare the subjective Likert score to the Prostate Imaging Reporting and Data System PIRADS v1 and v2 for characterisation of prostate lesions as benign or malignant at mpMRI.
Methods and Materials: From January 2012 to July 2015, 345 patients with suspect of prostatic cancer underwent 3 T-MRI. In all patients, MRI was performed at 3 T using a pelvic phased-array coil and included T2-weighted imaging, diffusion-weighted imaging and dynamic contrast-enhanced imaging. Inclusion criteria: available histology-proven diagnosis; exclusion criteria: prior radical prostatectomy and not available histology. Final population: 123 patients. Two senior readers prospectively noted the location, shape, and signal intensity of lesions on MR images from individual pulse sequences and scored each for likelihood of malignancy using a Likert scale (range 1-5). A junior reader retrospectively reviewed the database and did the same analysis. Then, the three readers again scored the lesions they described using the PIRADS v1 and v2 score. Results between readers were compared and final diagnosis was obtained in consensus between readers.
Results: In Likert score, agreement between the readers was 0.78; analysis obtained SE 81%, SP 76%, VPP 76%, and VPN 87%. In PIRADS v1 agreement was 0.80; analysis showed SE 79%, SP 77%, VPP 75%, and VPN 80%. In PIRADS v2 agreement was 0.86 and analysis showed SE 84%, SP 87%, VPP 87%, and VPN 84%.
Conclusion: Radiologists performed well with both PIRADS v1 and Likert scales for tumour characterisation; PIRADS v2 score is more accurate to detect PCa and to predict tumour grade.

B-0833 11:42

Diffusion-weighted MRI of urinary bladder: non-invasive quantification of tumour heterogeneity to differentiate malignant from benign tissues

H.T. Nguyen[1], Z. Shah[1], A. Mortazavi[1], K. Pohar[1], L. Wei[1], G. Jia[2], D. Zynger[1], M. Knopp[1]; [1]*Columbus, OH/US*, [2]*Baton Rouge, LA/US (nguyen.837@osu.edu)*

Purpose: To quantify the heterogeneity of tumour apparent diffusion coefficient (ADC) using voxel-based analysis to differentiate a malignancy from a benign wall thickening of the urinary bladder.
Methods and Materials: 19 patients with histopathological findings of their cystectomy specimen were included in this study. A dataset of voxel-based ADC values were acquired for each patient's lesion. Histogram analysis was performed on each dataset to calculate uniformity (U) and entropy (E). The k-means clustering of the voxel-wised ADC dataset was implemented to measure the mean intra-cluster distance (MICD) and the longest inter-cluster distance (LICD). The values of U, E, MICD, and LICD for malignant tumours were compared with those for benign lesions using two sample t-test.
Results: 11 patients had pathological confirmation of a malignant tumour and 8 with benign wall thickening. The data indicated that malignant tumours had significantly higher degree of ADC heterogeneity with a lower U ($P=0.016$) and higher E ($P=0.005$) than benign lesions. In agreement with the findings from histogram analysis, k-means clustering of voxel-wise ADC showed that malignancy presented with significantly higher MICD ($P < 0.001$) and higher LICD ($P=0.002$) than benign wall thickening.
Conclusion: The quantitative assessment of tumour diffusion heterogeneity using the voxel-based ADC analysis can be a non-invasive tool to distinguish malignant from benign tissues of urinary bladder cancer.

B-0834 11:50

Role of contrast-enhanced ultrasound (CEUS) after inconclusive contrast-enhanced computed tomography or magnetic resonance in evaluating hypovascular small renal masses

E. Raimondi, M. Bassi, M. Tilli, S. Dall'ara, R. Rizzati, M. Simone, M. Giganti, G. Benea; *Ferrara/IT (dr.edoardo.raimondi@gmail.com)*

Purpose: To assess the role and diagnostic value of CEUS in evaluating hypovascular small renal masses (SRM) seen on contrast-enhanced CT (CECT) or MRI.
Methods and Materials: From January 2012 to July 2015, 39 patients (age range, 40-81 years; 25 men, 14 women) with inconclusive characterisation of SRM enhancement pattern at contrast-enhanced CT (32) or MRI (7) underwent CEUS. Real-time CEUS perfusional pattern of all SRM was evaluated in order to define their further diagnostic-therapeutic management.
Results: CEUS showed contrast enhancement SRM wash-in in 26/39 patients. Nephron-sparing surgery was performed in 22 patients based on imaging and clinical suspect for malignancy. Pathological findings confirmed malignancy in 17 patients (6 clear cell carcinoma, 10 papillary renal cell carcinoma, 1 chromophobe) and benign lesions in 5 patients (2 oncocytoma, 3 minimal-fat angiomyolipoma); four patients showing enhancing lesions were not eligible for surgery and are currently under follow-up (CEUS/MRI). The remaining 13 patients showed no pathological CEUS enhancement, representing complicated cysts (Bosniak II/IIF) and therefore did not underwent surgery.
Conclusion: CEUS can be an useful tool in evaluating real-time enhancement in SRM, especially for hypovascular tumours with indeterminate pattern at CECT or MRI. CEUS is very sensitive in detecting slight tumour blood flow, improving the accuracy in the evaluation of tumour perfusion and vascular enhancement patterns. CEUS plays a complementary role as problem solving tool in the assessment of indeterminate renal findings at CECT or MRI and should be considered in future diagnostic algorithms of SRM management.

10:30 - 12:00 **Room F2**

Abdominal Viscera

SS 1001b

Hepatocellular carcinoma: evaluation of therapeutic response

Moderators:
D. Akata; Ankara/TR
L. Crocetti; Pisa/IT

B-0835 10:30

Dynamic contrast enhanced perfusion CT imaging as an early predictor for tumour response to Sorafenib treatment in patients with advanced HCC lesions: preliminary results

D. Ippolito, G. Querques, C. Talei Franzesi, P.A. Bonaffini, D. Fior, S. Sironi; *Monza/IT (davide.atena@tiscalinet.it)*

Purpose: To determine the prognostic value of dynamic contrast-enhanced CT-perfusion (CT-p) imaging in evaluation of blood flow changes related to therapeutics effects of Sorafenib, by quantitative analysis of tumour vascularisation.
Methods and Materials: Eighty-one CT-p study were performed in 22 patients with biopsy proven diagnosis of HCC that underwent target antiangiogenetic therapy. Perfusion studies were performed at baseline and during treatment follow-up (every 3 months) on 256 multidetectorCT (iCT, Philips), with following parameters:100 Kv, 100 mAs;16 dynamic slices/scan;40 dynamic scans; 50 ml of contrast medium.The lesions and surrounding parenchyma were evaluated using a dedicated perfusion software which generated a quantitative colour map of vascularisation. Following perfusion parameters were considered:Hepatic perfusion (HP);Arterial Perfusion (AP);Blood volume (BV);Hepatic Perfusion Index (HPI) and Time to Peak (TTP) and statistically compared between responders (complete response,stable disease or partial response) and non-responders.
Results: Percentage variation of perfusion parameters (ΔHP), from baseline to follow-up study,was assessed and correlated with response classified according to mRECIST progression criteria.Responders group showed a significant ($p < 0.01$) reduction of values in HCC target lesions after anti-angiogenic therapy (HP 29.4±23.7vs51.9±16.8; AP 29.8±25.5vs52.2±17.9), in comparison with non-responder group that demonstrated an increase or no significant variation after treatment (HP 42.5±28.3 vs 38.5±11.8; AP 37.5±22.6 vs 35.9±11.2). Moreover in patients with complete response a significant ($p < 0.005$) reduction of 82.1% of ΔHP was obtained after treatment as compared to group with partial response or stable disease (35.8%).
Conclusion: The identification of response predictors, by quantitative analysis of perfusion parameters, might help clinicians in selection of patients who may benefit from targeted-therapy, allowing for optimisation of individualised treatment.

B-0836 10:38

Comparison between quantitative dual-energy CT iodine maps and dynamic volume perfusion CT parameters in patients with hepatocellular carcinoma before and after TACE

X. Wang[1], T. Henzler[2], S. Diehl[2], S.O. Schönberg[2], H.-D. Xue[1], Z.-Y. Jin[1], A. Smakic[2]; [1]*Beijing/CN*, [2]*Mannheim/DE (Arman.Smakic@medma.uni-heidelberg.de)*

Purpose: To assess the changes of iodine-related attenuation (IRA) in patients with hepatocellular carcinoma (HCC) before and after transarterial chemoembolisation (TACE) using dual-energy CT iodine map images, and to evaluate the correlation of IRA to 4D perfusion values calculated from dynamic volume perfusion CT (dVPCT).
Methods and Materials: 21 (pre-TACE, n=13; post-TACE, n=8) scans including both dVPCT and dual-energy CT datasets of 13 patients with HCC were analysed in this study. Hepatospheres loaded with Doxorubicin were used as drug-eluting beads (DEB) in the TACE procedure. The scan protocol

included a dVPCT using 70 kVp acquisitions and a dual-energy (90/150 kVp) arterial and PV acquisitions 25 minutes after the dVPCT. Iodine maps were generated from dual-energy images, and IRAs of arterial and PV phase were measured and compared between pre-TACE and post-TACE groups. ROIs were drawn in both tumour and liver parenchyma.
Results: The IRAs of tumour were significantly decreased after TACE procedure in both arterial (32.7 vs. 15.1, p=0.001) and PV (50.6 vs. 27.0, $p < 0.001$) phases, whilst the IRAs of liver parenchyma showed no statistical change. The IRA of tumour in arterial phase also exhibited a moderate correlation with arterial liver perfusion (ALP) value ($r=0.639$, $P < 0.001$).
Conclusion: IRAs of tumour of both arterial and PV phases changed after TACE in patients with HCC. The static IRA correlates with the ALP measured on dVPCT.

B-0837 10:46

Predictive value of paradoxical uptake on hepatobiliary phase of Gd-EOB-DTPA-enhanced MRI for response to transcatheter arterial chemoembolisation in hepatocellular carcinoma

J. Kim, C. Lee, Y. Park, J. Lee, J. Choi, K. Kim, C. Park, H. Lee; *Seoul/KR (pridebio@naver.com)*

Purpose: To compare response to TACE between HCC with paradoxical uptake on HBP and HCC with defect on HBP, and to identify imaging features that can differentiate between two groups.
Methods and Materials: This retrospective study was approved by our institutional review board and the requirement for informed consent was waived. 89 HCCs from 56 patients who underwent Gd-EOB-DTPA-enhanced MRI prior to TACE were included. HCCs were classified into two groups, "hyperintense" HCC showing paradoxical uptake and "hypointense" HCC showing defect on HBP. Using post-TACE CT scan as a reference standard, compact lipiodol uptake was assessed and compared between two groups. Arterial enhancement ratio (AER), signal intensity (SI) ratio of arterial phase and HBP, and presence of "capsule" on portal venous and/or delayed phase images were compared. After initial response, tumour recurrence within 6 and 18 months was also assessed based on follow-up CT or MRI.
Results: 12 "hyperintense" HCCs and 77 "hypointense" HCCs were included. Compact lipiodol uptake was more frequent in "hyperintense" HCCs than in "hypointense" HCCs (p=0.049). AER was lower in "hyperintense" HCCs than in "hypointense" HCCs (p=0.001) and SI ratio of HBP was higher in "hyperintense" HCCs ($p < 0.0001$). "Capsule" was more frequent in "hyperintense" HCCs ($p < 0.0001$). Tumour recurrence rate within 6months was lower in "hyperintense" HCCs although there was no statistical significance (0% vs. 25.0%, p=0.104).
Conclusion: Although AER was lower in "hyperintense" HCCs than in "hypointense" HCCs, there were more frequent compact lipiodol uptakes after TACE and no recurrence within 6months in "hyperintense" HCCs.

B-0838 10:54

Prognostic significance of liver stiffness measurements on MR elastography in patients with hepatocellular carcinoma treated with radiofrequency ablation

J. Kim, J. Lee, D. Lee, W. Chang, J. Han; *Seoul/KR (je0113kim@naver.com)*

Purpose: To evaluate whether liver stiffness (LS) value measured by magnetic resonance elastography (MRE) can affect ablation volume in hepatocellular carcinoma (HCC) patients treated by radiofrequency ablation (RFA).
Methods and Materials: From July 2007 to June 2014, 115 patients with single HCC who underwent MRE within 6 months before RFA were included. LS values were measured and patients were classified according to cutoff value of 4.49kPa and 5.8kPa which represent F4 hepatic fibrosis and portal hypertension, respectively. Ablation volume was calculated with liver CT. Statistical comparison was performed with Mann-Whitney test and multivariate linear regression. Time to local tumour progression (LTP) and intrahepatic distant recurrence (IDR) were compared using Kaplan-Meier analysis. Comparison of LS values between patients who showed liver function aggravation after RFA and patients who didn't was analysed using Mann-Whitney test.
Results: Ablation volume of 67 patients with LS higher than 4.49kPa was significantly larger than that of whom with LS lower than 4.49kPa ($p = 0.029$). LS value ($p = 0.049$) as well as tumour size ($p < 0.001$) were a significant affecting factor for ablation volume. There was no significant difference in time to LTP and IDR between three groups ($p = 0.624$ and $p = 0.940$, respectively). LS values of patient showed Child-Pugh score aggravation after RFA were significantly higher than that of the others ($p = 0.011$).
Conclusion: LS higher than 4.49 kPa measured by MRE would be an independent predictive factor for larger RFA volume. Larger ablation volume can lead to aggravation of liver function, therefore, in situ monitoring of ablation zone is required.

B-0839 11:02

Evaluation of treatment response of radiotherapy for HCC using pre- and post-treatment magnetic resonance imaging

S. Song, W. Jeong, J. Kim, Y. Kim, D. Choi, H. Park, J. Yu, J.-H. Lee; *Seoul/KR (songsti@naver.com)*

Purpose: Evaluation of treatment response following radiotherapy for HCC is challenging because irradiated liver shows changed signal intensity due to increased arterial hyperemia and delayed clearance of contrast agent. The purpose of study was to explore whether change of MR imaging features after radiotherapy could help evaluate viability of HCC.
Methods and Materials: 39 patients who underwent planning MRI before RT for HCC and followed by post-treatment MRI within 3 months were enrolled. Imaging features including index tumour size, index viable tumour size, arterial enhancement, hypointensity on portal venous and equilibrium phases, hyperintensity on diffusion weighted imaging were evaluated. The interval change of imaging feature such as disappearance of arterial enhancement with washout pattern were also investigated. Imaging observation was performed for 6 months to evaluate remaining viable tumours in the index area.
Results: 10 patients (10/39; 26%) shows progression of the disease. On post-RT MRI, the recurrence group showed significant higher incidence of imaging features of arterial enhancement with washout (p=0.032), hyperintense T2 signal intensity (p=0.021), hyperintensity on DWI ($p < 0.001$). Disappearance of arterial enhancement with washout features and hyperintensity on DWI were significantly related to 6-month viability (p=0.006 and 0.023). Hyperintensity on DWI was a significant predictor for tumour response in 6 months on multivariate analysis (odds ratio, 18.67, p= 0.015).
Conclusion: Change of imaging features suggesting viable HCC including arterial hypervascularity with washout and hyperintensity on DWI would be strong features for treatment response after radiotherapy of HCC.

B-0840 11:10

Assessment of post interventional hepatocellular carcinoma using morphological and functional MR data

M.A.M. Saad, A.M. Magdy; *Fayoom/EG (saadams71@yahoo.com)*

Purpose: To evaluate the role of dynamic contrast enhanced and DW MRI in the assessment of response to treatment and detection of residual tumour viability of HCC after TACE and RFA.
Methods and Materials: Pre contrast T1, T2, T2 SPAIR, DWI and dynamic contrast enhanced MRI and colour mapping obtained in 50 patients with HCC (25 post-RFA and 25 post-TACE). Dynamic enhanced & DWIs were assigned confidence levels for post-interventional HCC residue/recurrence and we categorize the patients into resolved and unresolved groups. The sensitivity, specificity, PPV, NPV and accuracy for both the dynamic and the DWI images in post-RFA & post-TACE patients were calculated.
Results: In post-TACE lesions, dynamic MRI had a sensitivity of 90%, a specificity of 100%, a positive predictive value of 100%, a negative predictive value of 93.8% and an accuracy of 96% compared to 100%, 66.66%, 66.66%, 100% and 80%, respectively of DWI. In post-RFA lesions, dynamic MRI had a sensitivity of 100%, a specificity of 92.9%, a positive predictive value of 91.7 %, a negative predictive value of 100% and an accuracy of 96% compared to 100%, 71.4%, 73.3%, 100% and 84% respectively of DWI.
Conclusion: Dynamic contrast enhanced MRI is superior to DWI in evaluating HCC response to locoregional therapy. DWI helps to improve the sensitivity for detecting marginal tumour recurrence after locoregional therapy, especially in indeterminate hyper vascular lesions without definite venous washout. Dynamic study with complementary DWI allow better tissue characterisation.

B-0841 11:18

Hypointensity rim of hepatocellular carcinoma on arterial phase of dynamic contrast-enhanced MRI can predict low recurrence rate after hepatectomy

Y. Fujinaga, M. Kurozumi, A. Fujita, A. Yamada, K. Ueda, T. Uehara, M. Kadoya; *Matsumoto/JP (fujinaga@shinshu-u.ac.jp)*

Purpose: To reveal the important MR findings of hepatocellular carcinoma (HCC) for predicting recurrences after hepatectomy.
Methods and Materials: We reviewed the database of our hospital, and selected 40 patients (27 men and 13 women, mean age 67.5 years old) who were performed dynamic contrast- enhanced MRI (DCE-MRI) using radial volumetric imaging breath-hold examination with k-space weighted image contrast reconstruction and surgical resection of HCC between April 2012 and March 2013. Two radiologists assessed three MR findings including hypointensity rim around the tumour on T2-weighted image (HIR-T2), hypointensity rim (HIR-AP) and corona enhancement (CE-AP) on arterial phase of DCE-MRI using a 4-point scale (0, absent; 1, present in < 1/3 of the tumour circumferences; 2, present in < 2/3; 3, present in ≥ 2/3) with having no patients' information. Tumour-free survival was calculated by Kaplan-Meier

method and compared between positive and negative groups in each finding by log rank test.
Results: When the patients were classified into two groups (negative group, the score 0 and 1; positive group, score 2 and 3), the recurrence rate of the positive/negative groups within 2 year after hepatectomy in HIR-T2, HIR-AP and CE-AP was 23.2%/43.8%, 21.4%/66.8% and 25.0%/39.3%. There was significant difference of the tumour-free survival between two groups in HIR-AP (p = 0.0087) though there was no significant difference in HIR-T2 (p = 0.0519) and CE- AP (p = 0.3107).
Conclusion: Hypointensity rim of hepatocellular carcinoma on arterial phase of DCE-MRI is an important factor for predicting low recurrence rate after hepatectomy.
Author Disclosures:
Y. Fujinaga: Research/Grant Support; This work was supported by Grant-in-Aid for Scientific Research (C) (15K09917) from the Ministry of Education, Culture, Sports, Science and Technology of Japan. **M. Kurozumi:** Research/Grant Support; This work was supported by Grant-in-Aid for Scientific Research (C) (15K09917) from the Ministry of Education, Culture, Sports, Science and Technology of Japan.

B-0842 11:26

Value of registration of preprocedure MR imaging and postprocedure multidetect CT for therapeutic response assessment of radiofrequency ablation for hepatocellular carcinoma
J. Park, J. Lee, D. Lee, I. Joo, J. Yoon, J. Park, J. Yoon, J. Han; *Seoul/KR (wnolf2@gmail.com)*

Purpose: A sufficient safety margin after RFA of HCC is required for therapeutic success. Sole visual comparison of pre-RFA MRI and post-RFA CT images may obscure proper interpretation of safety margin of ablation. The feasibility of nonrigid registration of pre-RFA MRI and post-RFA CT is assessed.
Methods and Materials: The safety margin after ablation was evaluated for 178 patients with HCC in two different interpretation sessions by two radiologists: first sole visual comparison of pre-RFA MRI and post-RFA CT side-by-side and second with registered images. The interobserver agreement with and without registered images was analysed. The patients were categorized into low and high risk groups according to the extent of safety margin in both interpretation sessions. Local tumour progression rate was compared between two groups.
Results: The interobserver agreement increased in interpretation session using registered images (0.416 vs. 0.505). The interpretation time was significantly different between two session but difference was minimal (150.00 vs. 155.15 seconds for reader 1, and 155.32 vs. 164.08 seconds for reader 2). More than 90% of registered images demonstrated good image quality after registration. The utilization of registered images helps, especially the inexperienced radiologist, stratify patients into low versus high risk group in which local tumour progression rate was significantly different (p = 0.101 vs. p = 0.007).
Conclusion: The nonrigid registration of pre-RFA MRI and post-RFA CT provides intuitive understanding of the relationship between the tumour and the ablation zone thus assisting stratification of the patients according to the risk of local tumour progression.

B-0843 11:34

Microwave ablation of large HCCs using a new device: a case series
L. Tarantino[1], P. Ambrosino[2]; [1]*Pagani/IT*, [2]*Naples/IT (luciano_tarantino@fastwebnet.it)*

Purpose: Evaluation of a new device designed to achieve large volumes of necrosis in hepatocellular carcinoma (HCC) by synchronous insertion and activation of multiple Microwave (MW) antennae.
Methods and Materials: 10 consecutive patients with a single large HCC nodule (diameter range: 3.5-6.5 cm; mean diameter: 4.6 cm) underwent ultrasound (US) guided percutaneous MW ablation by synchronous insertion of multiple MW antennae (SynchroWave 915 MHz antennas - MicroThermX® microwave ablation system, Terumo, Belgium, Europe). In general anesthesia, a single insertion of 2 antennae in 3 cases, and 3 antennae in 5 cases were performed. 2 insertions of 3 antennae in the same session were performed in 2cases. Treatment efficacy was assessed by three-phase contrast-enhanced computed tomography (CT) and bimonthly US follow-up.
Results: Post-treatment CT showed complete necrosis in 8/10 HCC nodules (80%). 2 patients with incomplete ablation underwent an additional MW ablation session. CT showed complete necrosis in both of them. Several major complication occurred: anaerobic infection of the treated necrotic area in 2 cases, severe right pleural effusion in one case, jaundice from transient liver failure. All complications recovered with medical treatment. Follow-up in 10 patients ranges from 12 to 20months. All patients are alive. In 6/10 (60%) cases, intrahepatic recurrence occurred within 6-14 months (mean10 months). Recurrences could be successfully treated with ablation in 3 cases. The other 3 patients started chemotherapy with Sorafenib.
Conclusion: The MicroThermX microwave ablation system seems an effective and relatively safe device for treatment of large HCC.

B-0844 11:42

Microwave ablation of large HCCs by simultaneous multiple antennae insertion: long term follow-up
L. Tarantino[1], P. Tarantino[2], P. Ambrosino[2]; [1]*Pagani/IT*, [2]*Naples/IT (luciano_tarantino@fastwebnet.it)*

Purpose: To report long-term results of microwawe (MW) ablation with simultaneous insertion of multiple antennae for large HCCs.
Methods and Materials: 36 cirrhotics with a single HCC nodule > 3 cm underwent MW ablation in a single session by simultaneous insertion of multiple 13-gauge-MW-antennae. All patients underwent intraoperative CEUS. Residual tumour at CEUS was treated in the same session by reinsertion of 2-3 MW antennae in the tumour. Efficacy of ablation was definitely assessed with three-phase CT after 1 month. Scheduled follow-up entailed US every 3 months and CT every 12 months.
Results: 10 and 18 patients were treated with a single insertion of 2 and 3 synchronous antennae, respectively. 8 patients were treated with 2 insertions of 3 antennae in the same session. Intraoperative CEUS showed residual tumour in 12 patients. 9 out of these patients underwent an additional insertion of two antennae and 3 patients of three antennae. Intraoperative CEUS showed complete necrosis in all patients. 1month-CT showed complete necrosis in 33/36 patients. Follow-up ranged from 18 to 78 months (mean: 42 months). Local recurrence occurred in 7 patients. Recurrences in other liver segments occurred in 35/36 patients. Extrahepatic metastasis from HCC were observed in 1 patient 24 months after treatment. 16 patients died within 18-60 months (mean: 36 months). 20 patients were alive at 18-78 months follow-up (mean: 42 months).
Conclusion: Ablation of large HCCs by simultaneous insertion of multiple MW antennae is a safe and effective treatment and can result in long survival of patients.

B-0845 11:50

Percutaneous ablation of small HCCs: comparison of 3 commercially available microwave devices
L. Tarantino[1], P. Ambrosino[2]; [1]*Pagani/IT*, [2]*Naples/IT (luciano_tarantino@fastwebnet.it)*

Purpose: To compare the effectiveness of 3 Microwawe (MW) devices for percutaneous treatment of small HCCs.
Methods and Materials: 24 patients with cirrhosis and a single HCC nodule (diameter < 2 cm) were treated with one of the following MW ablation devices : 1) 10 patients with 14G - 915 MHz antenna with 45 Watt MW generator (Vivawawe, Covidien, USA); 2) 5 patients with 14G - 2450 MHz antenna with 100 Watt generator (AMICA, Hospital Service, Italy); 3) 9 patients with 13G - 2450 MHz antenna with 180 W generator (Acculis, Microsulis Medical Ldt, England). Therapeutic efficacy in terms of size of the ablation areas were evaluated with CEUS at 48 hours from the ablation time.
Results: The diameter of HCC nodules ranged from 11 to 20 mm (mean: 15 mm). Post ablation CEUS and CT showed complete necrosis in all cases. Different size of ablation were obtained with different defices. Differences in transverse diameter of the area of necrosis between the Covidien device and the other two devices was statistically significant (P=0.01). There was no statistically significant difference between AMICA HS and Acculis devices. However, the time of application to obtain a similar result was consistently lower with Acculis device than with AMICA HS.
Conclusion: All devices seem to be effective and safe. The Acculis system is faster. The sizes of necrosis are lower than those reported from manufacturers (expected transverse diameter of necrosis area - Covidien: 3.2 cm; AMICA HS: 4.0 cm: Acculis: 4.5 cm).

10:30 - 12:00 **Room D1**

Chest

SS 1004

Imaging methods: something old, something new

Moderators:
J. Mayer; Heidelberg/DE
E.J. Stern; Seattle, WA/US

B-0846 10:30

Added value of dual energy subtraction radiography compared to standard conventional radiography using computed tomography as standard of reference

K. Martini, M. Bässler, T. Frauenfelder; *Zurich/CH*

Purpose: To compare diagnostic performance of dual energy subtraction radiography (DE) for interpretation of chest radiographs compared to conventional radiography (CR) using computed tomography (CT) as standard of reference.
Methods and Materials: In this IBR-approved clinical trial 199 patients (75 female; median age 67.10), who were scanned posteroanterior-lateral with dual-shot DE-technique, and underwent chest CT ±48h were included. The system used provides three types of images (bone weighted-image, soft tissue weighted-image (marked as DE-images) and a standard image (CR-images)). Images were evaluated by two radiologists for presence of installations, pneumothorax, pleural effusion, infective consolidation, interstitial lung changes, tumour, skeletal alterations, soft tissue alterations, aortic or tracheal sclerosis and pleural thickening. Inter-observer agreement between readers and sensitivity were calculated. McNemar's test was used to test for significant differences. Chest computed tomography served as standard of reference.
Results: Mean inter-observer agreement throughout the investigated parameters was higher in DE-images compared to CR-images (k_{DE}=0.935 vs. k_{CR}=0.858). DE-images showed to have higher sensitivity compared to CR-images for the detection of infective consolidations (40% vs. 60%), tumour (45% vs. 61%), interstitial lung changes (48% vs. 89%) and aortic or tracheal sclerosis (23 vs. 71%) ($p < 0.05$). There were no significant differences in sensitivity for the detection of installations, pneumothorax, pleural effusion, skeletal alterations, soft tissue alterations or pleural thickening ($p > 0.05$).
Conclusion: DE increases inter-reader agreement as well as diagnostic accuracy for the evaluation of chest radiography.

B-0847 10:38

Bone suppression images improve radiologists' performance on detection of lung nodules on chest radiographs

Y. Wang, L. Fan, Y. Guan, Y. Xia, S. Liu, W. Zou; *Shanghai/CN*

Purpose: To evaluate the performance of bone-suppressed chest radiographs technique on the detection of lung nodules in comparison with the radiologists' reading results.
Methods and Materials: Standard posteroanterior (PA) digital chest radiographs of 95 (average age 61±8) patients with a solitary nodule confirmed by CT and 46 (average age 62±7) controls were included in an observer study. In the observer study, 4 observers, including 2 radiologists and 2 residents, indicated their confidence level regarding the presence of a nodule for each lung (1 to 5), first by use of standard images, then with the addition of bone suppression images. The locations of these lung nodules on the PA CXRs were identified by consensus of other two radiologists who did not participate in the observer study, with all of the nodules confirmed by CT. Receiver operating characteristic (ROC) analysis was used to evaluate the observers' performance.
Results: Average nodule size was 28±10 mm (range from 9 mm to 49 mm).The 95 nodules were all solid nodules, and 91 were obscured by the clavicle or ribs. The mean value of the area under the ROC curve (AUC) for 4 observers was significantly improved from 0.844 with use of standard images alone to 0.887 with use of bone suppression images ($P < 0.001$). The mean sensitivity for the 4 observers was also significantly improved, from 73% with standard radiographs alone to 78% with additional bone suppression images ($p < 0.01$).Specificity increased with bone suppression images from 83% to 84.5% ($p < 0.01$).
Conclusion: Bone suppression technique can improve radiologists' performance on detection of lung nodules on chest radiographs.

B-0848 10:46

Digital tomosynthesis as problem-solving technique to confirm or exclude pulmonary lesions in the hidden areas

E. Baratella, E. Quaia, P. Gabriele, S. Kus, C. Cercato, M. Cova; *Trieste/IT (elisa.baratella@gmail.com)*

Purpose: To evaluate the capability of digital tomosynthesis (DTS) to characterise suspected pulmonary lesions in the so-called hidden areas at chest x-ray (CXR).
Methods and Materials: Among 726 patients with suspected pulmonary lesions at CXR who underwent DTS, 353 patients (201 male, 152 female; age 71.5 ±10.4 years) revealed suspected pulmonary lesions in the apex, hilar, retrocardiac, or paradiaphragmatic lung zones and were retrospectively included. Two readers analysed CXR and DTS images and provide a confidence score: 1 or 2=definitely or probable benign pulmonary or extra-pulmonary lesion, or pulmonary pseudolesion deserving no further diagnostic work-up; 3=indeterminate; 4 or 5=probable or definitely pulmonary lesion deserving further diagnostic work-up by CT. The nature of DTS findings was proven by CT (n=108 patients) or CXR during follow-up (n=245).
Results: In 62/353 patients the suspected lung lesions were located in the lung apex, in 92/353 in the hilar region, in 59/353 in the retrocardiac region, and 140/353 in the paradiaphragmatic region. DTS correctly characterised the CXR findings as benign pulmonary or extrapulmonary (score 1 or 2) in 43/62 patients (69%) in lung apex region, in 56/92 (61%) in pulmonary hilar region, in 40/59 (67%) in retrocardiac region and in 106/140 (76%) in the paradiaphragmatic region, while correctly recommended CT in the remaining cases due to the presence of true solid pulmonary lesion with the exception of 22 false negative findings.
Conclusion: DTS allowed to confirm or exclude the presence of true pulmonary lesions in the hidden areas of the chest.

B-0849 10:54

Digital tomosynthesis in the diagnosis of chest diseases and injuries

V. Nechaev; *Moscow/RU (dfkz2005@gmail.com)*

Purpose: To determine the possibilities of digital tomosynthesis (DTS) in the diagnosis of chest diseases and injuries.
Methods and Materials: 128 patients with suspected pathology on their chest radiograph (CXR) were included in the study. DTS was performed in all patients and 44 patients underwent chest computed tomography (CT) within a week of DTS.
Results: According to CXR patients were divided into 5 groups: lung consolidation (n=29; 22.66%); nodules (n=28; 21.88%); cavities (n=23; 18.75%); dissemination (n=23; 18.75%); skeletal thorax injury (n=22; 17.97%). The changes have been confirmed in 83.6% of cases after the DTS. Pseudolesion was identified in 16.4% of cases. Additional information was received in 84 patients. In 39.8% of cases received clinically relevant information which affect further patient management, namely, nodules (7.8%), cavities (6.4%), small focal dissemination (4.7%), air bronchogram (6.3%), amputation of bronchi (3.1%), ribs fractures (3.1%), bronchiectasis (1.6%) and Rigler's sing (1.6%). However in 6 (13.6%) cases the changes wasn't confirmed by CT. In 38 (29.7%) cases DTS were showed artifacts from breathing that reduced the visualisation of pathological changes.
Conclusion: DTS has been shown to be superior to CXR in the diagnosis of chest diseases and injuries and to be able to replace CT in selected cases. The presence of severe dyspnea may be a relative contraindication for the chest DTS. DTS could complement the algorithm of examination of patients in the diagnosis of chest diseases and injuries.

B-0850 11:02

Radiological interpretation quality in lung imaging of organ donors and its clinical relevance - a retrospective analysis

G. Bozovic[1], C. Adlercreutz[1], P. Höglund[1], I.M. Björkman-Burtscher[1], P. Reinstrup[1], R. Ingemansson[1], C.M. Schaefer-Prokop[2], R. Siemund[1], M. Geijer[1]; [1]*Lund/SE*, [2]*Utrecht/NL (Gracijela.Bozovic@med.lu.se)*

Purpose: Potential lung donor patients undergo various radiological examinations that are reported by local radiologists not always familiar with imaging findings with potential impact on the transplantation procedure.
Methods and Materials: The study included radiologic examinations of 110 brain-dead organ donors in a single transplantation center between 2007 and 2014. Bedside chest radiographs, mandatory for lung donor evaluation, chest CT and CT examinations partially including the lungs were analysed from the view-point of which information is crucial for transplant surgeons. Two chest radiologists assessed catheters and cardiovascular, parenchymal and pleural findings in consensus. Differences between the second reading and the primary reports were analysed with respect to their impact on immediate management (e.g., treatment, bronchoscopy) and on the assessment of using the lungs for transplantation.

Results: Totally 136 bedside chest radiographs and 14 complete and 27 incomplete CT examinations were analysed. There were no or no substantial differences between primary reporting and review for bedside chest radiography in 27 % and 21 %, respectively. In 52 % (n=78) important differences were found such as incorrectly placed nasogastric tubes (n=42), cardiac decompensation (n=36), pulmonary edema (n=14) and aspiration/infection (n=14). In the CT examinations totally 34 important changes (e.g. emphysema, lymphadenopathy, pulmonary emboli) were found which with few exceptions had not been reported.
Conclusion: The current study indicates that a second review of radiographic and CT examinations obtained in potential lung donor patients adds important information for the transplantation team with respect to the surgical procedure and the immediate postsurgical care.

B-0851 11:10

Chest x-ray in acute nontraumatic disease, is it a reliable diagnostic tool?
A. Fuentealba, D. Ramirez, J. Durán, N. Rossel, R. Aris, S. Aguirre, A. Pizarro, M. Castro; *Santiago/CL (andrea.fuentealba@gmail.com)*

Purpose: Chest radiography (CR) is an extension of examination in emergency room (ER). The sensitivity and specificity varies according the pathology and the pretest probability. The purpose was to determine the positive and negative predictive values of a CR in adult patients presenting with acute non traumatic pathology in an ER.
Methods and Materials: Retrospective study. Information recollection from 01.2012 to 05.2015 from IMPAX (Agfa). The inclusion criteria included adults patients that consulted in a ER with CR and Chest CT in less than a 48 hrs period. Exclusion criteria included trauma. The ethics committee grant waiver of the consent. Statistical analysis was performed with STATA v14.0, calculating VPP, VPN, and estimating agreement between the methods by Kappa test.
Results: N was 409 patients, 53.5% women. The mean age 56±20 years. The common complaints were dyspnea 25%, pneumonia 20%, chest pain 14%. Considering CT as "gold standard"; the overall PPV for the CR was 74% and the NPV was 77%. Regarding condensation, the PPV was 80% and the NPV of 85%. Pneumothorax showed a PPV 80% and NPV 99%. ILD obtained PPV 67% and NPV 61%. K was statistically significant with $p < 0.005$ in all evaluated findings. Good strength of agreement was achieved in pneumonia (k 0.62) and pneumothorax (κ 0.61).
Conclusion: Our experience confirms the usefulness of CR in condensation and pneumothorax, despite the percentage of false negatives and positives. Incorporating previous exams, the emergency physician will be prepared to take an action or request more complex imaging studies.

B-0852 11:18

Chest x-ray and detecting acute heart failure: what is the clinical value?
D. Goei, P. Visser, I. Koster, P. van der Valk, M. Kock; *Dordrecht/NL (goeidustin@hotmail.com)*

Purpose: According to the 2013 AHA Guideline for the Management of Heart Failure patients with suspected heart failure (HF) should undergo chest X-ray (CXR) to assess heart size and pulmonary congestion. Although CXR is routinely used, evidence for its efficacy is limited. Furthermore, the guidelines do not specify the individual radiographic signs in relationship to HF staging.
Methods and Materials: 102 ER-patients with dyspnoea in a large non-academic teaching hospital were consecutively included for the diagnosis of HF. CXRs were scored for 12 radiographic signs and overall diagnosis of HF, independently by 3 radiologists who were blinded for clinical parameters and outcome. Sensitivity, specificity, positive and negative predictive values (PPV and NPV), and interobserver agreement were calculated for the signs and overall diagnosis.
Results: 27 of 102 patients were clinically diagnosed with HF. Overall sensitivity, specificity, PPV and NPV of CXR for diagnosing HF were 92.6%, 57.5%, 42.4% and 95.8%, respectively. Cardiomegaly and artery-bronchus ratio yielded the highest sensitivity, with 81.5% and 92.6%, respectively. Pulmonary consolidations and Kerley lines yielded the highest specificity, with 97.5% and 96.2%, respectively.
Conclusion: Chest X-ray has an excellent sensitivity in the setting of suspected acute heart failure, where cardiomegaly and to a lesser extent, increased artery-bronchus ratios are useful to identify the presence of acute heart failure. Normal chest X-ray has an excellent negative predictive value in the setting of suspected heart failure, with the absence of pulmonary consolidations and Kerley lines as the most reliable individual signs to exclude this diagnosis.

B-0853 11:26

Computed tomography-based differentiation of acute mediastinitis from postoperative residuals after thoracic surgery with sternotomy
B. Foldyna, M. Müller, C. Luecke, M. Haensig, S. Nitzsche, T. Klemm, F. Mohr, M. Gutberlet, L. Lehmkuhl; *Leipzig/DE (muellermartin23@gmail.com)*

Purpose: To increase diagnostic accuracy of computed tomography (CT) in patients with suspected acute mediastinitis by evaluating qualitative image findings and their correlation with microbiological diagnosis.
Methods and Materials: Data of 103 patients (69±13 years; m/f: 77.7/22.3%) with suspected acute mediastinitis after sternotomy were analysed. Patients received a contrast-enhanced chest CT before deep revision surgery with collection of microbiological samples. 22 different CT findings were examined including mediastinal tissue composition, sternal condition, lymph node size and secondary paramediastinal findings. Microbiological results included amount and type of pathogen.
Results: All CT datasets were evaluated. Valid microbiological findings were available in 90% of patients. Most common CT findings were free mediastinal fluid (100%), mediastinal fluid collections (91.3%), pleural effusions (67.0%) and mediastinal gas bubbles (65.0%). According to microbiological results, acute mediastinitis was present in 71 (68.9%) patients. The three most sensitive/specific parameters were mediastinal fluid collections (95.8%/9.5%), pleural effusions (69.0%/33.3%), mediastinal gas bubbles (67.6/38.1%) and pericardial effusions with margin enhancement (5.6%/95.2%), pulmonary infiltrates (14.1.%/90.5%) and sternal lysis with reactive sclerosis (23.9%/85.7%). Within all parameter combinations, the combination of fluid collection and sternal lysis with reactive sclerosis reached the highest sensitivity and specificity of 21.1% and 90.5%.
Conclusion: CT allows only limited discrimination between acute mediastinitis and postoperative residuals after sternotomy. Single CT findings offered high specificity or high sensitivity only. Neither any individual finding nor any combination provided both high sensitivity and high specificity.

B-0854 11:34

Chest CT findings of toxocariasis: correlation with laboratory results
M. Koh, I. Lee; *Anyang city/KR (ttlkmj14@hotmail.com)*

Purpose: The purpose of this study was to assess the relationship between chest computed tomography (CT) findings of patients with toxocariasis and levels of serologic markers.
Methods and Materials: A total of 38 cases of patients diagnosed with toxocariasis by enzyme-linked immunosorbent assay (ELISA), CT scans and serologic markers were retrospectively reviewed. The presence of nodule with or without ground-glass opacity (GGO) halo, consolidation, focal GGO, pleural effusion and lymphadenopathy on chest CT were evaluated. Statistical analysis was performed with the Fisher's exact test.
Results: The most common chest CT findings in this study were nodule (n = 12, 31.6%) and focal GGO (n = 12, 31.6%). In patients with normal eosinophil levels, focal GGO (n = 9, 37.5%) was the most common finding. In contrast, nodule with GGO halo (n = 7, 50%) was the most common finding in the eosinophilia group. Nodule with GGO halo was more common in the eosinophilia group, with a statistically significant difference (p = 0.017). Nodule was more common in the eosinophilia group, and focal GGO was more common in the normal eosinophil group.
Conclusion: The most common chest CT findings in toxocariasis were nodule with or without GGO halo, and focal GGO. In the eosinophilia group, nodule with GGO halo was significantly more frequent. Other CT findings did not show a statistically significant relationship with serologic markers.

B-0855 11:42

Value of computed tomography of the chest in patients with acute respiratory distress syndrome
C. Berliner, S. Marcel, S. Braune, M. Metschke, H. Klose, S. Kluge, G. Adam, A. Laqmani; *Hamburg/DE (c.berliner@uke.de)*

Purpose: The value of computed tomography (CT) of the chest in the management of patients with acute respiratory distress syndrome (ARDS) are ill defined. The aim of this study was to assess the clinical utility of CT scans of the chest in patients with ARDS using the Berlin definition.
Methods and Materials: Retrospective study on all patients with ARDS in whom a CT scan of the chest was performed immediately prior to or during intensive care unit stay between 01/2007 and 06/2013.
Results: During the study period CT scans were performed on 204 patients with ARDS. ARDS was most often due to hospital acquired pneumonia (53.9%) and community acquired pneumoni a (32.8%). ARDS was classified as severe (84.3%) and moderate (15.2%). The most common pathologies of lung parenchyma were consolidations (94.1%), ground glass opacities (85.3%) and interstitial changes (59.3%). CT scans showed pleural effusions (80.4%), mediastinal lymphadenopathy (66.7%), signs of right ventricular strain and pulmonary hypertension (53.9%), pericardial effusion (37.3%), emphysema of

the chest wall (12.3%), pneumothorax (11.8%), emphysema of the mediastinum (7.4%) and pulmonary embolism (2.5%). Results of CT scans lead to changes in management in 26.5%. Mortality was significantly increased in patients with involvement of lung parenchyma of more than 80% (p = 0.004). Intrahospital transport from the ICU to the radiology department lead to critical incidents in 17 cases (8.3%).
Conclusion: Systematic evaluation of thoracic CT scans yielded information useful for making a diagnosis, predicting prognosis and recognising concomitant disorders requiring therapeutic interventions. In 1 out of 4 cases results of CT scans lead to changes in management.

B-0856 11:50

Comparison of HRCT features of pneumocystis Jiroveci pneumonia in patients with and without HIV
M.A. Karimi, S. Kahkouee, F. Mami; *Tehran/IR (mkarimidr@yahoo.com)*

Purpose: Pneumocystis jiroveci pneumonia (PJP) is a common opportunistic infection in immunocompromised patients, especially in HIV/AIDS patients. The aim of this study was to compare high-resolution computed tomography (HRCT) features of PJP in patients with and without HIV.
Methods and Materials: HRCT images of 43 patients (mean age 38±11 years; 83.7% male) with histopathologically proven PJP were reviewed by two expert pulmonary radiologists. Detailed HRCT findings were compared between HIV+ (n=27) and HIV- (n=16) patients.
Results: Bilateral ground glass opacities (GGOs) were the most common HRCT manifestation of PJP in both HIV+ and HIV- patients (90% vs. 75%; $p > 0.05$), followed by centrilobular nodular opacities (55.6% vs. 37.5%; $p > 0.05$). No cavitary lesion was seen in HIV+ patients, whilst 18.8% of HIV- patients had cavitary lesion (p=0.02). Interstitial reticulation and thickened septa in HIV+ patients were significantly higher than that of HIV- patients (44.4% vs. 12.5%; p=0.03). There were no statistically significant differences between two groups in order of other HRCT findings, including consolidation, air cyst, multiple nodules, bronchiectasis, pleural effusion, pneumothorax, pneumomediastinum, subcutaneous emphysema, and lymphadenopathy.
Conclusion: Bilateral diffuse GGOs are the most common HRCT manifestation of PJP in both HIV+ and HIV- patients. Septal thickening and reticular opacities are more commonly seen in PJP in HIV+ patients than in HIV- patients. Cavitary lesion as a manifestation of PJP is more common in HIV- patients.

10:30 - 12:00 **Room D2**

Interventional Radiology

SS 1009
Liver ablation

Moderators:
J. Garnon; Strasbourg/FR
N.N.

K-23 10:30

Keynote lecture
N.N.

B-0857 10:39

Thermal ablation for hepatocellular carcinoma: a large-scale analysis of long-term outcome and prognostic factors
X. Jing, J. Ding, Y. Wang, F. Wang, Y. Wang; *Tianjin/CN (dr.jingxiang@aliyun.com)*

Purpose: To investigate the long-term outcome and prognostic factors, when treating hepatocellular carcinoma (HCC) with thermal ablation.
Methods and Materials: A total of 846 patients with HCC, diagnosed pathologically and/or radiologically, underwent thermal ablation, from October 2001 to May 2013. Thermal ablation included both radiofrequency ablation (RFA) and microwave ablation (MWA), and was performed by percutaneous, open and laparoscopic approaches. Clinical data, especially focused on disease-free and overall survival, were retrospectively analysed by univariate and multivariate analyses.
Results: A total of 1,185 thermal ablation treatments were performed, corresponding to 1,240 tumours. Complete ablation rate was 97.1%. The 12-, 24-, 36-, and 60-month disease-free survival rates after thermal ablation were 72.3%, 52.7%, 33.5% and 16.1%, respectively. Multivariate analysis indicated that alkaline phosphatase (ALP), and the number of tumours were independent risk factors affecting disease-free survival. The 12-, 36-, 60-, 84-, and 120-month overall survival rates of all patients were 92.9%, 74.7%, 58.1%, 41.3% and 15.8%, respectively. Multivariate analysis indicated that age, ALP, number of tumours, and treatment time per case were independent risk factors related to overall survival.
Conclusion: In our experience, thermal ablation was a relatively safe and effective procedure. Patients with increased serum ALP levels and/or multiple tumours had a higher incidence of recurrence and poorer prognosis, and should therefore be paid special attention to, in clinical practice.

B-0858 10:47

Post-surgical recurrence of HCC along the resection margin treated by percutaneous US-guided ablation
M. Calandri[1], C. Gazzera[1], S. Yevich[2], A. Veltri[3], P. Fonio[1], G. Gandini[1]; [1]*Turin/IT*, [2]*Villejuif/FR*, [3]*Orbassano/IT (marco.calandri@live.it)*

Purpose: To evaluate the safety and efficacy of percutaneous ablation for HCC hepatic recurrence along surgical resection margins to achieve complete cure or bridge for additional treatment. No current recommendations exist for these lesions.
Methods and Materials: Retrospective review of post-surgical recurrent HCC located along surgical margins treated by percutaneous ultrasound-guided ablation from 2006-2014. Ablation was performed by radiofrequency ablation (RFA) or percutaneous ethanol injection (PEI), selected for recurrence in proximity to extrahepatic organs.
Results: In total, nine patients (49-82yo, mean 73.8±8.3) were treated for 13 recurrent HCC nodules (9-35 mm, mean 21.5±8.1) located along resection margins by RFA (11 nodules) and PEI (2 nodules). Mean time between surgery and percutaneous ablation was 64 months (range 10-149). At a mean follow-up of 17 months (± 9), complete ablation was achieved in 9 nodules (69.2%, 8 after RF, 1 after PEI) and partial ablation was achieved in 4 nodules (3 after RFA, 1 after PEI). Complications were limited to minor abdominal pain in 2 patients requiring medical therapy (15.3%). Of the 4 partially ablated nodules, subsequent therapy achieved complete response in 3 nodules (1 patient with TACE, 1 patient with stereotactic radiotherapy, and one with liver transplantation), while the last nodule progressed despite subsequent TACE.
Conclusion: HCC recurrence along the surgical margin can be safely and effectively treated by percutaneous therapy, despite the misconception of the surgical margin as a hostile location. Ablation results are comparable to treatment of intrahepatic lesions. Moreover, percutaneous treatment may bridge the patient for additional therapy.

B-0859 10:55

Intraparenchymal hydrodissection in liver to minimise flow mediated cooling from vessels during radiofrequency ablation of hepatocellular carcinoma
A.K. Chaturvedi; *New Delhi/IN (arvindatdelhi@yahoo.com)*

Purpose: To minimise heat sink effect from adjacent vessels during radiofrequency ablation (RFA) of hepatocellular carcinoma (HCC).
Methods and Materials: Twelve patients of HCC who were candidates for RFA and had a major vessel within 1 cm of the index lesion were subjected to intraparenchymal hydrodissection to insulate the lesion from the vessel. All procedures were performed under CT guidance (Siemens Somatom Definition AS 128 slice). 20 ml to 50 ml of 5% dextrose solution was used for the purpose of hydrodissection. Hand held injection was given adjacent to the vessel wall which created a potential space between the lesion and the vessel. RFA was carried out using a cool tip electrode (Covidien e-Series) with a 3 cm active tip in a 12 minute ablation cycle. Track ablation was carried out before withdrawing the electrode. A contrast enhanced CT (CECT) was done after 24 hours to check the efficacy of ablation close to the vessel wall.
Results: Satisfactory ablation was seen in all but one case and the area of coagulation was seen extending upto the vessel wall. In none of the caes any injury to the vessel wall was observed. Local recurrence within one year was seen in two cases.
Conclusion: Intraparenchymal hydrodissection with 5% dextrose water is a feasible and effective technique for RFA of HCC in close proximity to a major vessel.

B-0860 11:03

Evaluation of thermal microwave ablation (MWA) of liver malignancy with real-time enhanced spatial energy control to achieve a spherical ablation zone
T.J. Vogl, L. Basten, B. Panahi, N.N.N. Naguib, N.-E. Nour-Eldin; *Frankfurt a. Main/DE (t.vogl@em.uni-frankfurt.de)*

Purpose: To retrospectively evaluate the formation of a spherical ablation zone after treatment of liver metastases with thermal microwave ablation (MWA) with Thermosphere™ technology.
Methods and Materials: In this retrospective study 76 hepatic tumours in 67 patients (34 men, 33 women; mean 60.5 years; range 31-83) were treated from July 2014 to September 2015 in 76 sessions using MWA with Thermosphere™ technology. For evaluation of sphericity the following Parameters were ascertained in MR images: (a) Ratio of ablation volume longitudinal divided by transverse volume and its deviation from target value 1.00, corresponding to a

sphere; (b) the transverse and longitudinal length, with and their ratio for each ablation zone section. Ratios of (b) were computed for each transverse and each longitudinal slice and the deviation from 1.00 of their average was calculated for comprehensive characterisation of the Ablation zone`s morphology.
Results: Technical success in the context of an A0 ablation was achieved in 100% (76/76) with a complication rate of 2.63% (2/76). Complications detected were pleural effusion and a minimal liver abscess. Median deviation from target 1.0 of volume ratios was 0.066 (mean: 0.096; 25th-percentile: 0.04 75th-percentile: 0.14). For Diameter measurements a median deviation of 0.145 (mean: 0.159; 25th-percentile: 0.104, 75th-percentile: 0.195) was seen.
Conclusion: Thermal MWA of liver malignancies with real-time enhanced spatial energy control achieves a nearly spherical ablation zone in the majority of treatments. Rates for technical success and complications are comparable to common values of MWA.

B-0861 11:11

MR-guided microwave ablation in hepatic tumours: initial results in clinical routine

R. Hoffmann, H. Rempp, D. Kessler, J. Weiss, K. Nikolaou, S. Clasen;
Tübingen/DE (ruediger.hoffmann@med.uni-tuebingen.de)

Purpose: Evaluation of the technical effectiveness, technical success and patient safety of MR-guided microwave ablation using a wide-bore 1.5-T MR system.
Methods and Materials: Institutional review board approval and patient informed consent were obtained for this prospective study. 14 Patients (60.2 years ± 9.7 [standard deviation]) with 17 hepatic malignancies (7 hepatocellular carcinoma, 10 hepatic metastases) underwent MR-guided microwave ablation between February and August 2015. Mean tumour size was 15.5 mm ± 7.7 (range: 7 - 37 mm). Planning, applicator placement, therapy monitoring and control imaging were carried out using a 1.5 T MR system. Technical success and ablation zone diameters were assessed by contrast-enhanced post-ablative control MR imaging. Technique effectiveness was assessed by dynamic hepatic MR study 1 month after treatment. Mean follow-up was 2.9 months ± 2.2 (range: 1-7 months).
Results: Technical success and technique effectiveness were achieved in all lesions (100%). One major complication (pneumothorax) occurred. Lesions were treated using 2.5 ± 1.2 applicator positions. Mean energy applied was 38.6 kJ ± 22.6 per tumour (range: 9 - 87 kJ). Mean total duration of energy application was 25.1 min ± 11.6 (range: 7 - 49 min) per tumour. Ablation zone short axis and long axis diameter were 30.7 mm ± 10.6 (range: 16 - 65 mm) and 53.2 mm ± 14.8 (range: 27 - 94 mm), respectively. 5 Patients developed new tumour manifestation in the untreated liver during initial follow-up. Local tumour progression was not observed.
Conclusion: MR-guided microwave ablation provides safe and effective treatment of hepatic malignancies.

B-0862 11:19

Microwave ablation in colorectal liver metastases: comparison of volume decrease, progression time, recurrence and survival rates with two different microwave systems

T.J. Vogl, A. Hagar, E. Mbalisike, S. Zangos; *Frankfurt a. Main/DE (t.vogl@em.uni-frankfurt.de)*

Purpose: To compare volume decrease in the ablated region, progression time, recurrence and survival rates in patients with colorectal liver metastases after microwave ablation (MWA) with a low-frequency system (LF)(Covidien™,Colorado/USA;915 MHz) vs. high-frequency system (HF)(AMICA™,Aprilia/ Italy;2450 MHz).
Methods and Materials: In this retrospective study 50 patients (30males/20females) underwent MWA in 79 ablation sessions: 23 patients (30 ablations) with an LF-system, 27 patients (30 ablations) with HF. MRI was performed 24hours after each therapy and at 3.6,12.18, and 24 months post ablation. Both groups were compared with Fisher's exact-test. Survival rates were calculated from first Ablation using Kaplan-Meier-test. Volume decrease in the ablated region was measured by Kruskal-Wallis-method. Inclusion criteria:≤5 liver metastases and ≤5 cm in size.
Results: Volume decrease was significantly higher with LF vs. HF after 3 months (LF: 52.04%; HF: 39.69%) and 6 months (70.52% vs. 58.22%), but there was no statistically significant difference at 12 months (LF:73.67%, HF:66.97%), 18 months (72.37% vs. 82.86%) and 24 months (83.27% vs. 85.09%). With HF there were 3 recurrent lesions (p=0.061) vs. LF 2 recurrent lesions (p=0.066). Median time-to-progression was 5.4 months with LF vs. 5.0 months with HF. Regarding survival, there were no statistically significant differences between the two systems at 1-,2-,3- and 4-year survival rates. 2-year survival rate was 100% for HF vs 95.65%(22/23) for LF, and 4-year survival rate was 96.77%(30/31) for HF vs 91.3%(21/23) for LF.
Conclusion: Both MWA-generators are effective treatment methods for colorectal liver metastases with differences seen in ablated volume, recurrence rates and progression time and no differences in volume decrease, stable response and survival rates.

B-0863 11:27

Applied energy and ablation volume after CT-guided radiofrequency- and microwave ablation of colorectal liver metastases

W.J. Heerink, R. Vliegenthart, M. Oudkerk, K.P. de Jong; *Groningen/NL (w.j.heerink@umcg.nl)*

Purpose: To determine the association between applied energy and ablation volume in computed tomography (CT)-guided percutaneous radiofrequency ablation (RFA) and microwave ablation (MWA) of colorectal liver metastases.
Methods and Materials: Thirty patients with colorectal liver metastases treated with RFA or MWA were retrospectively identified. The settings of the RFA and MWA generators were according to the vendor's protocol and documented during the procedure. These recordings were used to determine the total applied energy. Volumetry of the ablation zone was performed on portal venous phase CT scans acquired seven days after the ablation procedure, using a semi-automatic region growing algorithm. The correlation between applied energy (E) and ablation volume (V) was assessed by linear regression analysis.
Results: For RFA the mean ablation time was 73 minutes, applied energy was 455.2 kJ, and ablation volume 69.6 mL. For MWA, these measures were 21 minutes, 182.4 kJ and 66.8 mL, respectively. The correlation between applied energy and ablation volume could be approximated by the linear functions V = 9.53 + 0.13*E. (R2 = 0.84) and V = 8.39 + 0.32*E (R2 = 0.66), for RFA and MWA, respectively. The regression coefficient, indicating the relationship between applied energy and resulting ablation volume, was significantly higher in MWA than in RFA (p=0.002).
Conclusion: The correlation between applied energy and ablation volume of colorectal liver metastases is approximately linear, and is stronger for MWA than for RFA. Applied energy may be a useful parameter to monitor during ablation procedures.

B-0864 11:35

Does DEB-TACE enhance the local effect of IRE? Imaging and histopathological evaluation in a porcine model

P. Isfort[1], P. Rauen[1], H.-S. Na[1], N. Ito[2], C. Wilkmann[1], C. Kuhl[1], P. Bruners[1];
[1]*Aachen/DE*, [2]*Tokyo/JP (isfort@ukaachen.de)*

Purpose: Irreversible electroporation (IRE) is associated with a hypervascularised penumbra of vital temporarily damaged tissue due to reversible electroporation. Transarterial treatment of this penumbra could increase local efficacy of IRE. We conducted an in-vivo trial on swine to compare the ablation volumes of an IRE/DEB-TACE combination vs. IRE-only.
Methods and Materials: Nine swine underwent IRE in one liver lobe and DEB-TACE immediately followed by IRE in a different liver lobe. For DEB-TACE, 100-300 µm beads were loaded with 50 mg doxorubicin. For IRE, NanoKnife® was used with two IRE electrodes according to the vendor's recommended protocol. After one day (n=3), three days (n=3) and seven days (n=3) animals were sacrificed, and ablation volumes were evaluated histopathologically. Imaging follow-up was performed using CT and MRI. Lesion volumes were measured one day (n=9), three days (n=6) and 7 days (n=3) after the procedure.
Results: Mean histopathological ablation volume of IRE/DEB-TACE combination lesions after one, three and seven days were 15.7 ± 11.1 ml, 11.9 ± 9.3 ml and 4.2 ± 1.4 ml. Mean histopathological ablation volumes of IRE-only lesions after one, three and seven days were 7.2 ± 4.5 ml, 4.1 ± 1.0 ml and 2.3 ± 1.5 ml. In intra-individual comparison the ablation volumes of the IRE/DEB-TACE combination group were on average 199.6 %, 163.3% and 98.5% larger than IRE-only lesions after one, three and seven days.
Conclusion: IRE followed by DEB-TACE resulted in larger ablation volumes compared to IRE suggesting that local efficacy of IRE can be enhanced by post-IRE DEB-TACE.

B-0865 11:43

Iterative metal artefact reduction for CT-guided microwave antenna positioning: impact on image quality for different exposure settings

T.D. Do[1], C. Schlett[1], C. Melzig[1], T. Gockner[2], P. Flechsig[1], P.L. Peireira[1], H.-U. Kauczor[1], W. Stiller[1], C.M. Sommer[1]; [1]*Heidelberg/DE*, [2]*Mainz/DE (thuyd_do@gmx.de)*

Purpose: To compare objective and subjective image quality between iterative metal artefact reduction and standard filtered back projection for CT-guided microwave antenna positioning.
Methods and Materials: A microwave antenna was positioned in livers of 3 pigs. Seven CT-acquisitions with exposure settings ranging from 120 kVp/200 mAs to 120 kVp/50 mAs followed. Advanced Modeled Iterative REconstruction (ADMIRE-I301) and standard Filtered Back Projection (sFBP-B30) were used to obtain images with a slice thickness/increment of 2/1 mm. Density measurements in different positions [e.g. antenna tip, liver distal to the antenna tip, liver > 3 cm away from the antenna (L> 3 cm) and inferior vena cava] were performed. Difference in density between liver distal to the antenna tip and L> 3 cm (DD) as well as the inferior vena cava to L> 3 cm signal-to-noise ratio (SNR) were calculated. Artefacts (1-none, 2-mild, 3-moderate, 4-severe) and overall image quality (1-excellent, 2-good, 3-fair, 4-poor, 5-non-diagnostic) were rated. Two observers analysed all images twice.
Results: DD was significantly lower and SNR was significantly higher for ADMIRE-I301 compared with sFBP-B30 for different exposure settings (e.g. 120 kVp/100 mAs: -44.35±31.09 HU vs. -213.40±21.93 HU [$p < 0.01$] and 3.16±0.15 vs. 2.81±0.22 [$p < 0.05$], respectively). Artefacts were lower for ADMIRE-I301 compared with sFBP-B30 and overall image quality was comparable between both techniques for different exposure settings (e.g. 120 kVp/100 mAs: 2.2±0.3 vs. 4.0±0.0 and 2.0±0.0 vs. 1.8±0.3, respectively). Inter-observer agreement was substantial for different exposure settings (e.g. 120 kVp/100 mAs, DD, ADMIRE-I301: intraclass correlation coefficient of 0.81 with a 95%-confidence interval of 0.62-0.99).
Conclusion: For CT-guided microwave antenna positioning, ADMIRE-I301 improves objective and subjective image quality for different exposure settings compared with sFBP-B30.

10:30 - 12:00 **Room G**

Radiographers

SS 1014

High dose antidotes

Moderators:
I. Arkhipova; Moscow/RU
S. Brandão; Porto/PT

B-0866 10:30

Patient doses in lumbar spine

A. Henner, K. Paalimäki-Paakki; *Oulu/FI (anja.henner@oamk.fi)*

Purpose: Finnish Radiation and Nuclear Safety Authority set updated diagnostic reference levels in 2014 for adult's lumbar spine both for ESD and DAP values. New values are: pa/ap projection 3.5 mGy (1 Gy*Cm2) and lateral projection 10 mGy (2.1 Gy*Cm2). There is also new achievable level with DR for pa/ap 1.8 mGy (0.7 Gy*Cm2) and for lateral 1.5 Gy*Cm2. Purpose of this study was to find out doses of plain lumbar spine examination and compare them to updated reference levels.
Methods and Materials: Student radiographers collected data during their clinical practice in Finland during spring 2014 and 2015 from health centres and central hospitals. Imaging protocols, equipment and doses were documented. Entrance surface doses were counted with formula ESD = Y (U,F) · (FDD/FSD)2 · Q · BSF. Measurements of radiation output were done by vendors or hospital engineers. DAP meter was available only in few places.
Results: Source to image distance 150 cm, focal spot size 1 mm/1.2 mm, grid 10:1 or 12:1 and AEC with central chamber were used. Added filtration varied as well kV. Mean ESD was 2.6 mGy in pa/ap and 4.9 mGy in lateral projection.
Conclusion: The results show that mean ESD 2.6 mGy in pa/ap projection compared to DRL 3.5 mGy and in lateral ESD 4.9 mGy compared to 10 mGy clearly are below reference level. Both CR and DR detectors are included in the mean. With DR the mean ESD in pa was 1.2 mGy which is under the achievable level.

B-0867 10:38

Patient skin dose in interventional radiology: an international review of procedures

L. O'Hora[1], M.-L. Butler[1], D. Catania[2], M. Ong[3], R. Decoster[4], J. Offermans[5], T. Starc[6], L. Rainford[1]; [1]*Dublin/IE*, [2]*Milan/IT*, [3]*Singapore/SG*, [4]*Brussles/BE*, [5]*Maastricht/NL*, [6]*Ljubljana/SI (lohora@mater.ie)*

Purpose: To establish clinical implementation of best practice guidance (BPG)in the identification and follow-up of potential tissue reactions in interventional radiology (IR).
Methods and Materials: Staff in a number of international interventional radiology centres were surveyed to investigate how BPG has been interpreted and implemented into policy. A 31 question survey was generated. This was distributed through professional bodies and academic institutions in 6 countries. The questionnaire was divided into sections: staff and training; IR specialties and procedure numbers; equipment and dose metrics; patient consent; tissue reaction identification; patient follow-up and tissue reaction management.
Results: Completed questionnaires (n=207) were collected from 6 countries (Ireland, Italy, Republic of Singapore, Belgium, the Netherlands and Slovenia) which delivered IR specialties including cardiac, neurological, general and vascular. Mean annual patient procedures per center was 3165. In 83.9 % (n=167) of respondents (n=199), the radiographer is responsible for practical radiation safety operations during IR procedures. Only 19.6% (n=20) of respondents (n=102) included tissue reactions in IR patient consent. Whilst 16.6% (n=15) of respondents (n=90) indicated use of a pre-determined dose metric 'trigger value' to indicate potential skin injury only 3 respondents are using current BPG values. Respondents, 27% (n=17) of an overall potential response (n=63) indicated that patients are informed once established trigger levels are reached.
Conclusion: Results demonstrate poor implementation of BPG. Only 16.6% of respondents use patient dose trigger values to identify potential tissue reactions, 3.33% using BPG values. Findings suggest a lack of understanding of dose metrics and appropriate trigger values.

B-0868 10:46

Small fov cone beam computed tomography: dosimetry for temporomandibular joint exam

M.V.L. Oliveira[1], M. Andrade Almeida[2], W. Batista[1], P. Flores[1]; [1]*Salvador/BR*, [2]*Recife/BR (marcusradiology@gmail.com)*

Purpose: The aim of this study was to evaluate the doses of radiation to which organs of the head and neck are submitted in Cone Beam Computed Tomography (CBCT) examinations of the Temporomandibular Joint (TMJ).
Methods and Materials: a tissue-equivalent anthropomorphic phantom (model RS-230, Radiation Support Devices) and an unit CS9000 3D (Carestream Health, New York, New York, USA) were used. Thermoluminescent dosimeters, type TLD-100 (LiF:Mg,Ti), were placed on the surface corresponding to the eyes, and the parotid, submandibular and thyroid glands. The air DAP (Dose-Area Product) meter reference level for CBCT was used. In addition, to evaluate the X-ray beam, a multimeter of the semiconductor type was used, placed on the equipment detector.
Results: The radiation dose on the surface of the organs increase with the increase in kilovoltage; eyes and parotid glands were the organs most exposed: 2.14 mGy and 0.55 mGy, respectively; the DAP measured ranged from 171.6 mGy.cm² to 261 mGy.cm² and increased with the increase in kilovoltage (kV); the mean voltage was lower than the selected voltage.
Conclusion: The radiation doses were non uniform on the surface of organs on the left and right sides; The radiation dose on the organ surface varies according to its location in relation to the TMJ; the DAP values are situated within acceptable limits; the difference between the voltage used and voltage measured recommends periodic calibration of the equipment.

B-0869 10:54

Quantification of tertiary scatter radiation in a CT room

R.P.P. Almeida, A. Calafate, P. Sousa, S. Rodrigues, L.P. Ribeiro, J.P. Pinheiro, K.B. Azevedo, A.F.C.L. Abrantes; *Faro/PT (jppinheiro@ualg.pt)*

Purpose: It is inadvertently assumed that tertiary scatter radiation is negligible. Furthermore, there is not a simple method to easily estimate the tertiary scatter levels for specific facilities. So, the main goal of this study was to quantify the tertiary scatter radiation in a CT room through a suitable method, especially considering the increases in workloads of interventional CT procedures.
Methods and Materials: An experimental study was conducted in a CT room using a 16 slices equipment and a water phantom simulating the patient. In the first stage, measurements in different configurations were performed using a radiation detector (Atomtex AT1123) and a lead shield with a thickness of 20 cm between the CT equipment and radiation detector. In the second stage, measurements were performed with thermoluminescent dosimeters and a full

body anthropomorphic phantom assuming the role of occupationally exposed individuals such the interventional radiologist.
Results: The tertiary scatter radiation had a minimum contribution of 3.4% with the detector oriented to gantry (0°) and a maximum contribution of 42.4% in the opposite orientation (180º). The most exposed anatomical regions to the effects of radiation were hands, skull and crystalline lens with values of equivalent dose of 2.01x10-3 mSv/s, 1.58x10-3 mSv/s 1.20x10-3 mSv/s, respectively. The entrance skin dose rate was 2x10-3 mSv/s considering a maximum time of 90 minutes during a CT procedure guided by fluoroscopy.
Conclusion: Radiation protection measures are needed to minimise the tertiary scatter radiation effects on health professionals, especially when performing interventional procedures.

B-0870 11:02

Analysis of overexposed areas in paediatric plain radiography
A. Pereira, B. Poiares, B. Esteves, G. Paulo, J. Santos; *Coimbra/PT (xana.sp12@hotmail.com)*

Purpose: Compare the beam collimation with electronic collimation in chest, abdomen and pelvis paediatric plain radiographies, in order to quantify the over exposed areas. Analyse the impact of beam collimation in DAP values in paediatrics.
Methods and Materials: Retrospective analysis of exposure parameters, dose values and beam collimation (based on the irradiated detector area) of chest, abdomen and pelvis plain radiographies Digital Imaging Archiving and Communication System (DICOM) headers, available on Picture Archiving and Communication System (PACS). The electronic collimation and anatomic collimation (based on the European Guidelines in quality criteria) were directly measure on the image using the same calibrated workstation, and the areas were calculated. The impact of the reduction of 1 cm2 beam collimation in DAP values was analysed using paediatric anthropomorphic phantoms.
Results: The exposure parameters and dose values of the chest, abdomen and pelvis radiographies (n=256), as expected, increased with the patient age, however this fact non-occurred for the beam collimation. Significant differences were founded for beam collimation and electronic collimation areas, with a 17% mean overexposed area. There were no significant differences from anatomic and electronic collimated areas. The variation of 1 cm2 in beam collimation in paediatric anthropomorphic phantoms revealed an increased of 9% in DAP values.
Conclusion: In the majority of the exposures, radiographers electronic collimated according to the anatomic quality criteria instead of using beam collimation. Considering the impact of beam collimation in DAP values this collimation type must be used in order to reduce the dose values in children.

B-0871 11:10

Skindoses in cardiac intervention at St. Olavs University Hospital Norway
T. Berglund; *Trondheim/NO (tommy.berglund@stolav.no)*

Purpose: Apart from its benefits, interventional cardiology is known to generate high radiation doses. To be able to evaluate the dose levels given to patients, a monitoring of the maximum skin doses (MSD) should be done at the cardiac interventional departments. This study has measured radiation doses to the skin (MSD) to patients for some selected procedures in cardiac intervention. These doses were then correlated with dose indicators provided by the imaging equipment.
Methods and Materials: Data were collected from a total of 43 patients undergoing percutaneous coronary interventions (PCI) or radiofrequency ablation (RFA). Dose area product (DAP) and cumulative air kerma (CAK) were recorded concurrently with (MSD). The correlation between MSD - DAP and MSD - CAK was calculated.
Results: Correlation MSD and DAP, PCI patients: R2 = 0.82. Correlation MSD and CAK, PCI patients: R2 = 0.77. Correlation MSD and DAP, RFA patients: R2 = 0.97. Correlation MSD and CAK, RFA patients: R2 = 0.96.
Conclusion: A good correlation between MSD and both dose indicators was found. Threshold values and follow-up procedures in this study were established at the cardiac interventional department at St. Olav Hospital.

B-0872 11:18

An evaluation of organ doses and effective dose with dual-energy CT (DECT) and single-energy CT (SECT) using adult whole body imaging protocols
K. Yagami[1], T. Miyoshi[1], S. Shigeyama[1], H. Okada[1], T. Ukai[2], S. Suzuki[2]; [1]*Gifu/JP*, [2]*Toyoake/JP (yagami@gifu-u.ac.jp)*

Purpose: The aim of this study was to evaluate the characteristics of radiation exposure of DECT with the fast kVp switching method (Gemstone Spectral Imaging[GSI]).
Methods and Materials: The dose evaluations were performed using 64-detector CT scanner. A human equivalent body phantom with thermoluminescent dosimeters inside and on the surface was used to measure organ doses and effective dose. At tube voltage, GSI (80 kVp and 140 kVp), 80 kVp, and 140 kVp were used with a tube current of 360 mA. In addition, using AEC (Automatic Exposure Control) systems at 120 kVp were compared to those with GSI. Effective dose was calculated as the sum of organ doses multiplied by a weighting factor found in International Commission on Radiological Protection Publication 103.
Results: As the effective doses with GSI was 17 mSv, at 80 kVp it was 50% and at 140 kVp it was 2.0 times. Effective dose at 120 kVp using AEC was about 10 mSv. Organ doses with GSI were 17 mGy in the lungs and 27 mGy in the stomach. At 120 kVp, both were lower by at least 50%. The gonad dose with GSI was 14 mGy, which was about 50% of that with 120 kVp.
Conclusion: The effective dose with GSI was higher than that with 120 kVp using AEC, but the absorbed doses changed greatly depending on the organ.

B-0873 11:26

Exposure index in digital radiology
L.P. Ribeiro, J. Ribeiro, R.P.P. Almeida, S. Rodrigues, A.F.C.L. Abrantes, K.B. Azevedo, J.P. Pinheiro, O. Lesyuk; *Faro/PT (lpribeiro@ualg.pt)*

Purpose: To evaluate the Exposure Index (EI) of two different systems of digital radiology, compare it with the manufacturers standards and verify the image exposure conditions.
Methods and Materials: A total sample of 800 radiographs was collected (400 from system 1 and 400 from system 2) in two different radiology departments considering 4 different anatomical regions (chest, spine, abdomen and extremities). The following parameters were recorded for each radiograph using structured observation grids: exposure index, voltage, current-time product, dose-area product, use or not of anti-scatter grid and focus image distance. Correlation tests between dependent and independent variables were made.
Results: Most of the radiographs were considered above the standards (underexposed) for both systems. With the system 1, 92% of the radiographs were underexposed for the chest examinations with anti-scatter grid, 84% for the chest without anti-scatter grid grid, 75% for the abdomen, 94% for the spine and 66% for the extremities. With the system 2, 94% were underexpose for the chest with anti-scatter grid, 56% underexpose and 8% overexposed for the chest without anti-scatter grid, 70% underexposed for the abdomen, 74% underexposed for the spine, and 52% underexposed and 17% overexposed for the extremities. Using the Pearson correlation coefficient, it was verified a statistical significante correlation ($p < 0.01$) between EI with tension and focus image distance.
Conclusion: The Exposure Index is an important tool in patient radioprotection, since they are easily accessible values and represents an estimate of the patient exposure in order to avoid overexposure and attending the ALARA principle.

B-0874 11:34

Dosimetric advantage of percutaneous femoral artery approach vs radial approach in coronary angiography: preliminary analysis
D. Aviano[1], S. Presilla[1], M. Mangiarotti[2], F. Ruda[1], M. Moccetti[1]; [1]*Lugano/CH*, [2]*Varese/IT (davide.aviano@gmail.com)*

Purpose: The aim of our study was to measure radiation dose absorbed by patient and interventional operators during coronary procedures comparing transradial and transfemoral access;using sterile and scattered radiation-absorbing shield-or not.
Methods and Materials: We studied 20 patients,10 undergoing cardiovascular percutaneous procedures by femoral artery approach and 10 by radial artery approach;for 5 patients by both approaches we used the sterile radiation-absorbing shields placed near the site of puncture. The two accesses were compared for effectiveness,time and use of fluoroscopy and fluorography.Data were collected through the use of "live" dosimeters,able to provide in real time the values of radiation dose absorbed by the patient and the operator,discerning the dose to skin,crystalline and internal organs.
Results: The study showed a reduced operator radiation exposure during percutaneous coronary procedures through femoral approach:-8% and -43% of superficial doses respect to radial access for the first operator and the second operator.The use of sterile radiation-absorbing shields is effective for radiation protection for operators and for patients in both the types of access: superficial dose reduction of 74% for femoral access and 81% for radial access with use of drape for first operator; -42% and -22% of superficial dose to the chest respectively for femoral and radial access with use of the drape for the patient.
Conclusion: From a radiation protection point of view,the femoral approach using sterile radiation-absorbing shields is preferred over the radial approach given that,on equal efficacy of the result,we have reduced dose for operators and patients.

B-0875 11:42

Effect of patient size on radiation dose for abdominal MDCT performed with automatic exposure control

O. Seraydarmansour; *Tehran/IR (mansour.omid@yahoo.com)*

Purpose: The purpose of this study was to investigate the effect of patient size on the radiation used to perform abdomen-pelvic CT examinations with automatic exposure control.
Methods and Materials: 60 patients underwent abdominal-pelvic CT with 16 slice multidetector row CT (Neuviz 16, Neusoft Medical co.China) using automatic exposure control in the x,y and z planes. Scan parameters included 120 kvp, pitch 0.986 ,detector collimation 16x0.75 mm, slice thickness 5 mm, rotation time 0.6 s. Each patient was weighed by the CT operator and was recorded in the patient setup at the CT console. CTDIvol listed on the dose report from the CT scanner. Two radiologists evaluated the studies for noise and diagnostic acceptability.
Results: Among the 60 patients (38 men,22 women ,average age 51 years and average weight 84 kg) the average CTDIvol was 14.2 mGy to perform abdomen-pelvic CT examinations. CTDIvol increased as a function of patient weight. There is good correlation between the effective tube current and body mass index of patient with the automatic exposure control.
Conclusion: We conclude that for CT examination of the abdominal-pelvic with automatic exposure control, the radiation to perform the examinations in 90 kg patients is approximately 2 times that of a 60 kg patient.

B-0876 11:50

Study of the effect of classification of patients on CT radiation dose

S. Kwon[1], J. Lee[1], D. Han[2]; [1]*Seoul/KR*, [2]*Sungnam-si/KR*
(kso4301@naver.com)

Purpose: The purpose of this study was to investigate the effect of classification of patients according to BMI, sex, age, and referring medical department on radiation dose.
Methods and Materials: We included 22,615 patients (13,175 male and 9,440 female patients) who underwent Abdomen and Pelvis CT, Chest CT, and Low-Dose Chest CT from October to December, 2013. To estimate and analyse radiation dose, we used CTDI and DLP calculated on 15 CT machines (10 Siemens Healthcare machines, 5 GE Healthcare machines). Statistical analysis was performed using SPSS 21.0.
Results: In all 3 different examinations, radiation dose was higher in male patients than female patients, and the difference showed statistically significant. There was low significant correlation between age and radiation dose, however, radiation dose was lower in the older age group. The statistical test also revealed that relationship between BMI and radiation dose was statistically significant. Radiation dose also varied between the different medical departments. Radiation dose was about 7% lower (518 mGy) than average (554 mGy) in CT exams of Gastroenterology department, while it was about 8% higher (597.8 mGy) than average in CT exams of Urology department. Radiation dose varied a lot between different machines and sex although other conditions-height and weight- were same.
Conclusion: Radiation dose varies depending on patients' sex, BMI, and age. Therefore, we can reduce CT radiation dose by adjusting radiation exposure according to the classification of patients.

10:30 - 12:00 **Room M 1**

Head and Neck

SS 1008

Maxillofacial imaging

Moderators:
N.I. Traykova; Plovdiv/BG
G. Widmann; Innsbruck/AT

B-0877 10:30

Advanced modeled iterative reconstruction in low-tube-voltage contrast-enhanced neck CT: evaluation of objective and subjective image quality

J.-E. Scholtz, M. Kaup, K. Hüsers, M.H. Albrecht, B. Bodelle, R.W. Bauer, T. Lehnert, T.J. Vogl, J.L. Wichmann; *Frankfurt a. Main/DE*
(janerikscholtz@gmail.com)

Purpose: Dose-saving techniques in neck CT cause increased image noise that can be counteracted by iterative reconstruction. Our aim was to evaluate image quality of advanced modeled iterative reconstruction (ADMIRE) in contrast-enhanced low-tube-voltage neck CT.
Methods and Materials: Sixty-one patients underwent 90-kVp neck CT using third-generation 192-slice dual-source CT. Image series were reconstructed with standard filtered back projection (FBP) and ADMIRE strength levels 1, 3, and 5. Attenuation and noise of sternocleidomastoid muscle, internal jugular vein (IJV), submandibular gland, tongue, subscapularis muscle, and cervical fat were measured. Signal-to-noise (SNR) and contrast-to-noise ratios (CNR) were calculated. Two radiologists assessed image noise, image contrast, delineation of smaller structures, and overall diagnostic acceptability. Interobserver agreement was calculated.
Results: Image noise was significantly reduced using ADMIRE compared to FBP with lowest noise observed in ADMIRE 5 (FBP, 9.4±2.4 HU; ADMIRE 1, 8.3±2.8 HU, ADMIRE 3, 6.7±2.0 HU; ADMIRE 5, 5.4±1.7 HU; all $p < 0.001$). Sternocleidomastoid SNR and IJV-sternocleidomastoid CNR were significantly higher for ADMIRE with best results in ADMIRE 5 (all $p < 0.001$). Subjective image quality and image contrast of ADMIRE 3 and 5 were consistently rated better than for FBP and ADMIRE 1 (all $p < 0.001$). Image noise was rated highest for ADMIRE 5 (all $p < 0.005$). Delineation of smaller structures was voted higher in all ADMIRE strength levels compared to FBP ($p < 0.001$). Global interobserver agreement was good (0.75). Calculated SSDE was 13.6±1.2 mGy
Conclusion: Contrast-enhanced 90-kVp neck CT is feasible and ADMIRE 5 shows superior objective image quality compared to FBP. ADMIRE 3 and 5 show best subjective image quality.
Author Disclosures:
R.W. Bauer: Speaker; Siemens Healthcare, Computed Tomography Division.

B-0878 10:38

3rd dual-source CT of the neck using automated tube voltage adaptation in combination with advanced modeled iterative reconstruction: evaluation of image quality and radiation dose

J.-E. Scholtz, J.L. Wichmann, K. Hüsers, M.H. Albrecht, M. Beeres, S. Fischer, R.W. Bauer, T.J. Vogl, B. Bodelle; *Frankfurt a. Main/DE*
(janerikscholtz@gmail.com)

Purpose: To evaluate image quality and radiation dose in third-generation dual-source computed tomography (DSCT) of the neck using automated tube voltage adaptation (TVA) with advanced modeled iterative reconstruction (ADMIRE) algorithm.
Methods and Materials: 116 patients were retrospectively evaluated. Group A (n=59) was examined on second-generation DSCT with automated TVA and filtered back projection. Group B (n=57) was examined on a third-generation DSCT with automated TVA and ADMIRE. Age, body diameter, attenuation of several anatomic structures, noise, signal-to-noise ratio (SNR), contrast-to-noise ratio (CNR), radiation dose (CTDIvol) and size-specific dose estimates (SSDE) were assessed. Diagnostic acceptability was rated by three readers.
Results: Age ($p=0.87$) and body diameter ($p=0.075$) did not differ significantly. Tube voltage in Group A was set automatically to 100 kV for all patients (n=59), and to 70 kV (n=2), 80 kV (n=5), and 90 kV (n=50) in Group B. Noise was reduced and CNR was increased significantly ($p < 0.001$). Diagnostic acceptability was rated high in both groups with better ratings in Group B ($p < 0.001$). SSDE was reduced by 34% in Group B (20.38±1.63 mGy vs. 13.04±1.50 mGy, $p < 0.001$).
Conclusion: Combination of automated TVA and ADMIRE in neck CT using third-generation DSCT results in a substantially radiation dose reduction with low noise and increased CNR.
Author Disclosures:
R.W. Bauer: Speaker; Siemens Healthcare, Computed Tomography Division.

B-0879 10:46

Low-dose CT of the paranasal sinuses: minimising x-ray exposure with spectral shaping

W. Wuest, M. May, M. Uder, M. Lell; *Erlangen/DE*
(wolfgang.wuest@uk-erlangen.de)

Purpose: Shaping the energy spectrum of the x-ray beam has been shown to be beneficial in low dose CT. Aim of this study was to investigate dose and image quality of tin filtration at 100 kV for preoperative planning in low-dose paranasal CT imaging in a large patient cohort.
Methods and Materials: In a prospective trial 129 patients were included. 64 patients were randomly assigned to the study protocol (100 kV with additional tin filtration, 150 mAs, 192x0.6 mm slice collimation) and 65 patients to the standard low-dose protocol (100 kV, 50 mAs, 128×0.6-mm slice collimation). To assess the image quality, subjective parameters were evaluated using a 5-point scale. This scale was applied on overall image quality and contour delineation of 10 critical anatomical structures.
Results: All scans were of diagnostic image quality. Bony structures showed at least good image quality in both groups, soft tissues were rated moderately in the study group because of a high level of noise. Radiation exposure was very low in both groups, but significantly lower in the study group ($CTDI_{vol}$ 1.2 mGy vs. 4.4 mGy, $p < 0.001$).
Conclusion: Spectral optimisation (tin filtration at 100 kV) allows for visualisation of the paranasal sinus with sufficient image quality at a very low radiation exposure.
Author Disclosures:
W. Wuest: Speaker; Siemens. **M. May:** Speaker; Siemens. **M. Uder:** Speaker; Siemens, Bayer, Bracco. **M. Lell:** Speaker; Siemens, Bayer, Bracco.

B-0880 10:54

Effect of spectral shaping on radiation dose in computed tomography of the paranasal sinuses

M.S. May, M. Lell, M. Uder, W. Wüst; *Erlangen/DE*
(matthias.may@uk-erlangen.de)

Purpose: Spectral shaping of the x-ray beam by tin prefiltration has been shown to be beneficial in low dose Computed Tomography (CT). Aim of this study was to investigate the extent of radiation dose reduction by tin filtration at 100 kV in low-dose paranasal CT imaging at constant image quality.
Methods and Materials: 100 Patients were randomised to a study group (A: 100 kV, 200 mAs) with tin filtration and a reference group (B: 100 kV, 25 mAs) without tin filtration (B) using a third generation Dual Source CT. Subjective image quality was rated on a 5 Point Likert scale. Objective image quality was measured as standard deviation of the attenuation values in the vitreous body and air in the maxillary sinus on both sides and contrast to noise ratio (CNR) was calculated. Radiation dose was assessed as CTDIvol.
Results: All scans were of diagnostic image quality. Mean image noise was 16±2 HU in A and 16±3 HU in B for measurements in the vitreous body (p=0.7) and 14±3 HU (A) vs. 15±3 HU (B) in the maxillary sinus without statistically significant differences (p=0.7 and 0.08). CNR was comparable (p=0.7) between A (63±11) and B (63±10). However, radiation exposure was as low as 1.7 mGy (A) vs. 2.1 mGy (B, $p < 0.01$).
Conclusion: Spectral shaping by tin filtration at 100 kV allows for visualisation of the paranasal sinuses with comparable image quality and 19% radiation dose reduction compared to examinations without tin filtration.
Author Disclosures:
M.S. May: Other; Speakers' bureau Siemens Healthcare GmbH. **M. Lell:** Other; Speakers' bureau Siemens Healthcare GmbH. **M. Uder:** Other; Speakers' bureau Siemens Healthcare GmbH. **W. Wüst:** Other; Speakers' bureau Siemens Healthcare GmbH.

B-0881 11:02

Radiation exposure (RE) and image quality of low-dose computed tomography (CT) of the paranasal sinuses (PS) using iterative reconstructions (IR)

M. Cellina, G. Sciveres, D. Mariani, M. Orsi, B. Tagliaferri, G. Oliva; *Milan/IT*
(m.cellina@yahoo.it)

Purpose: Our aim was to determine the effect of reducing mAs using IR on image quality, Effective Dose (ED) and RE of lens and thyroid in CT of PS.
Methods and Materials: 3 groups of 30 patients (23-44; 32±7 years) with suspected inflammatory disease of PS underwent CT with either standard settings (A)(130 mAs, 100 kV, time rotation: 1 sec, collimation: 128 x 0.6 mm, pitch: 0.8), reconstructed with filtered-back projections, or with low-dose protocol at 80 (B) or 40 (C) mAs, reconstructed with IR (SAFIRE). Raw datasets were reconstructed with bone and soft-tissue algorithms.ED was calculated from the dose-length product. Orbital and thyroid RE was measured using thermoluminescent dosimeters.2 readers, blinded to examination protocols, rated independently image quality with a 5-point grading scale (1=poor, 5 = excellent) and assessment of 5 anatomic structures (0= not demonstrated, 2= clearly defined). Interobserver agreement was estimated with k-coefficient.
Results: Mean ED was 0.41±0.004 mSv (A) vs 0.26±0.01 mSv (B) vs 0.12±0.01 mSv (C) ($p < 0.01$) resulting in a dose reduction of 36.5 (B) and 70.7%(C).Radiation exposures of thyroid were: 1235±2140 µSv (A), 428±165 µSv (B), 192±54 µSv (C); of the lens: 10352±2156 µSv (A), 6842±837 µSv (B), 3592±746 µSv (C) ($p < 0.01$).k values were: 0.79 - 0.84. Best image quality was observed in A (4.9±0.2) vs 4.5±0.4 (B) vs 4±0.8 (C). Anatomic stuctures assessment was 2 (A) vs 1.9±0.2 (B)vs 1.8±0.4 (C) (p=0.22).
Conclusion: The use of low-dose protocol with IR allowed significant dose reduction up to 70% and markedly reduced RE of lens and thyroid without impairing the image quality for PS CT.

B-0882 11:10

Cone beam CT (CBCT) and multislice CT (MSCT) in the diagnostic imaging of the maxillary sinuses: evaluation of patient radiation dose and radiographic assessment of findings

E. Saukko, H. Niiniviita, H. Lauren; *Turku/FI (ekaterina83@hotmail.com)*

Purpose: CBCT has become an important diagnostic modality in dental practice. Broadening range of CBCT clinical applications has enabled imaging of the maxillary sinuses. The aim of this paper was to evaluate radiation dose to patient and to assess radiographic finding from CBCT and MSCT.
Methods and Materials: Patient radiation doses were measured in both modalities using TLD chips implanted at various positions within an anthropomorphic head phantom. DLP and CTDIvol were collected from MSCT (n=20), for CBCT they were determined by the pre-selected exposure values and fixed FOV. Effective dose (ED) was calculated from DLP by using a conversion factor. Radiographic assessment of findings was performed retrospectively from reports of 20 CBCT and 20 MSCT scans of maxillary sinuses.
Results: The measured radiation dose for MSCT was 3.99 mGy and for CBCT 3.06 mGy, 3.95 mGy and 4.69 mGy for small, medium and large scan protocols. Compared with MSCT, the DLP, CTDIvol and ED were lower in CBCT when using small and medium scan protocols. Typical indication for imaging sinuses in CBCT and in MSCT was known or suspected sinusitis. The most common finding detected in CBCT was maxillary sinusitis (n=9, 45%) and in MSCT the structural abnormalities (n=6, 30%). One third of detected maxillary sinusitises in CBCT were tooth associated (n=3). The 85 % (n=17) of evaluated MSCT scans of sinuses could have been initially performed with CBCT.
Conclusion: Patient radiation dose can be optimised by selection of an appropriate imaging modality in the imaging of maxillary sinuses.

B-0883 11:18

Incidental findings in cone beam CT of the maxillofacial region

M.J. Braun[1], T. Rauneker[2], T. Hoffmann[2], F. Dammann[3], J. Dreyhaupt[2], M. Beer[2]; [1]*Günzburg/DE*, [2]*Ulm/DE*, [3]*Göppingen/DE*
(michael.braun@bkh-guenzburg.de)

Purpose: To identify frequency and clinical impact of incidental findings in CBCT examinations.
Methods and Materials: 374 consecutive CBCT examinations of a clinical collective were evaluated retrospectively for the presence of incidental findings, respectively pathological findings in addition to the primary indication. With few exceptions CBCT was executed by applying a FOV of 100 x 100 mm and an isotropic voxel size of 0.25 mm. Clinical relevance of the incidental findings was appraised in accordance to a three step scale. Furthermore,in a subgroup of 54 patients clinical records were screened for medical history and therapeutic consequences that were derived from additional findings in the CBCT.
Results: In each CBCT examination a mean of 3.3 additional diagnoses were detected. 29% of these diagnoses required a treatment, additional 23% a follow-up. 48% were clinically not relevant. In the subgroup evaluated by medical file analysis 29 patients showed additional findings which were previously unknown. Additional findings of 19 patients led to a change of therapy management. These group of findings requiring treatment included periapical diseases (45%), inflammation of the sinus (20%), marginal resorptions (20%) and others (15%).
Conclusion: CBCT of the maxillofacial region reveals additional findings with clinical importance in a high percentage. These findings which were frequently unknown before CBCT, induce a change of therapy or follow-up management in nearly every second patient.

B-0884 11:26

Bisphosphonate-induced osteonecrosis of the jaws: CT image spectrums and their correlation with disease prognosis

H. Kim, J. Kim, S.-Y. Jeong; *Seoul/KR (coffee@catholic.ac.kr)*

Purpose: Bisphosphonate-induced osteonecrosis of the jaws (BRONJ) is a non-healing exposure of bone in the maxillofacial region in patients who have been treated with bisphosphonate. The aim of this study is to evaluate the CT findings of BRONJ and their correlation with prognosis.
Methods and Materials: We retrospectively reviewed CT images and clinical data of patients diagnosed as BRONJ at our institution between Feb 2005 and Feb 2015. 22 lesions of 19 patients are included. The CT appearances were classified into two types: type I predominantly sclerotic; type II predominantly osteolytic. CT findings of each lesion were evaluated in regard with extent, cortical breakage and presence of sequestrum. Follow-up images were classified into three types: healing, no significant change and progression.
Results: Of the 22 lesions, 14 (64%) were located at mandible. CT appearance of the lesion was type II in 15 (68%) and type I in 7 (32%). Osteolysis was present in all of the cases and sclerosis was present in 19 (86%). Extent of the lesions was less than 1/2 of maxilla or mandible in 12 (55%). Cortical breakage and sequestrum were present in 18 (82%) and 14 (64%), respectively. Follow-up CT showed healing in 9 (41%), progression in 4 (18%) and no significant change in 8 (36%). There were no statistically significant features related with healing or aggravation of the lesions.
Conclusion: Dominant CT feature of BRONJ was predominantly osteolytic (68%). CT findings such as disease extent, dominant feature, presence of sequestrum and cortical breakage were not statistically related with prognosis.

B-0885 11:34

Morphometric analysis of joint elements and masticatory muscles in temporomandibular joint dysfunction

F. Duman[1], A.E. Cicekcibasi[2], N. Atci[1], I. Damlar[1], E. Dogru[1], F. Öztürk[1], T. Duman[1]; [1]*Hatay/TR*, [2]*Konya/TR (fatmaoz22@hotmail.com)*

Purpose: The aim of this study is examination of relation between discus articularis and mandibular condyle and changes in the size of the mastication muscles with magnetic resonance imaging (MRI) in patients with temporomandibular joint dysfunction (TMD).
Methods and Materials: 34 patients with TMD were diagnosed (mean age 29.44 ± 12.97 years) and 17 healthy subjects (mean age 32.82 ± 11.99 years) were included in the study. M. masseter, the superior and inferior parts of lateral pterygoid muscle and medial pterygoid muscle' length and widthand the depth of the mandibular fossa were measured on MRI. In addition, the types of mandibular condyle was recorded.
Results: It was observed that the length and the width of masticatory muscles were shorter and depth of the mandibular fossa was more shallow in patients with TMD than contol group (p0.05).
Conclusion: It was observed that intra-articular structures and size of the mastication muscles was found to be influenced negatively in patients with TMD. Mandibular fossa is shallower in patients with TMD than control group and that suggesting predispose to dysfunction. Also mastication muscles' length and width was seen lower in patients with TMD. It was thought that, limitation of jaw motion is blocking the work of the muscles in the physiological range and it is a possible cause of atrophy in the future.

B-0886 11:42

Sleep MRI with EEG: assessment of mechanism and obstruction level in patients with obstructive sleep apnea syndrome

P. Kavcic, A. Koren, B. Koritnik, L. Dolenc Groselj; *Ljubljana/SI (pavel.kavcic@gmail.com)*

Purpose: To evaluate the mechanism and level of upper airway obstruction in obstructive sleep apnea (OSA) patients during natural sleep together with synchronous electroencephalogram (EEG) and respiratory events registration at 3 Tesla MRI platform with high spatial and temporal resolution.
Methods and Materials: Twenty OSA patients were randomly selected for the study. Fifteen patients were able to complete spontaneous sleep during MRI. While asleep, dynamic MR images of pharynx were obtained in the midline sagittal view. During the scan, nasal and oral airflow, thoracoabdominal wall effort and EEG were synchronously recorded. The physiologic data were retrospectively scored to identify periods of apneas and synchronised with dynamic MR images.
Results: In all 15 patients the site of complete airway obstruction occurred at the retropalatal space. We noticed different position of soft palate during apneic events. In 7 out of 15 patients (47%) soft palate was attached to the tongue base and moved backwards compressing the airway. In 5 out of 15 patients (33%) soft palate was detached from the tongue base and solely moved backwards compressing the airway. In 3 patients (20%) we recorded both mechanisms of complete airway obstruction. In a group with attached soft palate to the tongue base we noticed significant narrowing of the retrolingual space during apneic events.
Conclusion: We describe a novel mechanism of obstruction depending on the position of soft palate. This mechanism might play an important role in selecting candidates for surgery or treatment with hypoglossal nerve stimulation.

B-0887 11:50

Diagnosing bone involvement in buccal malignancies with DWIBS (diffusion-weighted whole body imaging with background signal suppression): is it a better tool?

R. Balaji; *Chennai/IN (ravikanthbalaji@gmail.com)*

Purpose: To evaluate use of diffusion-weighted imaging with Background Signal Suppression (DWIBS) sequence to demonstrate cortical involvement in malignancies of buccal mucosa.
Methods and Materials: A retrospective study of CT and MR images was carried out in forty-three patients with buccal mucosal malignancies who underwent imaging for staging. Multi-planar reconstruction was performed on CT images which were acquired with patients puffing their cheeks. MR imaging was performed with T1 and T2 TSE, contrast and DWIBS sequences. DWIBS imaging was performed with b value of 1200. The CT and MR images were reviewed for maxillary or mandibular bony involvement. The usefulness of DWIBS sequence was evaluated and compared to currently accepted CT and T1-weighted MR imaging for bony cortical and marrow involvement. The results were correlated with surgical and pathological findings.
Results: DWIBS imaging identified presence or absence of cortical erosion and mandibular involvement in all patients. Diffusion imaging accurately identified cortical involvement in 38 patients, T1-weighted images in 30 and CT in 26.
Conclusion: DWIBS would be a more sensitive and accurate sequence in identifying cortical and marrow involvement in patients with buccal mucosal malignancies.

10:30 - 12:00 **Room M 2**

Paediatric

SS 1012

Abdominal and foetal imaging

Moderators:
G. Kasprian; Vienna/AT
G. Papaioannou; Athens/GR

B-0888 10:30

Can we avoid unnecessary scrotal exploration? The value of the sonographic chondral sign in the diagnosis of hydatid of Morgagni torsion in children: a decade's experience

V.N. Zefov, S.M. El-Maadawy, D. Abdul Rahman; *Dubai/AE (samarmaadawy@gmail.com)*

Purpose: Acute testicular pain and swelling are common presenting features of testicular and hydatid of Morgagni torsion in boys. The purpose of our 10 year prospective study is to assess the value of using the ultrasound "chondral sign" in the diagnosis and differential diagnosis between hydatid of Morgagni and testicular torsion thus avoiding unnecessary scrotal exploration.
Methods and Materials: 160 boys were included in our study. All had sonographic diagnosis of testicular or hydatid of Morgagni torsion. Data were collected from 2005 to 2015. All boys were examined by paediatric radiologist using a high resolution linear probe with color Doppler imaging. The results were correlated with the operative and histopathology findings.
Results: 30 cases were reported as testicular torsion and 130 reported as hydatid of Morgagni torsion. The age ranged from 1 day to 13 years with a median of 9 years. None of the testicular torsion cases were missed and all of them were explored with a sensitivity, specificity and positive predictive values of ultrasound of 100%, 80% and 96.1% respectively. Using the ultrasound chondral sign, the sensitivity, specificity, positive and negative predictive values for hydatid of Morgagni torsion were 98.3%, 80.0%, 92.3% and 80% respectively. 89 cases were explored and 41 cases treated conservatively and followed by ultrasound.
Conclusion: We believe that the sonographic "chondral sign" is a reliable diagnostic tool for hydatid of Morgagni torsion. The high sensitivity and specificity of ultrasound can help avoid unnecessary scrotal exploration.

B-0889 10:38

Diffusion-weighted imaging (DWI) in paediatric liver MRI - confuses or helps?

E. Petrash, E. Mikhaylova, D. Sevryukov; *Moscow/RU*
(cherkun.ekaterina@gmail.com)

Purpose: The purpose of this study was to find out whether apparent diffusion coefficient (ADC) can enable differentiation of benign and malignant focal liver lesions (FLL) in children.
Methods and Materials: 33 patients (male - 17, female - 16) with 72 FLL in total underwent MRI of the liver including DWI. The age of patients ranged from 5 months to 17years (mean-7.3). Inclusion based on the following criteria: the presence of newly diagnosed FLL, size of lesions more than 1 cm. Liver lesions were divided into benign (27) and malignant (45). Among benign-focal nodular hyperplasia (7), regenerating nodules (11), haemangiomas (9), among malignant-hepatoblastoma (6), hepatocellular carcinoma (4), cholangiocarcinoma (27), metastases (8). Diagnosis was confirmed histologically (all malignant and a part of benign FLL), by contrast-enhanced MRI (including hepatobilliary MRI contrast agents) and using dynamic control (for benign FLL).
Results: It was found that malignant tumours in the liver have a lower ADC (1,083±0.245*10-3s/mm2) than benign (1,372 ± 0.383*10-3s/mm2) ($p = 0.009$). ADC of malignant FLL was in the range 0.838 - 1.328*10-3 s/mm2, benign - 0.989-1,755*10-3 s/ mm2. It was suggested that FLL with ADC 0.989*10-3s/mm2 and lower can be attributed to malignant, above 1.328*10-3s/mm2 - benign. Neoplasms with ADC in the range of 0.989-1,328*10-3s/mm2 should be additionally examined and needs morphological verification.
Conclusion: Though differences in mean ADC values of benign and malignant FLL were significant, confidence intervals indicate their large overlap, so ADC can't be the main differential diagnostic criterion. Analysis of DWI images can help in difficult diagnostic cases, but should only be used in conjunction with standard MRI, including contrast-enhanced MRI.

B-0890 10:46

Accuracy of ultrasound signs, ARFI and clinico-laboratoristic data for detection of biliary atresia in cholestatic patients

L. Monti, M. Salsano, G. Soglia, M. Colella Bisogno, A. Simonetti, G. Torre, P. Rossi, L. Bonomo, P. Tomà; *Rome/IT (marco.salsano@hotmail.it)*

Purpose: To evaluate the accuracy of acoustic radiation force impulse (ARFI), ultrasound (US) findings and clinico-laboratoristic data for diagnosis of biliary atresia (BA) in cholestatic patients.
Methods and Materials: Clinical, laboratoristic, B-mode with color Doppler US findings and ARFI values were retrospectively reviewed in 91 consecutive patients with infantile cholestasis between April 2009 and October 2014. Diagnosis was confirmed by liver biopsy in all 49 patients with BA and in 18 of the 42 patients without BA. ROC curves were employed to identify the accuracy of the best cut-off point.
Results: Concerning clinical and laboratoristic evaluation, only the weight, the gamma-glutamyltransferase level and the presence of clay stool were significantly different between BA and non-BA patients ($p < 0.005$; accuracy respectively of 70%,73%,86%). The diagnostic accuracy of the different US findings was as follows: splenomegaly 77%, TC sign 87%, parenchymal dishomogeneity 70%%, liver profile alteration 82%, increased hepatic artery diameter 84%, dysmorphic gallbladder 93%. All these signs were significantly more frequent in BA patients ($p < 0.001$); only the portal vein diameter and the presence of cirrhosis did not result suitable to differentiate the two groups ($p > 0.3$). ARFI values were significantly higher in patients with BA than in those without BA cholestasis ($p < 0.005$; median ±standard deviation= 2.67 ±0.80 m/sec vs 1.42 ±0.48 m/sec; accuracy of 78% with a cut-off of 2.12 m/sec).
Conclusion: Ultrasonography is a powerful tool for diagnosis of BA in cholestatic patients. ARFI, clinical and laboratory data can help to differentiate between BA and non-BA cholestasis but are not discriminative themselves.

B-0893 10:54

Bowel contraction amplitude measured in CINE MR enterography (MRE) as a marker of inflammatory activity in children with Crohn's disease

J. Podgorska, R. Pacho, P. Albrecht, I. Łazowska-Przeorek; *Warsaw/PL*
(jpodgo@gmail.com)

Purpose: To determine whether a simple contraction amplitude measurement can be a marker of inflammatory activity.
Methods and Materials: MRE examinations of 77 consecutive paediatric patients (36 female, mean age 14, range 7-17), with confirmed Crohn's disease were retrospectively reviewed. The 'cine' imaging (coronal, Fiesta sequence, TR 3.5 ms, TE 1.5 ms, slice thickness 5 mm, 22 sec. breath hold) was performed through the small bowel. The terminal ileum (TI) was identified, its maximal and minimal diameter were measured, and the amplitude calculated. Other MRE sequences were used to evaluate Crohn's disease activity characteristics in TI: bowel wall thickness, T2 hyperintensity, relative contrast enhancement (RCE), deep ulcerations and mesenteric hyperaemia. ROC curve analysis between the amplitude and each of the activity characteristics was performed.
Results: Strong negative correlation was found between the amplitude, presence of deep ulcerations (OR=0.85, $p < 0.007$, area under the ROC curve (AUC) 0.92) and mesenteric hyperaemia (OR=0.88, $p < 0.001$, AUC=0.92), which are considered markers of severe Crohn's activity. Quite strong negative correlation was found between the amplitude and T2 hyperintensity (OR=0.92, $p < 0.001$, AUC=0.86). Linear negative correlation was found between bowel wall thickening and the amplitude (OR=0.94, $p < 0.001$, AUC=0.81). For patients with higher amplitude than 53% the analysis showed a significantly lower risk of wall thickening (OR=0. 09, $p < 0.001$). Weakest correlation was found between the amplitude and RCE (OR=0.95, $p < 0.001$, AUC=0.78).
Conclusion: This retrospective study showed that TI contraction amplitude can be easily measured, without dedicated software, and negatively correlates with other signs of inflammatory activity in Crohn's disease.

B-0894 11:02

MRI-US fusion imaging in real-time virtual sonography for the evaluation of foetal anomalies: preliminary study

S. Bernardo, V. Vinci, M. Saldari, A. Giancotti, C. Catalano, L. Manganaro;
Rome/IT (silviabernardo@live.it)

Purpose: Real-time virtual sonography (RVS) is a new technique that uses magnetic navigation and computer software for the synchronised display of real-time US and multiplanar reconstruction MRI images. The purpose was to evaluate the feasibility and ability of RVS to assess different pathologies in foetuses with suspected US anomalies.
Methods and Materials: Fusion imaging (Hitachi HI Vision Ascendus) was offered to 35 patients undergoing foetal MRI. The MRI image dataset acquired was loaded into the fusion system and displayed together with the US image. Both sets of images were then manually synchronised and images were registered using multiple planes MR imaging.The ability of RVS imaging to assess the main anatomical sites and fetal anomalies was evaluated and compared with standard US and MRI images previously acquired.
Results: RVS was technically possible in all cases. Data registration, matching and fusion imaging were performed in less than 15-20 minutes. The cases were 25 for the encephalic district and 10 for the body (8 thoraco-abdominal; 2 heart). In 10 cases of body, fusion imaging helped the diagnosis in 25%. In the 15/25 cases of encephalic pathology, fusion imaging improved the diagnosis; in the other 10 cases, MRI was superior to US even using the RVS.
Conclusion: This is a preliminary study on the feasibility and practical use of a foetal MRI-US real-time fusion imaging. Thanks to information from both US and MRI, fusion imaging allows better identification of the different foetal pathologies and could improve the performance of ultrasound examination.

B-0895 11:10

Comparison of amniotic fluid volumetry between fetal sonography (AFI) und MRI (AFVMRI) and its' correlation to diffusion parameters (ADC) of the foetal kidney

E. Kudryavtseva[1], D. Güllmar[1], A. Fiedler[1], U. John[1], D. Renz[1], D. Schlembach[2], E. Schleußner[1], U. Schneider[1], H.-J. Mentzel[1]; [1]*Jena/DE*, [2]*Berlin/DE*

Purpose: Amniotic fluid plays an important role in foetal well-being and changes in its' volume are often closely associated with foetal renal pathology (CAKUT) thus exact measurement of amniotic fluid volume (AFV) is of essential importance during pregnancy. The study determined whether AFV determination by magnetic resonance imaging (MRI) can be compared with ultrasound-based amniotic fluid index (AFI) and whether diffusion-weighted imaging (DWI) of the foetal kidneys can be used as a surrogate marker for the assessment of AFV and foetal kidney function.
Methods and Materials: Prospective evaluation of AFV based on TRUFI MRI (1.5 T) in 2 spatial planes (AFVMRI) and ultrasound-based AFI (n=16, 23-37 weeks of gestation). ROI analysis of the ADC values in normal kidneys and in pathological foetal kidneys (CAKUT) (b=0; 700/800 s/mm²) (n=30, 19-37 wk). Correlation of AFVMRI vs. AFI, renal volume and ADC.
Results: The correlation between AFI (13.60±2.46 cm) and AFVMRI (579±207 mL) was 0.66 ($p=0.05$). There was no significant correlation between AFVMRI and kidney volume, between AFVMRI and ADC700 and ADC800. The B700-ADC values of foetuses with CAKUT (n=14) were considerably higher than that in foetuses with healthy kidneys.
Conclusion: Foetal MRI can potentially be applied to determine the amount of amniotic fluid and provides a volume measure. The AFVMRI correlates with the ultrasound method. Diffusion values of foetal kidney are inverse proportional to AFVMRI; foetal kidneys with CAKUT present higher diffusivity. So, the diffusivity (ADC) can serve as a surrogate marker of foetal renal function in CAKUT.

B-0896 11:18

Can fetal MRI predit the need for neonatal emergency procedures?

M. Saldari, V. Vinci, S. Bernardo, L. Manganaro, C. Catalano; *Rome/IT (matteo.saldari@gmail.com)*

Purpose: To evaluate the role of Fetal MRI in predicting the need and helping the planning of neonatal emergency procedures.
Methods and Materials: In this prospective study we enrolled 35 consecutive pregnant women with ultrasound detection of fetal abnormalities possibly requiring a postpartum surgical procedure or anesthetic management and referred to our department of Radiology for a Fetal MRI. Fetal MRI protocol included T1- and T2-weighted, TrueFISP and DWI sequences on a 1.5 T magnet. Two Radiologists, not blinded to the US diagnosis and with more than 10 years of experience in fetal MRI, reviewed the MR images in order to detect the presence of findings suggestive for the necessity of a neonatal surgical or anesthetic intervention.
Results: Fetal MRI confirmed the US suspicion of: congenital diaphragmatic hernia (n= 10), gastroschisis (n=6), omphalocele (n=3), bronchogenic cyst (n=1) and 15 cases of neck masses, which Fetal MRI were able to characterise: cystic hygroma (n=4), lymphangioma (n=8) and cervical teratoma (n=3). All prenatal diagnoses were confirmed by surgical or pathological findings. In 23 cases (66%) Fetal MRI highlighted the need for emergency neonatal surgery, whereas in 12 fetuses (34%) MR excluded it, suggesting a medical management until respiratory and cardiovascular statuses were stabilize. In 16 cases (45%) Fetal MRI suggested the necessity of an emergency EXIT procedure.
Conclusion: Fetal MRI provides useful information for a proper neonatal intervention to prevent a fatal outcome in cases of life-threatening fetal abnormalities.

B-0897 11:26

Fetal MRI: 3 T or 1.5 T?

K. Pegoretti, S. Arulkumaran, J. Allsop, M.J. Fox, A. Price, J. Hajnal, M. Rutherford, C. Malamateniou; *London/UK (kelly.pegoretti@kcl.ac.uk)*

Purpose: Fetal magnetic resonance imaging (MRI) has been predominantly performed at 1.5 T magnetic field strength. A few centres have now reported results from imaging at 3 T, taking advantage of the increased signal-to-noise ratio (SNR) at higher field, which is beneficial for the visualisation of fetal anatomy. However, higher field imaging may also produce more artefacts. The purpose of this paper is to document the challenges and advantages of performing fetal MRI scans at 3 T and 1.5 T in healthy and complicated pregnancies both from a radiological/diagnostic and a radiographic/image quality perspective.
Methods and Materials: We assessed images from ten fetuses scanned at 1.5 T and ten gestationally age-matched foetuses scanned at 3 T, with equal numbers of controls and clinical cases imaged at each field strength. Customised patient care and patient safety protocols and optimised imaging techniques were used. T2-weighted fast spin echo images at three anatomical planes were evaluated for anatomic depiction of 55 different fetal and extra-fetal structures using a three-point rating scale. Similarly a comprehensive radiographic evaluation rated the SNR, field homogeneity and presence of artefacts on different fetal imaging acquisitions.
Results: Although 3 T images had significantly higher SNR, they also presented more field inhomogeneity and parallel imaging reconstruction artefacts. Anatomical depiction was comparable on both fields.
Conclusion: Fetal MRI at 1.5 T is adequate for the demands of a clinical setting. Imaging at 3 T to exploit the improved SNR for fetal imaging currently requires considerable expertise to deal with the complex issues of image artefacts at higher field.

B-0898 11:34

Postmortem MRI as a method of evaluating the degree of maceration at intrauterine fetal death

S.M. Voevodin, U.N. Tumanova, V.M. Liapin, A.I. Shchegolev, G.T. Sukhikh; *Moscow/RU (patan777@gmail.com)*

Purpose: The basis for determining the time remoteness of intrauterine fetal death is the assessment of the severity of the processes of maceration during the autopsy. Magnetic resonance (MR) imaging is an ideal modality to observe gross global changes in tissue structure, as is present with maceration.
Methods and Materials: The object of the study were the bodies of the 8 fetuses (gestational age 18-21 weeks) and 18 stillbirths (15 antenatal, 3 intranatal, gestational age 22-40 weeks). Postmortem imaging were performed on the unit 3 T Siemens Magnetom Verio (Germany). At the T1-and T2-weighted images were calculated MR maceration indicators for brain, lung, liver and kidney (MI=T2/T1 * K, where K is the specific coefficient characterizing features of MRI signal in different tissues) and the time of death. At autopsy, were evaluated macroscopic and histological signs of the degree of maceration and time of death.
Results: Based on the autopsy, the degree of maceration ranged from 0 to 4, the remoteness in time of death from 0 h to 40 days. MR maceration indicators (MI) of studied organs depends on the severity of maceration, and consequently from the time since death.
Conclusion: Increase the duration of intrauterine fetal death is accompanied by strengthening of tissue maceration processes and accordingly changes of the signal in T1-and T2 at MRI. The most accurate degree of maceration and time of death can be determined by calculating the MR maceration indicator of kidney from a stillborn at the time of death before 14 days.

10:30 - 12:00 **Room M 3**

Molecular Imaging

SS 1006

Advanced hybrid imaging in oncology

Moderators:
N.N.
N.N.

K-22 10:30

Keynote lecture

G. Cook; London/UK

B-0899 10:39

Variations of clinical PET/MR operations: an international web-based survey

T. Beyer[1], K. Herrmann[2], J. Czernin[3]; [1]*Vienna/AT*, [2] *Würzburg/DE*, [3]*Los Angeles, CA/US*

Purpose: To gather information on current PET/MR operations and clinical PET/MR perspectives worldwide.
Methods and Materials: As of 05/2015 all 69 active PET/MR users were surveyed. The survey was composed of 37 questions related to (A) PET/MR center and installation, (B) variations in imaging protocols and (C) potential future applications.
Results: Responses were collected from 38 (55%) sites: North America (24%), Europe (59%) and APAC (17%), corresponding to the regional installations. Sites operated PET/MR for (27±16) months. Funding for PET/MR installations came from hospitals (26%), governments (18%), private donations (30%) and grant support (26%). PET/MR installations were in Departments of Nuclear Medicine (32%), Radiology (26%), Radiation Oncology (5%), joint Imaging (29%) and other (8%). PET/MR operations were equally clinical (48%) and research oriented (52%). In total, 33'507 patients have been examined at all responding sites with an average throughput or 7 patients/week. On average sites employed PET/MR for indications in oncology (66%), neurology (18%), other (10%) and cardiology (6%). Among the frequent indications in oncology are brain, prostate, gastrointestinal and head/neck cancer. Depending on the imaging protocol parameters used average protocol time for neurology, cardiology and oncology was 49±24 min, 68±20 min and 57±14 min, respectively. PET/MR scans are reported jointly by Rad/NM (76% sites), by Rad only (13%) and Nuc only (3%).
Conclusion: An international survey among early adopters of PET/MR reveals a mix of clinical routine and research applications with a focus on oncology and neurology. On-site imaging protocols vary widely.
Author Disclosures:
T. Beyer: Grant Recipient; Siemens. **J. Czernin:** Founder; Sofiebioscience.

B-0900 10:47

Comparison of [18 F] choline PET/CT with [18 F] choline MRI/PET in patients with suspected recurrent prostate cancer: a prospective study

A. Wetter[1], B. Schaarschmidt[2], S. Lütje[1], H. Rübben[1], T.C. Lauenstein[1]; [1]*Essen/DE*, [2]*Düsseldorf/DE (axel.wetter@uk-essen.de)*

Purpose: To compare diagnostic performance of [18 F] choline PET/CT with [18 F] choline MRI/PET in patients with suspected recurrent prostate cancer.
Methods and Materials: 68 patients with a rising PSA-level after radical prostatectomy were examined with [18 F] choline PET/CT and simultaneous [18 F] choline MRI/PET. PET/CT examinations consisted of a full-dose whole body scan with i.v. contrast, MRI/PET consisted of one pelvic PET scan and simultaneous acquisition of T2- and T1-weighted MR images before and after administration of a paramagnetic contrast agent. PET/CT and MR/PET image analysis was prospectively performed by different groups of nuclear medicine physicians and radiologists with respect to the detection of lymph node metastases, bone metastases and local recurrence of the tumour.
Results: Concordant diagnoses of PET/CT and MRI/PET were achieved in 60 patients, whereas MRI/PET led to a discordant diagnosis in 8 patients (11.8 %). In three patients where no suspicious lesion was detected with PET/CT, MRI/PET led to the diagnosis of a local recurrence in 1 patient and

suspected bone metastases in two patients. In the remaining five patients, MRI/PET found additional lymph node metastases in one patient and additional bone metastases in four patients. From a clinical point of view, MRI/PET led to a change of management in 2 patients (2.9 %).
Conclusion: Simultaneous [18 F] choline MRI/PETI provides additional information as compared to PET/CT in patients with suspected recurrent prostate cancer. A significant change of diagnosis with following change of treatment is observed only in a small percentage of patients.

B-0901 10:55

Focal 18 F-FDG uptake in PET/MRI indicates activated facet arthrosis and guides facet block therapy

L.M. Sawicki[1], B.M. Schaarschmidt[1], P. Heusch[1], C. Buchbender[1], S. Rosenbaum-Krumme[2], L. Umutlu[2], A. Bockisch[2], G. Antoch[1], F.W. Floeth[1]; [1]*Düsseldorf/DE*, [2]*Essen/DE*

Purpose: To evaluate the ability of 18 F-fluorodeoxyglucose positron emission tomography/magnetic resonance imaging (18 F-FDG PET/MRI) to detect activated facet arthrosis and guide facet block therapy.
Methods and Materials: Eleven patients (65.8 years old) with chronic musculoskeletal neck pain underwent cervical PET/MRI 74±23 min after injection of a mean activity of 150±20 MBq 18 F-FDG. Maximum standard uptake values (SUVmax) of all facet joints were measured. Bone marrow signal intensity (SI) ratios were calculated for each facet joint on T2-weighted turbo inversion recovery magnitude (TIRM) images. Post-hoc Mann-Whitney-U assessed differences in SUVmax and bone marrow SI ratio on TIRM between normal facets, arthrotic facets, and activated facet arthrosis. Pearson's correlation coefficients were calculated between bone marrow SI ratios on TIRM and SUVmax. Focal 18 F-FDG uptake in facet joints served as target for computed tomography (CT)-guided facet block therapy. In PET-negative patients, facet blocks were performed to the segment of maximum facet arthrosis. Neck pain was measured on visual analogue scale (VAS) before and after therapy.
Results: 18 F-FDG PET/MRI detected activated facet arthrosis in six patients. SUVmax and bone marrow SI ratio on TIRM were significantly higher in activated facet arthrosis than in normal or arthrotic facets ($p < 0.001$). Correlation was strong between bone marrow SI ratio on TIRM images and SUVmax (P=0.7; $p < 0.001$). Following facet block therapy patients with activated facet arthrosis had significantly less pain than patients without activated facet arthrosis (VAS 2.3±1.0 vs. 6.0±1.8; p=0.01).
Conclusion: 18 F-FDG PET/MRI detects activated facet arthrosis and facilitates identification of patients benefitting from facet block therapy.

B-0902 11:03

A comparison between 18 F-FDG-PET/CT and 18 F-FDG-PET/MRI for detection of primary head-and-neck cancer

P. Stumpp, Y. Risy, S. Purz, M. Gawlitza, O. Sabri, T. Kahn; *Leipzig/DE*
(patrick.stumpp@medizin.uni-leipzig.de)

Purpose: To evaluate significant differences between the results of 18 F-FDG-PET/CT and 18 F-FDG-PET/MRI in their ability to detect primary head-and-neck cancer and local metastatic spread.
Methods and Materials: The test results of 21 patients with suspected primary head-and-neck cancer which were examined with dedicated examination of the neck at simultaneous 18-F-FDG-PET/CT and immediately thereafter a simultaneous 18-F-FDG-PET/MRI were analysed. A nuclear medicine physician and a radiologist evaluated the data of both examinations in consensus in a blinded manner with a 6-week gap between evaluation of the two examinations. Thereafter the results were compared with the gold standard of histopathological report, follow-up imaging or a consensus interpretation of all available data. Sensitivity, specificity, positive (PPV) and negative predictive value (NPV) were calculated for both methods.
Results: Altogether 345 lesions were detected in PET/CT and 383 lesions in PET/MRI. By use of gold standard 112 malignant lesions were found, 21 primary tumours and 91 lymph node metastases. PET/CT presented a sensitivity of 69.6%, a specificity of 97.4%, a PPV of 92.9% and a NPV of 87.0%. PET/MRI presented a sensitivity of 80.4%, a specificity of 90.8%, a PPV of 78.3% and a NPV of 91.8%.
Conclusion: 18 F-FDG-PET/MRI shows a higher sensitivity but a lower specificity in detection of primary head-and-neck cancer and local metastases in comparison to 18 F-FDG-PET/CT.
Author Disclosures:
O. Sabri: Speaker; Siemens.

B-0903 11:11

Comparison of whole-body PET/MRI and whole-body DWI/MRI for the evaluation of patients with lymphoma

J. Grueneisen[1], L. Sawicki[2], B. Schaarschmidt[2], S. Suntharalingam[1], H. Quick[1], M. Forsting[1], L. Umutlu[1]; [1]*Essen/DE*, [2]*Düsseldorf/DE*
(johannes.grueneisen@uk-essen.de)

Purpose: To prospectively evaluate the diagnostic performance of integrated PET/MRI for whole-body staging of patients with lymphoma in comparison to DWI/MRI.
Methods and Materials: 47 patients underwent 50 whole-body PET/MRI examinations, including diffusion-weighted imaging (DWI) for pretreatment staging as well as for therapy monitoring and surveillance of lymphoma disease. Two radiologists separately evaluated the DWI/MRI datasets, followed by a second reading of PET/MRI datasets. Statistical values for the detection of lymphoma patients were calculated for DWI/MRI and PET/MRI. Furthermore, the tumour stage for each imaging modality was determined based on the Lugano classification system, differentiating between limited or advanced disease.
Results: Malignant lesions were present in 26 of 50 examinations. PET/MRI enabled correct identification of patients with lymphoma in all 26 cases, which revealed a sensitivity, specificity, positive predictive value, negative predictive value and diagnostic accuracy of 100%, 92%, 93%, 100% and 96%, respectively. The respective values for DWI/MRI were 88%, 79%, 82%, 86% and 84%. Among the 26 examinations providing malignant lymphoma lesions, n=18 cases were classified as limited disease and n=8 cases showed advanced tumour stages. In the remaining 24 examinations no lymphoma was present. MRI/DWI enabled correct identification of the tumour stage in 41/50 (82%) examinations. PET/MRI correctly determined patients` disease status in 47/50 (94%) cases.
Conclusion: Our results demonstrate the usefulness of ^{18}F-FDG-PET data as a valuable additive to MRI for a more accurate evaluation of patients with lymphomas, which has high impact on further patient management.

B-0904 11:19

SUV-quantification of physiological lung tissue in an integrated PET/MR-system: impact of lung density and bone tissue

F.F. Seith, H. Schmidt, I. Bezrukov, S.-C. Schüle, C. Schraml, C. Pfannenberg, C. La Fougère, K. Nikolaou, N. Schwenzer; *Tübingen/DE*
(Ferdinand.Seith@med.uni-tuebingen.de)

Purpose: Quantification of tracer uptake plays a key role in positron emission tomography, expressed as standardized uptake value (SUV). The aim of the study was to investigate the influence of regional lung density changes as well as the vicinity of bone tissue on the SUV.
Methods and Materials: 21 patients with mostly oncologic diseases were examined in PET/CT and subsequently in an fully integrated PET/MR scanner. From each PET dataset acquired in PET/MR, four different PET reconstructions were computed using different attenuation maps (µ-maps): i) CT-based µ-map (gold standard); ii) CT-based µ-map in which the linear attenuation coefficients (LAC) of the lung tissue was replaced by the lung LAC from the MR-based segmentation method; iii) based on reconstruction ii), the LAC of bone structures was additionally replaced with the LAC from the MR-based segmentation method; iv) the vendor-provided MR-based µ-map (segmentation-based method). Those steps were performed using MATLAB. SUVmean was acquired in different levels and regions of the lung. Relative differences between the differently corrected PETs were computed.
Results: Compared to the gold standard, reconstruction ii), iii) and iv) led to a significant relative underestimation of SUV in the posterior regions of -9.1%, -12.4% and -16.8% respectively. Anterior regions were less affected with an overestimation of about 8% in reconstructions ii) - iv).
Conclusion: It could be shown that both, differences in lung density and the vicinity of bone tissue in the µ-map can have an influence on SUV, mostly affecting the posterior lung regions.

B-0905 11:27

Evaluation of a FAST-protocol for simultaneous PET/MRI used for staging patients with lymphoma

J. Grueneisen[1], L. Sawicki[2], B. Schaarschmidt[2], S. Suntharalingam[1], H. Quick[1], M. Forsting[1], L. Umutlu[1]; [1]*Essen/DE*, [2]*Düsseldorf/DE*
(johannes.grueneisen@uk-essen.de)

Purpose: To evaluate the diagnostic performance of a FAST-protocol for integrated PET/MR imaging of patients with lymphoma in comparison to PET/CT.
Methods and Materials: 48 lymphoma patients were prospectively enrolled for a clinically indicated PET/CT and a subsequent PET/MR examination. For PET/MRI readings, a whole-body FAST-protocol was implemented, comprising a diffusion-weighted (EPI) sequence, a T2w HASTE sequence and a post-contrast T1w VIBE sequence. Two readers separately evaluated both

examinations and were instructed to identify all tumour lesions. Furthermore, the standardized uptake value (SUV) for all ^{18}F-FDG-avid lesions were determined in PET/CT and PET/MRI. Agreement between PET/CT and PET/MRI regarding SUVmax and SUVmean was tested using Pearson's product-moment correlation.
Results: Both, PET/CT and PET/MRI correctly identified disease presence in all 26 patients with lymphoma. Furthermore, all PET-positive lesions that were visible on PET/CT were also detectable on PET/MRI. Determined SUVs were significantly higher in PET/MRI than in PET/CT (SUVmax 9.3±6.1 vs 6.9±4.3, $p < 0.05$; SUVmean 5.1±3.3 vs 4.1±2.7, $p < 0.001$), however, there was a strong correlation between SUVmax and SUVmean of the two imaging modalities (R=0.91 $p < 0.001$ and R=0.90, $p < 0.001$). Estimated scan duration of one whole-body PET/CT examination as well as for PET/MR imaging amounted to 17.3±1.9 min and 27.8±3.7 min, respectively. Calculated mean effective-dose for a whole-body PET/CT scan was 64.5% higher than for PET/MRI.
Conclusion: FAST-PET/MRI offers a comparably high diagnostic performance for staging lymphoma patients compared to PET/CT with slightly prolonged examination time, yet providing a marked reduction of radiation dose.

B-0906 11:35

Simultaneous 18 F-FDG PET/MRI in comparison to 18 F-FDG PET/CT in patients with suspected recurrence or residual manifestation of head and neck cancer

P. Stumpp, R. Diogo, M. Gawlitza, S. Purz, A. Boehm, O. Sabri, T. Kahn;
Leipzig/DE (r.rakeld.d@gmail.com)

Purpose: Comparison of the diagnostic performance of simultaneous 18 F-FDG-PET/MRI and 18 F-FDG-PET/CT in patients with suspected recurrent or residual head and neck cancer.
Methods and Materials: Study population consisted of 22 consecutive patients (3 female, 19 male, mean age 56 years) with suspected recurrent or residual head and neck cancer who underwent 18 F-FDG-PET/CT immediately followed by simultaneous 18 F-FDG-PET/MRI. Subsequently all scans were assigned to an expert panel for independent, blinded evaluation. Findings were compared to the gold standard, derived from histopathology (n=17) or follow-up (n=5). Standard statistic indicators were calculated. Group differences were evaluated with Wilcoxon-test and Mann-Whitney-U-test.
Results: Gold standard defined 125 lesions (19 local recurrences, 31 metastatic cervical lymph nodes and 75 benign). PET/MRI showed sensitivity of 72%, specificity of 67.2%, PPV of 62.1%, NPV of 76.3%. Respective values for PET/CT were 50%, 97.1%, 92.6%, 72.5%. The differences were statistically significant ($P < 0.001$). The higher detection rate was due to statistically significant higher SUVmax values in PET/MRI as compared to PET/CT.
Conclusion: 18 F-FDG-PET/MRI shows a significantly higher sensitivity in detection of recurrent or residual head and neck cancer as compared to PET/CT, while specificity is reduced.
Author Disclosures:
O. Sabri: Speaker; Siemens.

B-0907 11:43

Impact of combined FDG-PET/CT and MRI on detection of local recurrence and nodal metastases of thyroid cancer

J.-M. Hempel[1], R. Kloeckner[2], S. Krick[2], S. Schadmand-Fischer[2], M. Schreckenberger[2], M. Miederer[2]; [1]*Tübingen/DE*, [2]*Mainz/DE*
(post@jmhempel.de)

Purpose: To investigate the impact of combined FDG-PET/CT and MRI on detection of local recurrence and nodal metastases of high risk thyroid cancer.
Methods and Materials: 46 consecutive patients with suspected local recurrent thyroid cancer or nodal metastases after thyroidectomy and radio-iodine therapy were retrospectively selected for analysis. Inclusion criteria comprised elevated thyroglobulin blood levels, a negative ultrasound and iodine whole body scan, as well as combined FDG-PET/CT and MRI examinations. Neck compartments in FDG-PET/CT and MRI examinations were independently analysed by two blinded observers for local recurrence and nodal metastases of thyroid cancer. Consecutively, the scans were read in consensus. To explore a possible synergistic effect, FDG-PET/CT and MRI results were combined. Histopathology or long-term follow-up served as gold-standard. For method comparison, sensitivity, specificity, positive and negative predictive values, and diagnostic accuracy were calculated.
Results: FDG-PET/CT was substantially more sensitive and slightly more specific than MRI in detection of both local recurrence and nodal metastases. Inter-observer agreement was substantial both for local recurrence (κ=0.71) and nodal metastasis (κ=0.63) detection in FDG-PET/CT. In MRI it was substantial for local recurrence (κ=0.69) and moderate for nodal metastasis (κ=0.55) detection. In contrast, FDG-PET/CT and MRI showed only slight agreement (κ=0.21). However, its combination created a synergistic effect. The multidisciplinary consensus reading further increased sensitivity, specificity, and diagnostic accuracy.
Conclusion: FDG-PET/CT and MRI should be combined to improve detection of local recurrence and nodal metastases of thyroid cancer in high risk patients. The multidisciplinary consensus reading is a key element in diagnostic approach.

B-0908 11:51

Sentinel lymph node detection and in vivo/ex vivo assessment of melanin distribution by means of multispectral optoacoustic tomography in patients with malignant melanoma

I. Stoffels[1], S. Morscher[2], N.C. Burton[2], J. Klode[1]; [1]*Essen/DE*, [2]*Munich/DE*
(Ingo.Stoffels@uk-essen.de)

Purpose: Melanoma metastasizes early into sentinel lymph nodes (SLN); SLN excision is the most important diagnostic procedure for melanoma patients. However, a clear need exists to improve SLN analysis. Multispectral optoacoustic tomography (MSOT) utilizes the molecular specificity of optical imaging, but capitalizes on the high temporal/spatial resolution of ultrasound imaging. MSOT allows sensitive detection of optical markers such as melanin, which would identify potentially metastatic lymph nodes, and indocyanine green (ICG), which labels SLN.
Methods and Materials: 148 SLN were excised from 65 melanoma patients, and SLN were examined by MSOT ex vivo to guide the pathologist to examination of melanin-containing regions of the lymph node. 20 patients were scanned with a handheld MSOT device. Peritumoral injection of ICG marked the SLN, and it was scanned for melanin. All scans were compared to histology of the excised SLN.
Results: A control cohort of SLN showed a detection rate of 14%, whereas MSOT-guided pathology resulted in a detection rate of 22%. Compared to histology, MSOT demonstrated a superior 100% sensitivity/41% specificity. Imaging yielded a detection rate of 100% of the SLN, with the added ability of non-invasive assessment of the melanin status prior to excision. MSOT measurements were compared with other imaging techniques, with a promising concordance between MSOT measurements and gold standard assessments.
Conclusion: MSOT represents a compelling modality to improve histological analysis of excised SLN in melanoma patients, and offers the ability to stage lymph nodes noninvasively, potentially reducing the necessity to excise lymph nodes in some melanoma patients.
Author Disclosures:
S. Morscher: Employee; iThera Medical. **N.C. Burton:** Employee; iThera Medical.

10:30 - 12:00 **Room M 4**

Musculoskeletal

SS 1010b

Hip and shoulder

Moderators:
S.E. Anderson; Baden/CH
T. Geith; Munich/DE

B-0909 10:30

Indirect arthrography with 3D PD SPACE and 3D T1 VIBE at 3 T MRI for the detection of acetabular labral tears

A. Lazik, O. Kraff, K. Körsmeier, S. Landgraeber, J.M. Theysohn; *Essen/DE*
(jens.theysohn@uk-essen.de)

Purpose: To evaluate indirect 3 Tesla MR arthrography using 3D proton density weighted (PD) fat saturated turbo spin echo sequence with variable flip angle (called SPACE: Sampling Perfection with Application optimized Contrasts using different flip angle Evolution) and 3D T1 weighted volume interpolated breathhold examination (VIBE) for the detection of acetabular labral tears.
Methods and Materials: 23 patients who underwent arthroscopy because of femoroacetabular impingement were imaged at 3 T MRI, using 3D PD SPACE (0.8 mm isotropic) and 3D T1 VIBE (0.4 mm isotropic) 1 hour after intravenous contrast agent administration and subsequent exercise. After reconstructions in 3 orthogonal planes and radially to the acetabular labrum both sequences were rated independently regarding the occurrence of a full-thickness labral tear in consensus by two radiologists. Results were compared to the arthroscopic report taken as the gold standard. Additionally, contrast ratios were measured between the acetabular labrum and the joint fluid in both sequences.
Results: In 11 of the 23 patients, a labral tear was diagnosed by arthroscopy. Sensitivity, specificity, positive predictive value and negative predictive value were 81%, 67%, 69% and 80% for PD SPACE, and 88%, 45%, 57% and 83% for T1 VIBE respectively. Contrast ratios ranged between 0.63 and 0.85 for PD SPACE and 0.37 and 0.63 for T1 VIBE.

Conclusion: Indirect arthrography using 3D PD SPACE and 3D T1 VIBE can be recommended for the non-invasive detection of labral tears. While PD SPACE delivers better contrast and is being more specific, T1 yielded a higher sensitivity.

B-0910 10:38

Utility of MR arthrography with and without leg traction in detection of loose bodies in the hip joint

F. Schmaranzer[1], M. Kogler[2], M. Reichkendler[2], E. Schmaranzer[2];
[1]*Innsbruck/AT*, [2]*St. Johann i. Tirol/AT*
(florian.schmaranzer@student.i-med.ac.at)

Purpose: According to the literature, diagnostic performance of MR arthrography (MRA) of the hip in detection of loose bodies is only moderate at best. Traction MRA can be used to improve visualisation of the central compartment of the hip. We aimed to assess the utility of MRA with and without traction in detection of loose bodies.
Methods and Materials: An author not involved in the readings selected 13 patients with and randomly chose 35 patients without arthroscopic diagnosis of loose bodies. All patients (48 hips/patients; mean age, 33.4a) underwent MRA ± traction (1.5 T) of the hip at our institution. Up to 30 ml were injected into the joint. The used traction device is MR compatible and enabled weight load adaption (15-23 kg) according to patients constitution. Coronal MRAs with and without traction were separately assessed for the overall presence of loose bodies and for their region (peripheral/central compartment) by one radiologist who was blinded to the arthroscopic records. Overall and regional sensitivity and specificity was calculated with arthroscopic reference.
Results: Among the 13 patients central respectively peripheral loose bodies were identified arthroscopically in 12 and 9 cases. Overall sensitivity/specificity was 92%/86% for non-traction imaging and 92%/89% for traction imaging. Sensitivity was 100%/67% for non-traction imaging and 100%/83% for traction imaging in detection of peripheral/central loose bodies. Specificity was 87%/89% for non-traction imaging and 90%/92% for traction imaging in detection of peripheral/central loose bodies.
Conclusion: MR arthrography of the hip ± traction was accurate in detecting and localizing loose bodies.
Author Disclosures:
M. Reichkendler: Consultant; Menges Medical GmbH. **E. Schmaranzer:** Consultant; Menges Medical GmbH.

B-0911 10:46

MRI assessment of hip joint cartilage in patients with femoroacetabular impingement (FAI): usability and comparison of radial sequences and reconstructions

A. Pomianowska[1], J. Walecki[1], J. Czubak[1], M. Złotorowicz[1], J. Ludwikowska[2], M. Frel[1]; [1]*Otwock/PL*, [2] *Warsaw/PL (apomianowska@poczta.onet.pl)*

Purpose: To evaluate usability and compare radial sequences and radial reconstructions in assessment of hip joint cartilage
Methods and Materials: Using a 1.5 T MRI scanner we examined 56 hip joints (28 patients: 15 females, 13 males, age range 15-57 years) with suspected FAI. Each hip was examined in basic and extended protocol. The basic protocol consisted of following sequences: TSE/PD cor, PDfs cor, PDfs tra, PD cor obl, PD ax obl, PDfs ax obl and the extended protocol included additional reconstructions based on SPC_RST_SPAIR_ISO/PDfs cor and TSE/PDfs radial sequences at 15° intervals. Hip joint cartilage was assessed using the modified Outerbridge classification.
Results: No additional cartilage pathology was detected using the extended protocol (kappa=1) suggesting that it does not provide additional significant information regarding hip joint cartilage. There was also no difference in measurements provided by radial sequences and reconstructions (kappa=1).
Conclusion: Extended protocol provides no additional information about hip joint cartilage. There is no difference in measurements provided by radial sequences and radial reconstructions indicating they can be used interchangeably.

B-0912 10:54

Validation of joint space mapping: a new 3D approach to quantitative multimodal hip joint space assessment

T.D. Turmezei, A.H. Gee, K.E.S. Poole, G.M. Treece; *Cambridge/UK (tom@diagnosticradiology.eu)*

Purpose: Radiological assessment of osteoarthritis is limited by lack of accuracy and reliability, hindering progression in disease prediction and therapy development. Validation of a new method of 3D quantitative structural assessment of both CT and MR imaging at the hip joint is presented.
Methods and Materials: Standard clinical CT (0.31 x 0.31 mm pixel spacing, 1.5 mm separation) and 3D T1-weighted spoiled gradient recalled sequence (Siemens VIBE, 0.78 mm isotropic) imaging was acquired from 20 embalmed female human cadaveric right hip joints. An automated sphere fitting algorithm was performed, followed by 3D mesh segmentation of the acetabular shadow, then automated 3D joint space width (CT) or total cartilage thickness (MR) measurement. After cross-registration, results were compared to high resolution peripheral quantitative CT (0.082 mm isotropic) for validation.
Results: The accuracy (mean bias) of CT was 0.002 mm with a reliability (standard deviation) of 0.59 mm; the accuracy of MR was -0.18 mm with a reliability of 0.38 mm. The systematic underestimation of cartilage thickness compared to joint space width can be explained by cross-modality differences in structure representation.
Conclusion: Both joint space width (CT) and total cartilage thickness (MR) can be measured accurately and reliably in 3D with these new automated algorithms. These techniques lay the platform for a new approach to assessing structural disease in osteoarthritis with cross-sectional imaging.
Author Disclosures:
T.D. Turmezei: Speaker; to the AMGEN Global Advisory Board in educational fora. **A.H. Gee:** Grant Recipient; from AMGEN and Eli Lilly & Company for unrelated work. **K.E.S. Poole:** Advisory Board; for AMGEN and UCB Pharma. Grant Recipient; from AMGEN and Eli Lilly & Company for unrelated work. Patent Holder; inventor on a related patent application GB0917524.1. Speaker; for AMGEN and Eli Lilly & Company in educational fora. **G.M. Treece:** Grant Recipient; from AMGEN and Eli Lilly & Company for unrelated work. Patent Holder; inventor on a related patent application GB0917524.1.

B-0913 11:02

Scoring hip OA with MRI (SHOMRI) for the longitudinal assessment of MRI in hip osteoarthritis in correlation with clinical progression

B.J. Schwaiger, A.S. Gersing, S. Lee, L. Nardo, M.A. Samaan, R.B. Souza, T.M. Link, S. Majumdar; *San Francisco, CA/US*

Purpose: To assess the evolution of MRI findings in subjects with and without hip osteoarthritis (OA) over 1.5 years, described by the semi-quantitative Scoring Hip OA with MRI (SHOMRI) system, in association with clinical parameters.
Methods and Materials: In 18 subjects with radiographic OA (Kellgren-Lawrence (KL) score of 2-3; age 54.4±11.2y; 27.8% women), 22 with borderline OA (KL=1; age 45.4±11.8y; 36.4% women) and 14 controls (KL=0; age 41.0±14.2y; 71.4% women), 3 T hip MRI and the Hip Disability and Osteoarthritis Outcome Score (HOOS) were obtained at baseline and after 1.5 years. Findings and their evolution over time were compared between groups; logistic and linear regressions were used to assess associations between SHOMRI and clinical scores.
Results: Baseline SHOMRI total was significantly higher in OA subjects than controls (median (range), 12.5 (5-47) vs. 7 (1-20); p=0.047) and borderline OA subjects (7.5 (0-22); p=0.048). Over 1.5 years, progression of subchondral cysts was significantly higher in OA subjects than in controls (16.7 vs. 0.0%; p=0.048) and borderline OA subjects (0.0%; p=0.046). Baseline bone marrow edema pattern (BMEP) was significantly associated with worsening of HOOS subscales for pain (p=0.017) and quality of life (p=0.024). Progression of subchondral cysts was significantly associated with worsening of HOOS symptoms other than pain (p=0.020).
Conclusion: OA subjects had significantly higher progression of several SHOMRI subscales and clinical parameters. Presence of BMEP predicted clinical worsening and progression of subchondral cyst correlated with worsening of clinical symptoms. This suggests that SHOMRI may be used for the longitudinal assessment of hip OA.

B-0914 11:10

Evaluation of usability and comparison of radial sequences and reconstructions in MRI assessment of hips with femoroacetabular impingement (FAI)

A. Pomianowska[1], J. Walecki[1], J. Czubak[1], M. Złotorowicz[1], J. Ludwikowska[2], M. Frel[1]; [1]*Otwock/PL*, [2] *Warsaw/PL (apomianowska@poczta.onet.pl)*

Purpose: To assess usability and compare radial sequences and reconstructions in measuring alpha angle, acetabular depth and acetabular retroversion.
Methods and Materials: Using a 1.5 T MRI scanner we examined 56 hip joints (28 patients: 15 females, 13 males, age range 15-57 years) with suspected FAI. Each hip was examined in basic and extended protocol. The basic protocol consisted of the following sequences: TSE/PD cor, PDfs cor, PDfs tra, PD cor obl, PD ax obl, PDfs ax obl. The extended protocol included additional reconstructions based on SPC_RST_SPAIR_ISO/PDfs cor and TSE/PDfs radial sequences at 15° intervals.
Results: Only one additional pathological alpha angle and seven additional pathological acetabular depths were detected using the extended protocol (kappa=0.964 and 0.647 respectively) indicating a lack of significant information provided by the extended protocol. Eighteen additional cases of acetabular retroversion were detected using the extended protocol (kappa=0.356) indicating a moderate amount of supplementary information

provided by the extended protocol. There was no difference in measurements provided by radial sequences and radial reconstructions (kappa=1).
Conclusion: The extended protocol provides additional information about acetabular retroversion but no additional information about pathological alpha angle and acetabular depth. There is no difference in measurements provided by radial sequences and radial reconstructions indicating they can be used interchangeably.

B-0915 11:18

Osteophytes of the fovea capitis femoris are a common finding in MRI of asymptomatic volunteers

S. Bensler, C.A. Agten, C.W.A. Pfirrmann, R. Sutter; *Zurich/CH (bensler@gmx.de)*

Purpose: To investigate the spectrum of osteophytes at the borders of the fovea capitis femoris and to assess different morphological types of the fovea capitis femoris in asymptomatic individuals and patients with hip osteoarthritis.
Methods and Materials: 59 asymptomatic volunteers and 65 patients with radiologically confirmed osteoarthritis of the hip underwent dedicated hip MRI. Two radiologists independently assessed fovea morphology (standard type, diamond type, flat type, triangular type), as well as frequency, location, and size of osteophytes at the border of the fovea. Descriptive and inferential statistics were applied.
Results: Distribution of fovea morphology was similar for volunteers and patients: 47%/51% (standard type), 9%/6% (diamond type), 20 %/25% (flat type), 24%/18% (triangular type), without a statistically significant difference (p=0.76). Osteophytes at the fovea were detected in 71% of volunteers and 97% of patients, but patients had significantly larger osteophytes (mean size 1.9 mm±0.7) than volunteers (1.6 mm±0.3) at all locations (p=0.004). Osteophytes were most frequently located at the anterior border of the fovea capitis femoris both in the volunteers (42%) and in the patient group (80%).
Conclusion: Osteophyte-like structures of the fovea capitis femoris were found in 71% of healthy individuals, but were smaller in size and less commonly seen than in patients with hip osteoarthritis. Small osteophytes may be physiologically seen at the fovea and do not necessarily indicate that hip osteoarthritis is present.

B-0916 11:26

A review of 10 years' experience: prevalence and patterns of radiographically occult femoral and pelvic fractures detected by MRI following low-energy trauma

P.M. Yeap, T.B. Oliver; *Dundee/UK (pheymingyeap@gmail.com)*

Purpose: Magnetic resonance imaging (MRI) is considered the investigation of choice in patients in whom there is clinical suspicion of a femoral fracture but normal radiographs. Our aims were to characterise prevailing radiographically occult fracture patterns on MRI examinations in low-energy trauma patients.
Methods and Materials: This is a single-centre retrospective study of pelvic MRI performed over 10 years (January 2005 to December 2014). We reviewed 827 MRI requests and imaging records, and identified 316 low-energy trauma cases with radiographically occult femoral and pelvic fractures on pelvic MR. MRI examinations were reviewed and fracture was recorded.
Results: The 316 study cases had a median age of 83 years and 145 (45.9%) were male. The median interval between pelvic radiographs and MRI was 2 days. MRI showed undiagnosed femoral fracture in 132 cases (41.8%), sacral fracture in 119 (37.7%), and pubic fracture in 162 (51.3%). In 23 (7.3%) cases, MRI showed undiagnosed fractures of both proximal femur and pelvic ring. There was an increase in the number of radiographically occult femoral and pelvic fractures on pelvic MR over the most recent 5 years (N=214, January 2010 - December 2014 vs. N=102, January 2005 - December 2009) but no significant change in the pattern of occult femoral and pelvic fractures detected.
Conclusion: There was a high prevalence of radiographically occult femoral and pelvic fractures on pelvic MRI in low-energy trauma patients, with clinical suspicion of fracture despite normal radiographs. A small proportion of these were co-existing occult femoral and pelvic ring fractures.

B-0917 11:34

Non-contrast enhanced MRI with diffusion-weighted imaging: diagnostic performance for abscess formation in cellulitis patients in comparison with contrast-enhanced MRI

J. Baik[1], J.-Y. Jung[1], C.-W. Chun[2], W.-H. Jee[1]; [1]*Seoul/KR*, [2]*Uijeongbu/KR (bailla114@gmail.com)*

Purpose: To compare the diagnostic performance between non-contrast enhanced MRI with diffusion-weighted imaging (DWI) and contrast-enhanced MRI for detecting abscess formation in cellulitis patients.
Methods and Materials: One-hundred nineteen patients (mean age: 56 years) with cellulitis who underwent contrast enhanced MRI with DWI (b=0-800) on 3 T were included. Two readers independently reviewed three image sets - non-enhanced conventional MR images (NECI) alone, NECI+DWI, and NECI+fat-suppressed T1-weighted imaging (CEFST1)- for the presence of abscess. To compare diagnostic performances of three image sets, McNemar tests for sensitivity and specificity, and areas under the receiver-operating characteristic curves (AUC) analyses were performed. Interobserver agreements (κ) were calculated for each image set.
Results: Forty of 119 patients were confirmed with abscess. Sensitivity, specificity, and accuracy were 47.5%, 97.0% and 80.7% for NECI alone, 90.0%, 88.6% and 89.1% for NECI+DWI, and 82.5%, 89.9% and 87.4% for NECI+CEFST1 in reader 1, whereas 52.5%, 94.9% and 80.7% for NECI alone, 77.5%, 88.6% and 84.9% for NECI+DWI, and 80.0%, 84.8% and 83.2% for NECI+CEFST1 in reader 2, respectively. Sensitivity and specificity were significantly higher on NECI+DWI and NECI+CEFST1 than NECI alone. However, sensitivity and specificity were not significantly different between NECI+DWI and NECI+CEFST1. Likewise, AUC analyses demonstrated superior diagnostic performance of NECI+DWI and NECI+CEFST1 to NECI alone, but no significant difference between NECI+DWI and NECI+CEFST1. Interobserver agreement was substantial in three image sets: κ=0.67 (NECI), 0.80 (NECI+DWI), and 0.76 (NECI+CEFST1).
Conclusion: Non-contrast enhanced MRI with DWI has comparable diagnostic performance to contrast enhanced MRI for diagnosing abscess in cellulitis patients.

B-0918 11:42

Diagnostic accuracy of conventional MRI in detecting long biceps muscle tendon abnormalities

R. Lee, S. Choi, J. Ahn, C. Kang, D. Shin, M. Lee, K. Lee; *Gangneung-si/KR (rowoon2@hanmail.net)*

Purpose: To investigate the diagnostic accuracy of 3 T shoulder MRI in detecting long head of the biceps tendon (LHBT) tears and to evaluate MR findings to be helpful in detecting partial LHBT tears.
Methods and Materials: 80 consecutive patients who underwent arthroscopic surgery for rotator cuff tendon tears were included in this study. Two radiologists independently reviewed preoperative 3 T shoulder MRI with regard to the presence of the LHBT tears. The diagnostic performance of the 3 T shoulder MRI was calculated using arthroscopic result as a standard of reference. Fat suppressed T2 weighted images were independently reviewed with regard to the signal intensity, shape, outer margin of the LHBT and intratendineous defect or C-sign.
Results: There were 35 partial tears and 5 complete tears noted at arthroscopy. For observers 1 and 2, respectively: shoulder MRI showed a sensitivity of 77.14%, 80%, a specificity of 71.11%, 73.33% in detecting partial LHBT tears and a sensitivity of 80%, 100%, a specificity of 100%, 100% in detecting complete LHBT tears. Increased T2 signal intensity of the LHBT showed high sensitivity (82.85%, 80%) in detecting partial LHBT tears. The abnormalities of the shape and outer margin of the LHBT showed high specificity (91.11%, 82%; 91.11%, 86.66%) and the intratendineous defect or c-sign showed the highest specificity (95.55%, 93.33%) in detecting partial LHBT tears.
Conclusion: MRI shows the diagnostic usefulness in detection of LHBT tears.

Saturday, March 5

10:30 - 12:00 **Room C**

Breast

SS 1402a

Screening

Moderators:
S. Perez Rodrigo; Madrid/ES
R.M. Pijnappel; Utrecht/NL

B-0920 10:30

Screen detected cancers vs interval cancers: influence of image modality and breast density

L. Timmermans[1], L. Bleyen[1], I. De Brabander[2], K. Lemmens[3], A. Van Steen[3], C. Van Ongeval[3], K. Van Herck[1], K. Bacher[1], H. Thierens[1]; [1]*Ghent/BE*, [2]*Brussels/BE*, [3]*Leuven/BE (lore.timmermans@ugent.be)*

Purpose: To investigate if Direct Radiography (DR) mammography systems perform better in high density breasts than Computed Radiography (CR) mammography or Screen film mammography (SFM). The influence of image modality and density was examined with respect to the number of screen detected and interval cancers.
Methods and Materials: Data of 351.532 women who participated the Flemish Breast Cancer Screening Programme in 2009-2010 were collected. The number of screen detected and interval cancers was determined by linkage with the National Cancer Registry database. Breast densities scored by the second readers, according to the BIRADS classification, were adopted. This was justified by a comparison analysis of the density of 200 mammographic images scored by radiologists and the Volpara density programme.
Results: In each modality, one third of the occurring cancers are interval cancers. In SFM, there are significantly lower screen detected cancers found than in DR. With increasing breast density, the number of interval cancers increases in the different modalities and even oversizes the screen detected cancers in the highest density class except for DR. In DR, screen detected cancers are higher than in CR and SFM and always exceed the interval cancers. As the breast density decreases by women's age, the number of screen detected cancers increases but the interval cancers remain the same.
Conclusion: Interval cancers represent an important fraction of occurring cancers in high density breasts where DR performs better than CR or SFM. These results support to take breast density into account as a parameter for individualised screening.

B-0921 10:38

Prognostic factors of interval carcinomas occurring in an intermediate and high risk breast cancer screening program

S. Vreemann, A. Gubern-Mérida, S. Lardenoije, N. Karssemeijer, R.M. Mann; *Nijmegen/NL (suzanvreemann@gmail.com)*

Purpose: Women at increased risk for breast cancer are screened with annual MRI and mammography. However, despite this intensive surveillance interval cancers still occur. The purpose of this study is to evaluate prognostic factors of interval cancers and compare these to prognostic factors of screen detected cancers.
Methods and Materials: In a review of our intermediate and high risk screening program from 2003 to 2013, 174 cancers in 161 women were identified. Of these, 14 cancers were true interval cancers presenting with symptoms, and 135 were detected in screening. Twenty-five further cancers were detected in prophylactic mastectomy specimens, and were excluded from this study. Patient- and cancer characteristics of screen detected cancers and interval cancers were compared using a Pearson's chi-squared test for categorical variables and a Student's t-test for continuous variables.
Results: Interval cancers occurred in younger patients (p=0.001), had a higher pT-stage (p=0.039), were more often ER-negative and PR-negative (p=0.014, and p=0.002, respectively), and tumour grade appeared worse (p=0.050). Interval cancers were more often invasive, but this did not reach statistical significance (p=0.059). HER2-status was not significantly different. Fortunately, no difference was observed in pN-stage or presence of metastatic disease.
Conclusion: Interval cancers occurring in women participating in intensive surveillance programs are of more aggressive nature than screen detected cancers. However, our results suggest that interval cancers are detected when the disease is local. This still results in a relatively good prognosis for patients with interval cancer.
Author Disclosures:
N. Karssemeijer: Shareholder; Matakina Ltd Consultant, QView Medical Inc Director, ScreenPoint Medical BV. **R.M. Mann:** Speaker; Bayer AG.

B-0922 10:46

Interpretation time in a population-based breast screening program: digital breast tomosynthesis versus 2D mammography

A. Nitrosi[1], M. Bertolini[1], C. Campari[1], L. Braglia[1], V. Iotti[1], R. Vacondio[1], V. Ginocchi[2], P. Pattacini[1], M. Iori[1]; [1]*Reggio Emilia/IT*, [2]*Guastalla/IT (nitrosi.andrea@asmn.re.it)*

Purpose: To compare interpretation time of digital breast tomosynthesis (DBT) and 2D digital mammography (FFDM) in a population-based screening program (PBBSP).
Methods and Materials: DBT and FFDM are used in our PBBSP inviting all women aged 46-69. Both examinations are bi-lateral and include standard CC and MLO views. PACS workstations and an integrated structured double blinded reading RIS module for screening are used. DBT readings involve slabs (1 cm thick) and planes (1 mm). Interpretation times of a total of 43483 FFDM and 4743 DBT assessments by 9 radiologists were recorded. Reading times were analysed across readers for first and second reading, as well as for recalls and non-recalls. A 2-sample t-test was used to check statistical differences.
Results: Median reading times [25th,75th percentiles] expressed in seconds across readers for DBT and FFDM were respectively 60 [46.82] and 37 [24.62] for first reading, 56 [41.80] and 32 [22.52] for second reading. For recalls 108 [62,175] and 99 [63,154] for first reading, 108 [66,177] and 93 [58,149] for second reading. For non-recalls 59 [46.80] and 36 [24.59] for first reading, 56 [41.78] and 31 [21.49] for second reading. Differences in interpretation time between DBT and FFDM were significant for first and second readings, as well as for non-recalls (p=4E-70,p=8E-100,p=8E-218), but were not significant for recalls (p=0.11).
Conclusion: DBT interpretation time could partially impact department workflow in a PBBSP. It should be considered in a DTB instead FFDM use cost-benefits comparison analysys.

B-0923 10:54

Poulation-based biennal mammographic screening: how many women ask for more?

A. Pisani Mainini[1], L.A. Carbonaro[2], C. De Angelis[1], I. Ioan[1], A. Benedek[2], L. Menicagli[2], R.M. Trimboli[2], R. Lucchini[3], F. Sardanelli[2]; [1]*Milan/IT*, [2]*San Donato Milanese/IT*, [3]*Vimodrone/IT (anna.mainini@hotmail.it)*

Purpose: To evaluate the rate of women who participate in an organised biennial mammographic screening and who perform added spontaneous breast imaging examinations outside the programmed mammographic controls.
Methods and Materials: IRB approved retrospective study and waived informed consent. All the women (49-69 yo) who performed a mammography in an organised biennial screening program between January and June 2014 were considered. The women at their first screening mammogram were excluded by this analysis. Any mammography performed by these women outside the organised screening program (as spontaneous screening) between the 2014 screening mammogram and the prior was recorded. Furthermore, the number of the patients who reported any spontaneous screening mammogram performed in another facility between the 2014 screening mammogram and the prior was recorded.
Results: Of 2,777 women who had a screening mammogram in 2014, 2,566 had had a previous screening mammogram in 2011 or 2012. Of these 2,566 women, during the interval from the previous screening mammogram, 63 (2.5%) had performed at our institution one mammogram (with or without breast ultrasound) as spontaneous screening. In addition, 237/2,566 (9.2%) reported to be examined with a mammogram at another facility.
Conclusion: In an organised population-based biennial mammographic screening program about 11% showed a history of a spontaneous mammography outside the programmed mammographic controls. This rate should be considered as an indicator to evaluate the effectiveness of population-based mammographic screening programs.
Author Disclosures:
L.A. Carbonaro: Other; Congress sponsorship by Bracco SpA. **A. Benedek:** Other; Congress sponsored by Bracco SpA. **R.M. Trimboli:** Other; Congress sponsorship from Bracco SpA. **F. Sardanelli:** Speaker; Bracco SpA.

B-0924 11:02

Engaging users in service improvement using social media: an example from breast screening

L. Robinson[1], C. Ure[1], J. Wray[1], M. Griffiths[1], C. Hill[2], G. Shires[2], J. Stein Hodgins[3], B. Scragg[4]; [1]*Salford/UK*, [2]*Manchester/UK*, [3]*Bolton/UK*, [4]*Burnley/UK (l.robinson@salford.ac.uk)*

Purpose: Women have complained of being poorly prepared for screening mammography. Current health care discourse promotes patient involvement in decision-making and research. The project utilised Social Media to engage

women in the development of a user-designed web-based information and support hub for mammography.
Methods and Materials: Potential participants were informed about the project (through Twitter, Blogs and Facebook networks) and invited to join a private Facebook User Design group (FBUDG). An analysis of the FBUDG was carried out over a 7 month period (31/1/15-5/9/15) using Grytics on-line group analytics tool. The posts were also thematically analysed for content.
Results: 89 women joined the group, comprising service users and mammographers (approx equal split). There were 206 posts eliciting 1124 further comments. Thematic analysis showed that women want more information about: screening in general and for breast cancer; breast anatomy; the mammographic examination; after the mammogram; breast cancer; DCIS; other pathologies and research. These main themes included additional much finer grained detail to help inform the hub content. Women were also keen to engage in discussions about the breast; how it is perceived more widely contrasted with its objectification by health care professionals. The social element of the FBUDG was important. Women shared experiences, information and links and the longest conversations occurred when women were being 'virtually' supported through a mammogram by other members of the group.
Conclusion: Engaging users in service improvement initiatives using social media provides rich data which can be used to ensure patient information and support is meaningful.

B-0925 11:10

Type and extent of surgery for screen-detected and interval cancers at blinded vs non-blinded double reading in a population-based screening mammography programme

R.J.P. Weber[1], R.M.G. van Bommel[1], W. Setz-Pels[1], A.C. Voogd[1], E.G. Klompenhouwer[1], M.W. Louwman[1], L.J.A. Strobbe[2], V.C.G. Tjan-Heijnen[3], L.E.M. Duijm[1]; [1]*Eindhoven/NL*, [2]*Nijmegen/NL*, [3]*Maastricht/NL (royweber@gmail.com)*

Purpose: To compare the type and extent of surgery in patients with screen-detected and interval cancers after blinded or non-blinded double reading of screening mammograms.
Methods and Materials: We included a consecutive series of respectively 44,491 and 42,996 screens, double read either in a blinded or non-blinded fashion between 2009 and 2011. During 2-year follow-up, we collected the radiology reports, surgical correspondence and pathology reports of all screen-detected and interval cancers.
Results: In total, 325 women were diagnosed with a screen-detected breast cancer at blinded and 284 at non-blinded double reading. The majority of women were treated by breast-conserving surgery (BCS) at both reading strategies (78.2% versus 81.7%, p=0.51). We observed larger total resection volumes at BCS for DCIS treatment in patients after blinded double reading (p=0.005). Proportion of positive resection margins following BCS was comparable for patients with DCIS (p=0.81) or invasive screen-detected cancers (p=0.38) for both reading strategies. A total of 158 interval cancers was diagnosed. The proportion of patients treated with BCS was comparable for both reading strategies (p=0.42). Total resection volume (p=0.13) and proportion of positive resection margins following BCS (p=0.32) for invasive interval cancer were comparable for both cohorts. The BCS rate was higher in women following non-blinded double reading (p=0.04).
Conclusion: Blinded and non-blinded double reading yield comparable surgical treatment in women with screen-detected or interval breast cancer except of larger total resection volumes at BCS for screen-detected DCIS and a higher BCS rate for interval cancers at non-blinded double reading.

B-0926 11:18

15 years of imaging of the male breast: a retrospective analysis

O. Scholz, H. Amer, F. Schmitzberger, K.-J. Winzer, H. Schmuschkowitsch, E.M. Fallenberg; *Berlin/DE (oriane.scholz@charite.de)*

Purpose: To assess the use of breast imaging modalities and frequency of pathological findings in male breast patients.
Methods and Materials: After informed consent 1056 male patients who were seen in the mammography-unit between January 2000 and July 2015 were retrospectively evaluated. Medical histories, causes of referral, findings from imaging as well as histopathology and operative records were retrospectively assessed.
Results: Patients had a mean age of 47.4 years (12-92). Mammography+sonography were performed in 65.6% of all cases, sonography alone in 31.6%, galactography in one case. The main finding was gynecomastia in 667 patients (63%), followed by lipomastia in 112 (10.6%), 50 lipoma (4.7%), 27 intramammary malignancies (2.6%, including 18 primary breast cancers (1.7%) and 9 cancers with different origin), 15 inflammatory conditions (mastitis, abscess, granulomatous inflammation) (1.4%), 11 cystic lesions (1%), 68 other benign conditions not originating from breast tissue and 106 normal images (10.1%). All malignant lesions presented as suspicious masses. Gynacomastia impressed mainly as a typical retromamillar flame shaped density only in 5 cases as mass. A family history of breast cancer was seen in 9.3% (98) of the cases, 4.1% (4) of which were diagnosed with primary breast cancer. In patients without a family history (958), primary breast cancer was found in 1.5 % (14) of all cases.
Conclusion: Gynecomastia is the main reason for male patients presenting in a breast unit. Intramammary malignancies occur only in 2.5 % of these cases and are more likely to be primary breast cancers in patients with family history.

B-0928 11:26

A four year review of screening-detected breast cancers with discordant interpretations on double read screening mammography

B. Batohi, M.J. Michell, D. Evans, J. Goligher, J. Morel, C. Peacock, K. Satchithananda, R. Wasan, S. Wijesuriya, R. Rahim; *London/UK (bhavnabatohi@doctors.org.uk)*

Purpose: Discordant breast cancers are identified following differing interpretations on double-read screening mammograms. The aim of this audit was to analyse the mammographic features of discordant breast cancers to improve reader sensitivity.
Methods and Materials: The screening programme database was used to identify breast cancers that were diagnosed from 01/04/2010-31/03/2012 and from 01/04/2012-31/03/2014. The data from each of these periods was evaluated and then combined. During this period, 187161 women were screened and 1416 cancers detected. Discordant cases were reviewed at a consensus meeting of at least five experienced readers at which the mammographic sign, size, site, parenchymal pattern, final histology and reader were recorded.
Results: 126/1416 (8.9%) were discordant cancers: 57 between 2010-2012, 69 between 2012-2014. Spiculate masses were the most frequent mammographic sign in the first period, and isolated clustered microcalcification in the second period. 70.6% of the abnormalities were small (i.e. ≤ 15 mm). Single view cancers were no more detectable on craniocaudal or mediolateral oblique projections. The histology results showed no difference in distribution of tumour type compared to non-discordant tumours. 23% of lesions detected were DCIS with no invasive component on final pathology and 64% were invasive ductal carcinoma. The second reader identified 75.5% of the discordant cancers.
Conclusion: 8.9% of the screen-detected cancers were a discordant-read cancer which corresponds with published findings. The mammographic features of discordant cancers were similar to non-discordant cancers. The study supports the continued use of two readers to maximise sensitivity. Discordant cancer review remains an essential component of film-reading quality assurance.

B-0929 11:34

Complaints against radiologist submitted to disciplinary tribunals (DT) in the Netherlands (2007-2014)

G.J. Jager, M.J.C.M. Rutten; *'s-Hertogenbosch/NL (g.jager@jbz.nl)*

Purpose: We analysed the disciplinary law verdicts against radiologist submitted to the Dutch Disciplinary Tribunals (DT), to identify factors that lead to a complaint. We analysed verdicts in which the complaints were radiology-related but the complaint was against other physicians.
Methods and Materials: The Dutch disciplinary law system offers patients the opportunity to file complaints against physicians outside a legal malpractice system. Approximately 7000 complaints lead to 3500 verdicts during a 7-year period of January 1, 2008 through December 31, 2014. We searched for the term "radiologist". We analysed all verdicts concerning radiologist and radiology-related verdicts.
Results: Fifty-four (< 1%) complaints were against radiologist, 27 came to court, 10 led to a verdict. The latter were due to failure to diagnose (8), failure to communicate (2), poor supervision (1) and failure to advice adequate follow-up. A total of 368 verdicts contain the term "radiologist". In 24 cases, the complaint was radiology-related [missed radiological diagnosis (11), failure to communicate (6), failure to perform in time (1), failure to advise adequate follow-up (3), improper documentation (2)].
Conclusion: Radiologists are at relative low risk in getting involved in a complaint to a DT. In a substantial part of complaints concerning missed diagnosis and inadequate communication, the complaint is not against radiologists.

B-0930 11:42

Breast cancers missed by screening radiologists can be detected by reading mammograms from distance

I.L. Schreutelkamp[1], R.M. Kwee[2], P. Veekmans[3], M.S.O. van Wissen[2], M.E.A.P. Adriaensen[2]; [1]*Maastricht/NL*, [2]*Heerlen/NL*, [3] *Weert/NL (miraude@gmail.com)*

Purpose: During quality assurance evaluation, it was noticed that screening radiologists missed some tumours which might have been detected from distance. Therefore, the objective of our study was to determine whether

tumours missed by individual screening radiologists can indeed be detected from distance.
Methods and Materials: A test-set of 84 screening mammograms, two views (craniocaudal and mediolateral-oblique) per breast, was compiled. Twenty-eight screening mammograms of 28 females (mean age 63 years, range 49-73) with a pathologically proven malignant tumour missed by individual screening radiologists were mixed with 56 normal screening mammograms of 56 females (mean age 63 years, range 53-74). The test-set was independently assessed by a senior screening radiologist and by a radiology resident without prior training in screening mammography at 1.5 meter distance from the screen display. Readers were unaware of the prevalence of pathologically proven malignant tumours in the test-set. Primary outcome was whether the reader would recall the woman. Sensitivity and specificity for each reader were calculated.
Results: The senior screening radiologist recalled 28 of 28 women with a pathologically proven tumour (sensitivity of 100%) and 16 of 56 women without pathology (specificity of 71%). The radiology resident recalled 25 of 28 women with a pathologically proven tumour (sensitivity of 89%) and 10 of 56 women without pathology (specificity of 82%).
Conclusion: Some tumours missed by an individual screening radiologist can be detected from 1.5 meter distance. Therefore, we recommend that screening radiologists take a distant view before closely evaluating the mammogram in detail.

10:30 - 12:00 **Room Z**

Molecular Imaging

SS 1406
Advanced experimental imaging

Moderators:
S. Walker-Samuel; London/UK
B. Wängler; Mannheim/DE

B-0931 10:30

$\alpha_v\beta_3$-integrin-targeted MRI for the assessment of early anti-angiogenic therapy effects in experimental breast cancer

P.M. Kazmierczak, M. Schneider, T. Habereder, H. Hirner-Eppeneder, R. Eschbach, M. Moser, M.F. Reiser, C.C. Cyran; *Munich/DE (Philipp.Kazmierczak@med.uni-muenchen.de)*

Purpose: To investigate MRI with $\alpha_v\beta_3$-integrin-targeted ultrasmall superparamagnetic iron oxide (USPIO) nanoparticles for the *in vivo* monitoring of early anti-angiogenic therapy effects in experimental breast cancer.
Methods and Materials: Orthotopic human breast cancer (MDA-MB-231) xenograft-bearing SCID mice were imaged before and after a one-week therapy with VEGF receptor-antibody bevacizumab or placebo (n=10 per group) on a clinical 3-Tesla scanner (Magnetom Skyra, Siemens Healthcare, Erlangen, Germany) prior to and 60 min after the i.v. injection of $\alpha_v\beta_3$-integrin-targeted USPIO nanoparticles (P04000, Guerbet, Villepinte, France). R2 relaxometry employing a T2 spin-echo sequence with n=4 echo times (TE=20/40/60/80 ms; TR 3800 ms; matrix=128x128; FOV=50x50; ST=1.2 mm; TA=25 min) was used as semiquantitative measure to determine USPIO nanoparticle uptake. Imaging results were validated by *ex vivo* multiparametric immunohistochemistry with regard to $\alpha_v\beta_3$-integrin expression, microvascular density (CD31), proliferation (Ki-67), and apoptosis (TUNEL).
Results: The $\alpha_v\beta_3$-integrin-targeted USPIO nanoparticle uptake was significantly reduced following VEGF inhibition, compared to the control group in which an increased binding was detected ($\Delta R2_{Therapy}$=-0.80±0.78 s^{-1}; $\Delta R2_{Control}$=+0.27±0.59 s^{-1}; p=0.002). Correspondingly, immunohistochemistry revealed a significantly lower $\alpha_v\beta_3$-integrin expression (91±30 vs. 357±72, $p < 0.001$), microvascular density (CD31, 109±46 vs. 440±208; $p < 0.001$), tumour cell proliferation (Ki-67, 4,040±1,373 vs. 6,530±1,217; $p < 0.001$), as well as significantly higher apoptosis (TUNEL, 11,186±4,387 vs. 4,017±1,191; p=0.004) in the therapy compared to the control group.
Conclusion: MRI with $\alpha_v\beta_3$-integrin-targeted USPIO nanoparticles allows for the in vivo monitoring of early anti-angiogenic therapy effects in experimental breast cancer.
Author Disclosures:
P.M. Kazmierczak: Other; The contrast agent P04000 (Guerbet, Villepinte, France) was supplied by the manufacturer free of charge. **C.C. Cyran:** Other; The contrast agent P04000 (Guerbet, Villepinte, France) was supplied by the manufacturer free of charge.

B-0932 10:38

In vivo imaging of prostate cancer using an anti-PSMA fragment as a probe

C. Mazzocco[1], N. Grenier[1], G. Fracasso[2], C. Germain-Genevois[1], N. Dugot-Senant[1], F. Couillaud[1]; [1]*Bordeaux/FR*, [2]*Verona/IT (nicolas.grenier@chu-bordeaux.fr)*

Purpose: To evaluate a fluorescent-labeled single chain variable fragment (scFv) of anti-PSMA antibody as a specific probe for the detection of prostate cancer by fluorescence imaging in vivo.
Methods and Materials: An orthotopic model of prostate cancer was generated by injecting LNCaP cells within prostate lobe. ScFvD2B, a high affinity anti-PSMA antibody fragment, was labeled using a near-infrared fluorophore to generate a specific imaging probe (X770-scFvD2B). X770-scFvD2B was injected intravenously in mouse bearing prostate tumours and fluorescence was monitored in vivo by fluorescence molecular tomography (FMT). Unrelated scFv; X770 labelled, was used as control.
Results: The X770-scFvD2B specifically bound to PSMA and was internalised in PSMA expressing LNCaP cells. After intravenous injection, X770-scFvD2B was detected in vivo by FMT in the prostate region. On excised prostate the scFv probe co-localise with the cancer cells and was found internalised in PSMA expressing cells. The PSMA-unrelated scFv used as control did not label the prostate cancer cells.
Conclusion: Our data demonstrated that scFvD2B is a high affinity contrast agent for in vivo detection of PSMA-expressing cells into the prostate gland. NIR labeled-scFvD2B could be further developed as a clinical probe for imaging-guided targeted biopsies.
Author Disclosures:
N. Grenier: Advisory Board; Supersonic Imagine.

B-0933 10:46

^{68}Ga-TRAP-$(RGD)_3$-PET/CT for the in vivo assessment of $\alpha_v\beta_3$-integrin expression as biomarker of early anti-angiogenic therapy effects in experimental breast cancer

P. Kazmierczak, A. Todica, H. Hirner-Eppeneder, A. Rominger, M.F. Reiser, C.C. Cyran; *Munich/DE (Philipp.Kazmierczak@med.uni-muenchen.de)*

Purpose: To investigate radiolabelled arginine-glycine-aspartic acid (^{68}Ga-TRAP-$(RGD)_3$)-PET/CT for the *in vivo* monitoring of $\alpha_v\beta_3$-integrin expression as biomarker of early anti-angiogenic effects in experimental breast cancer.
Methods and Materials: Orthotopic human breast cancer (MDA-MB-231) xenograft-bearing SCID mice (n=13) were imaged on a dedicated small animal PET (Inveon, Siemens Healthcare) before and after a one-week therapy with VEGF receptor-antibody bevacizumab or placebo (therapy n=7). Transmission/emission scans were performed from 53 to 90 min after i.v. injection of 20 MBq ^{68}Ga-TRAP-$(RGD)_3$. PET and unenhanced CT (Somatom Force, Siemens Healthcare; 35 mAs, 100 kV, ST0.6 mm) data sets were fused for anatomic co-registration and tumour localisation. The target-to-background ratio (TBR, $VOImax_{tumor}/VOImean_{muscle}$) was determined to semi-quantitatively assess tumour radiotracer accumulation. Imaging results were validated by multiparametric immunohistochemistry ($\alpha_v\beta_3$-integrin expression, microvascular density-CD31, proliferation-Ki-67, apoptosis-TUNEL), conducted in a separate animal cohort (n=12) to exclude competitive blocking effects.
Results: We detected a significantly reduced ^{68}Ga-TRAP-$(RGD)_3$ binding following VEGF inhibition, with an unidirectionally decreased accumulation in all animals ($\Delta TBR_{follow\text{-}up/baseline}$: therapy -1.07±0.83, control +0.32±1.01, p=0.022). Immunohistochemistry revealed a significant reduction of $\alpha_v\beta_3$-integrin expression (308±135 vs. 635±325, p=0.03), microvascular density (CD31, 168±108 vs. 432±70, p=0.002), proliferation (Ki-67, 5,195±1,002 vs. 7,574±418, p=0.004) as well as significantly higher apoptosis (TUNEL, 14,432±1,974 vs. 3,776±1,378, p=0.002) in the therapy compared to the control group. Tumour volume development assessed by CT did not differ between therapy and control group ($\Delta volume_{therapy}$ 134±77 µL, $\Delta volume_{control}$ 132±56 µL, p=1.000).
Conclusion: ^{68}Ga-TRAP-$(RGD)_3$-PET/CT allows for the *in vivo* assessment of $\alpha_v\beta_3$-integrin expression as biomarker of early anti-angiogenic therapy effects in experimental breast cancer.

B-0934 10:54

Multiparametric contrast-enhanced ultrasound with VEGFR-2-targeted microbubbles and DCE-MRI for monitoring the effects of regorafenib on colon carcinoma xenografts in rats

R.S. Eschbach, D.A. Clevert, H. Hirner-Eppeneder, P.M. Kazmierczak, M. Moser, M. Schneider, D. Tadros, M.F. Reiser, C.C. Cyran; *Munich/DE (ralf.eschbach@med.uni-muenchen.de)*

Purpose: To investigate contrast-enhanced ultrasound (CE-US) with VEGFR-2-targeted microbubbles for monitoring therapy effects of regorafenib on experimental colon carcinomas with correlation to DCE-MRI.

Methods and Materials: Colorectal adenocarcinoma xenografts were implanted in 19 athymic rats, randomised to therapy or control group. Animals were imaged at baseline and after a one-week daily treatment with regorafenib or placebo, using CE-US with VEGFR-2-targeted microbubbles (BR55, Bracco, Milan, Italy) and DCE-MRI. In CE-US, tumour perfusion was assessed during an early vascular phase and VEGFR-2-specific binding during late phase. In DCE-MRI, the functional parameters such as plasma flow (PF) and plasma volume (PV) were quantified. For validation purposes, CE-US parameters were correlated with DCE-MRI parameters and immunohistochemical VEGFR-2, CD-31 and TUNEL stainings.
Results: CE-US perfusion parameters decreased significantly ($p < 0.05$) in control group. The number of bound microbubbles in the late phase was significantly higher ($p < 0.05$) in control group than in therapy group on day 7. PF and PV assessed by DCE-MRI decreased significantly ($p < 0.05$) in therapy group. Immunohistochemistry revealed significantly fewer VEGFR-2 and CD-31 as well as significantly more TUNEL-positive cells ($p < 0.05$) in the therapy group. CE-US parameters showed significant ($p < 0.05$) correlations to DCE-MRI parameters and to immunohistochemistry.
Conclusion: BR55-enhanced CE-US allowed for monitoring regorafenib functional and molecular therapy effects on experimental colorectal adenocarcinomas with a significant decline of CE-US and DCE-MRI perfusion parameters as well as a significant reduction of specifically bound microbubbles under therapy, consistent with a reduced expression of VEGFR-2.

B-0935 11:02

RGD peptide-modified PEGylated dendrimer-entrapped gold nanoparticles for targeted CT imaging of breast carcinoma

K. Li; *Shanghai/CN (kanganli@sina.com)*

Purpose: We report the synthesis and characterisation of cyclo (Arg-Gly-Asp-D-Phe-Lys) peptide (RGD)-modified PEGylated dendrimer-entrapped gold nanoparticles (Au DENPs) for targeted computed tomography (CT)imaging of integrin-rich breast carcinomas.
Methods and Materials: In this study, generation-5 amine-terminated poly (amidoamine)dendrimers (G5.NH2) were modified with methoxyl polyethylene glycol acid (mPEG-COOH) and RGD-PEG-COOH peptides, and the products G5.NH2-(PEG-RGD)7-mPEG8 were then used as templates to entrap gold nanoparticles (AuNPs). Following acetylation of the remaining dendrimer terminal amines, integrin αvβ3-targeted {(Au0)300-G5.NHAc-(PEG-RGD)7-mPEG8} DENPs (PEGylated Au DENPs-RGD) were obtained. The formed PEGylated Au DENPs-RGD probes were characterised via different techniques.
Results: We demonstrate that PEGylated Au DENPs-RGD with an AuNP core size of 2.8 nm are water dispersible, stable at different pH and temperature conditions, and biocompatible at the given concentration range. With the presence of Au NPs, the PEGylated Au DENPs-RGD displayed high X-ray attenuation intensity. The conjugated RGD ligand can specifically identify and target overexpressed integrins on both endothelial and cancer cells. Moreover, the half-decay time demonstrated by pharmacokinetic studies is sufficiently long to ensure accumulation of the NPs in the target area. These properties of the particles enable them to be used as nanoprobes for targeted CT imaging of integrin-rich breast carcinoma cells in vitro and xenograft tumour model in vivo via an integrin-mediated pathway.
Conclusion: These findings suggest that the designed PEGylated Au DENPs-RGD can be used as targeted nanoprobes with good biocompatibility for targeted CT Imaging and diagnosis of integrin-positive tumours.

B-0936 11:10

Radiolabeled somatostatin receptor agonist versus antagonist for molecular imaging and therapy

S. Dalm, J. Nonnekens, G. Doeswijk, E. de Blois, D. van Gent, M. Konijnenberg, M. de Jong; *Rotterdam/NL (s.dalm@erasmusmc.nl)*

Purpose: Radiolabeled somatostatin receptor 2 (SSTR2) agonists are successfully used in the clinic for the imaging and therapy of neuroendocrine tumours. Recently, radiolabeled SSTR2 antagonists have been described that surprisingly showed superiority for imaging purposes compared to SSTR2 agonists. The aim of this study is to investigate the difference in therapeutic effects between a SSTR2 agonist and antagonist.
Methods and Materials: In-vitro uptake and the produced DNA double strand breaks (by determining the number of p53 binding protein 1 (53BP1) foci) were determined after incubating cells with a radiolabeled SSTR2 agonist, 177Lu-DOTA-octreotate, and antagonist, 177Lu-DOTA-JR11. Also, in-vivo therapy studies were performed comparing the therapeutic effect of the radiotracers. For this the optimal peptide amount for therapy studies was first determined by performing biodistribution/imaging studies.
Results: We found a five times higher uptake of 177Lu-DOTA-JR11 compared to 177Lu-DOTA-octreotate. 74±3% of the agonist uptake was internalized, while 88±1% of the antagonist uptake was membrane-bound. Furthermore, we found more 53BP1 foci after incubation with the antagonist compared to the agonist. When animals were injected with the optimal peptide amount for 177Lu-DOTA-JR11 (0.5 µg/30 MBq 177Lu-DOTA-JR11, resulting in a tumour dose of 1.8±0.7 Gy/MBq), 177Lu-DOTA-octreotate (0.5 µg/30 MBq 177Lu-DOTA-octretotate, resulting in a tumour dose of 0.41±0.11 Gy/MBq) or received a sham injection, median survival rates were 71, 61 and 43.5 days, respectively.
Conclusion: Based on these results we conclude that peptide receptor-based imaging and radionuclide therapy using SSTR2 radioligands can be improved by using SSTR2 antagonists instead of the currently used SSTR2 agonists.
Author Disclosures:
M. de Jong: Shareholder; Marion de Jong is shareholder in AAA, but this is not related to this project.

B-0937 11:18

Probing thePI3K/Akt/mTOR signalling inhibitors response in breast cancer cellsby 31P-NMR spectroscopy

S.M. Phyu, T.A.D. Smith, C.-C. Tseng; *Aberdeen/UK (suphyusu@gmail.com)*

Purpose: To investigate the changes in 31P-NMR (phospholipid metabolites) by inhibitors targeting progressively downstream in the PI3K/Akt/mTOR pathway as phospholipid metabolism is crucial for cell proliferation and key enzymes are up-regulated by signalling pathways in cancer cells.
Methods and Materials: 31P-NMR spectroscopy has been applied to breast cancer cells responding to inhibitors of the PI3K/Akt/mTOR pathway (LY294002, MK2206, Rapamycin and AZD8055 respectively) to detect alterations in phospholipid metabolites and also high energy phosphates (ATP) induced by drug treatment. [Methyl-3H]-choline uptake was also determined to assess the utility of 31P-NMR spectroscopy in treatment response detection.
Results: The findings showed dose dependent inhibition of several components of the PI3K/Akt/mTOR pathway was seen in triple negative breast cancer MDA-MB 468 cells. In terms of NMR spectra, treatments increased GPC and GPE content whilst LY and MK treatments decreased PC. (Interestingly, a UDP sugar peak was higher in LY and ADZ treated cells). However, that peak turned down to control level when SB 216763, glycogen synthase kinase inhibitor, was given. [3H]-choline uptake was decreased in LY and MK but not Rapamycin treated samples.
Conclusion: In conclusion, these inhibitors induced different changes in phospholipid metabolites by 31P NMR. Moreover, spectral changes in 31P NMR were consistent with up-regulation of GSK induced by the PI3K inhibitor LY294002 and mTOR2 inhibitor AZD8055. However, the underlying mechanism of appearance of phospholipid metabolites has to be found out to prove these biomarkers could be used for detection of treatment response.

B-0938 11:26

Semi-quantitative dynamic contrast-enhanced magnetic resonance imaging parameters for evaluating tumour hypoxia in a maxillofacial VX2 rabbit model

L. Zheng[1], Y. Li[2], Z. Zhang[1], G. Zhang[2]; [1]*Chicago, IL/US*, [2]*Shanghai/CN (zhenglinfeng04@aliyun.com)*

Purpose: The aim of this study is to test the feasibility of semi-quantitative dynamic contrast-enhanced magnetic resonance imaging (DCE-MRI) parameters for evaluating tumour hypoxia in a maxillofacial VX2 rabbit model.
Methods and Materials: Eight New Zealand rabbits were established a maxillofacial VX2 tumour rabbit model and DCE-MRI were carried out using a 1.5 Tesla scanner. Semi-quantitative DCE-MRI parameters, maximal enhancement ratio (MER) and slope of enhancement (SLE), were calculated and analysed. The tumour samples from rabbits underwent hematoxylin-eosin (HE), pimonidazole (PIMO) and vascular endothelial growth factor (VEGF) immunohistochemistry (IHC) staining, and the PIMO area fraction and VEGF IHC score were calculated. Spearman's rank correlation analysis was used for statistical analysis.
Results: The MER values of eight VX2 tumours ranged from 1.132 to 1.77 (1.406±0.258) and these values were negatively correlated with the corresponding PIMO area fraction ($p = 0.0000002$), but there was no significant correlation with the matched VEGF IHC score ($p = 0.578$). The SLE values of the eight VX2 tumours ranged from 0.0198 to 0.0532 s^{-1} (0.030±0.011 s^{-1}). Correlation analysis showed that there was a positive correlation between SLE and the corresponding VEGF IHC score ($p= 0.0149$). However, no correlation was found between SLE and the matched PIMO area fraction ($p = 0.662$). The VEGF positive staining distribution predominantly overlapped with the PIMO adducts area, except for the area adjacent to the tumour blood vessel.
Conclusion: The semi-quantitative parameters of DCE-MRI, MER and SLE could be used to noninvasively evaluate hypoxia during tumour treatment.

B-0939 11:34

The complement system and its influence on the development of acute renal failure: non-invasive renal perfusion measurement by MRI

B.J.U. Hensen, A. Thorenz, R. Chen, M. Meier, A. Klos, F. Wacker, D. Hartung, F. Güler, K. Hüper; *Hannover/DE (hensen.bennet@mh-hannover.de)*

Purpose: Our objective was to investigate the influence of complement receptor C5L2 on the development of acute kidney injury (AKI) after renal ischaemia reperfusion injury (IRI) in mice by measurement of renal perfusion in MRI. Findings were compared to surgical measurements of glomerular filtration rate (GFR), renal plasma flow (RPF) and histology.
Methods and Materials: AKI was induced by transient clamping of the right renal pedicle in C5L2 knockout (KO) (n=6) and corresponding wild-type (WT) mice (n=6) for 45 min. A FAIR ASL sequence was acquired on a 7T MRI 1, 7 and 21days after surgery. GFR and RPF were measured surgically 3weeks after IRI. Renal fibrosis was quantified by histology. Values are given as mean±SEM.
Results: On day1 after surgery perfusion was reduced to 612±49 and 662±64 ml/(min*100 g) (ns,p=0.55) in C5L2KO and WT animals. On day 7 min. values of perfusion in C5L2KO were higher than in WT animals (351±45 vs 219±34 ml/(min*100 g); $p < 0.05$). 21 days after surgery perfusion of C5L2KO was significantly higher than in WT animals (668±66 vs 410±47 ml/(min*100 g); $p < 0.01$). After 3 weeks, in C5L2KO, RPF (45.4±15 vs 19.8±8.4 µl/min; ns) and GFR (29.8±6.2 vs 11.4±2.3 µl/min; $p < 0.01$) were higher. The renal fibrosis was less pronounced in KO animals.
Conclusion: Deficiency of complement receptor C5L2 in mice is associated with less renal perfusion restrictions and has a positive influence on functional renal parameters and fibrosis. Measurement of perfusion using ASL provides the possibility to detect these positive effects non-invasively.

B-0940 11:42

Treatment of murine colon tumours using gold nanoparticles and localised hyperthermia

B.-F. Lee, N.-T. Chiu; *Tainan/TW (leelab0315@gmail.com)*

Purpose: Gold nanoparticles (AuNPs) could be allowed for targeted molecular therapy of cancer. Hyperthermia ablation therapy could induce tumour growth delay. The present study was designed to evaluate the efficacy and safety of AuNPs and localised hyperthermia in a murine colon tumour model. To investigate the antitumour effects of AuNPs, mice bearing CT-26 were administered AuNPs.
Methods and Materials: All mice injected with AuNPs were free of side effects. When tumour volumes reached 100 mm3, pretreatment images were acquired after injection of Tc-99m-HL91. The mice were divided into low and high hypoxic groups based on the tumour-to-non-tumour ratio of Tc-99m-HL91. When tumour volumes reached 500 mm3, they were divided into four groups, the control group, AuNPs group, localised hyperthermia group and the combined AuNPs and localised hyperthermia group. When tumour volumes reached 1000 mm3, histological examinations were performed.
Results: The treatment with combined AuNPs and localised hyperthermia significantly retarded the tumour growth and reduced the tumour volume lower than that of with AuNPs only, localised hyperthermia only, and controls. The accumulation of AuNPs was detected inside CT-26 culture cells in vitro. Moreover, the AuNPs were shown to be localised in the tumour cells in vivo.
Conclusion: In conclusion, considering the potential advantages in terms of noticeable antitumour activity, the treatment with combined AuNPs and localised hyperthermia might be potentially useful in the clinical setting. Moreover, this study provides the first evidence that Tc-99m-HL91 can serve as an imaging biomarker for predicting the treatment responses in a murine colon tumour model.

B-0941 11:50

USPIO-labeling in M1 and M2 macrophage population: an in vitro MR study

C. Zini[1], M. Venneri[1], S. Miglietta[1], M. Rengo[1], N. Porta[2], A. Isidori[1], V. Petrozza[2], A. Laghi[1]; [1]*Rome/IT*, [2]*Latina/IT (zini.chiara@gmail.com)*

Purpose: M2-like macrophages have been related with tumour growth and M1-like macrophages are involved in the the elimination of pathogens and cancer cells.Our aim was to evaluate USPIO labeling in different macrophage population (THP-1 cells M1 and M2 polarized) using a clinical 3.0 T MR unit with microscopy as gold standard.
Methods and Materials: THP-1 cells were differentiated into macrophages using 320 nM of PMA and polarized according to Tjiu method. A control population of macrophages, with no stimuli, was developed from THP-1 cells with PMA for 48 hrs. M1, M2 and control population were incubated with P904 (CheMatech, Guerbet Research)(200 µg Fe/mL) for 48 hrs at 37 °C in 5% CO_2. Four 2 mL gel phantoms (M1, M2 and control population incubated with P904 and control population without P904) containing at least 1x106 cells/milliliter of 1.6% agarose gel were analysed with a 3.0 T scan (Discovery MR750, GE Healthcare).Optical and electron microscopy was considered the gold standard.
Results: Different amounts of USPIO-tagged cells were demonstrated in the phantoms. In particular, it was demonstrated that M2 cells showed "slope effect" after 48 hrs of incubation.This effect was not evident in all the other populations. Moreover a high signal on T1w GRE was demonstrated only in the M2 population. Those results were confirmed by optical and electron microscopy.
Conclusion: Avid and selective USPIO-labeling for M2 population was demonstrated with a 3.0 T clinical scan. Further studies on same topic would be highly desirable to investigate the possible role of non-invasive diagnosis in inflammation and cancer imaging.

10:30 - 12:00 **Studio 2016**

Genitourinary

SS 1407

Multi-parametric MR of prostate cancer: an update

Moderators:
D. Junker; Innsbruck/AT
J.C. Vilanova; Girona/ ES

K-26 10:30

Keynote lecture

J.C. Vilanova; Girona/ ES

B-0942 10:39

Comparison of the prostate imaging reporting and data system version 1 and 2 in a cohort of 245 patients with histopathological and long term follow-up

P.J.L. De Visschere, E. Pattyn, P. Ost, T. Claeys, G.M. Villeirs; *Ghent/BE (Pieter.DeVisschere@uzgent.be)*

Purpose: To compare the performance of the Prostate Imaging Reporting and Data System version 1 and 2 (PIRADSv1 and v2) for detection of clinically significant prostate cancer (clinsigPC) with multiparametric MRI (mpMRI).
Methods and Materials: 245 patients with elevated PSA (mean 17.2 ng/ml) underwent mpMRI before biopsy at 3.0 Tesla without endorectal coil between 5/2011 and 12/2014. Patients underwent transrectal ultrasound guided systematic 12 core biopsy followed by radical prostatectomy (N=68), radiation therapy (N=91) or clinical follow-up for at least 2 years (N=86). All exams were scored on a per patient base according to PIRADSv1 and PIRADSv2 by a single blinded reader. ClinsigPC was defined as Gleason score ≥3+4 and/or tumour volume ≥0.5 cc and/or tumour stage ≥T3a.
Results: In 144 patients (58.8%) a clinsigPC was found within 2 years after mpMRI. The mean PIRADSv1 and PIRADSv2 overall assessment scores were significantly higher ($P < 0.001$) in patients with clinsigPC (3.89 and 3.84, respectively) as compared to patients without clinsigPC (2.50 and 2.49 respectively). ROC analysis showed an area under the curve of 0.82 (CI 0.76-0.87) for PIRADSv1 and 0.79 (CI 0.73-0.85) for PIRADSv2. A threshold score of 3 exhibited sensitivities and specificities for detection of clinsigPC of 88.2% and 64.4% with PIRADSv1 and 79.2% and 67.3% with PIRADSv2. The negative predictive value for exclusion of a Gleason score ≥4+3 prostate cancer was 93.9% with PIRADSv1 and 89.8% with PIRADSv2.
Conclusion: PIRADSv1 and v2 scoring systems are both valid prognostic tools and yield similar performance to detect clinsigPC in patients with elevated PSA.

B-0943 10:47

Does PI-RADS version 2 perform better than version 1.0 in the classification of prostate lesions in mpMRI?

S. Lucarini[1], L. Noferini[1], L.N. Mazzoni[2], L. Galastri[1], S. Busoni[1], I. Menchi[1]; [1]*Florence/IT*, [2]*Siena/IT (slucarini@iol.it)*

Purpose: PI-RADS version 2 classification has been released to improve diagnosis and treatment of prostate cancer with mpMRI. The available data set at our institution was retrospectively scored with PI-RADS version 1 and version 2 to assess whether the patient management was changed after reclassification from version 1 to version 2.
Methods and Materials: We reviewed 80 patients who underwent mpMRI and subsequent or previous biopsy for suspected prostate cancer between January 2014 and October 2015. All mpMRIs included morphological (T2W), DWI, DCE MR perfusion, MRS sequences on a 1.5-T scanner with endorectal coil. Lesions were classified into 3 groups according to PIRADS version 1. Group 1: lesions with PIRADS score 4-5; group 2: lesions PIRADS score 3, and group 3:

lesions with PIRADS score 1-2. Each lesion was scored again according to PI-RADS version 2. Correlation was made with histopathology.
Results: After re-scoring, in group 1, 82% of lesions remain in the same class, 12% were downgraded to group 2, and 6% were downgraded to group 3. The downgraded lesion were confirmed by the histopathological response. The lesions in group 2 were downgraded to group 3 (100%). The lesions in group 3 confirmed in 53% of cases the classification of PI-RADS version 1 and 47% were upgraded to group 2.
Conclusion: From our analysis, it results that with PI-RADS version 2 scoring system the specificity of the prostate mpMRI examination is improved. Furthermore, the second version reduces the time needed to perform the exam (exclusion of spectroscopy) and makes classification quick and easier.

B-0944 10:55

Head-to-head comparison of PI-RADS v1 and v2 in prostate lesions biopsied by MR-guided in-bore biopsy

S. Polanec, H. Bickel, D. Georg, K. Pinker Domenig, M. Susani, T.H. Helbich, P.A.T. Baltzer; *Vienna/AT (stephan.polanec@meduniwien.ac.at)*

Purpose: To compare the diagnostic performance of PI-RADS v1 and v2 for the diagnosis of prostate cancer (PCa) on multiparametric MRI.
Methods and Materials: This retrospective study included 65 consecutive biopsy-naïve or -negative patients (mean age: 65 years, mean PSA: 10.8 ng/ml). Two independent readers (R1, R2) scored each patient's dominant lesion according to PI-RADS v1 (v1) and PI-RADS v2 (v2). Statistical analysis compared measures of diagnostic precision (i.e. sensitivity, specificity, and area under the ROC-curve with ROC and McNemar statistics) was done for all cases and stratified by peripheral and transitional zone (TZ, PZ). Inter-reader agreement was assessed by kappa statistics.
Results: Overall AUCs were higher for both readers when using v1 (AUC 0.85-0.86) compared to v2 (AUC 0.71-0.75). In PZ, AUCs were higher when using v1 (AUC 0.82-0.83 for R2) compared to v2 (AUC 0.61-0.63). In TZ, no significant difference (p=0.56) in AUCs could be found. Overall, sensitivity between both readers and methods did not differ ($p > 0.05$). Specificity was higher using v1 as compared to v2 (R1: p=0.0078, R2: p=0.0313). In PZ, specificity was higher using v1 (43.8-62.3%) compared to v2 (12.5-18.8%). Sensitivity was 100% for both reading methods and readers. In TZ, both readers showed higher sensitivities using v2 (87.5-100%) compared to v1 (75%) but a lower specificity using v2 (50%-56.3%) compared to the v1 (68.8-75%).
Conclusion: Overall diagnostic performance of v1 was better than v2. This is mainly due to lower specificity of v2 in PZ lesions. However, PI-RADS v2 seems to improve diagnostic performance in TZ lesions.

B-0945 11:03

Influence of the PI-RADS version on the scoring of prostatic lesions

P. Asbach, H. Cash, B. Hamm, M. Haas; *Berlin/DE (patrick.asbach@charite.de)*

Purpose: With the introduction of the revised version of the PI-RADS scoring system a score inherent variability between version 1 (v1) and version 2 (v2) can be suspected. The aim of this study was to assess the reasons for differences of the PI-RADS score between v1 and v2 and to investigate a possible association to the Gleason score.
Methods and Materials: A cohort of 40 patients with biopsy proven prostate cancer and 58 lesions detected on pre-biopsy multiparametric 3 Tesla MRI was included in this analysis. Two experienced radiologists scored all lesions according to PI-RADS v1 und v2 with a 6 months interval. All lesions that were scored differently were analysed for respective reasons.
Results: The PI-RADS score differed between version 1 and 2 in 55% of patients (22/40) and in 41% of lesions (24/58). On a lesion basis, the reasons for the differences between the two PI-RADS versions were: difference related to sum score in v1 versus categorical approach in v2 in 54% (13/24); cut-off between PI-RADS 4 and 5 based on size in v2 versus the sum-score in v1 in 25% (6/24); inconclusive in 21% (5/24). In high grade prostate cancer, differing scores are mainly due to downgrading for lesion size < 1.5 cm.
Conclusion: PI-RADS scores frequently differ between v1 and v2. A major reason for the differences is score-inherent. Both the sum-score (v1) versus the categorical approach and the 1.5 cm size cutoff in v2 accounted for differing scores.
Author Disclosures:
B. Hamm: Consultant; Toshiba Medical Systems.

B-0946 11:11

Multiparametric magnetic resonance imaging of prostate cancer: diagnosis and stratification of patients with PIRADS 3 pattern through a multivariate statistical analysis

V. Panebianco; *Rome/IT (valeria.panebianco@gmail.com)*

Purpose: The objective of this study was to determine the best combination sequences between T2-weighted imaging, dynamic contrast-enhanced imaging and diffusion-weighted imaging to characterise PIRADS 3 lesions with 3 T scan.
Methods and Materials: Multivariate analysis was applied to the data set constituted by a matrix having as rows 64 patients with PIRADS 2, 4 and 5 and as column the values relative to different combination of T2, ADC1000, ADC3000, semi-quantitative kinetic parameters and quantitative kinetic parameters. The model built upon the 64 subjects then was checked on its ability to correctly classify 27 patients with PIRADS 3 lesions.
Results: Imposing to the OPLS-DA model two different classes of patients, patients with PIRADS 4 or 5 and patients with PIRADS2, we obtained a robust predictive model (Q2 = 0.80) using all MRI parameters. This model was used to assess the predictive capabilities for 27 other patients with PIRADS 3 lesions. The model predicted that 12 of the unknown patients belong to PIRADS 4/5 group, 4 to the PIRADS 2 and 11 to both groups (borderline). The actual identities of 27 patients were almost coincident with the predicted ones: 11 patients with prostate cancer, 5 healthy patients and 11 patients with ASAP.

Conclusion: Our findings suggest that multivariate analysis of combined T2WI, DCE and DWI parameters can significantly improve the diagnostic accuracy for patients with PIRADS 3 lesions. The multivariate approach gives a proof-of-concept of an integrative systemic view, made possible by multiparametric MRI, to non-invasively diagnose different prostate cancers.

B-0947 11:19

Multiparametric MRI in the follow-up of low-risk prostate cancer patients on active surveillance

A.R. Padhani[1], G. Petralia[2], H. Sokhi[3], F. Sanguedolce[4], N. Anyamene[1], G. Hellawell[5]; [1]*Northwood/UK*, [2]*Milan/IT*, [3]*Uxbridge/UK*, [4]*Northampton/UK*, [5]*Harrow/UK (anwar.padhani@stricklandscanner.org.uk)*

Purpose: Patients undergoing active surveillance (AS) for low-risk prostate cancer have high dropout rates in the first 2 years of AS, mainly related to tumour grade/volume reclassifications. We document MRI trends in consecutive follow-up (FU) of AS patients.
Methods and Materials: 162 patients on AS (conventional criteria) underwent baseline multiparametric (mp) prostate MRI (T2W, DW-MRI, DCE-MRI, MRSI). 288 approximately annual FU examinations (2008-2014) performed in 111 patients. Imaging findings reported by a single experienced reader were retrospectively reviewed and categorised into 7 groups with respect to the prior comparator study: (1) stable, (2) disappearance of abnormality, (3) emergence of new lesion (s), (4) morphologic progression with stable functional characteristics, (5) changing functional characteristics ±morphologic/lesion size change, (6) reduced lesion conspicuity/functional score, and (7) indeterminate.
Results: Number of FU examinations: 1=111; 2=76; 3=49; 4=30; ≥5=22. 43 of 111 (39%) patients showed stability on 94 FU (median 2; range 1-6) mpMRI scans (category 1). 68 (61%) patients showed changes on one or more of 194 FU exams (median 3, range 1-6); 57 of 68 patient had mpMRI changes consistent with tumour progression (categories 3-5). On the 288 FU scans, findings compared to preceding scan were consistent with progression (category 3 = 25 (9%); category 4 = 16 (6%); category 5 = 40 (14%)) and improved appearance (category 2 =9 (3%) ;category 6 = 15 (5%)); respectively
Conclusion: Changes on mpMRI are observable in 61% of patients during 1st 5 years of AS with 51% showing changes consistent with tumour progression.
Author Disclosures:
A.R. Padhani: Advisory Board; Siemens Heathcare. Research/Grant Support; Siemens Heathcare.

B-0948 11:27

The variability of prostate cancer volume by multiparametric MRI (mpMRI): results from an active surveillance cohort

F. Giganti, N. Petrides, C. Moore, M. Emberton, C. Allen, A. Kirkham; *London/UK (giganti.fra@gmail.com)*

Purpose: To describe the natural history of low-grade prostate cancer by MRI with T2, diffusion weighted and dynamically enhanced sequences in patients under active surveillance.
Methods and Materials: A total of 86 men had more than one surveillance MRI, the first in 2012 or before. Two radiologists, in consensus, were blinded to both patient demographics and date of scan. The scans were reported randomly (reducing any bias assuming an increase in size with time). For visible lesions we measured volume on the sequence best showing the tumour, and attributed a score (PIRADS 1).

Results: 43/86 patients did not have a visible lesion on the initial MRI (< 3, ESUR criteria). Of these patients, 5/43 had developed a lesion scoring > 2/5 at a median of 3.6 years of follow-up. 40/86 patients had a lesion scoring 3/5 (or more) on more than 2 scans. There was a significant ($p < 0.01$, Wilcoxon signed rank) increase in volume over 3.6 years: by a median of 5.5% for Gleason 3+3 and 16% for 3+4 (p=0.09, Mann-Whitney U test). In 38/40 patients having 2 scans separated by < 18 months, 9/38 showed a decrease in lesion size between 5 and 50 %.
Conclusion: The lack of a visible lesion on MRI was a highly reproducible. There is considerable variation in the measurement of small visible lesions, but it is possible to measure significant growth over a period of 3.6 years.

B-0949 11:35

Accuracy of multiparametric MRI in detection and extension of high-grade prostate cancer using PIRADS version 2 criteria
N. Demany, V. Tissot, J. Ognard, A. Valeri, D. Ben Salem; *Brest/FR (nicolas.demany@chu-brest.fr)*

Purpose: To retrospectively assess the revised version 2 of ESUR PI-RADS criteria for detection and extraprostatic extension of high-grade prostate cancer (≥Gleason 4 + 3 and/or lesions ≥ 0.5 cm3).
Methods and Materials: 54 consecutive patients underwent 3-T multiparametric MR imaging before prostatectomy. Two readers (experienced and junior) determined prostatic lesion score for each patient using the PIRADS version 2 criteria and determined if there was an extra prostatic extension in each case.
Results: Pathologist found 64 high-grade prostate cancers. Areas under the receiver operating characteristic curves of experienced and junior readers were respectively 0.92 and 0.83 for the detection with sensitivity of 93.8% and 89.6%. The specificity were respectively 85.3% and 86.5% for the extra prostatic extension and 98% for the seminal vesicles invasion. The area under the curve for the PIRADS 1 criteria was 0.79 with a sensitivity of 85.6%. The inter-observer agreement was 0.56 for the detection score and 0.62 for the local expansion.
Conclusion: The multiparametric MRI have a very good sensitivity for significant prostate cancer detection using the new PIRADS criteria and good specificity in his local extension.

B-0950 11:43

Low PI-RADS scores exclude extracapsular extension of prostate cancer: a histology validated study including 301 operated patients
S. Alessi, P. Pricolo, P. Summers, E. Tagliabue, G. Petralia; *Milan/IT*

Purpose: To investigate the use of PI-RADS scores for the prediction of extracapsular extension (ECE) of prostate cancer (PCa).
Methods and Materials: 301 PCa patients, classified as low- or intermediate/high-risk based on clinical parameters (PSA, Gleason score, digital rectal examination), underwent pre-surgical multiparametric magnetic resonance imaging (mpMRI). An mpMRI-based PI-RADS score was assigned for each lesion. Histopathologic analysis of the whole-mount radical prostatectomy specimen was the reference standard. Univariate analysis was performed to evaluate the association of PI-RADS score of the intraprostatic dominant lesion (IDL) with ECE. Receiver Operating Characteristic (ROC) curves for prediction of ECE based on PI-RADS score of the intraprostatic dominant lesion (IDL) were calculated, and the Pi-RADS score cut-off which maximised the area under the curve (AUC) identified.
Results: ECE was found in 119 out of the 301 (39.5%) operated patients. With an AUC of 0.60 on univariate ROC analysis, a PI-RADS score cut-off ≥ 4 was identified. Using this PI-RADS score cut-off value, the overall performance for ruling-out (SE, NPV, LR-) and ruling-in (SP, PPV, LR+) of ECE was 99%/97%/0.05 and 21%/45%/1.25 respectively. In the low risk group the corresponding values were 96%/97%/0.13 and 27%/25%/1.31 and in the intermediate/high-risk group 100%/100%/0 and 12%/59%/1.14.
Conclusion: In our cohort, PI-RADS scores of 1, 2 or 3 confidently ruled out the presence of ECE irrespective of clinical risk group; this may have an impact in patient management.

B-0951 11:51

Validation of 3 T MRI including diffusion-weighted imaging for nodal staging of newly diagnosed intermediate- and high-risk prostate cancer
C.M. von Below; *Uppsala/SE (catrin.vonbelow@radiol.uu.se)*

Purpose: The aim of this study was to prospectively validate 3 T MRI including DWI (MRI DWI) for preoperative lymph node (LN) staging in a clinical setting, in intermediate and high risk prostate cancer (PCa) patients using laparoscopic extended lymph node dissection (ePLND) as standard of reference.
Methods and Materials: Between Aug 2011 and May 2013, 40 newly diagnosed intermediate and high risk Pca patients underwent preoperative LN staging with 3 T MRI DWI using histopathology of ePLND as the standard of reference. The sensitivity, specificity and accuracy of MRI DWI was calculated. A subgroup analysis of proven LN positive patients was made to investigate differences in PSA, Gleason score, number and size of LN metastases, estimated risk of LN involvement and if curative treatment was indicated, between the true positive and the false negative group.
Results: A total of 728 LNs was harvested from six anatomical regions per patient (external, obturator, internal) with a mean number of 18 LNs per patient (range 11-40). Twenty patients had histologically proven LN positive disease. Specificity was 90% sensitivity 55% and accuracy 72.5%. The true positive patients had significantly more involved LNs (mean 6.9 vs 2.7, p=0.017), with larger diameter (mean12.3 vs 5.2 mm, p=0.048) and fewer were treated with curative intent 6 vs 9 (p=0.030), compared with the false negative group.
Conclusion: MRI DWI LN staging has a low sensitivity but high specificity. The true positive patients have a considerably higher burden of LN metastases compared to false negative patients.

10:30 - 12:00 **Room E1**

Musculoskeletal

SS 1410

Applications in CT and MR: something old, something new

Moderators:
A. Cotten; Lille/FR
N.N.

B-0952 10:30

Can we predict who can benefit from axial-loaded MRI?
T. Lorenc, P. Palczewski, D. Wojcik, M. Golebiowski; *Warsaw/PL (tomasz.lorenc@wum.edu.pl)*

Purpose: To determine the group of low back pain (LBP) patients in whom axial-loaded MRI of the lumbar spine is clinically justified.
Methods and Materials: The study group consisted of 90 patients (46 male, 44 female, aged 20-90 years) with LBP. Lumbar spine MRI without and with axial loading was performed in supine position on 1.5 T system (Ingenia, Phillips) with the use of commercially available device (DynaWell). A high-resolution 3D T2-weighted sequence was used for the acquisition of images. Clinical characteristics of patients were established using seven questionnaire surveys and demographic data. Thirteen radiological parameters were taken into consideration when assessing the influence of axial loading on the images. Qualitative assessment criteria for clinical significance of changes observed after axial loading were developed on the basis of a literature review. After determining which patients showed statistically significant changes, logit regression analysis with 15 potential predictors (clinical, demographic, and radiological) was performed.
Results: 48.9% of patients showed additional changes on axial-loaded MRI. Multivariate analysis demonstrated a statistically significant effect on the occurrence of changes only for obesity (p0.1). After axial loading, 13 potentially clinically significant changes appeared in 9 patients, the most common being the absolute spinal stenosis not visible without axial loading (n=8).
Conclusion: Axial loading may increase the diagnostic value of lumbar spine MRI in patients with obesity and/or suspected spinal stenosis.

B-0953 10:38

Effects of contrast enhancement on phantom-less bone mineral density measurements in computed tomography
N. Abdullayev[1], V.-F. Neuhaus[1], G. Bratke[1], S. Voss[1], A. Wulff[2], D. Maintz[1], J. Borggrefe[1]; [1]*Cologne/DE*, [2]*Quakenbrück/DE (Jan.Borggrefe@uk-koeln.de)*

Purpose: To test the potential of phantomless volumetric bone mineral density measurements (PLvBMD) for the determination of vBMD in routine contrast-enhanced (CE) staging computed tomography (CT).
Methods and Materials: 56 CT datasets of the abdomen from patients, age 20-80 years, that received a tri-phasic native, arterial and portal venous CT at the University Clinic Cologne between 2010 and 2014. Four radiologists used the Intellispace-Density-Software (Philips®, Amsterdam, The Netherlands) to determine the mean volumetric bone mineral density (vBMD) from three lumbar vertebrae in each contrast phase of the patients CT data. Statistical analysis tested variance of vBMD in dependence of contrast enhancement using Bland-Altman analysis, Student's T test as well as the inter- and intraobserver coefficients of variation.
Results: In comparison to native CT scans, the CE let to a significant increase of the mean measured PLvBMD from 97.8 mg/cc (native) to 106.3 mg/cc (arterial equal to portal venous phase) (8.6%) with comparable standard deviation ratios between 37.7% and 38.3%. The interobserver coefficient of variation was comparable between the native and contrast-enhanced vBMD measurements (native: mean 0.07, SEM 0.05, 95% CI [-0.01-0.15], portal venous: mean 0.08, SEM 0.08, 95% CI [-0.06-0.22]). The vBMD intraobserver

coefficients of variation in dependence of CE ranged between a mean of 0.08, SEM 0.05, 95% CI [-0.00-0.17] and 0.11, SEM 0.10, 95% CI [-0.06-0.28].
Conclusion: Compared to quantitative CT measurements reported in the literature, the PLvBMD increase of 8.6% associated to contrast enhancement was relatively small and did not lead to significant changes of the coefficients of variation. Thus, the method can improve osteoporosis screening by allowing to detect reduced bone mass of the vertebra in each CECT scan conducted in clinical routine.

B-0954 10:46

Metal artefact reduction capacity of virtual monochromatic dual-layer detector spectral CT-imaging in unilateral and bilateral total hip prostheses

R.H.H. Wellenberg[1], M.F. Boomsma[1], J.A.C. van Osch[1], A. Vlassenbroek[2], J. Milles[3], M.A. Edens[1], G.J. Streekstra[4], M. Maas[4], C.H. Slump[5]; [1]*Zwolle/NL*, [2]*Brussels/BE*, [3]*Eindhoven/NL*, [4]*Amsterdam/NL*, [5]*Enschede/NL (r.h.h.wellenberg@isala.nl)*

Purpose: To quantify metal artefact reduction in the CT imaging of unilateral and bilateral hip prostheses using virtual monochromatic Spectral CT-imaging.
Methods and Materials: A water-filled phantom made of PMMA, using six different hip prostheses configurations surrounded by 18 hydroxyapatite/calcium carbonate pellets representing bone, was used. Scans were acquired on a 128-slice Philips IQon Spectral CT-scanner at 120 and 140-kVp. Images were reconstructed with iterative reconstruction and analysed at monochromatic energies ranging from 40-200 keV. CT numbers in Hounsfield Units (HU), noise [HU], signal-to-noise-ratios (SNRs) and contrast-to-noise-ratios (CNRs) were analysed within fixed regions-of-interests.
Results: CT numbers of the pellets in 70 and 74 keV virtual monochromatic images were similar to 120 and 140-kVp polychromatic results. A separation into categories of metal artefacts was made (no, mild/moderate and severe) based on HU deviations. At high keVs overall image contrast was reduced. For mild/moderate artefacts, highest CNRs were attained with virtual monochromatic 130 keV images, acquired at 140-kVp. In 130 keV images, only mild/moderate metal artefacts were significantly reduced where deviations in CT numbers, noise, SNRs and CNRs compared to unaffected pellets were decreased with respectively 64%, 57%, 62% and 63% ($p < 0.001$).
Conclusion: High keV virtual monochromatic Spectral CT imaging results in a significant reduction of streak artefacts produced by beam-hardening in mild and moderate artefacts in a total hip arthroplasty phantom. CT number accuracy, SNRs and CNRs were improved while noise values decreased which will likely improve diagnostic accuracy of soft tissue and bone pathology in patients after total hip arthroplasty.
Author Disclosures:
A. Vlassenbroek: Employee; Employee of Philips Medical Systems. **J. Milles:** Employee; Employee of Philips Medical Systems.

B-0955 10:54

Clinical evaluation of a commercially available algorithm for metal artefact reduction for CT in patients with orthopaedic implants

D. Schmitz, R. Seidel, R. Dabew, A. Buecker; *Homburg/DE (daniel.schmitz@uks.eu)*

Purpose: O-MAR (Metal Artefact Reduction for Orthopaedic Implants) is a commercially available algorithm for metal artefact reduction in CT. Information about the algorithms operating mode is limited. Our aim was to evaluate its influence on reconstructed images in a clinical evaluation to elucidate O-MARs function.
Methods and Materials: CT data sets of 50 patients (19 females; mean age 55) with orthopaedic implants were analysed retrospectively. CT attenuation values and image noise were compared between O-MAR images and images reconstructed without the metal artefact reduction algorithm (noMAR) in different image areas, including measurements within the most pronounced streak artefacts of each data set. O-MAR reconstructions were additionally evaluated with respect to the extent of metal-related artefacts and miscalculations of osseous structure.
Results: O-MAR showed a reduction of metal-related artefacts in all evaluated clinical data sets. It significantly reduced image noise (32.01 vs. 34.32; $p=0.011$) and calculated more plausible attenuation values of artefact-affected tissue as compared to noMAR (-123.33 vs. -679.71 HU; $p < 0.0001$). In comparison with the noMAR reference standard, O-MAR concurrently miscalculated periprosthetic osseous structure in 88% (44/50) of reviewed clinical data sets.
Conclusion: O-MAR reduces metal-related artefacts and image noise. The algorithm can provide more plausible attenuation values of artefact-affected tissue than standard noMAR reconstructions. Due to concurrent O-MAR-related miscalculations of periprosthetic osseous structure, an additional review of noMAR images is essential to avoid false diagnosis.

B-0956 11:02

Intra-subject comparison of 3 metal artifact reduction techniques for MDCT of arthroplasty implants

V. Kalia[1], M.K. Fuld[2], S.R. Raman[2], E.K. Fishman[2], J. Fritz[2]; [1]*Burlington, VT/US*, [2]*Baltimore, MD/US (vivekkalia@gmail.com)*

Purpose: Our primary aim is to compare the image quality of MDCT of arthroplasty using 3 different, optimized metal artefact reduction techniques.
Methods and Materials: This study was approved by our institutional review board. Anonymized data of ten patients undergoing dual-source MDCT of hip (n=4), knee (n=3) and shoulder (n=3) arthroplasty implants were used. Dual energy data were acquired with 100 and 140 kV (Sn filtered) tube energies and 300 mAs variable tube current. Axial images of 3 mm slice thickness were created using weighted filtered back projection (WFBP) and virtual high energy monoenergetic reconstruction at 190 keV (Mono+) as well as a prototype iterative metal artifact reduction algorithm (iMAR) that is based on a frequency split sinogram filling approach with linear interpolation. Three experienced readers graded the image quality, including rankings of the overall best image quality, the degree of metal artefacts, as well as visibility of bone, bone-implant interface and surrounding soft tissue structures. The studies were presented in random order in bone and soft tissue windows using a 3 x 2 side by side comparison hanging scheme. Qualitative measurements were statistically analysed using non-parametric tests.
Results: When compared to WFBP and Mono+, iMAR achieved the best image quality with lowest degree of metal artefact and best visibility of bone, bone-implant interface, and soft tissues.
Conclusion: MDCT of arthroplasty implants benefits disproportionately more from iMAR than from WFBP and Mono+ and comes with the advantage of single source data compatibility.
Author Disclosures:
M.K. Fuld: Employee; Siemens Medical Solutions USA, Inc.

B-0957 11:10

Image quality of iterative reconstructions compared with filtered back projection in cervical spine CT

M. Geijer[1], T. Malmquist[1], S. Götestrand[1], E. Gunnlaugsson[1], A. Löve[2], H. Geijer[3]; [1]*Lund/SE*, [2]*Reykjavik/IS*, [3]*Örebro/SE (mats@geijer.info)*

Purpose: Computed tomography (CT) of the cervical spine may suffer from reduced image quality in the lower part. Iterative reconstructions (IR) may be used to reduce dose or reduce image noise. The purpose was to compare subjective and objective image quality of IR and filtered back-projection (FBP) in cervical spine CT.
Methods and Materials: Image quality on FBP and IR with two strength levels was evaluated on 33 patients examined on a 64-channel CT. Image quality of bone and soft tissue structures at C4-C5 and C7-Th1 and noise were evaluated by four radiologists on a five-point scale. Signal-to-noise and contrast-to-noise ratios were calculated. After Bonferroni correction, $P < 0.004$ was considered statistically significant.
Results: No significantly improved subjective image quality was found for any criterion for IR strength level 1 compared with FBP. For strength level 6, subjective image quality for bone and soft tissue at the C7 level was scored better compared with FBP ($P < 0.004$). Overall subjective noise level was also better for IR strength level 6 compared with FBP ($P < 0.001$). For all objective image quality measurements IR strength level 6 was significantly better than level 1, which in turn was significantly better than FBP.
Conclusion: Improved subjective image quality for soft tissue in the cervical spine and for bone in the lower part of the cervical spine may be accomplished with IR at higher strength levels.

B-0958 11:18

The role of contrast enhanced computed tomography in the diagnosis of necrotising fasciitis and comparison with the laboratory risk indicator for necrotising fasciitis (LRINEC)

F. Carbonetti, A. Cremona, V. Carusi, M. Guidi, M. Di Girolamo, E. Iannicelli, G. Francione, V. David; *Rome/IT (francescocarbonetti799@hotmail.com)*

Purpose: to evaluate the diagnostic efficacy of contrast enhanced computed tomography (CECT) in emergency departments for diagnosis of necrotizing fasciitis (NF) and for differential diagnosis of other musculoskeletal infections; to correlate radiological findings with the laboratory risk indicator for necrotizing fasciitis (LRINEC).
Methods and Materials: 7 radiological parameters to be analysed on CECT scans were established, exams of 36 patients with proven diagnosis of NF (n12) and other musculoskeletal infections (n24) were retrospectively reviewed; LRINEC score was calculated. Fisher's test and Spearman's and Kendall's coefficients of rank correlations were performed.
Results: two parameters were found to be strongly associated with the diagnosis of NF: involvement of the fascia (Spearman's rho of 0.888, $p < 0.001$) and lack of fascial enhancement (Spearman's rho of

0.672,p < 0.001). LRINEC score did not show strong association with the presence of fasciitis NF (Spearman's rho of 0.490, p = 0.0024).
Conclusion: CT parameters, which are significantly associated with the diagnosis of NF, are the involvement of the fascia and its lack of enhancement;LRINEC score could be high (> 5) also in other musculoskeletal infections. Final diagnosis of necrosis among the fascia is surgical. Presence of gas is not a specific sign of necrotizing fasciitis being present in other musculoskeletal infections. CT could easily discriminate NF from other musculoskeletal infections, adds an important value to clinical and laboratory tests in diagnosis of NF in an emergency context when MRI,which is superior to CT in this discernment, could not be performed.

B-0959 11:26

Application of DTI in the evaluation of peripheral nerve tumours and in the preoperative planning of surgical intervention
L. Patriarca, S. Mariani, A. La Marra, F. Arrigoni, A. Barile, C. Masciocchi;
L'Aquila/IT (lu.patriarca@gmail.com)

Purpose: Most of symptomatic peripheral nerve tumours (PNSTs) are schwannomas and neurofibromas. DTI can provide diagnostic insights beyond conventional MRI techniques. The aim of this study was to evaluate PNSTs and to examine the usefulness of DTI in the preoperative planning.
Methods and Materials: Since January to September 2015, 15 patients with suspect PNST were investigated using 3-Tesla MRI scanner (EPI-sequence, 3 diffusion directions,b-value 1000 s/mm2). The diffusion was quantified with apparent diffusion coefficient (ADC) and fractional anisotropy maps, and the diffusion direction was color-coded. High-resolution images were also acquired using morphological sequences. Images were evaluated for image quality, ADC of the lesion, tractography, and fractional anisotropy of nerves. The informations obtained were used for preoperative planning.
Results: MRI demonstrated in all patients a ovalar mass, with a tapered morphology, uneven signal intensity, peripherical contrast enhancement. DTI and tractography reconstruction demonstrated close connection between tumour and nerve fibers with 95.8% sensitivity, 66.8% specificity, 89% positive predictive value. In all patients there was good correlation between nerve fiber location (on DTI) and its anatomical location seen intraoperatively.
Conclusion: PNSTs can usually be resected while minimising motor and sensory deficits if approached with the proper techniques. Planning the extent of resection is highly dependent on the intraoperative findings because preoperative MRI evaluation usually can be insufficient. Our study demonstrate that MR DTI techniques allow the visualisation of axons in peripheral nerves. Preoperative DTI techniques are useful in helping the surgeon to plan the safest surgical approach to minimise postoperative deficit.

B-0960 11:34

Role of diffusion tensor imaging and tractography of median nerve as a quantitative method in diagnosing carpal tunnel syndrome (CTS)
M.M.H. Abd Ellah, C. Kremser, F. Cartez-Zumelzu, E. Gizewski, A. Klauser;
Innsbruck/AT (dr_m_hamdy2006@hotmail.com)

Purpose: To evaluate the feasibility of quantitative analysis of diffusion tensor imaging (DTI) and tractography in diagnosing carpal tunnel syndrome using 3 T scanner.
Methods and Materials: Twenty-one patients (8 males and 13 females) and 14 healthy volunteers (7 males and 7 females) [mean age 60.3±14.12 and 30.5±10.23 years respectively] were examined by a 3 T MR scanner (Skyra, Erlangen, Germany). The examination protocol included diffusion tensor imaging (DTI) in addition to routine sequences (axial T1 VIBE and T2 TIRM) for anatomical correlation. All patients were clinically diagnosed and confirmed by nerve conduction studies. Mean cross sectional area of median nerve was calculated from T2 TIRM. Using DTI mean apparent diffusion coefficient (ADC) and fractional anisotropy (FA) were evaluated. Results were compared between patients and healthy volunteers.
Results: Subjects were classified into volunteer and patient groups. Median nerve was successfully visualized for both groups on DTI and T2 TIRM. Mean CSA was (12.99 versus 20.2 mm2), mean ADC was (1.425x10-3 versus 1.541x10-3) and mean FA was (0.689 versus 0.523) for volunteers and patients respectively with significant difference for all parameters (P < 0.05). Using FA threshold of 0.649 pathologic median nerves could be identified with 95% sensitivity and 93% specificity.
Conclusion: Quantitative analysis using ADC and FA proved feasible to diagnose CTS with significant difference between patients and healthy volunteers; however FA was superior to ADC with a high significant difference encountered.

B-0961 11:42

Whole-body MRI: can it be used as a screening tool in multiple hereditary exostoses (MHE) and Ollier disease?
R. Giggens, K. Partington; *Oxford/UK (roxannegiggens@gmail.com)*

Purpose: To evaluate the role of whole-body MRI as a screening tool in asymptomatic patients with MHE and Ollier disease.
Methods and Materials: We retrospectively reviewed eleven whole-body MRI examinations performed in asymptomatic patients with MHE or Ollier disease, between February 2013 and May 2015. Coronal T1-weighted and STIR sequences were obtained on a 3-tesla unit using a Q-body coil. The MRI examinations were reviewed for lesion number, location, and features of de-differentiation, and compared with previous radiological tests.
Results: Nine scans were performed as a baseline study in patients who had not previously had whole-body imaging. Previously undetected lesions were visualised in 7/9 (77.8%) of these. Two scans were performed for surveillance in patients with previous whole-body imaging for comparison. Whole-body MRI accurately detected all of the previously demonstrated lesions. In one case, whole-body MRI screening directed further focal imaging of an osteochondroma, with features of concern for de-differentiation.
Conclusion: These initial results show that whole-body MRI can accurately detect multifocal bone disease, including clinically occult lesions, in MHE and Ollier disease. We have shown that whole-body MRI is a useful tool for providing a baseline of disease distribution and for screening in asymptomatic patients, where detection of potential complications can guide further focal imaging and management. The major advantage of utilising whole-body MRI in this patient group, who are likely to require long-term screening, is that it does not involve exposure to ionising radiation.

B-0962 11:50

Low-dose full-spine CT with iterative model reconstruction (IMR) algorithm in children with scoliosis
A.-N. Hu[1], Y. Jiang[2], B. Zhu[1]; [1]*Nanjing/CN*, [2]*Shanghai/CN*
(Lynn.Jiang@philips.com)

Purpose: To investigate the image quality of low-dose full-spine CT with iterative model reconstruction (IMR) algorithm in children with scoliosis compared to routine-dose CT scans.
Methods and Materials: 40 children (28 male, age range 11-15) with scoliosis were randomly assigned to 2 groups (20 for each), and underwent full-spine CT examination on a 256-slice scanner. The scan range was from skull base to the end of coccyx. The tube voltage for routine-dose (RD) group was 120 kVp, whilst for low-dose (LD) group was 100 kVp. Automatic tube modulation (AC^{TM}, DoseRight, Philips Healthcare) was used for both groups with a reference tube current product of 83 mAs for RD group and of 50 mAs for LD group. Images from RD group were reconstructed with filtered back projection (FBP) algorithm, whilst images from LD group were reconstructed with IMR algorithm. Image noise and SNR were measured. Subjective image quality was assessed by two radiologists independently according to the feature of noise, artefacts and overall image quality.
Results: CTDIvol was reduced 67.8% in LD-group compared to RD-group (1.85 mGy±0.23 5.75 mGy±0.83, p=0.00). Lower image noise and higher SNR were found in LD group compared to RD group. No difference in subjective image quality was found between the two groups.
Conclusion: Using of IMR, low-dose full-spine CT allows even better image quality when compared to routine-dose scans.
Author Disclosures:
Y. Jiang: Employee; Philips.

10:30 - 12:00 **Room E2**

Neuro

SS 1411a
Cerebrovascular disease (4)

Moderators:
D. Bos; Rotterdam/NL
C. Calli; Izmir/TR

B-0963 10:30

Interpretation and clinical use of amide proton transfer imaging signal MTRasym (3.5 ppm) in acute ischemic stroke
X. Luo[1], M. Chen[1], J. Zhou[2]; [1]*Beijing/CN*, [2]*Baltimore, MD/US*
(archaeopteryxdin@163.com)

Purpose: To apply amide proton transfer magnetic resonance imaging technique to acute ischemic stroke, and to discuss clinical values of the APT-MRI main parameter - MTRasym (3.5 ppm).

Methods and Materials: 18 patients (F=4, average age=72 years, symptom onset ≤24 hours,3 patients ≤ 6 hours) were included in this study. All patients underwent MR scanning on the brain at 3.0 Tesla. Besides the conventional scans for stroke, the APT sequence was performed. APT weighted images were calculated using magnetization transfer ratio asymmetry at 3.5 ppm with respect to water. MRI Signals in APTW, DWI and FLAIR were visually evaluated. Shapiro-Wilk tests were performed to find out the distribution of MTRasym (3.5 ppm). Compare the mean MTRasym (3.5 ppm) of infarction regions with that of contralateral NAWMs.
Results: High signal intensity was observed in DWI and FLAIR in all 18 patients. However, signal intensity was somewhat different in APTW. 13 patients were found decreased APT effect, and 5 were with equal APT effect. MTRasym (3.5 ppm)s were proven, with Shapiro-Wilk test, to distribute normally within the whole sample (W=0.964,p=0.288), infarction regions (W=0.962,p=0.645), and NAWMs (W=0.929,p=0.187). However, its normality was not satisfactory due to greater deviations (absolute value> 0.06) of some cases in detrended normal P-P plots. Paired-t test analysis shows that MTRasym (3.5 ppm) in infarction regions (-0.035%±1.02%) was significantly lower than that in NAWMs (0.386%±0.79%) (t=-2.273, p=0.036). However, there was no significant difference between infarction regions and NAWMs when two sample t-test was performed (t=-1.386,p=0.175).
Conclusion: MTRasym (3.5 ppm) can be used to evaluate acute ischemic stroke with a broad future scope in clinical work.

B-0964 10:38

CT perfusion CBV and blood-brain barrier permeability measured in infarct core and ischaemic penumbra of acute ischemic stroke patients with haemorrhagic transformation

A. Clarizia, E. Raimondi, G. Di Cecco, E. Groppo, A. Bernardoni, A. Saletti, M. Giganti, E. Fainardi; *Ferrara/IT (alessioclarizia@hotmail.it)*

Purpose: To verify the potential association between admission CT perfusion (CTP) cerebral blood volume (CBV) values and blood-brain barrier permeability abnormalities, as measured by volume transfer coefficient (K^{trans}) values, and HT in infarct core and ischemic penumbra of acute ischaemic stroke (AIS) patients.
Methods and Materials: We retrospectively investigated 68 patients with anterior circulation acute ischaemic stroke (25 HT and 43 non-HT) who were imaged at admission within 8 hours from stroke symptom with CTP. CBV and K^{trans} values were measured in infarct core and ischemic penumbra volumes identified by an automated software procedure based on threshold-based volumetric analysis after tissue segmentation of grey matter/white matter using the currently accepted cut-off values (relative CBF< 30% for core and absolute Tmax > 6s for penumbra).
Results: Infarct core, ischemic penumbra and total hypoperfusion (core+penumbra) volumes were higher in HT than in non-HT AIS patients ($p < 0.001$, $p < 0.01$ and $p < 0.0001$, respectively). No differences were found between HT and non-HT AIS patients for CBV and K^{trans} levels in infarct core, ischemic penumbra and total hypoperfusion regions.
Conclusion: Our findings suggest that CBV and K^{trans} values do not differ between HT and no-HT AIS patients indicating that low CBV and blood-brain barrier permeability levels detected at onset are not good predictors of HT. Conversely, HT seems to be related to the extent of ischaemia. In particular, the occurrence of HT results to be dependent on total hypoperfusion size.

B-0965 10:46

Predictive value of small vessel occlusions detected by CT perfusion-based wavelet-transformed angiography in patients with acute ischemic stroke

W.G. Kunz, W.H. Sommer, B. Ertl-Wagner, O. Dietrich, L. Havla, M.F. Reiser, K.M. Thierfelder; *Munich/DE (wolfgang.kunz@med.lmu.de)*

Purpose: To evaluate the impact of vessel occlusions detected by a CT perfusion-based wavelet-transformed angiography (waveCTA) on morphologic outcome in stroke patients with unremarkable single-phase CTA (spCTA).
Methods and Materials: Patients out of a cohort of 791 consecutive patients who underwent multiparametric CT including whole-brain CT perfusion were included. Inclusion criteria were: (1) significant cerebral blood flow (CBF) deficit, (2) no evidence of vessel occlusion on spCTA, and (3) acute ischemic non-watershed infarction as confirmed by follow-up MRI. Initial and follow-up imaging datasets were independently analysed by two readers with respect to early infarction signs, CBF deficit volume, CBF-CBV mismatch, follow-up MRI infarction volume, and presence of waveCTA occlusion. The morphologic outcome was defined as follow-up MRI infarction volume divided by CBF deficit volume.
Results: Fifty-nine patients fulfilled the inclusion criteria. In 31 (52.5%) patients with unremarkable spCTA, an occlusion could be identified by waveCTA (vascular territories: MCA 27, ACA 2, PCA 2). Detection of waveCTA occlusions correlated with higher CBF deficit volume (r=0.42; p=0.001), higher MRI infarction volume (r=0.29; p=0.02) and shorter time from symptom onset (r=-0.31; p=0.03). A linear regression analysis of patients treated with IV-thrombolysis (n=31) demonstrated that the presence of a waveCTA occlusion was an independent predictor of a favorable morphologic outcome (beta=-0.482; p=0.01), while it failed to predict morphologic outcome in patients receiving standard care (beta=0.01; p> 0.05).
Conclusion: The presence of a small vessel occlusion as detected by waveCTA proved to be an independent predictor of a favorable morphologic outcome in stroke patients receiving IV-thrombolysis.

B-0966 10:54

Cerebral blood flow measured by 3D arterial spin labelling MRI in MELAS patients with m.3243 A>G mutation: a preliminary study

Y. Li, J. Lin, H. Li, Y. Bao; *Shanghai/CN (liyuxin76@126.com)*

Purpose: Cerebrovascular haemodynamics in MELAS are complicated and can reflect different states of the disease. The purpose of this study is to evaluate regional cerebral blood flow (CBF) of acute lesions, chronic lesions and normal appearing gray matter (NAGM) in MELAS.
Methods and Materials: Fourteen patients with m.3243 A>G mutation (ten acute patients, two of whom experienced recurrent attacks, four patients in recovery) underwent 3D ASL and conventional MRI scans. Two expert radiologists classified the lesions into four groups (acute and chronic lesions, NAGM with hyperperfusion and NAGM with hypoperfusion) on conventional MRI and CBF maps. Regions of interest were selected in each lesion and in bilateral caudate nucleus (CN), which was used a reference. CBF was calculated and compared between hyperperfusion groups and hypoperfusion groups respectively.
Results: Twenty-four acute lesions showing total hyperperfusion (165.34±42.31 ml/100 ml/min) and twenty-one chronic lesions showing hypoperfusion (29.43±10.84 ml/100 ml/min) were found. Six NAGM lesions with abnormal hyperperfusion (130.59±26.75 ml/100 ml/min) were detected in four recovery state patients. Sixteen NAGM lesions with hypoperfusion (49.32 ±17.09 ml/100 ml/min) were identified in six acute patients and three recovery patients. The %CBF (mean CBF in the lesion/ mean CBF in CN) of acute lesions and NAGM with hyperfusion showed no significant difference (246.82%, 205.53%, p=0.176). The %CBF of the chronic lesions and NAGM with hypoperfusion showed a remarkable significant difference (83.37%, 45.26%, $p < 0.001$).
Conclusion: 3D ASL can detect CBF features of the whole brain in various states of MELAS, and is a potentially useful biomarker in diagnosis and disease monitoring.

B-0967 11:02

Advanced virtual monoenergetic reconstruction of unenhanced head CT for detection of intracranial hemorrhage: optimisation of kiloelectron volt settings to improve image contrast

J.-E. Scholtz, M.H. Albrecht, S. Martin, S. Mahmoudi, C. Frellesen, R.W. Bauer, T.J. Vogl, J.L. Wichmann; *Frankfurt a. Main/DE (janerikscholtz@gmail.com)*

Purpose: To compare quantitative image quality parameters in unenhanced dual-energy CT (DECT) for the detection of intracranial hemorrhage (ICH) using an advanced image-based reconstruction algorithm (Mono+) for virtual monoenergetic imaging and conventional polychromatic DECT.
Methods and Materials: 123 patients underwent unenhanced head DECT (80-kVp/Sn150-kVp) due to suspected ICH. Conventional polychromatic image series were reconstructed as linear-blended (F_0.5, 50% low-kV spectrum). Additionally, image series using Mono+ at energy levels from 40-keV to 190-keV in 5-keV increments were calculated. Gray matter (GM) signal-to-noise ratio (SNR), white matter (WM) SNR, GM-WM contrast-to-noise ratio (CNR), ICH-GM CNR, and posterior fossa artifact index (PFAI) were calculated. Optimal mean values for each parameter were compared with those from conventional linear blended image series.
Results: GM SNR (15.52±2.54 vs. 8.30±0.97) and WM SNR (18.53±3.48 vs. 11.02±1.15) were significantly higher at 110-keV compared to F_0.5 (all $p < 0.001$). GM-WM CNR (40 keV, 2.28±0.61 vs. 1.77±0.44, $p < 0.001$) and ICH-GM CNR (140 keV, 7.66±3.74, $p < 0.001$) were significantly higher using Mono+ compared to linear-blended F_0.5. GM-WM CNR at 40-keV and ICH-GM CNR at 140-keV showed no significant differences compared to values at 110-keV (p> 0.05). Minimal PFAI was observed at 115-keV (2.14±0.32 vs. 4.44±0.41 [F_0.5], $p < 0.001$) with no significant difference compared to 110-keV (p> 0.05).
Conclusion: Advanced virtual monoenergetic reconstruction of unenhanced dual-energy head CT for detection of ICH at an optimal energy level of 110-keV maximises image quality compared to conventional polychromatic DECT.
Author Disclosures:
R.W. Bauer: Speaker; Siemens Healthcare, Computed Tomography Division.

B-0968 11:10

Diagnostic accuracy of whole-brain CT perfusion in MRI-confirmed infratentorial infarctions

K.M. Thierfelder, C. Bollwein, B. Ertl-Wagner, L. von Baumgarten, H. Janssen, M.F. Reiser, W.H. Sommer; *Munich/DE*
(kolja.thierfelder@med.uni-muenchen.de)

Purpose: To determine the diagnostic accuracy of whole-brain CT perfusion (WB-CTP) for infratentorial infarctions and to identify factors influencing the detection rate.
Methods and Materials: Out of a cohort of 1361 consecutive patients who underwent WB-CTP due to suspected stroke, we selected all patients with an MRI-confirmed infratentorial ischaemic infarction. The study was designed as a case-control study with a ratio of cases to controls without infratentorial infarction of 1:3. Two readers independently evaluated 4 different perfusion maps - Cerebral Blood Flow (CBF), Cerebral Blood Volume (CBV), Mean Transit Time (MTT), and Time to Drain (TTD) for the presence and location of an infratentorial perfusion deficit.
Results: Seventy subjects met the inclusion criteria. The control group consisted of 210 patients. Overall, WB-CTP reached a sensitivity of 45.4% and a specificity of 88.7%. Infarctions of the cerebellum were detected in 20/38 (53%), while infarctions of the brain stem were detected in only 9/32 (28%) of the cases, $p < 0.05$. Among the different perfusion maps, TTD was the most sensitive (47.2%), followed by MTT (41.0%), CBF (39.2), and CBV (9.1%). With respect to specificity, CBV (98.1%) reached the highest value, followed by CBF (93.8%), TTD (92.9%), and MTT (89.2%). Mean final infarction volume (15.2 ml) and diameter (27.1 mm) of infarctions that were detected in WB-CTP were significantly larger than volume (5.4 ml) and diameter (17.8 mm) of infarctions that were not detected (each with $p < 0.001$).
Conclusion: Depending on infarction size and localization, WB-CTP is able to detect 45% of infratentorial infarctions with a specificity of 89%.

B-0969 11:18

Perivascular spaces in the hippocampus are associated with markers of vascular disease only, and not of Alzheimer´s disease

D. Van Westen, C. Panizo, L. Minthon, S. Palmqvist, O. Hansson; *Lund/SE*
(clara_panizo@hotmail.com)

Purpose: Enlarged perivascular spaces (PVS) have been recognized as marker of small vessel disease (SVD). SVD and Alzheimer´s disease (AD) share common risk factors, however the relationship between these disease entities is as yet not fully understood. Here, we investigate the relationship between PVS in the hippocampus, an important area with regard to dementia, amyloid deposition estimated using CSF biomarkers, and cognitive tests.
Methods and Materials: High resolution T1-W images and 2D FLAIR images acquired at 3 T in 166 MCI patients (age 71.4 years, 41.6 % female) from the Swedish BioFINDER study (www.biofinder.se) were used to assess the presence of PVS with diameter over 1 mm in the hippocampus. Cerebrospinal fluid (CSF) levels of Aβ38, Aβ40 and Aβ42 were determined using ELISA. Cognitive tests included the Minimal Mental State Examination (MMSE) and ADAS-cog item 3 of delayed memory recall.
Results: PVS (1 or more) in the left or right hippocampus were present in 70.5% of cases and the mean number of PVS was 3.2. PVS correlated negatively with CSF Aβ38 (p=0.01) and CSF Aβ40 (p=0.02), but not with CSF Aβ42 (p=0.95). Furthermore, PVS were not associated with MMSE or ADAS-cog item 3. All correlations were corrected for age and gender.
Conclusion: Our results suggest that PVS in the hippocampus are associated with CSF Aβ38 and Aβ40, which might reflect vascular wall pathology/amyloidosis, but not with Aβ42, that reflects parenchymal accumulation of Aβ fibrils in AD. This is confirmed by the absence of correlation with cognitive tests.

B-0970 11:26

Imaging the remodeling of ipsilateral internal capsule following focal cerebral ischemia in rats by DKI

X. Zhang, Y. Yang, L. Yin, X. Hao, J. Tian; *Shanghai/CN*
(shiqingguyun@126.com)

Purpose: Unilateral middle cerebral artery occlusion (MCAO)could result in degeneration of axonal cytoskeleton in infarct area, which can induce dysfunction of body movement in rats. Restoration of function after stroke relates to neuronal remodeling, which also occur in internal capsule (IC). Nowadays many researches prove that diffusion kurtosis imaging (DKI) can provide more biomarkers. The purpose of our study is to explore the relationship between recovery of neural function and restoration of IC by using DKI.
Methods and Materials: Twelve adult Sprague-Dawley rats implemented transient MCAO were used in study. Sham-operated experiments were performed on other five rats as the control. Sensorimotor function was assessed according to behavioral tests on day 1, 3, 7, 14 and 2 months in both groups. DKI were acquired using 3 T scanner after assessing neurological score. Fractional anisotropy (FA), radial kurtosis (Kr), and mean kurtosis (MK) were measured on the IC using ROIs measurement.
Results: FA, MK and Kr displayed dynamic changes in ipsilateral IC compared with controls in stroke group. FA decreased from day 1 ($p < 0.05$), but increased from day 14 ($p < 0.05$). MK and Kr increased from day 3 ($p < 0.05$), but decreased from day 7 ($p < 0.05$), then increased from day 14 ($p < 0.05$), but still lower than the contralateral. Neurological score showed that rats revealed functional deficits after MCAO and functional recovery occurred from day 14 ($p < 0.05$).In sham-operated rats, they didn't reveal significantly changes.
Conclusion: DKI can display the structural remodeling in the ipsilateral IC following focal cerebral ischemia. After transient MCAO, the neural remodeling occurrs in a time-dependent procedure.

B-0971 11:34

Amigo: a new tool to report functional MRI of cerebrovascular reserve

E. Condamine, O. Heck, N. Boudiaf, T. Perret, J. Pietras, C. Remy, A. Krainik; *Grenoble/FR (eric.condamine@ujf-grenoble.fr)*

Purpose: Functional MRI of cerebrovascular reserve (CVR fMRI) relies on thousands of images and multiple acquisitions. Image quality check has to be conducted to avoid inappropriate interpretation. CVR fMRI generates multiple maps. Our purpose was to provide a comprehensive report to better understand and discuss individual CVR fMRI results.
Methods and Materials: We developed Amigo (Automatic Medical Image GeneratOr), a Python-written software, in order to report 1°) image quality check for each acquisition (image visualisation, movement analysis); 2°) stimulus quality check (physiological monitoring, signal timecourse); 3°) regions-of-interest analysis (comparison with population); 4°) parametric maps display. We used Amigo to report CVR fMRI. Each examination included 3DT1 anatomy, basal perfusion using dynamic susceptibility contrast, functional challenge of perfusion using BOLD contrast during hypercapnic stimuli.
Results: To better check for image quality, Amigo displays native images and identifies images outliers. To better check for excessive movements, Amigo displays movements timecourse and may warn for abnormal motion. To better compare multiparametric maps, Amigo displays all maps in a standardized manner with colour scales. To better estimate regional CVR impairment, Amigo provides a comprehensive representation of individual ROI analyses compared to a control population. When fMRI and perfusion data have been previously processed, Amigo produced a report immediately. Thus, Amigo can be used retrospectively. Amigo can also fully process the data, by running SPM/Matlab batches to conduct spatial preprocessing, perfusion and BOLD fMRI postprocessing.
Conclusion: Amigo provides a comprehensive report to better interpret fMRI of of cerebrovascular reserve in clinical practice and research.

B-0972 11:42

Patient selection using the e-ASPECTS software for automated detection of acute ischaemic stroke on a mobile stroke unit

I. Grunwald[1], A. Kühn[2], K. Fassbender[3]; [1]*Chelmsford/UK*, [2] *Worcester, MA/US*, [3]*Homburg/DE*

Purpose: Resources for endovascular treatment are still scarce and hospitals swiftly need to establish diagnostic and selection algorithms as well as transportation pathways for eligible patients. In this setting, we evaluated integration of e-ASPECTS onto a Mobile Stroke Unit.
Methods and Materials: We evaluated if the e-ASPECTS software, a CE-marked, standardised and fully automated ASPECTS scoring tool can be integrated onto a Mobile Stroke Unit (MSU) to assist pre-hospital diagnosis and triage of patients in acute ischaemic stroke. The MSU is an ambulance equipped with a CT scanner and point of care lab that has previously been shown effective in patient triage and reducing time to treatment.
Results: Both server- and cloud-based integration successfully functioned in the pre-hospital setting. In addition, transmission of ASPECTS imaging results to the hospital-based stroke team mobile devices was successfully integrated.
Conclusion: Integration of e-ASPECTS onto a Mobile stroke unit provides a solution for those centres, where expert assessment of pre-hospital (MSU) CT imaging is not available 24/7.

B-0973 11:50

Cerebral whole brain CT-Perfusion with single rotation angiography (srCTA) of the neck - evaluation of a one-stop-shopping CT stroke protocol

S. Wong, L. De-Paoli, K. Hausegger; *Klagenfurt/AT (roentahpat@gmail.com)*

Purpose: Recently volume-CT scanners have been introduced with a 16 cm single-rotation z-axis coverage. With those scanners whole brain CT perfusion scans (CTP) can be combined with single rotation CTA (srCTA) of the cervical arteries (joggle-scan). The purpose of this study was to evaluate the feasibility,

scan coverage and image quality of the cervical arteries acquired with srCTA during CTP in ischemic stroke patients.
Methods and Materials: CTP with srCTA was performed in 70 patients with a single contrast medium injection of 60 cc. Hounsfield Units (HU) of cervical arteries and veins were objectively measured, and carotid bifurcations were subjectively reviewed [grading from poor (=0) to good (=2)]. Incidence of artefacts and adequacy of supraaortic vessels coverage were recorded.
Results: srCTA neck included all supraaortic vessel origins from the aortic arch in 28 patients (40%). 579 arterial and 564 venous segments were available for analysis. 98.1% (568/579) of arterial segments were of adequate attenuation (> 150 HU). Detection of arteries from veins were possible in 72.1% (400/555) segments. In 23.1% (128/555) segments opacification of veins was higher than arteries, indicating delayed timing of acquisition. Average image quality scoring of the carotid bifurcations was 1.9 with good quality in 93.6% (131/140 bifurcations). Significant artefacts were from beam hardening due to metal/dental implants (21.4%), photon starvation in the shoulder region (10%) and contrast injection (15.7%).
Conclusion: srCTA of neck acquired during CTP is a feasible part of stroke protocol. Main drawbacks were inadequate coverage of supra-aortic arteries and delayed timing of the joggle.

10:30 - 12:00 **Room F2**

Abdominal Viscera

SS 1401

Advances in abdominal MRI

Moderators:
A.J. van der Molen; Leiden/NL
N.N.

B-0974 10:30

Evaluation of hypointense liver lesions during hepatobiliary phase MR imaging in normal and cirrhotic livers: is increasing flip angle reliable?
Y.-D. Xiao; *Changsha/CN (254876393@qq.com)*

Purpose: To determine whether increasing the flip angle (FA) can improve the evaluation of focal liver lesions (FLLs) with Gd-EOB-DTPA-enhanced MR in normal and cirrhotic livers.
Methods and Materials: Patients with Child A class (n=36), Child B class (n=23), Child C class (n=16) or without liver cirrhosis (n=39) were enrolled. Contrast-enhanced images were acquired at the unenhanced phase, and the hepatobiliary phase (HP) of 5 min, 10 min, 15 min, 20 min after Gd-EOB-DTPA administration. The signal to noise ratio (SNR), liver to lesion contrast (LLC) and the liver to lesion signal intensity (SI) ratio at each phase were calculated for the evaluation of image quality.
Results: Both of the LLC and the liver to lesion SI ratio with high FA protocol were always higher than those of low FA protocol. In general, in noncirrhotic group and Child A group, the LLC and the SI ratio were gradually increased with either high FA or low FA protocol. However, in Child B group and Child C group, the LLC and the SI ratio were significantly reduced at low FA protocol from the timing of 15 min to 20 min after contrast agent injection, which was different to that of high FA. Additionally, at high FA images, more small liver lesion was detected, peritumoral invasion was found, and better visualisation of bile duct was observed.
Conclusion: To those of patients with severe liver cirrhosis, increasing the FA can obviously improve the image quality, which is reliable for FLLs depiction.

B-0975 10:38

A short breath-hold high-resolution technique may be the first step to overcoming degraded hepatic arterial phase in liver MR imaging: a prospective randomised control study
C.-H. Lee, J. Kim, J. Yoo, Y. Park, C. Park; *Seoul/KR (chlee86@hanmail.net)*

Purpose: To assess whether a short breath-hold high-resolution technique can improve hepatic arterial phase image quality in gadoxetic acid-enhanced magnetic resonance imaging (MRI) compared to a conventional long breath-hold technique.
Methods and Materials: Institutional review board approval and patient consent were obtained for this prospective randomised control study. One hundred twenty-eight patients undergoing gadoxetic acid-enhanced MRI were allocated into groups A or B (long and short breath-hold techniques, respectively). Respiratory-related graphs of the precontrast and hepatic arterial phases were acquired. The breath-hold degree was graded based on the standard deviation (SD) value of respiratory waveforms. Gadoxetic acid-related dyspnea was defined as when the SD value of the hepatic arterial phase was 200 greater than that of the precontrast phase without degraded image quality in portal and transitional phases. Overall image quality, motion artifacts, liver margin sharpness, and hepatic artery clarity were evaluated. The groups were compared using Student t or Fisher exact test.
Results: The incidence of breath-holding difficulty during the hepatic arterial phase was 43.55% (27/62) and 36.84% (21/57) for group A and B, respectively. Gadoxetic acid-related dyspnea was seen in 19.35% (12/62) of group A and 7.02% (4/57) of group B. Group B showed better precontrast and hepatic arterial phase image quality than group A ($p < 0.001$). Degraded hepatic arterial phase was observed in 9.68% (6/62) and 3.51% (2/57) of group A and B, respectively.
Conclusion: A short breath-hold high-resolution MR technique showed better hepatic arterial phase image quality with less gadoxetic acid-related dyspnea than a long breath-hold technique.
Author Disclosures:
C. Lee: Grant Recipient; Bayer Grant.

B-0976 10:46

Impact of CAIPIRINHA VIBE on interobserver agreement in comparison with conventional VIBE sequences in contrast-enhanced MRI of focal liver lesions
M.H. Albrecht, J.L. Wichmann, B. Bodelle, P. Dewes, A.M. Bucher, R.W. Bauer, S. Zangos, T. Lehnert, T.J. Vogl; *Frankfurt a. Main/DE (MoritzAlbrecht@gmx.net)*

Purpose: To evaluate the impact of 'controlled aliasing in parallel imaging results in higher acceleration' (CAIPIRINHA) technique on image quality and interobserver agreement of contrast-enhanced volumetric interpolated breath-hold examination (VIBE) in comparison with standard VIBE sequences in magnetic resonance imaging (MRI) of liver lesions.
Methods and Materials: In this intra-individual comparison study, abdominal contrast-enhanced MRI examinations of 23 patients examined on a 3-T system were retrospectively included. Each patient underwent both CAIPIRNHA VIBE and conventional VIBE within 3 months showing stable disease. The sequences were reviewed by two blinded radiologists with more than 20 years (A) and 5 years of experience (B) in MRI imaging using a 5-point rating scale for liver lesions and affected segments (ranging from 1=definitely benign to 5=definitely malignant) and with regard to overall image quality and sharpness of intrahepatic vessels (ranging from 1=poor to 5=excellent). Cohens κ analysis and Wilcoxon matched pairs tests were performed.
Results: A superior interobserver agreement was observed both per-lesion and per-segment for reporting CAIPIRINHA (per-lesion $\kappa=0.18$, $p < 0.04$ and per-segment $\kappa=0.47$, $p < 0.01$) compared to conventional VIBE sequences (per-lesion $\kappa=0.16$, $p < 0.03$ and per-segment $\kappa=0.38$; $p < 0.001$). CAIPIRINHA VIBE series received better scores (image quality: A=4.8, B=3.7; sharpness of intrahepatic vessels: A=4.2, B=3.7) than standard VIBE sequences (image quality: A=4.0, B=3.0; sharpness of intrahepatic vessels A=3.5, B=3.0) for both reviewers ($p < 0.01$, respectively).
Conclusion: CAIPIRINHA VIBE series enables a superior image quality than standard VIBE sequences with consequently superior inter-observer agreement regarding dignity and allocation of focal liver lesions.
Author Disclosures:
R.W. Bauer: Speaker; Speakers' bureau of Siemens Healthcare, Computed Tomography division.

B-0977 10:54

Gadoxetic acid-enhanced MR-imaging in chronic liver disease - correlation of perfusion parameters and hepatic uptake function with histology
B. Leporq[1], J.-L. Daire[1], C. Pastor[2], C. Sempoux[3], R. Meuli[3], P. Deltenre[3], B. van Beers[1], S. Schmidt[3]; [1]*Paris/FR*, [2]*Geneva/CH*, [3]*Lausanne/CH (sabine.schmidt@chuv.ch)*

Purpose: To evaluate the feasibility of simultaneous quantification of perfusion and hepatic uptake function using dynamic Gadoxetic acid-enhanced (Gd-EOB-DTPA) MR-imaging (DCE-MRI) to assess liver fibrosis and correlation with histology.
Methods and Materials: Twenty-three patients with chronic liver disease (18 men, mean age 50.3 ± 10.1) scheduled for liver biopsy were prospectively included. DCE-MRI was performed at 3 T using 3D TWIST MR-sequences in coronal plane. After intravenous injection of Gd-EOB-DTPA (0.025 mmol//kg, 1 mL/s) 280 dynamic measurements were continuously acquired in free breathing. For each patient, mean quantitative parameters were derived from 6 different liver regions. Gd-EOB-DTPA kinetics was evaluated with a dual input two-compartment uptake model to extract both, quantitative hemodynamic and hepatic uptake function parameters. Relative enhancement at t=20 min (index T20) was also measured in order to derive a semi-quantitative index of uptake function.
Results: Between absent/non-advanced (n=10 METAVIR F0-F1), advanced fibrosis (n=8, F2-F3) and cirrhosis (n=5, F4), statistically significant differences in both, hemodynamic and hepatic uptake parameters were found ($p < 0.01$). To diagnose advanced fibrosis the hepatic uptake fraction gave the best area

under receiver operating curve (AUROC) compared to hepatic perfusion index (HPI) and index t20 (0.95 vs. 0.80 and 0.79, respectively). This was also true for cirrhosis (AUROC: 0.96 vs. 0.84 and 0.94, respectively).
Conclusion: The simultaneous quantification of liver perfusion and uptake function is feasible with free breathing Gd-EOB-DTPA DCE-MRI. To assess liver fibrosis, the uptake function parameter derived from a dynamic approach performs better than perfusion parameters and semi-quantitative uptake index derived from a static approach.
Author Disclosures:
C. Sempoux: Research/Grant Support; Bayer Healthcare, Switzerland. **R. Meuli:** Research/Grant Support; Bayer Healthcare, Switzerland. **P. Deltenre:** Research/Grant Support; Bayer Healthcare, Switzerland. **S. Schmidt:** Research/Grant Support; Bayer Healthcare, Switzerland.

B-0978 11:02

Influence of different contrast agent application protocols on transient severe motion (TSM) at gadoxetate disodium-enhanced MRI
K.I. Ringe, C. von Falck, H.-J. Raatschen, F. Wacker, J. Hinrichs; *Hannover/DE (ringe.kristina@mh-hannover.de)*

Purpose: To evaluate the incidence of transient severe motion (TSM) at gadoxetate disodium-enhanced MRI using different contrast application protocols.
Methods and Materials: 200 patients (m=129,f=71; mean age 51y) referred for MRI were included in this IRB approved study. Contrast agent application protocols (n=4) differed with regards to injection rate (1 or 2 ml/s), dose (0.1 ml/kg or fixed dose of 10 ml) and nasal oxygen application (no/yes). SNR measurements were performed in the aorta and portal vein in the arterial phase. Qualitatively, two readers separately assessed motion artifacts in each phase of the contrast dynamic (5-point-scale) and the quality of the arterial phase (4-point-scale). SNR measurements, motion score and arterial image quality were compared (Kruskal-Wallis, Dunn's multiple comparison Test). The incidence of TSM was calculated for different protocols. The rate of TSM using different application parameters was assessed using univariate analysis.
Results: SNR in the aorta and portal vein were significantly higher in protocols using the lower injection rate. There was no significant difference regarding motion artifacts comparing different protocols. The overall incidence of TSM was 11.5%, with no significant difference between protocols. At univariate analysis, injection rate, dose and oxygen application had no significant influence on rate of TSM ($p > 0.05$).
Conclusion: TSM is a known adverse effect after gadoxetate disodium injection, degrading image quality in a significant proportion of studies. The variation of contrast dose or injection rate, as well as supporting oxygen application do not seem to significantly reduce the incidence of TSM in clinical routine.

B-0979 11:10

Impact of injection protocol on arterial tumour enhancement, artifacts, and arterial blood gases in rabbit VX2 tumour model: comparison of Gd-EOB-DTPA and Gd-DTPA
T. Tsuboyama[1], J. Gregor[2], T. Kim[1], M. Hori[1], H. Onishi[1], M. Tatsumi[1], M. Sakane[1], P. Hubertus[2], N. Tomiyama[1]; [1]*Suita/JP*, [2]*Berlin/DE (t-tsuboyama@radiol.med.osaka-u.ac.jp)*

Purpose: To compare the effect of Gd-EOB-DTPA and Gd-DTPA on arterial blood gases (ABG), on artifacts, and on tumour enhancement during arterial phase imaging.
Methods and Materials: ABG analysis and MR imaging analysis were performed in 13 and 6 rabbits with VX2 liver tumour, respectively. Standard doses of Gd-EOB-DTPA (0.025 mmol/kg) and of Gd-DTPA (0.1 mmol/kg) were administered to each rabbit using a rapid injection protocol (1 ml/s; injection time 0.6-0.8s). For MR imaging on a 1.5 T clinical scanner, a slow injection protocol (0.25 ml/s; 2.4-3.2s) of Gd-EOB-DTPA was added. MRI was performed under anesthesia with a ventilation stop during image acquisition. Artifacts on the arterial phase images were assessed using a 4-point score.
Results: Gd-EOB-DTPA and Gd-DTPA did not cause any significant change in ABG. Spontaneous respiratory motion persisted in 8 of 18 examinations (as assessed by bolus tracking images). The number of artifacts was significantly higher in rabbits with spontaneous respiratory motion (p=0.03). There was no significant difference in the score of the artifacts among the three injection protocols (p=0.59). No severe artifacts appeared with any injection protocol. Gd-DTPA showed significantly higher arterial tumour enhancement than Gd-EOB-DTPA. Slow injection of Gd-EOB-DTPA shows a trend for higher tumour enhancement than rapid injection.
Conclusion: Injection of Gd-EOB-DTPA and Gd-DTPA do not affect arterial blood gases. Artifacts on arterial phase images are related to spontaneous respiratory motion but not to contrast media type or injection protocol. Although Gd-EOB-DTPA (0.025 mmol/kg) accomplishes lower arterial tumour enhancement than Gd-DTPA (0.1 mmol/kg), slow injection may improve the enhancement.

Author Disclosures:
T. Tsuboyama: Research/Grant Support; Bayer Healthcare. **J. Gregor:** Employee; Bayer Healthcare. **P. Hubertus:** Employee; Bayer Healthcare.

B-0980 11:18

Measuring liver fat content on MRI: the effect on accuracy of simplified sampling protocols
J. Sun, A.J. Procter, P. Malcolm, A. Toms; *Norwich/UK (julia.yusun@nnuh.nhs.uk)*

Purpose: Post-processing of liver MRI for fat fraction is slow if the whole liver is segmented with freehand regions of interest (ROI). Selective elliptical ROIs are quicker but may be less accurate. The aim of this study was to perform an inter-method comparison of sampling strategies for liver fat fraction measurements.
Methods and Materials: Retrospective analysis of liver MRI in 34 patients using a 3-point Dixon IDEAL sequence was performed. Two observers independently measured % fat fraction using one of two methods: freehand whole-liver ROI and elliptical-ROI centred on the right lobe of liver. Results were analysed using intraclass correlation coefficients (ICC), non-parametric statistics and Bland-Altman plots.
Results: Inter-observer reliability for all measurements was 'excellent' (ICC=0.99). The median % fat from whole-liver ROI (observer1) was 4.0% (95% CI: 3.5-4.8, IQR: 3.1-6.0) and for elliptical ROI was 3.3% (95% CI: 2.5-3.7, IQR 2.4-5.6) which was significantly different (Paired Wilcoxon Test: $p < 0.001$). Inter-method comparison demonstrated mean difference of 0.62% with 95% limits: 0.61 to 1.84%. There was no significant difference in median % fat when the slice number was reduced to 1. The mean coefficient of variance increased when more slices were sampled (3 slices = 0.1, 95% CI: 0.04-0.12, 11 slices = 0.17, 95% CI 0.15-0.24, $p < 0.001$).
Conclusion: Elliptical ROI measurements vary by less than 3% fat fraction compared to whole liver ROI. If a 3% fat fraction margin is clinically acceptable, then a single slice elliptical ROI could be used as a faster way to measure median fat %.

B-0981 11:26

Quantification of liver proton-density fat fraction in ultra-high-field MR systems: magnitude and complex fitting approach
J.-P. Kühn, C. Mahlke, B. Mensel, M.-L. Kromrey, N. Hosten; *Greiswald/DE (kuehn@uni-greifswald.de)*

Purpose: To investigate the feasibility of assessing the proton-density fat fraction (PDFF) using an ultra-high-field magnetic resonance imaging (MRI) system and to compare the accuracy of liver fat quantification using magnitude-based and complex-based fitting approaches.
Methods and Materials: Fourteen leptin-deficient ob/ob mice and eight intact controls were examined in a 7.1 Tesla animal scanner using a T1-independent 3-dimensional six-echo chemical shift-encoded pulse sequence. Confounder-corrected PDFF was calculated using magnitude and complex fitting. Differences between fitting techniques were compared using Bland-Altman analysis. In addition, PDFFs derived with both reconstructions were correlated with chemical and histopathological fat content using linear regression analysis.
Results: The PDFF determined with use of both reconstructions correlated very strongly; r=0.84. However, mean bias between reconstructions demonstrated divergent results (5.9%; CI 4.2%-7.6%) with slight overestimation for complex fitting. Linear correlation was shown for both reconstructions with histopathology (complex fitting: r=0.86; magnitude fitting: r=0.9), triglyceride content (complex fitting: r=0.74; magnitude fitting: r=0.85) and total fat content (complex fitting: r=0.78; magnitude fitting: r=0.85).
Conclusion: Liver fat quantification using the PDFF derived from MRI performed at ultra-high field strength is principally feasible. PDFF has strong to very strong correlation with histopathological and chemical fat content. However, small differences between types of PDFF reconstruction may impair the robustness and reliability of the biomarker at 7.1 Tesla, and warrants further investigation.

B-0982 11:34

Quantitative MR imaging of hepatic steatosis: validation in ex vivo human livers
P. Bannas[1], H. Kramer[2], D. Hernando[3], R. Agni[3], U. Motosugi[3], S.D. Sharma[3], L. Fernandez[3], G. Adam[1], S.B. Reeder[3]; [1]*Hamburg/DE*, [2]*Munich/DE*, [3]*Madison, WI/US (p.bannas@uke.de)*

Purpose: The aim of this ex vivo study was to validate the accuracy of MRI-derived proton density fat-fraction (MRI-PDFF) as an imaging biomarker of hepatic steatosis.
Methods and Materials: Using ex vivo human livers, we compared MRI-PDFF with magnetic resonance spectroscopy-PDFF (MRS-PDFF), biochemical triglyceride extraction and histology as three independent reference standards.

MRI-PDFF was prospectively performed at 1.5 T in 13 explanted human livers. We performed co-localized paired evaluation of liver fat content in all nine Couinaud segments using single-voxel MRS-PDFF (n=117), tissue wedges for biochemical triglyceride extraction (n=117), and core biopsies performed in each segment for histologic grading (n=117). Accuracy of MRI-PDFF was assessed through linear regression with MRS-PDFF, triglyceride extraction and histology. Intra-observer agreement, inter-observer agreement and repeatability of MRI-PDFF and histologic grading were assessed through Bland-Altman analyses.
Results: MRI-PDFF showed an excellent correlation with MRS-PDFF (r=0.984; CI: 0.978-0.989) and strong correlation with histology (r=0.850; CI: 0.791-0.894) and triglyceride extraction (r=0.871; CI: 0.818-0.909). Intra-observer agreement, inter-observer agreement and repeatability showed a significantly smaller variance for MRI-PDFF than for histologic steatosis grading (all $p < 0.001$).
Conclusion: MRI-PDFF is an accurate, precise and reader-independent non-invasive imaging biomarker of liver triglyceride content, capable of steatosis quantification over the entire liver.

B-0983 11:42

Optimum slice-based MRI estimates of visceral adipose tissue volumes in patients with excess weight: influence of gender, age and BMI range
A. Schaudinn, N. Linder, N. Garnov, M. Blüher, T. Karlas, A. Dietrich, T. Schütz, T. Kahn, H. Busse; *Leipzig/DE (Alexander.Schaudinn@medizin.uni-leipzig.de)*

Purpose: MRI data are well suited for the quantification of visceral adipose tissue (VAT) but image processing is generally time-consuming. The aim of this study was to retrospectively determine the accuracy of optimum slice-based estimates of total abdominal VAT volume (V-VAT) and to study the influence of gender, age and BMI range.
Methods and Materials: 327 overweight to morbidly obese patients (226 females) with a mean BMI of 39.0 kg/m2 (range 25.2-64.1) underwent IRB-approved MRI examination. After semiautomatic segmentation of VAT regions on axial slices (between diaphragm and pelvic floor), VAT volumes (V-VAT) and VAT areas of single (A-VAT-1) or five adjacent slices (A-VAT-5) were determined at different axial levels (five lumbar intervertebral spaces L1-S1, umbilicus and femoral heads). Statistic measures were coefficient of determination and standard deviations σ1 and σ5 of the differences between estimated and measured VAT volumes (Bland-Altman). Effects of age and BMI were studied in subgroup analyses.
Results: Mean V-VAT was 3.9 L for females and 6.8 L for males. Five slices generally yielded a slightly smaller standard deviation than single slices. Best agreement for females was found at level L3-L4, independent of BMI (σ5/1 = 562/688 ml). In males, BMI range mattered with smallest deviations at L2-L3 (σ5/1 = 613/706 ml) for patients with BMI 40 kg/m². Age had no significant impact on the above results.
Conclusion: Visceral adipose tissue volume can be reliably estimated with a simple but gender and BMI-specific image analysis.

B-0984 11:50

Monitoring of abdominal fat compartments by magnetic resonance imaging in obese subjects during a low-calorie weight-loss program
J.-P. Kühn, M.-L. Kromrey, L. Vogt, C. Mahlke, J. Mayerle, M. Lerch, N. Hosten; *Greiswald/DE (kuehn@uni-greifswald.de)*

Purpose: To investigate changes in abdominal fat and muscle compartments following a low-calorie diet in obese patients using magnetic resonance imaging (MRI).
Methods and Materials: Twenty-nine obese diabetics (10/19 men/women, median age: 59.0 years, median body mass index (BMI): 34.0 kg/m²) prospectively joined a standardized weight-loss program. An abdominal chemical-shift confounder-corrected sequence with water/fat separation was acquired before, during, and at the end of the program. Fat fractions of abdominal organs and lumbar spine as well as volumes of visceral and subcutaneous fat were determined. Furthermore, sarcopenia was evaluated using the L4/L5 method. Data were compared using the Wilcoxon signed-rank test for paired samples.
Results: Median BMI decreased significantly from 34.0 kg/m² to 29.9 kg/m² ($p < 0.001$) after 15 weeks. Liver fat content (14.2% to 4.1%, p 0.15). In addition, visceral fat volume (3.2 l to 1.6 l, $p < 0.001$) and subcutaneous fat diameter (3.0 cm to 2.2 cm, $p < 0.001$) decreased significantly. Muscle mass declined by 6.8% from 243.9 cm² to 226.8 cm².
Conclusion: Weight loss in obese subjects is associated with a decrease in fat content of liver, lumbar spine as well as in visceral and subcutaneous fat volumes. In contrast, weight loss had no influence on pancreas fat content in our cohort.

Chest

SS 1404
Chest CT dose reduction

Moderators:
T. Henzler; Mannheim/DE
D. Tack; Baudour/BE

K-25 10:30

Keynote lecture
J. Neuwirth; Prague/CZ

B-0985 10:39

Ultra low dose unenhanced chest CT with iterative reconstruction: should we acquire it at 80 kV or 135 kV? A qualitative and quantitative prospective study on 51 patients
C. Ludes; *Strasbourg/FR (clairelucchetta@gmail.com)*

Purpose: To qualitatively and quantitatively compare unenhanced ultra-low-dose chest computed tomography (ULD-CT) acquired at 80 kVp and 135 kVp, so as to determine an optimal acquisition protocol.
Methods and Materials: Fifty-one patients (57% men; 64.7±11.6yo; BMI=26.2±6.3) referred for a clinically indicated unenhanced chest CT were prospectively included and underwent, in addition to a standard acquisition, two ULD acquisitions (80 kVp-40 mA and 135 kVp-10 mA - parameters chosen to obtain the same radiation dose). Image quality and depiction of major parenchymal lesions of both ULD-CTs were blindly assessed by three radiologists using a 5-level Likert scale and compared with a logistic regression model. Image noise was measured within the tracheal lumen and compared with a Wilcoxon test.
Results: The dose-length product at 80 kVp and at 135 kVp differed statistically but remained similar: 14.7±1.8 mGy.cm versus 15.6±1.9 mGy.cm ($p < 0.001$). Image noise was significantly lower at 135 kVp (58.9±12.4 versus 74.7±14.5; $p < 0.001$). For all readers and for 100% of cases, the 135 kVp acquisition offered the best image quality over the 80 kVp, with a mean qualitative score of 4.5±0.7 versus 3.9±0.8 ($p < 0.001$). Depiction of nodule, mass, bronchiectasis, ground-glass opacities, alveolar consolidation and interstitial abnormalities were constantly better on 135 kVp for all readers, whereas depiction of emphysema was equivalent between both acquisitions. The 135 kVp acquisitions were significantly more often of diagnostic quality (92.3% versus 77.8%; $p < 0.001$) and were more robust to image quality deterioration in obese patients.
Conclusion: Unenhanced ULD chest CT should be acquired at a high kilovoltage and low current, such as 135 kVp-10 mA, in order to obtain the best diagnostic image quality.
Author Disclosures:
C. Ludes: Author; A. Labani, F. Severac, M. Schaal, M-Y. Jeung, C. Roy, M. Ohana.

B-0986 10:47

Radiation dose reduction with 320-row sequential wide-volume over helical acquisitions in chest CT: a prospective study in an ultra-low-dose setting
E. Meyer[1], A. Labani[1], F. Severac[1], M.-Y. Jeung[1], C. Ludes[1], A. Meyer[1], K. Haouin[2], C. Roy[1], M. Ohana[1]; [1]*Strasbourg/FR*, [2]*Puteaux/FR (elsa.meyer1@hotmail.com)*

Purpose: To assess the non-inferiority and the radiation dose reduction in chest CT obtained with sequential 320-row wide-volume (WV) over helical acquisitions, using an ultra-low-dose (ULD) intra-patient prospective comparison.
Methods and Materials: Sixty-four consecutive patients (72% men; 67.6yo±7.8; BMI 26.1±5.3) referred for a clinically indicated unenhanced chest CT were prospectively included and underwent, in addition to a standard acquisition (120 kV/auto-mA), two ULD acquisitions (135 kV/10 mA): one in helical mode and one in sequential WV mode. All three sets were acquired on second-generation 320-row scanner, with iterative reconstruction and exact same length coverage. Subjective image quality (overall IQ and WV stack registration) ranked with a 5-level Likert scale and diagnostic performance for the detection of parenchymal lesions were blindly assessed by two chest radiologists and compared with a logistic regression model. Image noise was measured within the tracheal lumen and compared with a Wilcoxon test.
Results: Radiation dose was significantly lower for the WV ULD acquisition over the helical ones (mean dose-length-product 14.1±1.3 versus 15.8±1.3 mGy.cm, $p < 0.0001$). Subjective image quality (4.5±0.6 versus 4.4±0.7, p=0.8), quantitative image noise (41.7±8 versus 40.9±8.7, p=0.3) and

diagnostic performances (pooled sensitivity of 87% versus 86% and specificity of 95% versus 93%) were equivalent between WV and helical ULD acquisitions.
Conclusion: Chest CT can be acquired using sequential VW mode, with conservation of subjective and objective image quality as well as diagnostic performance. It achieves an additional 11% radiation dose reduction in a ULD setting, that could go up to 40% in a standard-dose acquisition.
Author Disclosures:
K. Haouin: Employee; Toshiba medical.

B-0987 10:55

Effect of tin filtration on image quality and radiation dose: preliminary experience with a third-generation dual-source CT system in 133 adult patients

R. Daghistani, S. Khung, J.-B. Faivre, A. Duhamel, J. Rémy, M. Remy-Jardin; *Lille/FR (martine.remy@chru-lille.fr)*

Purpose: To evaluate the image quality and radiation exposure of low-kV examinations with tin pre-filtration.
Methods and Materials: 133 patients, less than 90 kg of body weight, underwent two non-contrast CT examinations: (a) the first examination was obtained with a second-generation dual-source CT system with an individually-adapted selection of the kilovoltage according to the patient's weight (Group 1); (b) the second examination was performed with a third-generation dual-source CT at 100 kV with tin pre-filtration (100 Sn kV/300 mAs) (Group 2). In both groups, chest examinations were performed in dual-source, single-energy, high-pitch helical mode with milliamperage modulation.
Results: Compared to Group 1, Group 2 examinations were characterised by : (a) a significantly lower mean objective noise (22.06 ± 5.9 HU vs 25.52 ± 8.78 HU; p=0.0006); (b) a better SNR (2.44 ± 1.2 vs 1.99 ± 0.89; $p < 0.0001$); (c) a significantly higher score of visibility of normal anatomical structures on lung and mediastinal images (1.27 ± 0.12 vs 1.18 ± 0.13; $p < 0.0001$); (d) a significantly lower DLP (27.08 ± 7.22 mGy.cm; $p < 0.0001$) (effective dose: 0.4 mSv). Similar trends for improvement in objective and subjective image noise and SNR and reduction in radiation exposure were observed in the subgroup of 112 patients scanned at 100 kV at T0, then at 100 Sn kV at T1.
Conclusion: Tin pre-filtration at 100 kV improves the image quality and reduces the radiation exposure of routine chest examinations in adult patients < 90 kg b.w.

B-0988 11:03

Image quality and sharpness of ground-glass nodules on ultralow-dose CT at 0.3 mSv using Tin filtration: comparison of five iterative reconstruction strengths

V. Ai[1], R. Wong[1], K. Otani[2], W. Chin[3], S. Lau[1], L. Leung[1], G. Lo[1];
[1]*Hong Kong/HK*, [2]*Tokyo/JP*, [3]*Singapore/SG (victorhgai@gmail.com)*

Purpose: To assess and compare image quality (IQ) and image sharpness (IS) of ground-glass nodules (GGN) on ultralow-dose CT (ULDCT) using Sn 100 kV scan protocol with 5 iterative reconstruction strengths (IRS).
Methods and Materials: Sixteen consecutive patients were scanned by 3rd generation dual-source CT (SOMATOM Force) using standard low-dose protocol (LDCT) (100-120 kV, 54-132 mAs, mean effective dose 1.81mSv) and ULDCT with tin filtration (100 kV, 181.5 mAs, 0.32mSv) reconstructed with IRS 1-5. Images were randomly presented and assessed by 2 radiologists blinded to IRS. Using LDCT images as standards, IQ and IS were scored on 5-point scale. Generalized estimation equations with exchangeable correlation were used to compare mean scores across IRS, using the highest scoring strength as reference. Inter-observer agreement assessed by weighted kappa statistic.
Results: All 26 GGN seen on LDCT were identified on ULDCT (mean maximum/minimum diameter 8.9/ 6.6 mm). Images reconstructed with IRS 4 had the highest mean IQ/IS scores (4.83/4.84), with significant difference compared with IRS 1 and 5 (P=0.001, P=0.001 for IQ; $P < 0.001$, $P < 0.001$ for IS, for IRS 1 and 5 respectively). No significant difference in IQ and IS was found between IRS 2, 3 and 4. Inter-observer agreement was fair for IQ (weighted kappa 0.4), moderate for IS (0.47).
Conclusion: GGN can be readily detected by ULDCT. Our study suggests that, to achieve optimal IQ and IS, IRS 2-4 are superior to 1 and 5, with IRS 4 scoring the highest.

B-0989 11:11

Detection of artificial pulmonary lung nodules in ultralow-dose CT using an ex vivo lung phantom

C.A. Burgard, T. Gaaß, D. Bondesson, M.F. Reiser, J. Dinkel; *Munich/DE (caroline.burgard@med.uni-muenchen.de)*

Purpose: To assess the image quality of 3 different ultra-low-dose (ULD) CT protocols with model based iterative reconstruction on pulmonary nodule depiction in a ventilated ex vivo-system.
Methods and Materials: Four porcine lungs were inflated inside a dedicated chest phantom and prepared with n=61 artificial nodules (0.3-1 ml). The artificial chest wall was filled with water to simulate the absorption of a human chest. Images were acquired with a 2x192-row detector CT using normal and 3 different ULD protocols (respective effective doses: 4mSv and 0.1mSv). A different tube voltage was used for each ULD protocol: 70 kV, 100 kV with tin filter (100 kV_Sn) and 150 kV with tin filter (150 kV_Sn). Nodule delineation was assessed by two observers (scores 1-5, 1=unsure, 5=high confidence).
Results: The diameter of the 61 detected artificial nodules ranged from 0.9 to 18.6 mm (mean 9.5+-5.4 mm). The best ULD scores were achieved using 100 kV_Sn and 70 kV ULD protocols (4.46 and 4.39 respectively). Both protocols were not significantly different (p=0.305). The mean score of 3.94 in ULD 150 kV_Sn was significantly lower compared to other ULD protocols ($p < 0.001$). The lowest rated score of 1 was assigned to five artificial nodules using 150 kV_Sn protocol due to low contrast to noise and a score of 2 to one nodule using 70 kV ULD protocol due to beam hardening artifacts close to the diaphragm.
Conclusion: The results of this initial experiment, conducted in a realistic setting show the feasibility of ultra-low-dose CT for the detection of pulmonary nodules.

B-0990 11:19

Equal delineation of mediastinal, hilar, and peripheral lymph nodes at 64-row-MDCT of the chest with a one-millisievert protocol when compared with standard dose

U.G. Mueller-Lisse, L. Marwitz, A. Tufman, R. Huber, M.F. Reiser, M. Paolini; *Munich/DE*

Purpose: To compare mediastinal, hilar, and peripheral lymph node delineation at contrast-enhanced MDCT of the chest between a dose-reduced and a standard examination protocol.
Methods and Materials: This ethics-committee-approved, mono-institutional, retrospective, case-control study included 186 adult patients (99 female; age, 53±19 years) with contrast-enhanced, dose-modulated 64-row-MDCT of the chest (Optima 660, GE) over 18 months. Cases (n=62; dose-reduced protocol, 100 KVp, CTDI, 1.66±0.51, ASIR-iterative-image-reconstruction 50%) were individually matched with controls (n=124; standard-dose-protocol, 120 KVp, CTDI, 5.36±2.24, ASIR 40%) for gender, age, body height, weight, anterior-posterior and transverse diameters of chest and lung. Lymph node size (cut-off-value, 1 cm) and delineation (measurably delineated) were compared for six different IASLC-based groups (upper mediastinal, aorto-pulmonary, subcarinal, lower mediastinal, hilar, peripheral). Two-tailed statisitcal tests (Student's-T-test, chi-square-test) were significant for $p < 0.05$.
Results: Lymph node size did not differ significantly between cases and controls. Lymph nodes delineated well in 280/372 lymph node groups (75%) in cases and 519/744 (70%) in controls (chi-square, 3.4373, $0.05<p < 0.1$, power 90%). Hilar (53/62 vs. 88/124, chi-square, 3.9904, $0.025<p < 0.05$) and peripheral nodes (35/62 vs. 43/124, chi-square, 7.1787, $0.005<p < 0.01$) delineated better in cases. There were no significant differences for other lymph node groups. Dose-length-product was 59.0±19.0 mGy-cm (effective dose, 1.06±0.34 mSv) in cases and 198.6±88.3 (3.57±1.59 mSv) in controls.
Conclusion: Contrast-enhanced low-dose MDCT of the chest with an average dose of 1.06 mSv demonstrated equal delineation of mediastinal, hilar, and peripheral lymph nodes when compared with standard chest CT at 3.57 mSv.
Author Disclosures:
U.G. Mueller-Lisse: Speaker; U.G. Mueller-Lisse and M. Paolini have been invited speakers at meetings organized by General Electric. **M. Paolini:** Speaker; has been invited as a speaker at meetings organized by General Electric.

B-0991 11:27

The application of kV assist in low-dose chest CT screening

Z.-L. Zhang; *Beijing/CN (zhangzhuolu@yeah.net)*

Purpose: To compare the image quality scanned by 120 kVp and 100 kVp. To discuss the application of kV assist in low-dose chest CT screening.
Methods and Materials: Totally 300 patients were categorized randomly into group A (120 kVp), B (100 kVp) and C (kV assist). Smart mA cooperated with 50% ASiR-V was applied with noise index (NI) set as 20. Height, weight and radiation dose were recorded, and BMI (body mass index) was calculated. Image noise was defined as the standard deviation (SD) of CT value at ascending aorta. Two radiologists evaluated images by 5-points scale and assessed image quality for various pulmonary lesions.
Results: The effective dose of group A, B and C were 0.47±0.07mSv, 0.30±0.03mSv and 0.34±0.11mSv, respectively ($P < 0.05$). For group A, C and normal-weighted people (BMI< 24) in group B, image quality was determined as diagnostic (score≥3). For over-weighted people (BMI≥24) in group B, the images of 24% lung algorithm and 21% standard algorithm were lower than 3, which were determined as non-diagnostic. The SD of group A (19.83±2.20) was lower than group B (20.88±1.42) and C (20.80±1.48)($P < 0.05$). No

statistically significant difference in terms of lesion detection frequency. The BMI of the people chosen as 120 kVp and 100 kVp in group C was 28.72±2.29 kg/m2, 23.97±2.40 kg/m2 (P < 0.05).
Conclusion: For over-weighted people, image quality was determined as non-diagnostic for some cases scanned by 100 kVp. KV assist technique can auto-select the best kVp based on the scout image of patient. Lower radiation dose can be achieved by kV assist, while providing acceptable images.

B-0992 11:35

Chest CT for airway stent evaluation in patients with malignant tracheal stenosis with iterative reconstruction algorithms

T. Li[1], Z. Yonggao[1], J. Yan[2], G. Jianbo[1]; [1]*Zhenzhou/CN*, [2]*Shanghai/CN*
(13513895183@163.com)

Purpose: To investigate the image quality of low dose CT with hybrid iterative reconstruction (HIR) and iterative model reconstruction (IMR) algorithms for airway stents evaluation compared to routine dose CT in patients with malignant tracheal stenosis.
Methods and Materials: 60 patients (59±9.3 years, 37 male) with airway stent who are randomly assigned into two groups (routine-dose (RD) and low-dose (LD) group, 30 for each) underwent chest CT on a 256-slice CT (RD-group 120 kV, 250 mAs, LD-group 120 kV, 120 mAs). Images were reconstructed with filtered back projection (FBP) in RD group, while with HIR and IMR in LD group. Effective radiation dose of both groups was recorded. Image quality assessment was performed by two radiologists according to structure demarcation near stents, artifacts, noise, and diagnostic confidence using a five-point scale[1 (poor) to 5 (excellent)]. Image noise and CNR were measured.
Results: The effective radiation dose of LD group was reduced 52.3% compared with RD group (P < 0.01).IMR enabled better image quality for all four subjective image quality scores on LD group images compared with FBP images of RD group (p0.05),while HIR enabled a higher score in image quality of artifacts (P=0.03). Both IMR and HIR yielded significant lower noise and higher CNR on LD images compared to FBP images of RD group (p < 0.01, all).
Conclusion: Both IMR and HIR improved image quality of low dose chest CT by comparison of routine dose images reconstructed with FBP, meanwhile, IMR allows further image quality improvement than HIR.

B-0993 11:43

Image quality of CT pulmonary angiography at reduced radiation exposure and contrast material volume using iterative model image reconstruction and iDose4 technique in comparison to FBP

A. Laqmani[1], S. Butscheidt[1], M. Kurfürst[1], J. Schmidt-Holtz[1], C. Behzadi[1], S. Sehner[1], H. Nagel[2], G. Adam[1], M. Regier[1]; [1]*Hamburg/DE*, [2]*Buchholz/DE*
(a.laqmani@uke.de)

Purpose: To assess image quality of CT pulmonary angiography (CTPA) at reduced radiation exposure (RD-CTPA) and contrast material volume using two different iterative reconstruction (IR) algorithms [iDose4 and iterative model image reconstruction (IMR)] in comparison to filtered back projection (FBP).
Methods and Materials: 52 patients (body weight < 100 kg, mean BMI: 23.9) with suspected pulmonary embolism (PE) underwent RD-CTPA (Brilliance iCT; tube voltage: 80 kV; mean CTDIvol: 1.9 mGy) using 40 ml contrast material. The raw data were reconstructed using FBP and the two different IR algorithms (iDose4 and IMR, Philips Healthcare). Two radiologists assessed subjective image quality. Conspicuity of PE was assessed in central, segmental, and subsegmental arteries. CT attenuation, objective image noise (OIN) and contrast-to-noise ratios (CNR) were assessed.
Results: Noise reduction of up to 57% to 66% was achieved with iDose4 and up to 78% to 89% with IMR compared to FBP. CNR significantly increased with iDose4 and IMR compared to FBP (p < 0.05). Subjective image quality was rated significantly higher at IMR reconstructions in comparison with iDose4 and FBP. Diagnosis of PE was feasible with each data set; however, conspicuity of central and segmental PE significantly improved with the use of IMR. In subsegmental arteries, IMR was inferior to iDose4.
Conclusion: CTPA at reduced radiation exposure and contrast material volume is feasible with use of IMR, which provides improved image quality and conspicuity of pulmonary embolism in central and segmental arteries.

B-0994 11:51

Spine evaluation in 70 kV thoracic CT: dose effectiveness and image quality

C. Polkowski, B. Bodelle, T.J. Vogl; *Frankfurt a. Main/DE*

Purpose: Evaluation of image quality and radiation dose in 70 kV computed tomography of the thoracic spine in comparison to 100 kV standard CT.
Methods and Materials: 64 patients (40 men, 24 women) underwent CT of the thoracic spine using a tube potential of 70 kV (reference mAs 65) and 100 kV (reference mAs 87). Attenuation and image noise were measured and SNR and CNR were calculated for objective image quality evaluation. For evaluation of radiation exposure DLP values were compared. Image quality was assessed by 2 readers independently and scaled from 1 (non-diagnostic) to 5 (excellent) separately for the spine, the intervertebral disks and pathological changes such as osteochondrosis, spondylarthrosis, fractures and metastases.
Results: The median DLP was significantly lower with a tube potential of 70 kV (37.84 mGycm, SD 14.37 mGycm) compared to 100 kV protocol (133.23 mGycm, SD 42.21 mGycm). SNR measured in the thoracic spine was 3.33 (SD 1.15) for 70 kV and 4.28 (SD 1.71) for 100 kV. Subjective rating for the evaluation of the spine was 3.4 (SD 0.83) for 70 kV and 4.63 (SD 0.52) for 100 kV.
Conclusion: CT of the thoracic spine using a tube potential of 70 kV shows a moderate to good diagnostic image quality and reduces overall radiation dose significantly compared to a standard protocol at 100 kV.

10:30 - 12:00 **Room D2**

Interventional Radiology

SS 1409

Intra-arterial therapies in the liver

Moderators:
R.F. Dondelinger; Liège/BE
C. Schmid-Tannwald; Munich/DE

B-0995 10:30

Yttrium-90 radioembolisation for colorectal cancer liver metastases: a prospective cohort study on circulating angiogenic factors and treatment response

C. Rosenbaum, A. van den Hoven, M. Braat, M. Koopman, M. Lam, B. Zonnenberg, H. Verkooijen, M. van den Bosch; *Utrecht/NL*
(c.rosenbaum@gmail.com)

Purpose: Yttrium-90 radioembolisation (90Y-RE) for liver tumours results in radiation damage and hypoxia in liver tissue, which may stimulate the systemic release of angiogenic factors and enable tumour growth. We examined changes in plasma levels of these factors following 90Y-RE in relation to response.
Methods and Materials: In this prospective cohort study, 42 patients with irresectable, chemorefractory colorectal cancer liver metastases were treated with 90Y-RE. Blood samples were collected at baseline, and 0, 1, 3, 7 and 30 days after treatment. Response was measured with MRI and 18 F-FDG-PET at 1 month and subsequently 3 month intervals after treatment. Linear mixed models were used to investigate the association between angiogenic factors and response.
Results: At 1 month after 90Y-RE, 10 patients had progressive liver disease (=non-responders) and 32 patients showed stable disease or partial response of liver lesions (=responders). Following 90Y-RE, levels of 3 angiogenic factors increased, i.e. vascular endothelial growth factor (VEGF), hepatocyte growth factor (HGF) and angiopoietin-2 (Ang-2). Non-responders had statistically significant higher peaks of Ang-2 and HGF at 3 and 7 days post-treatment compared to responders. Median overall survival was 9.2 months (95%-confidence interval (CI) 6.1 - 12.4). Median time to liver progression was 3.0 months (95%-CI 2.8 - 3.3).
Conclusion: Statistically significant increases in plasma levels of Ang-2 and HGF in the first week after treatment were associated with early progressive disease of liver lesions. Combining 90Y-RE with systemic medication, for example anti-angiogenic therapy, may be a valuable option in improving the effect of this treatment.
Author Disclosures:
M. Koopman: Advisory Board; Advisory role for Bayer, Nordic Pharma, Merck, Roche, Amgen. Grant Recipient; Research grants from Bayer, Roche, Sanofi Aventis. **M. Lam:** Advisory Board; Advisor for BTG and for Bayer Health Care. Speaker; Speaker for SIRTeX. **B. Zonnenberg:** Consultant; Incidentally acts as consultant for Novartis Pharma.

B-0996 10:38

Selective internal radiation therapy in patients with progressing neuroendocrine liver metastases

C. Ebeling Barbier, U. Garske-Roman, M. Sandström, R. Nyman, D. Granberg; *Uppsala/SE (charlotte.ebeling_barbier@radiol.uu.se)*

Purpose: To evaluate the safety and efficacy of selective internal radiation therapy (SIRT) in patients with unresectable liver metastases from neuroendocrine tumours (NETLMs).
Methods and Materials: 40 patients with progressing NETLMs (22 women, 18 men, mean age 61.6) who underwent SIRT with 90Y-labelled resin microspheres were retrospectively reviewed. Tumour response was evaluated according to the modified Response Evaluation Criteria in Solid Tumours

(mRECIST) on computed tomography or magnetic resonance images. Medical records were scrutinised.
Results: 54 SIRT treatments were performed, 33 to the right liver lobe (mean activity 1.31 GBq), 13 to the left lobe (mean activity 0.85 GBq), and 8 to both lobes (mean activity 1.61 GBq). Late follow-up (mean 20 months) imaging was performed after 44 of the treatments. Objective tumour response (OR) and disease control (DC) were 54% (n=29/54) and 94% (n=51/54) respectively at early follow-up (mean 3 months) and 34% (n=15/44) and 57% (n=25/44) respectively at late follow-up. Mean overall survival from first SIRT was 34.8 months and 1-, 2-, 3-, and 5-year survival was 76%, 59%, 52% and 35% respectively. Adverse effects were generally mild and easily manageable, apart from one patient, who died from radiation induced liver failure. 45% of the patients had received peptide receptor radionuclide therapy (PRRT) prior to SIRT.
Conclusion: SIRT with 90Y-labelled resin microspheres is a safe and effective treatment for patients with progressing NETLM, also for those who have received prior PRRT.

B-0997 10:46

Reduced peri-procedural analgesia following replacement of water for injection (WFI) with glucose 5% (G5) as the infusion medium for 90yttrium resin microspheres

K.J. Paprottka, S. Lehner, W.P. Fendler, H. Ilhan, A. Rominger, W. Sommer, D.A. Clevert, M.F. Reiser, P.M. Paprottka; *Munich/DE (karolin.paprottka@med.uni-muenchen.de)*

Purpose: Our study primary aim was to compare the need for peri-interventional on-demand analgesia when water for injection (WFI) was replaced with glucose-5%(G5) - also known as dextrose-5%-water (D5 W) - for 90yttrium-resin-microspheres administration.
Methods and Materials: In total, 41 patients who received 77 SIRT procedures with G5 (2014-2015) were retrospectively matched with 41 patients (77 SIRT procedures) who received SIRT with WFI (2011-2014) at our centre. The need for on-demand pain medication was chosen as an objective and accessible measure of the peri-procedural pain experienced by patients.
Results: Patients were well-matched according to sex, age, tumour type and involvement, and prior anti-angiogenic therapies. Peri-interventional analgesic requirements were significantly lower for SIRT procedures performed with G5 compared with WFI: 5 of 77 (6.5%) vs. 29 of 77 (37.7%), $p \leq 0.001$, respectively. Early stasis (defined as slowed antegrade flow, before total vascular stasis) occurred in 12 of 154 (7.8%) SIRT procedures overall and was not different ($p \leq 0.229$) between the two groups [4 of 77 (5.2%) vs. 8 of 77 (10.4%)].
Conclusion: Slow pulsatile administration of 90Y resin microspheres with WFI is associated with a low rate of stasis. Replacement of WFI with G5 significantly reduces the need for peri-procedural analgesia. These data favour the use G5 for 90Y-resin-microspheres implantation in daily practice.

B-0998 10:54

Trends for using lipiodol-Doxorubicin vs drug-eluting beads-Doxorubicin for transarterial chemoembolisation in hepatocellular carcinoma: a single-centre experience

A.S. Moustafa, A.M.K. Abdel Aal, D. Redden, S. Saddekni, D. Dubay; *Birmingham, AL/US (AKAMEL66@HOTMAIL.COM)*

Purpose: There is not enough data in the literature to advocate for the best mixture used in transarterial chemoembolisation (TACE) for treatment of unresectable hepatocellular carcinoma (HCC). The present study was performed to evaluate the trends for using lipiodol-Doxorubicin-based conventional TACE (cTACE) compared to drug-eluting beads-Doxorubicin TACE (DEBS-TACE) in HCC patients and compare the survival outcomes and tumour response between both groups.
Methods and Materials: We retrospectively reviewed our medical records between January 2008 and December 2014. A total of 314 patients were included in the study, cTACE (n=139) versus DEBS-TACE (n=175). The primary endpoint was overall survival, and secondary endpoint was tumour response rate categorised according to the modified Response Evaluation Criteria in Solid Tumours (mRECIST).
Results: No significant difference between both groups in the baseline characteristics. However, DEBS-TACE was significantly utilised more often with multifocal disease (1.8±1.3 vs. 1.5±1.7; p=0.01) and there was a trend towards greater utilisation of DEBS-TACE with increasing total tumour diameter (6.5 cm±5.0 vs. 5.7 cm±3.6; p=0.09) compared to cTACE. On univariate analysis, Child-Pugh class B and C ($p < 0.01$, p=0.04) and total tumour diameter (p=0.01) were associated with worse survival. After controlling significant covariates, the DEBS-TACE group showed a longer median survival of 22.3 months compared to 19.7 months in the cTACE group (p=0.04).
Conclusion: The current study demonstrates a trend towards using DEBS-TACE in HCC patients with multifocal disease and large total tumour diameter. Although no significant difference in tumour response was noted, survival was significantly superior in the DEBS-TACE group compared to cTACE group.

Author Disclosures:
A.M.K. Abdel Aal: Consultant; St Jude Medical, Baxter Health Corp, Bard Peripheral Vascular Inc. **S. Saddekni:** Consultant; St Jude Medical.

B-0999 11:02

Surgical resection versus radiofrequency ablation plus drug-eluting beads transcatheter arterial chemoembolisation in the treatment of single large hepatocellular carcinoma

A. Posa, R. Iezzi, G. Coppola, E.G.M. Antonuccio, A. Gasbarrini, L. Bonomo; *Rome/IT (alessandro.posa@gmail.com)*

Purpose: To compare liver resection (RES) and single-step combined therapy with radiofrequency ablation and drug-eluting beads transarterial chemoembolisation (RFA+TACE) in patients with single hepatocellular carcinoma (HCC) > 3 cm and compensated cirrhosis. Primary endpoints were overall survival (OS) and tumour recurrence (TR) rates.
Methods and Materials: This retrospective study involved 56 Child-Pugh A cirrhotic patients (25 RES, 33 RFA+TACE) with single HCC observed between 2010 and 2014 in our centre. All the patients did not show macroscopic vascular invasion and/or extrahepatic tumour spreading before treatment. The treatment choice was made after multidisciplinary evaluation. RFA+TACE was performed using a single-step procedure (RFA during balloon occlusion of the tumour-feeding artery, followed by TACE). Cumulative OS and TR rates were analysed using the Kaplan-Meyer method.
Results: Median follow-up period was 16.5 months. Median HCC size was 4.5 cm in RES group (range 3-7.4 cm), 4 cm in RFA+TACE group (range 3-6.8 cm). Demographic, clinical and laboratory parameters as well as treatment-related complications did not significantly differ between groups. OS rates at 1-3 years were 91.8%-75.2% in RES group and 86.3%-61.6% in RFA+TACE group. Overall TR rates at 1-3 years were significantly lower in resected patients (RES 32.7%-42.3%, RFA+TACE 43%-74.7%). Both 3-year local tumour progression (RES 31.1%, RFA+TACE 74.6%) and distant intrahepatic recurrence (RES 34.8%, RFA+TACE 77.0%) were significantly higher in RFA+TACE group.
Conclusion: RES seems to be the choice treatment in compensated cirrhotic patients with single HCC > 3 cm. One-step combined RFA+TACE treatment is an effective alternative therapeutic option in patients not suitable for RES after multidisciplinary evaluation.

B-1000 11:10

Radiation exposition of staff in SIRT: a proposal for a better ß radiation protection

R. Adamus, E. Guni, R. Loose; *Nuremberg/DE (adamus@klinikum-nuernberg.de)*

Purpose: To demonstrate real radiation exposition measurements of eye of Y 90 injecting staff and show proposals for better ß radiation protection in the area close to the ß radiation-emitting tube and catheter.
Methods and Materials: Measurements with a dosimeter (Thermo-Fisher, EPO2k2+) were made close to the SIR spheres containing plexiglas container (1.4 Gbq) and of the region near to the eye of ínterventionalist and the nuclearmedicine colleague. After this in 15 SIRT procedures [mean activity 1.75 Gbq (0.81-2.52)] measurements were made in the same dosimeter localisations, but with a special plexiglas shielding of the ß radiation emitting tube (outside the protecting plexiglas box) and catheter leading to the patient.
Results: The sum of the interventionalist dose without special Plexiglas shielding for the one procedure was 0.1 milliSievert (mSv). The dose with plexiglas shielding in the 15 procedures was 0.015 mSv (medium, range 0.001-0.027).
Conclusion: Considering the eye lens dose limit of 150 mSv/year (according BSS), in our institute limited to of 20 mSv/year and even in the current discussion of having no threshold for development of detectable opacities or visible impairment, the exposition dose of staff during SIRT procedures is within a tolerable range nevertheless our proposed plexigas shielding can be recommended.

B-1001 11:18

Single-session combined radiofrequency ablation and transarterial chemoembolisation in the treatment of hepatocellular carcinoma

A.M. Gabr[1], M.A. Dawoud[1], R.E. Mohamed[1], M.S. El Waraki[2]; [1]*Tanta/EG*, [2]*Shebin El Koum/EG (ahmedgabr@me.com)*

Purpose: The efficacy of locoregional treatment in small hepatocellular carcinoma (HCC) is comparable to surgical outcomes. However, both medium-sized and large tumours remain a challenge with less robust outcomes. In the current study, we used a multimodal treatment approach, in the form of combined percutaneous radiofrequency ablation (RFA) with transarterial chemoembolisation (TACE) for controlling large HCCs, more than 3 cm in diameter, in order to enhance the therapeutic effect.

Methods and Materials: We conducted this study on 30 patients; all were subjected to a single-session combined RFA with TACE. Targeting of the lesion with RFA needle was done first to secure the RFA needle into the lesion under ultrasound guidance. Super-selective TACE was then performed, followed by the RFA procedure.
Results: One-month follow-up revealed complete ablation of the tumour in 25 patients (83.3%), while 5 patients (16.7%) showed residual tumour activity, necessitating an additional TACE/RFA session. No major complications related to the procedure were recorded during the duration of this study. The probability of encountering, both intra- and post-procedural, minor complications was significantly higher with larger focal lesion diameters (p=0.039, and p=0.003, respectively).
Conclusion: Single-session combined TACE and RFA is a safe and effective treatment option for the control of large HCC lesions, with no major procedure-related complications.

B-1002 11:26

Local hepatic tumour control in patients with HCC undergoing transarterial lipiodol embolisation followed by microwave ablation
R. Seidel, A. Massmann, P. Fries, G. Schneider, A. Buecker; *Homburg/DE (drrolandseidel@schlau.com)*

Purpose: To investigate local tumour control in patients with HCC undergoing lipiodol embolisation and subsequent microwave ablation.
Methods and Materials: 34 patients with 53 HCC (mean size 24 mm, SD 8 mm) underwent superselective transarterial embolisation with lipiodol. Subsequently percutaneous CT guided microwave ablation of the tumours was performed using a 2.45 GHz generator (power output 80 to 120 W) with cooled tip probes (Acculis, Angiodynamics, USA). All patients were investigated before therapy by unenhanced and dynamic contrast-enhanced MR or CT; follow-up was performed within 1, 3, 6 and more months after treatment. Treatment was rated as successful in case of a complete rim of necrosis surrounding the lesion and no further tumour growth. Patient data were evaluated retrospectively on a PACS workstation by two readers in consensus.
Results: In 33 of 34 (97%) patients a complete ablation was diagnosed on the early follow-up imaging. The patient rated with incomplete ablation presented tumour progression on follow-up imaging. 1 patient initially rated as complete ablation presented lesion progression and underwent chemoembolisation with no residual tumour up to 510 d after microwave ablation. Overall complete ablation rate per patient was 94% (32 of 34 patients) and 96% per lesion (51 of 53 lesions).
Conclusion: Microwave ablation in combination with lipiodol embolisation for patients with HCC is a valuable therapeutic procedure for smaller hepatic tumours. Especially the targeting and embolising potential of the retained lipiodol is likely to contribute to a more reliable tumour access and ablation effect.
Author Disclosures:
G. Schneider: Consultant; BRACCO, imaging, Italy.

B-1003 11:34

Unresectable isolated hepatic metastases from uveal melanoma: treatment with chemosaturation with percutaneous hepatic perfusion of melphalan
T.J. Vogl[1], S. Koch[1], B. Gebauer[2], W. Willinek[3], C. Engelke[4], R. Brüning[5], F. Wacker[6], A. Enk[7]; [1]*Frankfurt a. Main/DE*, [2]*Berlin/DE*, [3]*Trier/DE*, [4]*Göttingen/DE*, [5]*Hamburg/DE*, [6]*Hannover/DE*, [7]*Heidelberg/DE (t.vogl@em.uni-frankfurt.de)*

Purpose: This multiinstitutional evaluation intends to retrospectively evaluate the results of the treatment of non-resectable haepatic metastases of uveal melanoma using percutaneous hepatic perfusion (PHP; Hepatic CHEMOSAT® Delivery System; Delcath Systems Inc., USA).
Methods and Materials: Between 2012 and 2015 sixteen patients with haepatic metastases of uveal melanoma received one to three sessions of Chemosaturation-PHP. Thirteen patients were evaluated by means of the RECIST criteria. Analysis of survival time was performed. Adverse events and complications were registered.
Results: Chemosaturation was well tolerated by the majority of all sixteen patients. After therapy seven patients developed leukopenia, six patients had thrombopenia and two patients showed neutropenia, infection and fever each. From the thirteen patients evaluated by means of RECIST criteria, five patients (39%) showed PR, SD was observed in six patients (46%) and two patients (15%) had PD. Three patients underwent two further sessions. After the first session tumour response of one patient turned from SD to PR and returned to SD after the third cycle. Treatment response of the other two patients showed PR in all three sessions. Survival time of all patients ranged from 1.5 to 27.8 months (median overall survival 10.5 months) following first chemosaturation. Time to progression of the two patients with PD was 6.2 months in one patient. The other patient died 1.6 months after evaluation.
Conclusion: Chemosaturation-PHP has been manifested as a potential treatment for patients with non-resectable hepatic metastases of uveal melanoma.

B-1004 11:42

Transarterial chemoembolisation (TACE) treatment of liver metastases: intraprocedural volume measurement by FAST C-arm-CT during treatment
T.J. Vogl, F. Dörr, S. Zangos, N.N.N. Naguib; *Frankfurt a. Main/DE (t.vogl@em.uni-frankfurt.de)*

Purpose: To evaluate the response of transarterial chemoembolisation (TACE) of secondary hepatic tumours by measuring parenchymal blood volume (PBV) using C-arm-Dyna-CT, monitoring changes in PBV after repeated TACE and correlating these changes with the change in tumour size measured in MRI.
Methods and Materials: From 06/2013-07/2014 this study was retrospectively performed in 54 patients with hepatic metastases. All patients underwent MRI and TACE with Mitomycin, Gemcitabine and Lipiodol in 1-month intervals. The cycle of blood volume measurements was determined by limited availability of C-arm-Dyna CT allowing PBV measurements to be conducted every two months. Blood volume measurement of liver metastases was performed using C-arm-CT. Image post processing was carried out on a workstation with graphical reconstruction of PBV measurement results and subsequent overlapping with MRI for correlation of blood volume with size of metastases.
Results: The results indicate significant correlations between blood volume change and resizing. The patients received either two (n=23) or three (n=31) PBV, thus providing significant data for further analysis. The average initial blood volume of all patients was 114.66 ml/1000 ml with an average size of the metastases of 4.88 cm. After several TACEs the average blood volume decreased to 78.6 ml/1000 ml associated with a significant reduction to an average diameter of 4.56 cm documented in MRI. In the course of the study a considerable reduction in volume (-31.45%) and in diameter (-6.56%) was documented.
Conclusion: A decrease in tumour size seems to result in decreasing blood volume. Therefore, PBV measurements may be suitable for assessing TACE effectiveness.

B-1005 11:50

Tace of liver metastases from CR cancer with DEBIRI tecniquein association with CHT: five years of our experience and follow-up
G. Scevola, M. Rastelli, G. Loreni; *Rome/IT (gscevola@sirm.org)*

Purpose: To evaluate the effect of TACE with DEBIRI on local response and survival of patients affected by colorectal liver metastases in a curative/palliative protocol.
Methods and Materials: Between February 2009 and July 2014, 87 patients (51 male, 36 female) with colorectal liver metastases, were treated by DEBIRI chemoembolisation. Involvement of more than 50% of hepatic parenchyma, evaluated by CT-scan, was considered an exclusion criteria. Treatments were performed by catheterization of hepatic artery and by super-selective treatment aimed at sparing intact liver tissue. Follow-up was done with PET-CT at 4 months, after two treatments. Efficacy was denoted by lack of disease progression and reduction of size's metastases. In case of progression disease, a third treatment was performed.
Results: 66 patients underwent a total of 152 treatments (average 2.3 per patient); 21 patients have performed a single treatment. All patients had post-embolisation syndrome prevalently characterised by pain (93%) and nausea (65%), controlled by medication, and increased transaminases (45%). One patient had a severe bradycardia and one allergy to mdc, all resolved with medical therapy. At 26 months follow-up, 14 patients were in remission of disease, 18 in stable phase, 21 in progression disease and 13 died. Overall, the efficacy of treatment, evaluated in terms of stability and remission of the disease, was 48.5%.
Conclusion: In our experience DEBIRI technique in association with chemotherapy is an efficacious palliative therapy for liver metastases from colorectal cancer.

10:30 - 12:00 **Room G**

Radiographers

SS 1414

Safety and patient care in medical imaging

Moderators:
A. Henner; Oulu/FI
D. Miletić; Rijeka/HR

B-1006 10:30

Work-place related ergonomic conditions as prognostic factors for work-related musculoskeletal disorders (WRMD) in radiographers

L.P. Ribeiro, I. Bodião, O. Lesyuk, A.F.C.L. Abrantes, R.P.P. Almeida, J.P. Pinheiro; *Faro/PT (lpribeiro@ualg.pt)*

Purpose: To quantify the relative contribution of work-related physical and psychosocial factors, individual factors, working conditions, and health-related factors to the development of musculoskeletal pain in radiographers.
Methods and Materials: Four self-applied questionnaires were assigned to 40 radiographers from imaging departments of two public hospitals, to identify musculoskeletal, auditory, visual and thermal symptoms. A checklist about work conditions and specialised equipment to measure light, temperature and noise intensity were used.
Results: There was a 50% prevalence of symptoms on musculoskeletal disorders. 58% of radiographers reported visual impairment and 45% said that noise affected their performance, however, noise levels were below regulations. 72% reported discomfort due to air temperature levels and the equipment registered temperatures above regulations. Regarding light we registered very low values that could impair performance near some workstations.
Conclusion: Analysis of ergonomic conditions reveal lack of suitability in the post-processing workstations of general radiology and computed tomography. The work environment should be improved regarding the ergonomic comfort to provide better working conditions and promoting worker performance.

B-1007 10:38

An investigation of radiography staff uniforms as vectors for infection: comparing home-laundering processes with hospital-laundering

P. Hogan, J. Lowe; *Dublin/IE (joanna.lowe@ucd.ie)*

Purpose: Infection control and prevention is imperative in providing patients with safe, high-quality healthcare. However, there are currently no recommendations for the infection control of healthcare workers' uniforms in Irish hospitals and virtually no Irish or European research on the importance of uniforms in the spread of nosocomial infections. The purpose of this study was therefore to compare the cleaning regimes of home- and professionally-laundered uniforms while determining the effects of optimal cleaning recommendations on home-laundered uniforms.
Methods and Materials: Ten radiographers participated in this research; five of whom wore professionally-laundered scrubs and five of whom wore their own home-laundered uniforms. The bacterial count from both sets of attire was examined using ATP swabs and correlated to the specific cleaning regime that accompanied both the scrubs and uniforms in order to determine whether one cleaning process was more effective than the other. Questionnaires were used to examine the home-laundry techniques before and after the introduction of optimal cleaning regimes in order to evaluate whether practices improved.
Results: Professional laundering of the scrubs removed an average of 98% of the original bacterial count. The average amount of bacteria removed from home-laundered uniforms post-cleaning was 75% of the original value before the introduction of cleaning recommendations and 87% following this introduction.
Conclusion: It seems that hospital-laundering of staff uniforms might reduce the risk of nosocomial infections, while the introduction of optimal cleaning recommendations in Ireland, and possibly Europe, could help lower bacterial levels on home-laundered uniforms.
Author Disclosures:
P. Hogan: Grant Recipient; Irish Institute of Radiographers and Radiation Therapists.

B-1008 10:46

An investigation into the effectiveness of common cleaning wipes in removing infection control risks from radiographic cassettes

M.J. Mann, K. Szczepura, A. England; *Manchester/UK (A.England@salford.ac.uk)*

Purpose: To assess the effectiveness of three different clinical disinfectant wipes at removing a contaminant from radiographic imaging cassettes.
Methods and Materials: A 35 by 43 cm CR cassette was coated in a solution simulating bodily fluid and allowed to dry. The fluid was only visible under ultraviolet light and was visually inspected to ensure that it covered the full cassette. Five volunteers were invited to independently clean the cassette using a single wipe with a 10 second time limit. This process was repeated three more times for each of the three wipes trialled, the whole process was repeated to test repeatability. Between each wipe a semitransparent grid with 1 cm2 squares was placed over the cassette, any squares still containing contamination were counted.
Results: Wipe A removed the most contamination with a single wipe (24%). Wipe B performed the worst with only 5% of the contamination removed. After two wipes, wipe A was still superior (45% removal) but wipe C was worst (21%). After four wipes, wipe A was able to removed 95% of the contamination whereas wipes B and C managed only 78% and 56%, respectively. Repeat results between the volunteers were comparable.
Conclusion: None of the three clinical wipes removed all of the contamination. The most superior product (Wipe A) removed 95% of the contamination but only after four wipes. Currently available clinical wipes may not be fit for cleaning radiographic imaging cassettes. A prolonged duration of cleaning is also recommended.

B-1009 10:54

Development in radiological department practices: an analysis of clinical audits in the years 2002 - 2014

K. Miettunen[1], E. Metsälä[2]; [1]*Vantaa/FI*, [2]*Helsinki/FI (kirsi.miettunen@philips.com)*

Purpose: The purpose of this study was to assess how practices in imaging units have changed with regard to clinical audits. The goal was to describe the role of clinical audits in the implementation of good practices. The differences in the distribution of recommendations between basic and demanding radiology units were also compared in this work.
Methods and Materials: The assessment was conducted as a longitudinal quasi-experimental follow-up study covering the years 2002 - 2014. The first round audits were performed in the years 2002 - 2004, the second round in 2009 - 2011, and the third round from 2014 onwards. For this study, 120 auditing reports were analysed according to recommendations by the Finnish National Institute for Health and Welfare advisory committee for clinical audit, subdivided into ten development categories. The method used was the Friedmann two-way analysis of variance (ANOVA).
Results: In the first audit round, most recommendations were given about instructions and quality assurance. In the second and third rounds, the majority of recommendations were given about guidelines, practices and justification. The recommendation nr. 4 by the Finnish committee for clinical audits on 1.5.2008 seems to have had a guiding influence on the audit results.
Conclusion: Based on the results it can be assumed that clinical audit has had an impact on the development of operations in imaging units, and in the implementation of good practices. The demanding radiology units seem to have improved their practices more than the basic imaging units towards the third round.
Author Disclosures:
K. Miettunen: Consultant; Labquality Ltd. Employee; Philips Healthcare.

B-1010 11:02

Survey on patient safety culture: an approach into imaging departments

K.B. Azevedo, E. Bernardino, A.F.C.L. Abrantes, A.M. Ribeiro, C.A. da Silva, R.P.P. Almeida, N.M. Pinto, L.P. Ribeiro; *Faro/PT (kbazevedo@ualg.pt)*

Purpose: The Hospital Survey on Patient Safety Culture (HSOPSC) is used worldwide to study safety culture in hospitals. Our aim was to study the psychometric properties and test the Portuguese version of the HSOPSC to evalute radiographers safety culture in imaging departments.
Methods and Materials: Cross-sectional survey developed in three different Radiology Departments, using the HSOPSC survey comprising a total of 67 radiographers. The survey consists of 42 questions measured on a five-points likert scale grouped into 12 dimensions of patient safety culture. Confirmatory factor analysis (CFA) was used to examine the applicability of the HSOPSC factor structure in imaging department settings, performed psychometric analysis for internal consistency and construct validity. Mann-Whitney and Spearman Ro correlation tests were also performed.

Results: CFA yielded satisfactory results with an internal consistency value of 0.89 in the application of the HSPSC in the imaging departments. "Teamwork" scored the highest positive value (87%) followed by "Perceptions of Safety" (75%). Gender, age-group, shifts and professional experience have shown significant statistical differences on some dimensions of the HSOPSC ($p < 0.05$).
Conclusion: The psychometric properties of the questionnaire need further investigations to be regarded as reliable in imaging departments. Classification of the dimensions should guide future development of safety culture improving action plans. The areas in need of intervention are "Non-punitive Response to Error" and "Hospital Management Support for Patient Safety". Improving safety culture is essential to increase the quality of service in the imaging departments, and thus, it becomes relevant to improve the above aspects.

B-1011 11:10

Complementary alternative medicine (CAM) to reduce MRI anxiety
S.I. Glenn; *Portland, OR/US (konxja@gmail.com)*

Purpose: Globally, anxiety causes prematurely terminated MRI exams delaying medical treatment and incurs financial losses. A pilot study evaluated whether CAM modalities, aromatherapy and breathing techniques are effective for reducing MRI anxiety.
Methods and Materials: Thirty eight self-proclaimed claustrophobic MRI patients with exams of the hip region and above participated. Experimental participants on anxiety medication (n=5), and non-medicated (n=13). Controls on anxiety medication (n=8) and, non-medicated (n=12). Aromatherapy and breathing techniques was performed by experimental groups before entering scanner bore. Control groups were provided standard care and sham aromatherapy. Study design was mixed methods with qualitative data used to inform quantitative. Quantitative data included Likert scales and physiological data and was analysed using exact binomial distribution and regression analysis. Qualitative included, open ended questions and analysed by mapping common themes then quantified.
Results: A 76.5% (p = 0.02&lt 0.05) statically significant reduction in anxiety from pre-scan to post-CAM treatment in experimental groups. Control groups experienced 66.7% (p = 0.12&gt 0.05) anxiety reduction. Experimental anxiety reduction from pre-scan to during scan was 76.5% (p = 0.02&lt 0.05), while control's was (p =0.69&gt 0.05). Qualitative findings were 33% reduction in anxiety for experimental group vs 22% in control. Physiological data show anxiety reduction (p= 0.02&lt 0.05) for both pre-scan to post treatment and pre-scan to during scan.
Conclusion: Aromatherapy and breathing techniques may reduce anxiety during MRIs. Potentially decreasing interruptions in medical treatment, financial loss to imaging centers, provides a low cost skill based intervention for technologist, and supports integrative medicine practices.
Author Disclosures:
S.I. Glenn: Consultant; Selena Glenn. Patent Holder; Selena Glenn.

B-1012 11:18

The radiographers' role in information giving prior to consent for computed tomography scans: a cross-sectional survey
L.C. Hadley, D. O'Leary, T. Watson; *Hertfordshire/UK (d.oleary@herts.ac.uk)*

Purpose: The use of computed tomography (CT) has increased in recent years with concerns regarding radiation risk. Informed consent requires that patients are informed of risks and benefits; however, radiation risk communication occurs infrequently between referrers and patients. This research aimed to explore the role of UK radiographers in giving information to patients prior to CT scans.
Methods and Materials: An on-line cross-sectional survey of UK-based CT radiographers was used to explore practice, attitudes and beliefs with regard to information giving prior to consent for CT. Current departmental practice in consent procedures and information sent to patients prior to scans was also evaluated.
Results: Seventy-eight completed surveys met the inclusion criteria. Radiographers predominantly saw their role as giving procedural information to reassure the patient. Only 2.6% of radiographers always discussed radiation risks, but a further 20.5% sometimes discussed it; risks due to iodinated contrast were discussed more frequently (44.9% always, 28.2% sometimes). Radiographers felt referrers should have a greater role in discussing risks and benefits of CT scans with patients. Although 92% of radiographers felt at least reasonably confident in giving information prior to CT, only 18/43 radiographers could give accurate dose estimates of a CT abdomen/pelvis scan and 22/43 radiographers significantly underestimated the dose.
Conclusion: There is variation in practice for information giving and consent procedure in CT. Radiation information communication is infrequent between radiographers and patients, unless the patient specifically asks about the risks. Relatively few radiographers gave an accurate estimation of radiation doses in CT.

B-1013 11:26

Patient participation in MRI: patient experiences and image quality addressing breath-hold acquisitions
E.M. Funk, A. Anderzen-Carlsson, P. Thunberg; *Örebro/SE (eva.funk@oru.se)*

Purpose: To investigate two different breath-hold techniques, in terms of patient experience and image quality, and describe patients' experiences of magnetic resonance imaging.
Methods and Materials: Thirty patients referred for an MRI of the liver conducted two separate breath-hold acquisitions in a randomised order, radiographer-directed and patient-initiated. Semi-structured interviews were held and analysed, and images were reviewed according to image quality.
Results: The patients' general experiences of the MRI were that they felt a loss of control, and almost half of the patients seemed to prefer the self-initiated breath-hold. About 20 % of the patients preferred to hand over the responsibility to the radiographer, and for some the technique did not matter. The patients empathized in general the importance of achieving the best image quality. There were no significant differences identified between the two breath-hold techniques, in regards to image quality.
Conclusion: The results show that self-initiated breath-hold acquisitions can be seen as a new alternative worth considering in clinical MRI since it is appreciated by the patients and give similar image quality compared to conventional breath-hold acquisitions. It also offers a possibility to achieve some control over the situation.

B-1014 11:34

Evaluation of magnetic resonance acoustic noise in 1.5 and 3 Tesla scanners
V.M. Silva, I. Ramos, J. Moreira, M. Marques; *Porto/PT (vitorsoft@gmail.com)*

Purpose: Acoustic noise is one of the major hazards from time-varying gradient fields (TVGF) in magnetic resonance imaging (MRI). A variety of types of acoustic noise is produced during a MRI. Lorenz forces are produced with the rapid switching of currents within static magnetic field (SMF) deforming and vibrating gradient coils. TVGF will impact among their mountings, causing acoustic noise. It creates a huge problem for both patients and MRI staff. Depending on noise levels, physical auditory damage and psychological distress can occur. Noise levels are imposed by Directive no. 2003/10/EC of European Parliament. This study aimed to evaluate equivalent continuous sound level (Lex, 8h) and peak sound pressure level (Lc peak) of different sequences used in brain MRI in two equipments with different SMF (1.5 T and 3 T).
Methods and Materials: Ten types of sequences were tested in each equipment with a sonometer attached to a compatible MRI cable. It was used ISO 9612:2009 for determination of noise exposure (engineering method).
Results: In 1.5 T equipment, Lex 8h ranged from 58.6 to 78.7 dB (A) and Lc peak ranged from 98.63 to 112.87 dB (C). In 3 T equipment, Lex 8h ranged from 47.4 to 63.8 dB (A) and Lc peak ranged from 89.18 to 99.06 dB (C).
Conclusion: Lex 8h and Lc peak values are higher in 1.5 T equipment. Lex 8h are higher in time of flight (TOF) sequences, while Lc peak values are higher in echo planar imaging (EPI) sequences. None of these values exceeded the limits imposed by EC Directive.

B-1015 11:42

Patient perceptions of radiographer communication skills
J. Vieira, L.P. Ribeiro, R.P.P. Almeida, A.F.C.L. Abrantes; *Faro/PT (lpribeiro@ualg.pt)*

Purpose: The improvement of results in healthcare through the transmission of information to the patient within a relation of empathy and trust is already a verified hypothesis. Healthcare professionals should base themselves on interpersonal competences throughout their daily work routine, to promote quality in diagnosis, patient safety and technical excellence. The aim of this study was the exploration of patient's perceptions regarding the performance of the Radiographer in terms of interpersonal communication skills.
Methods and Materials: The instrument used was the questionnaire "Communication Assessment Tool" (Makoul et al. 2007) adapted to the professional reality of the Radiographer. The sample was composed by 300 patients, aged between 18- and 85-year old, from a public hospital.
Results: The overall mean percentage of items from which radiographers was rated as excellent was 45%. Highest ratings were for talking in terms that patients could understand (60.7% excellent) and treating patients respectfully (60% excellent). Lowest ratings were given to encouraging patients to ask questions (16.3% excellent) and showing interest in their ideas about their health (27% excellent). Significant differences were found in the overall percentage of items based on age, gender and radiologic modality.
Conclusion: There is a need to improve the radiographer communication skills in the radiology department.

B-1016 11:50

First year radiography students' perceptions of professionalism

T. Kukkes[1], V. Challen[2], Z. Läänelaid[1]; [1]*Tartu/EE*, [2]*Lancaster/UK*
(tiinakukkes@nooruse.ee)

Purpose: To explore perceptions of professionalism amongst radiography students.
Methods and Materials: Data for this qualitative research study were collected using the focus group interview. The focus group of first year radiography students comprised 7 participants who had completed their first semester of undergraduate studies but had no clinical placement experience regarding radiography. The interview lasted 70 minutes. The recorded interview was transcribed and coded. Thematic analysis was used to analyse the collected data.
Results: Four main themes were identified on the basis of the data analysis: 1) characteristic features of professionalism, 2) factors influencing the development of professionalism, 3) common manifestations of unprofessional conduct, and 4) developmental needs for the achievement of professionalism. All the main themes included a number of sub-themes, e.g. the factors influencing the development of professionalism involved four groups of factors (theoretical studies, practical work experience, clinical placement environment and personal characteristics) that all had their impact on professionalism. An influencing factor may have a positive effect or a negative effect on the development of professionalism, depending on the nature of the particular factor. To achieve professionalism the respondents considered necessary to develop among other things their specific technical skills, and communication skills, especially with children and the elderly.
Conclusion: Awareness of student perceptions regarding professionalism would enable the educators, clinical supervisors and programme leaders assure the content and organisation of theoretical studies and clinical placement in the ways that facilitate the impact of positive factors and minimise the impact of negative ones.

10:30 - 12:00 **Room M 1**

Head and Neck

SS 1408

Thyroid nodules

Moderators:
K.S.S. Bhatia; Shatin/HK
N.N.

B-1017 10:30

Sonographic assessment of thyroid nodules: a comparison of current guidelines

P. Navin, A.M. Egan, B. Hutchinson, D. Bergin, M. Bell, J. Bruzzi; *Galway/IE*
(patrick.navin@hse.ie)

Purpose: There is disagreement between guidelines regarding which nodule characteristics indicate the need for fine needle aspiration (FNA). We aim to outline the sonographic characteristics on ultrasonography, which indicate the malignant potential of a nodule and to compare four guidelines independently.
Methods and Materials: This was a retrospective study of thyroid biopsies performed at our institution over an 18 month period. We assessed odds ratio (OR) and area under receiver operator characteristic curve (Az) for each songraphic characteristic. We compared each guideline's ability to predict malignant or benign disease in our cohort. Sensitivity, specificity and Az were assessed.
Results: FNA was completed on 160 nodules from January 2013 to June 2014. Solid appearance (OR = 4.18, CI = 1.33 - 13.18) and presence of suspicious lymph nodes (OR = 23.29, CI = 2.29 - 236.76) are associated with increased odds for malignancy. The AACE/EMA/ETA guideline offers the best diagnostic accuracy with an Az of 0.666 (Sensitivity 85%, Specificity 49%). The BTA guideline possesses a high sensitivity (100%) with low specificity (21%) (Az 0.609). This trade-off was also seen in the ATA (Az 0.519, Sens 95%, Spec 7%) and SRU (Az 0.515, Sens 85%, Spec 18%) guidelines.
Conclusion: We demonstrate that the presence of lymph nodes and solid nature of thyroid nodules are significant risk factors for malignancy. The AACE/AME/ETA guidelines demonstrate superior accuracy compared to other guidelines in optimising detection of thyroid malignancy while minimising unnecessary FNA.

B-1018 10:38

The assessment of thyroid imaging reporting and data system (TIRADS) in malignancy risk stratification

P. Priedītis, M. Tirāne, K. Stepanovs, M. Radziņa, M. Rauda, I. Štrumfa, M. Sperga; *Riga/LV (mr679@inbox.lv)*

Purpose: To evaluate TIRADS classification reliability to predict malignancy risk of thyroid nodules.
Methods and Materials: This was prospective descriptive and analytic research carried out at three medical institutions from November 2014 to October 2015. 768 thyroid nodules were categorised according to TIRADS and underwent US-guided fine-needle biopsy. Six ultrasonographic features were evaluated: marked hypoechogenity, microcalcification, lobulated or irregular margins, "taller-then-wider" sign, lymphadenopathy and elastography. Cytological results were interpreted according to the Bethesda system. Histological results were available for 67 patients.
Results: Biopsy results were informative in 79.3%. 511 (66.5%) cytology results out of 768 thyroid nodules were benign and 37 (4.8%) were malignant. Mean age for both groups was 55 (range 8-87) years. The dominant category was TIRADS 3 - 57.8%. The risk of malignancy was increased gradually with TIRADS stage - for TIRADS 2 it was 0%, TIRADS 3 - 0.6%, TIRADS 4 A - 5.3%, TIRADS 4B - 42%, TIRADS 5 - 83% ($p < 0.0001$). Elastography was positive in two cases. Other five evaluated US features had high total specificity, but lower sensitivity, 90 - 100% and 20-75%, respectively. All features had high negative predictive value - 94% - 99%. Malignancy odds ratio within evaluated features shifted from 6.7 for microcalcifications to 14.5 for "taller-than-wider" sign.
Conclusion: Majority of thyroid nodules TIRADS 3 are benign and TIRADS 5 have a high risk of malignancy. TIRADS classification is reliable in predicting thyroid malignancy. TIRADS application may lead to decrease of the amount of unnecessary fine-needle aspiration biopsy.

B-1019 10:46

Malignancy risk stratification of multinodular Goitre: a retrospective review of ultrasound features and their impact on histopathology and cancer risk

B.S. Kelly; *Dublin/IE (brendanskelly@me.com)*

Purpose: To analyse and stratify the risk of malignancy seen in Multinodular Goitre (MNG) utilizing ultrasound features and histopathology results from Fine Needle Aspiration Biopsy (FNAB).
Methods and Materials: Histopathological FNAB records from 2008-2012 were cross-referenced with Radiology RIS/PACS system. 567 biopsies were undertaken in a 5-year period, 397 had a pre-biopsy ultrasound. 289 of these were MNG and were included for analysis. MNG was defined as ≥3 nodules and "abnormal cytology" as Thy 5, 4 or 3. Binary logistic regression was applied to determine if there was any association between these features and cytology results. Odds Ratios with 95% CI were also calculated.
Results: Of our sample 9.3% had abnormal cytology and 4.8% were cancerous. In the presence of MNG, heterogeneous echogenicity within the nodules, cystic degeneration and microcalcification were all independently associated with abnormal cytology. Risk of thyroid cancer significantly increased by having 1 and > 1 risk factor ($p < 0.001$). Using our model, having no suspicious features in the presence of a MNG conferred an average risk of 0.0339 (95%CI 0.02831-0.04087) of abnormal cytology on FNAB. This represents an estimate ARR of 6% and a RR of 0.37.
Conclusion: Ultrasound features can be used to estimate risk of abnormal cytology in MNG. Abnormal cytology is unusual in the presence of MNG and in the absence of suspicious radiological findings follow-up with USS rather than FNAB may be appropriate in patients with a low clinical suspicion for malignancy.

B-1020 10:54

Relationship between elasticity imaging and ultrasonography in the assessment of the thyroid nodule

F.J. Campoy-Balbontín, M.C. Jurado-Gómez, J.C. Pérez-Tejada, C. Almeida-Gonzalez, R. Aznar-Méndez; *Sevilla/ES*
(fcampoy2000@gmail.com)

Purpose: To study the correlation between Ultrasound findings (US) including Doppler color, with Elasticity Imaging (EI) in the thyroid nodule.
Methods and Materials: This prospective study included 399 patients (mean age, 51.9 years; range 13-83 years), 294 women (86.7%) and 45 men (13.3%). In 426 nodule (N) US, color doppler, EI and fine needle acquisition (FNA) were performed. Cytological results were classified according to the Bethesda System. No-apt sample and atypia or follicular proliferation of uncertain origin, were excluded (60N). 339 N in 335 patients were studied. 43 N were surgically removed. EI was classified according to Asteria Patterns, but N were grouped by convenience in soft (I+II) and hard N (III+IV) to play the statistical analysis. Correlation between the US features and EI is made by $\chi 2$ test, the non-

parametric Wilcoxon Mann-Witney U test for categorical variables and Hodges-Lehman test for continuous variables (statistical significance < 0.05).
Results: Statistical correlation ($p < 0.05$) was found between hard N and the US features Taller than wide (27/29.7%; OR:3.186), heterogenic texture (38/41.8%; OR:1.823), very hypoechoic (8/8.8%; OR: 11.855), hypoechoic (29/31.9%; OR:1.763), infiltrative margin (12/13.2%; OR:7.382), and irregular border (10/11%; OR:10.041); and also between hard N and pathology of papillary carcinoma (OR:6.171). Correlation ($p < 0.05$) was also found between soft N and mixed nodule, isoechoic and spongiform appearance.
Conclusion: Benign US findings are more often found in soft nodules. Suspicious findings are more often depicted in hard nodules. There could be an association between papillary carcinoma and hard EI.

B-1021 11:02

Ultrasound features of conventional papillary thyroid carcinoma and follicular variant papillary thyroid carcinoma
N.M. Hughes, J. Barry, L. Feeley, P. Sheahan; *Cork/IE*
(Nicolahughes@rcsi.ie)

Purpose: Follicular variant papillary thyroid carcinoma (FVPTC) may pose a diagnostic challenge due to higher likelihood of showing lower risk cytology compared to conventional papillary thyroid carcinoma (PTC). Recent British Thyroid Association (BTA) guidelines have recommended the use of sonographic features to guide decisions to biopsy thyroid nodules. The purpose of this study was to evaluate the sonographic features of PTC and FVPTC.
Methods and Materials: Preoperative ultrasounds of 56 patients with conventional PTC (35) and FVPTC (21) were retrospectively reviewed. The reviewing radiologist was blinded to histological diagnosis. Sonographic features evaluated included size, shape, echotexture, presence of a halo, margins, micro- and macro- calcifications and capsular penetration. All nodules were given a U-grade using the BTA classification system.
Results: FVPTC had a significantly lower incidence of any calcifications (3/21 versus 20/35, p=0.002) and microcalcifications (2/21versus 17/35, p=0.003) than conventional PTC. 19/35 PTC nodules were hypoechoic versus 6/21 FVPTC nodules (p=0.096). 9/35 PTC nodules had taller>wide shape versus only 2/21 FVPTC (p=0. 18). 10/21 nodules with FVPTC had a halo compared with 8/35 with conventional PTC (p=0.08). FVPTC was significantly less likely to be classified sonographically as malignant (U5) (4/21 versus 21/35, p=0.005) or suspicious/malignant (U4/5) (9/21 versus 26/35, p=0.02) than conventional PTC. 4/21 (19%) of FVPTC were classified sonographically as benign (U2).
Conclusion: FVPTC nodules are less likely to show sonographic features of malignancy than conventional PTC. Reliance solely on sonographic features for thyroid nodule evaluation may not be sufficient to exclude FVPTC.

B-1022 11:10

Contrast enhanced ultrasound in diagnosis of solitary thyroid nodules, preliminary study on papillary cancer
P. Prieditis, M. Radzina, I. Strumfa, Z. Narbuts, A. Ozolins, A. Vanags; *Riga/LV*
(mradzina@gmail.com)

Purpose: To find out the ability of contrast enhanced ultrasound to differentiate malignant from benign thyroid nodules.
Methods and Materials: Thirty five patients with solitary thyroid nodules (17 malignant, 18 benign) were included. All patients underwent contrast enhanced ultrasound examination and nodule morphologic verification - histological for malignant and cytological for benign nodules. Results of contrast enhanced ultrasound were evaluated qualitatively and quantitatively. Nodules were characterised by enhancement patterns and wash-out in comparison to surrounding thyroid tissue and time intensity curve analysis.
Results: Morphological analysis of surgery material showed nodular malignancy in 17 patients: 12 cases were confirmed as papillary thyroid carcinoma, 4 cases follicular variant of papillary carcinoma, 1 case papillary microcarcinoma. Data of malignant nodules revealed isovascular (7/17) and hypo-vascular (8/17), heterogeneous (14/17) enhancement, with isoechoic wash-out (11/17) in comparison to the surrounding tissue and characterised by slow wash-out curve (11/17). Benign nodules were characterised as hyperechoic (11/18), heterogeneous during enhancement (11/18) compared to the surrounding tissue, with rim-like enhancement sign (11/18), relatively rapid wash-out (14/18) and hypervascular (10/18) in the microvascular imaging application, as well as characterised with biphasic wash-out curve (9/18). Quantitative analysis of time intensity curves showed longer half-time wash-out in malignant nodules than benign nodules, respectively 23.4 and 18.5 sec (p=0.048).
Conclusion: The preliminary results of the study shows that CEUS may be a valuable supplementary method to fine-needle aspiration biopsy. However, as a result of variability found in previous studies further studies and standardization of methods are required.

B-1023 11:18

Papillary thyroid cancer: optimal scan delay for contrast-enhanced CT in detecting lateral lymph node metastasis by quantitative assessment of enhancement
D. Park, J. Park, J. Lee, Y. Choi, J. Baek; *Seoul/KR*
(darlene8573@gmail.com)

Purpose: To determine the value of 25 seconds (s) delay contrast-enhanced CT (CECT) compared to 35 or 70 s in patients with papillary thyroid cancer for detecting lateral nodal metastasis by quantitative assessment of enhancement.
Methods and Materials: This retrospective study was approved by an institutional review board. One hundred thirty one PTC patients (327 lateral lymph nodes, 177 metastatic and 150 benign) underwent one of three protocols: 25s delay (75 mL iodine followed by 50 mL saline flushing),35s delay and 70s delay (100 mL iodine). CT numbers of enhancement for an entire LN, adjacent vessels and muscles were measured. Enhancement value and normalized enhancement value were compared between metastatic and benign LNs. An area under the receiver-operating characteristic curve (AUC) analysis and leave-one-out cross validation were performed and compared among 3 protocols.
Results: Metastatic LNs showed maximized difference at 25 s in all parameters compared to benign LNs (P <.001). A scan delay at 25 s showed superior diagnostic accuracy for detecting lateral LN metastasis (AUC, 0.90, CI; 0.82, 0.95) compared to 35 (P <.009) or 70 s (P <.004) using enhancement value, with sensitivity of 83.64% and specificity of 97.87%. The cross-validated AUC and accuracy of at 25s was 0.90 and 90%, respectively.
Conclusion: A scan delay of 25seconds in CECT in PTC patients can improve the ability to detect lateral LN metastasis with superior diagnostic performance and better contrast to benign LNs compared to that of 35 or 70 seconds, with benefit of reduced use of contrast media.

B-1024 11:26

Which nodules should have repeat biopsies: the role of thyroid imaging and reporting system (TI-RADS) in cases of nodiagnostic cytology
M.A. Öztek, K. Çeken, G.A. Ocak, A. Dablan, E. Durmaz, A. Kabaalioğlu, E.I. Gürer, A. Apaydın, T. Sindel; *Antalya/TR (Alpoztek@gmail.com)*

Purpose: FNAB of thyroid nodules yield non-diagnostic results in 3-22% of cases which are usually repeated. In this study, we aim to determine whether the TI-RADS classification may help in determining which nodules should be re-biopsied and which might be followed up.
Methods and Materials: Images and clips of nodules of 700 patients who underwent FNAB between 2013-July 2015 and those of 122 patients who had nondiagnostic results and were re-biopsied were retrospectively evaluated for hypoechogenicity, marked hypoechogenicity, irregular borders, microcalcifications and taller-than-wide shape. Depending on the number of features present, they were grouped into TI-RADS categories which was correlated with cytology results.
Results: Number of cases in each category, with the number and percentage of malignancies in parenthesis (all patients and re-biopsies of nondiagnostic results respectively) were as follows: Category 3:237 cases (0 malignant) and 33 re-biopsies (0), Category 4a:201 (0) and 34 (0), Category 4b:180 (9;5%) and 39 (2;5.1%); Category 4c:72 (18;25%) and 15 (6;40%); Category 5:10 (6;60%) and 1 (0). Malignancy rates were similar between two groups ($p < 0.05$). When all patients were considered, there was significant correlation between the number of suspicious features and the risk of malignancy (r=0.943, p=0.005).
Conclusion: TI-RADS category correlates well with the risk of malignancy. Category 3 and 4a nodules can be followed-up in case of nondiagnostic results, since the risk of malignancy is below the 3% risk of benign cytology, for which follow-up is recommended. Category 4c and 5 lesions have substantial risk, and in case of benign cytology, repeat FNAB may be warranted to exclude false negative results.

B-1025 11:34

The role of core needle biopsy as first-line in diagnosis for initially detected thyroid nodules: core needle biopsy could achieve highly diagnostic yield
H. Kim, Y. Kim, J. Seo, J. Lee, H. Han, K. Kim, S. Park; *Daejeon/KR*
(hellokim1242@hanmail.net)

Purpose: The usefulness of CNB in assessing thyroid nodules after inconclusive FNA results have been reported. However, 1st-line attempt of CNB for thyroid nodules has yet to be studied in large population. We, therefore, evaluated CNB yields on a large-scale basis to investigate its full potential in the preliminary diagnosis of thyroid nodules.
Methods and Materials: Between March 2005 and December 2013, 2448 thyroid nodules from 2120 patients who underwent CNB were evaluated. Of these, 72 nodules in 63 patients were excluded on the basis of prior FNA. The inconclusive result was referred to non-diagnostic, AUS or FLUS. The

diagnostic accuracy, sensitivity, specificity, PPV and negative predictive value of CNB were evaluated. the unnecessary surgery rate was also evaluated.
Results: Final diagnoses were acquired in 1200 of 2376 nodules (50.5%) and the others did not have adequate follow-up or surgery. At CNB as 1st-line method, the inconclusive result rate was 11.9% (283/2376), and the conclusive result rate was 88.1% (2093/2376). The malignancy detection rate was 19.9% (474/2376). And the unnecessary surgery was performed for only two nodules (2/363, 0.05%). The diagnostic accuracy, sensitivity, specificity, positive predictive value, and negative predictive value of CNB for malignancy were 96.7% (1160/1200), 89.7% (347/387), 100% (813/813), 100% (347/347), and 95.3% (813/853), respectively.
Conclusion: First-line use of CNB improve diagnostic accuracy in thyroid nodules, reducing inconclusive or false-negative results and unnecessary surgeries. Such benefits underscore the promising role of CNB in managing thyroid nodules and optimising related surgical decision-making.

B-1026 11:42

Perfusion analysis in malignant and benign thyroid lesions: analysis of microvascularisation in contrast-enhanced ultrasound (CEUS)
I. Wiesinger, E. Kroiss, C. Stroszczynski, E.M. Jung; *Regensburg/DE (emjung@gmx.de)*

Purpose: The aim of the study was to determine different perfusion patterns in thyroid adenoma and carcinoma in the perfusion analysis of CEUS.
Methods and Materials: CEUS was performed on 171 patients (72 males, 99 females; 18 - 85 years) before thyroidectomy or hemithyroidectomy. A bolus injection of 1-2.4 ml sulfur hexaflouride microbubbles was applied. Cine Loops (10 to 45s) were recorded continuously. Perfusion parameters such as Time to Peak, PEAK, mean Transit Time, RISE TIME and Wash-in and Wash out kinetics, as well as Time-Intensity Curves were analysed using VueBox®.
Results: In most cases carcinoma showed a complete wash-out in the late venous phase was found. Carcinoma (n=34) showed a shorter time to peak in the centre compared to the border and the healthy tissue (9.88 sec vs. 11.55 sec vs. 13.38 sec). PEAK was highest at the tumour margins followed by healthy tissue and the centre (8961.88 vs. 8817.55 vs. 6989.71). In adenoma PEAK was higher in the centre than in the healthy tissue (8.62 vs. 8.26). Mean Transit Time values are higher in the healthy tissue than in carcinoma (64.79 vs. 47.63). Mean Rise Time in carcinoma is lower in the centre (5.08 sec) than at the border (5.73 sec) than in the healthy tissue (5.94 sec).
Conclusion: CEUS with perfusion analysis offers new possibilities for the dynamic evaluation of microvascularisation in thyroid tumours that help to determine a tumour's malignancy or benignancy.

B-1027 11:50

Thyroid ultrasound in patients with chronic hepatitis C treated with interferon alpha
A. Bianek-Bodzak, K. Skrobisz- Balandowska, L. Obolonczyk, K. Sworczak; *Gdansk/PL (abianek@gumed.edu.pl)*

Purpose: The aim of this study was to investigate whether the interferon-alpha therapy increases the risk of developing thyroid dysfunction resulting of thyroid morphology and flow changes.
Methods and Materials: 66 patients had ultrasound examination first performed before the therapy and in 24th and 48th week of the therapy, respectively. The thyroid gland was examined for volume, echogenicity, echotexture, and type of the vascularisation (low, normal, elevated). The mean velocity and flow volume were measured in inferior thyroid artery. All the patients had laboratory tests such as TSH, fT4, fT3, TPO/Tg-Ab and TSHR-Ab. According to laboratory tests, they were classified into three groups: patients without any pathology during interferon-alpha therapy, patients with positive thyroid autoantibodies (de novo) without any hormonal imbalance and patients with overt thyroid dysfunction. The results of all tests in these 3 groups were statistically compared.
Results: Hormonal disturbances were detected in 24.2% (16) of study group; however, 43.9% (29) of patients had positive thyroid autoantibodies (de novo) without hormonal imbalance. There were no statistically important differences between study groups regarding thyroid volume, echotexture and vascularisation type. We found that patients who develop overt thyroid dysfunction in the last ultrasound examination had lower thyroid echogenicity and higher flow volume in the inferior thyroid artery (p= 0.0001 and p= 0.08).
Conclusion: Our study shows that there is a higher probability to develop thyroid dysfunction during IFN-α therapy. We observed in patients with overt thyroid dysfunction the important echogenicity reduction and the elevation of flow volume in thyroid arteries.

10:30 - 12:00 **Room M 2**

Oncologic Imaging

SS 1416

Pelvic and breast cancer

Moderators:
O. Abeyakoon; Cambridge/UK
B. Klumpp; Tübingen/DE

B-1028 10:30

MpMRI of endometrial adenocarcinoma: association of the ADC histographic analysis and MRI tumour volumetry with histological features of biologic aggressiveness
E. Venturini, M. Jannone, A. Palmisano, F. Giganti, A. Esposito, G. Mangili, M. Candiani, A. Del Maschio, F. De Cobelli; *Milan/IT (venturini.elena@hsr.it)*

Purpose: To evaluate the performance of ADC histographic analysis and MRI tumour volumetry in predicting the grade of endometrial adenocarcinoma and other histological features of tumour aggressiveness.
Methods and Materials: All women with endometrial adenocarcinoma enrolled underwent a multiparametric Magnetic Resonance Imaging (mpMRI) on a 1.5 T magnet. The protocol included T2-weighted, T1-weighted, diffusion-weighted sequences (b 0, 500, and 1000 sec/mm2) and perfusion study. The post-processing included tumour volumetry and ADC histographic analysis of the whole tumour volume.
Results: From November 2013 to May 2015 26 women with endometrial adenocarcinoma were enrolled. At final histology 17 type1 and 9 type2 adenocarcinomas were diagnosed (10 G1, 5 G2 and 11 G3). The minimum ADC value was significantly lower in G2-G3 than G1 adenocarcinomas (0.37x10-3 mm2/s and 0.51x10-3 mm2/s; $p < 0.05$). The minimum ADC value was significantly lower in cancer with lymphovascular invasion than in those without it ($p < 0.05$), while the maximum ADC value was higher in tumour with necrosis than in tumours without it (1.5x10-3 mm2/s and 1.11x10-3 mm2/s; $p < 0.05$). There was a significant difference among the maximum ADC values of tumours with different quantity of necrosis ($p < 0.05$). We also found an association of the tumour volume with myometrial infiltration, necrosis and lymphovascular invasion ($p < 0.05$).
Conclusion: A quantitative evaluation of the ADC with histographic analysis of the whole tumour volume may help in better characterise tumour heterogeneity. ADC histographic analysis and MRI tumour volumetry may be useful to non-invasively predict some histological features of tumour aggressiveness, such as the grade, the presence of lymphovascular invasion and of necrosis.

B-1029 10:38

Role of MR imaging in selection of patients with cervical cancer for abdominal radical trachelectomy
Z. Jiang, X. Ju, W. Peng, B. Yu; *Shanghai/CN (179791062@qq.com)*

Purpose: To evaluate the value of MRI in the assessment of tumour extension, and whether it can be used for selecting patients eligible for abdominal radical trachelectomy.
Methods and Materials: We conducted a retrospective review of a prospectively maintained database of patients with cervical malignancies being considered for ART at our institution from 01/2010 to 02/2015. A total of 84 patients were identified and entered into the study group.The MR images of all patients were analysed by two radiologists for tumour presence and the maximum tumour dimension, distance between tumour and internal os, and presence of deep cervical stromal invasion. The preoperative MRI findings were compared with surgical notes and histological examination.
Results: Sensitivity, specificity, positive and negative predictive values for detecting tumour: Radiologist 1: 84.5%, 82.4%, 71.4%, and 89.5%, respectively; Radiologist 2: 88.3%, 89.0%, 81.0%, and 92.5%, respectively. Size correlated between each radiologist and histology (radiologist 1 $r = 0.89$, $p < 0.001$; radiologist 2 $r= 0.91$, $p < 0.001$). For the distance between tumour and the internal os, the intraclass correlation coefficient was 0.78. If 1 cm between tumour and the internal os on MRI assumed as positive margin, the number of false-positives and false-negatives was: Radiologist 1: 7 and 3, Radiologist 2: 4 and 2, respectively. Differences between MRI and histology estimates of deep cervical stromal invasion were not significant.
Conclusion: In early cervical cancers, preoperative MRI has a high level of accuracy in evaluation of morphologic tumour features and can therefore play a major role in selecting candidates for radical trachelectomy.

B-1030 10:46

Pre-operative DWI MRI and PET studies of uterine cervical cancer lesions: added value of combined quantitative and volumetric analysis

P.A. Bonaffini, C. Crivellaro, M. Cuzzocrea, A. Casiraghi, D. Ippolito, C. Talei Franzesi, C. Landoni, S. Sironi; *Monza/IT*

Purpose: To assess the added value of quantitative and volumetric MRI and PET parameters obtained in pre-operative studies of cervical cancer patients.
Methods and Materials: We retrospectively evaluated 29 females (range 28-76 years) with cervical cancer, undergone a standard pelvic 1.5 T MRI (Achieva, Philips), which also included DWI (b:0-1000 mm2/sec) and an 18 F-FDG PET-CT (GE Healthcare). On PET images, SUVmax, SUVmean, metabolic tumour volume (MTV) and total lesion glycolysis (TLG) of cervical lesions were calculated. ADC values were achieved drawing regions of interest on tumour and normal myometrium. DWI tumour volume (DWI-V) was calculated as follows: Σ tumour area*(thickness+gap). All parameters and volumes were correlated with parametrial and lymphovascular invasion, tumour grade, nodes metastases and relapse.
Results: Cervical cancer ADC value was significantly lower (0.85±0.12x10-3 mm²/sec) than normal myometrium (1.15±0.20x10-3 mm²/sec). Grade 2 lesions had significantly lower DWI-V (mean 11.1 cm3;p=0.04), SUVmax (mean 9.2 g/ml;p=0.02), MTV (mean 6.5 ml;p=0.001) and TLG (mean 50.5 g;p=0.005) than grade 3 (mean 34.6 cm3, 13.5 g/ml, 21.6 ml and 164 g, respectively). Presence of node metastases was predicted by DWI-V considering a threshold of 20.8 cm3 (100% SN,68% SP), MTV with a cut-off of 7.9 ml (100% SN,48% SP), TLG 89.8 g (75% SN,64% SP). No other statistically significant differences were achieved, although DWI-V, MTV and TLG tended to be higher in relapsed patients (7; follow-up: mean 43.2 months, range 14.1-66).
Conclusion: MRI and PET volumes, SUVmax and TLG correlated with tumour grade and could predict presence of nodal metastases, furnishing additional pre-operative information potentially useful for prognostic stratification of cervical cancer.

B-1031 10:54

Three-dimensional contrast enhanced ultrasound in treatment prediction for breast cancer: comparison with dynamic contrast-enhanced magnetic resonance imaging and pathology

M. Chen, W. Jia, L. Tang, W.-M. Chai, D.-B. Wang, X.-C. Fei, J.-R. He, W.-P. Wang; *Shanghai/CN (maggiech3138@126.com)*

Purpose: To compare the capability of three-dimensional contrast enhanced ultrasound (3D-CEUS) and dynamic contrast-enhanced magnetic resonance (DCE-MRI) in predicting response to neoadjuvant chemotherapy (NAC) for breast cancer patients with pathology as a proof.
Methods and Materials: The study was approved by the institutional review board and written informed consent was obtained. Before and after NAC, 48 patients with unilateral breast cancer were recruited for 3D-CEUS and DCE-MRI examination. Imaging feature Changes and pathological vascularity response including microvessel density (MVD) and vascular endothelial growth factor (VEGF) were calculated. Pathological complete response (pCR) and major histological response (MHR) were used as references.
Results: 3D-CEUS score, DCE-MRI score, MVD and VEGF significantly decreased ($P < 0.0001$) before and after NAC. The correlation between Δ3D-CEUS and ΔDCE-MRI with pCR ($r = 0.649$, $P < 0.0001$;$r = 0.639$, $P < 0.0001$) and MHR ($r = 0.863$, $P < 0.0001$;$r = 0.836$, $P < 0.0001$) were significant. All scores showed statistical differences among pCR and non- pCR patients with the folder change of 0.1, 0.1, 2.4, 2.3 (P=0.0001, < 0.0001, < 0.0001, < 0.0001).
Conclusion: 3D-CEUS had the potential to predict treatment response to NAC for breast cancer patients.

B-1032 11:02

Method of contour analysis of neoplasms in x-ray mammograms

V. Sevastyanov, E. Romanycheva, Y. Furman; *Yoshkar-Ola/RU (katerina.rrr@bk.ru)*

Purpose: A method to describe neoplasm shapes through analysis of their contour features is proposed that improves the accuracy of differential diagnosis of neoplasms in X-ray mammography.
Methods and Materials: Mammograms were obtained from 42 female patients. Mathematical apparatus of contour analysis was used to analyse shapes of objects on mammograms. Quantitative methods included making mathematical models of neoplasm shapes based on mammography data, and obtaining informative diagnostic features. To quantify the degree of contour straightness, the index of straightness was introduced as a ratio between the overall length of contour sectors constituting a straight line and the total length of the contour.
Results: Analysis of mammograms shows that shapes of benign tumours have smooth contours with elongated straightline segments; malignant lesions have rough boundaries with long narrow edges. From the mathematical point of view, such characteristics indicate that the spectra of benign objects contours concentrate on low frequencies; the spectra of malignant objects at low frequencies demonstrate a significant trough. Extended contours of dense masses demonstrate high values of straightness index (ca 0.4); malignant tumours contours have significantly lower straightness index values (ca 0.08). An algorithm developed for classifying neoplasms according to informative features from contour analysis has proved its high efficiency in practice.
Conclusion: The method of neoplasm contour analysis on mammograms allows high accuracy and rapid differential diagnosis of breast diseases. The method is easy to implement and may allow for future automation of the process.

B-1033 11:10

Can contrast-enhanced ultrasound features of metastatic axillary lymph nodes reflect biological performances of primary breast cancer?

W. Jia, J.-n. Shi, X.-c. Fei, K.-w. Shen, M. Chen; *Shanghai/CN (jiawanru@126.com)*

Purpose: To compare contrast-enhanced ultrasound (CEUS) features of metastatic lymph nodes (LN) among different breast cancer subtypes, and to explore their correlation with biological markers.
Methods and Materials: Seventy-six patients (mean age 52.87±11.42, range 21-80) with histologically proved breast cancer and cytologically confirmed metastatic axillary LNs were enrolled in our study and underwent axillary CEUS. The early (wash-in and peak) and late phase (wash-out) features and quantitative parameters were compared among different subtypes (luminal, human epidermal growth factor receptor 2 (HER2) positive and triple negative (TN)). Their correlation with ER, PR, HER2 and Ki-67 expression were also evaluated.
Results: Enhancement features of metastatic LNs showed no significant difference among breast cancer subtypes ($P > 0.05$). However, time to peak (TP) was statistically longer for TN breast cancer. Further analysis demonstrated enhancement margin was correlated with HER2 expression (P=0.031, r=0.247), while wash-out pattern was significantly different between high and low Ki-67 expression (P=0.028). Simultaneously, wash-out pattern were also correlated with LN diameters.
Conclusion: CEUS features of metastatic LNs did not vary with different breast cancer subtypes, but longer time to peak was needed for TN cancer. Some of the CEUS characteristics may reflect biological performances of primary cancer to some extent.

B-1034 11:18

Urinary bladder mass: histopathological and cell type prediction by apparent diffusion coefficient

H.M.K. Imam, D.A. Hameed, G.S. Seifeldein, E.M. Moussa, R.S. Al Johi; *Assuit/EG (hishamimam62@hotmail.com)*

Purpose: assess the ability of the apparent diffusion coefficient (ADC) value to discriminate cell type of urinary bladder (UB) masses and predict the histological grade.
Methods and Materials: Hundred and tow patients underwent magnetic resonance imaging using 1.5 T machine include T2 weighted imaging and DWI using b value of 0 ,150,500 and 1000s/mm2. The ADC values of UB masses was measured. Final diagnosis was confirmed by histological examination of surgical specimens from all patients. To compare ADCs between three histologic grades and different cell type ANOVA with post Hoc LSD was used.The diagnostic performance was evaluated by receiver operating characteristic (ROC) curve.
Results: The mean ADC of transitional cell carcinoma (TCC) was (0.76 ± 0.21X 10-3 mm2/S), squamous cell carcinoma (SCC) was (0.83±0.14 X 10-3 mm2/S and adenocarcinoma was (0.9±0.12 X 10-3 mm2/S).The mean ADC of benign tumours was (1.2 ±0.15 X 10-3 mm2/S). A statistically insignificant relation was found between different cell types according to ADC value (P=0.156) but it was statistically significant between malignant tumours in general and benign tumours (P=0.000). A significant difference in ADC values were found between G1 and G3 (P0.000),G2and G3 (P= 0.045) but it was statistically insignificant between G1 and G2 (p=0.066). The cut-off value for differentiating malignant and benign bladder wall pathologies according to ADC values was found to be ≤ 1X10-3 mm2/s; 94.5% sensitivity and 87.5% specificity.
Conclusion: The ADC value provide prediction of the histologic grade but it has no role in discrimination between different cell type of UB cancer.
Author Disclosures:
G.S. Seifeldein: Author; Prof.Dr. Hisham M.K. Imam, Assist. Prof.Dr.Ehab M M Mousar, Assist.Prof.Dr. Diaa A Hameed, Dr.Rima S Al johi. Research/Grant Support; Grant office, Faculty of Medicine, Assiut university.

B-1035 11:26

USPIO-enhanced MRI as a potential predictor of tumour aggressiveness

P. Seyfer[1], C. Hengl[1], A.H. Mahnken[1], J.T. Heverhagen[2]; [1]*Marburg/DE*, [2]*Berne/CH (seyfer@med.uni-marburg.de)*

Purpose: tumour-associated macrophages (TAMs) are found in carcinomas and promote tumour growth. Previous studies have already confirmed that accumulation of ultrasmall superparamagnetic iron oxide particles (USPIO)-tagged monocytes in inflamed areas allows the differentiation between inflammation and carcinoma. The aim of the present study was to investigate if USPIO-enhanced MRI enables the detection of TAMs and can therefore be useful for predicting tumour aggressiveness.
Methods and Materials: HeLa-cells and bacteria were implanted into the hind thighs of athymic mice leading to tumours and intramuscular abscesses, respectively. Fourteen days after tumour implantation, MR imaging was performed pre contrast and serially for 24 hours after injecting USPIO. Harvested inflammation and carcinoma were stained with Hematoxylin-eosin and Prussian blue and evaluated using a light microscope. Immunostaining using monoclonal antibodies directed against-MAC-3 was used to evaluate macrophage content in tumours. Radiologic-histologic correlations were performed.
Results: 24h after the USPIO-injection, no remarkable changes were observed in most HeLa-carcinomas, whereas a mean reduction of signal-to-noise ratio (SNR) was noticed in inflammation and in some aggressively growing carcinomas. On histopathologic examination, tumours demonstrating a signal drop in T2*-MRI were found to include iron-containing macrophages indicating that the reduction in SNR was caused by USPIO-tagged monocytes. This was confirmed by Prussian blue and by MAC-3-Staining.
Conclusion: USPIO-enhanced MRI is able to differentiate a malignant human cancer from an inflammation and enables the detection of aggressively growing carcinomas, based on iron-positive macrophages. The results of our study confirm the value of USPIO-enhanced MRI as a potential predictor of tumour aggressiveness.

B-1036 11:34

Evaluation of 18 F-FDG PET/MRI, 18 F-FDG PET/CT, MRI, and CT in whole-body staging of recurrent breast cancer: initial results

L.M. Sawicki[1], J. Grueneisen[2], B. Schaarschmidt[1], C. Buchbender[1], P. Heusch[1], V. Ruhlmann[2], L. Umutlu[2], G. Antoch[1], S. Kinner[2]; [1]*Düsseldorf/DE*, [2]*Essen/DE*

Purpose: To compare PET/MRI with PET/CT, MRI and CT in whole-body staging of recurrent breast cancer.
Methods and Materials: Twenty-one patients with suspected breast cancer recurrence underwent PET/MRI immediately after PET/CT in a single-injection protocol (mean activity: 257±44 MBq 18 F-FDG). Each PET/MRI, PET/CT, as well as the CT component of PET/CT (CTPET/CT) and MR images of PET/MRI (MRIPET/MRI) were separately evaluated regarding lesion count, localization, and dignity (benign/malignant). The reference standard was based on histology, clinical information and all available imaging. SUVmax was correlated using Pearson's correlation coefficient and a Wilcoxon test assessed differences in SUVmax between PET/MRI and PET/CT in corresponding PET-positive lesions. Inter-observer reliability of dignity ratings was evaluated using Cohen's kappa.
Results: Seventeen patients had breast cancer recurrence. PET/MRI, PET/CT, and MRIPET/MRI correctly identified all 17 patients, whereas CTPET/CT correctly identified 15 patients. A total of 134 lesions was detected (116 malignant; 18 benign), of which PET/MRI, PET/CT, MRIPET/MRI, and CTPET/CT detected 100%, 97%, 96%, and 75%, respectively. PET/MRI yielded the highest proportion of correctly identified malignant lesions (100%) compared with PET/CT (95.7%), MRIPET/MRI (87.9%), and CTPET/CT (54.3%). SUVmax was strongly correlated (r=0.72) but measured higher on PET/MRI than on PET/CT (5.6±2.8 vs. 4.9±1.8; p=0.001). Inter-observer agreement on lesion dignity was substantial with PET/MRI (k=0.65) and PET/CT (k=0.65), moderate with MRIPET/MRI (k=0.56), and fair with CTPET/CT (k=0.31).
Conclusion: PET/MRI offered the highest diagnostic performance compared with PET/CT, MRI and CT. Thus, PET/MRI should be regarded as a valuable alternative in whole-body staging of recurrent breast cancer.

B-1037 11:42

Whole body diffusion-weighted MRI for tumour characterisation, staging and prediction of complete resection in ovarian carcinoma: a comparison with CT

K.L.M. Michielsen[1], I. Vergote[1], R. Vanslembrouck[1], E. Mussen[1], F. Amant[1], K. Leunen[1], F. De Keyzer[1], G. Souverijns[2], V. Vandecaveye[1]; [1]*Leuven/BE*, [2]*Hasselt/BE (katrijn.michielsen@med.kuleuven.be)*

Purpose: To prospectively assess whole body diffusion-weighted MRI (WB-DWI/MRI) for tumour characterisation, staging and prediction of complete (R0)-resection compared with computed tomography (CT) in patients with suspected ovarian carcinoma.
Methods and Materials: One-hundred-sixty-six patients suspected for ovarian carcinoma underwent 3-Tesla WB-DWI/MRI including DWI-sequences (b=0-1000 s/mm²), T2-weighted and contrast-enhanced T1-weighted sequences in addition to CT. WB-DWI/MRI and CT were independently and blindly assessed and correlated with pathological findings at surgery as reference standard. Superiority was assessed using two-tailed McNemar tests for following parameters: characterisation of the malignant nature and primary origin of the ovarian mass, assessment of disease extent according to FIGO stage and prediction of R0-resection according to predefined operability criteria. Interobserver agreement for WB-DWI/MRI and CT was determined using Cohen's kappa statistics.
Results: For characterisation of malignancy, WB-DWI/MRI showed significantly higher accuracy compared with CT (93 versus 82%, p=0.001). WB-DWI/MRI correctly depicted a non-ovarian malignant mass in 24/32 (75%) of cases compared to 6/32 (19%) for CT ($p < 0.001$). WB-DWI/MRI assigned more ovarian carcinoma patients to the correct FIGO stage (71/94, 76%) compared with CT (39/94, 41%). For prediction of R0-resection, WB-DWI/MRI showed significantly higher sensitivity (95 versus 80%), specificity (92 versus 74%) and accuracy (94 versus 77%) compared with CT (p=0.039, p=0.012 and $p < 0.001$, respectively). Interobserver agreement was moderate to almost perfect (κ=0.53-1.00) for WB-DWI/MRI versus slight to moderate (κ=0.04-0.52) for CT.
Conclusion: The superiority of WB-DWI/MRI to CT for lesion characterisation, staging and prediction of R0-resection justifies its development for pre-operative assessment of ovarian cancer patients.
Author Disclosures:
F. Amant: Research/Grant Support; senior researcher for the Research Fund Flanders (F.W.O).

B-1038 11:50

Whole-body diffusion-weighted magnetic resonance imaging for staging of women with cancer during pregnancy: a pilot study

R. Dresen, S. Han, K. Michielsen, F. De Keyzer, F. Amant, V. Vandecaveye; *Leuven/BE (elleke.dresen@uzleuven.be)*

Purpose: To evaluate the feasibility of radiation free whole-body diffusion weighted magnetic resonance imaging (WB-DWI) for staging of women with cancer during pregnancy.
Methods and Materials: Twenty patients diagnosed with cancer during pregnancy underwent WB-DWI additional to conventional imaging in this prospective single centre study. Reproducibility of WB-DWI between 2 readers was evaluated using Cohen's κ statistics and accuracy was compared to conventional imaging for assessing primary tumour site, nodal- and distant metastases. Histopathology after surgery or biopsy served as reference standard.
Results: Ten patients had breast cancer, 3 lymphoma, 2 cervical cancer, 1 ovarian borderline tumour, 2 colon cancer, 1 lung cancer and 1 conjunctival cancer. The WB-DWI readers showed very good agreement for lesion detection, κ = 0.94. Conventional imaging consisted of up to 7 different imaging techniques per patient, with or without the use of radiation. With WB-DWI, reader 1 detected 38 of 41 malignant lesions, reader 2 thirty-nine lesions and conventional imaging 27. WB-DWI showed overall sensitivity up to 95% (95% CI: 82-99) and specificity up to 99% (95% CI: 97-99) for both readers compared to 66% sensitivity (95% CI: 51-81) with 100% (95% CI: 97-100) specificity for conventional imaging. In 2 and 3 patients respectively WB-DWI detected distant metastases and nodal metastases that were not found with conventional imaging.
Conclusion: WB-DWI is feasible for single-step, non-invasive, radiation free imaging based cancer staging during pregnancy showing additional value to conventional imaging procedures for detecting nodal and distant metastases.

10:30 - 12:00 **Room M 3**

Vascular

SS 1415

Pulmonary vasculature: new and improved

Moderators:
N.N.
N.N.

B-1039 10:30

Intermittent contrast injection method for triple rule out computed tomography

T. Fujikawa, K. Ishida, H. Nobusawa, S. Yamamoto, S. Sasaguri; *Kawasaki/JP (fujikawa.takuya@gmail.com)*

Purpose: Although conventional triple rule out (TRO) scans provide simultaneous evaluation of pulmonary embolism, coronary artery disease, aortic disease, they are accompanied with high radiation and contrast doses. This study sought to evaluate the efficacy of our intermittent contrast injection method (ICI) for TRO comparing with conventional contrast injection method (CCI).
Methods and Materials: In ICI method, we injected contrasts intermittently (10 seconds interval time). We thought ICI method would lead to reduce radiation and contrast doses because the interval time might eliminate the limitation of the CT equipment and the unnecessary injection in CCI. We examined 80 consecutive patients who needed to undergo TRO for aortic operation, prospectively. ICI and CCI were performed alternately. All patients were measured their CT value at pulmonary artery, coronary artery, ascending aorta, celiac artery.
Results: In both group, there are no difference in patients' characteristics. ICI group had less mean radiation (691.3 mGy cm vs 971.2 mGy cm $p < 0.05$) and mean contrast doses (504.0 mgI/kg vs 554.2 mgI/kg, $p < 0.05$) than CCI group. CT values were almost similar in both groups at each level (ICI vs CCI; 253.4±71.7 HU vs 294.4±72.8 HU at left coronary artery, 395.8±106.4 HU vs 346.7±81.2 HU at ascending aorta, 392.6±96.4 HU vs 357.6±82.3 HU at celiac artery), and higher at pulmonary artery level (467.5+84.9 HU vs 328.4+90.7 HU).
Conclusion: In spite of less radiation and contrast doses, ICI had equivalent results with CCI. At pulmonary artery level, ICI had a rather high CT value than CCI. ICI can be a new standard contrast injection method.

B-1040 10:38

Individually tailored contrast enhancement in CT pulmonary angiography

B.M.F. Hendriks, M. Kok, C. Mihl, J.E. Wildberger, M. Das; *Maastricht/NL (babs.hendriks@mumc.nl)*

Purpose: The purpose was to evaluate individually shaped contrast media (CM) delivery in CT pulmonary angiography (CTPA) for suspected pulmonary embolism.
Methods and Materials: 100 consecutive emergency patients with clinical suspicion for pulmonary embolism were evaluated. High-pitch CTPA was performed on a 2nd generation dual-source CT using the following parameters: 100 kV, 200-250 mAsref, rot.time 0.28s, 128x0.6 mm col., image reconstruction 1.0/0.8 mm (B30f). Group 1 (n=50) received a fixed CM bolus (300 mgI/ml, volume=90 ml, flow rate=6 ml/s); group 2 (n=50) received a body weight adapted CM bolus determined by dedicated contrast injection software. For analysis, groups were further subdivided into low (40-75 kg) and high (76-117 kg) weight. Technical image quality was graded using a four-point Likert scale (1=non-diagnostic; 2=diagnostic; 3=good and 4=excellent image quality) at the level of the pulmonary trunk and pulmonary arteries. Objective image quality analysis was done measuring contrast enhancement in Hounsfield units (HU) at the same levels. Attenuation levels > 180 HU were considered diagnostic.
Results: All examinations were graded diagnostic at each level. The individual minimum pulmonary attenuation was 184 HU and 270 HU for group 1 and 2, respectively. Mean attenuation was as follows: group 1: 475±105 HU (40-75 kg) and 402±115 HU (76-117 kg), $p < 0.03$. Group 2: 424±76 HU (40-75 kg) and 418±100 HU (76-117 kg), p=0.8. For group 2, CM volumes were: 55±5 ml (40-75 kg) and 66±5 ml (76-117 kg), leading to a 16-51% CM reduction.
Conclusion: Even under emergency conditions, individualised CM protocols can provide diagnostic and robust image quality in CTPA for pulmonary embolism with a substantial reduction of CM volume for lower weight patients, compared to a fixed CM protocol.
Author Disclosures:
J.E. Wildberger: Research/Grant Support; Philips, Siemens, GE, Bayer, Bracco, Agfa.m. **Das:** Research/Grant Support; Bayer, Siemens, GE.

B-1041 10:46

Suction/inspiration against resistance: a new breathing technique to improve contrast density within the pulmonary artery

A. Gutzeit; *Zurich/CH (agutzeit2000@gmail.com)*

Purpose: Our aim was to prospectively investigate whether the recently introduced suction/inspiration against resistance breathing method leads to higher computed tomography (CT) contrast density in the pulmonary artery compared to standard breathing.
Methods and Materials: The present study was approved by the Medical Ethics committee and all subjects gave written informed consent. Fifteen patients, each without suspicious lung emboli, were randomly assigned to four different groups with different breathing maneuvers (suction against resistance, Valsalva, inspiration, expiration) during routine CT. Contrast enhancement in the central and peripheral sections of the pulmonary artery were measured and compared with one another.
Results: Peripheral enhancement during suction yielded increased mean densities of 138.14 Hounsfield units (HU) ($p = 0.001$), compared to Valsalva and a mean density of 67.97 HU superior to inspiration ($p = 0.075$). Finally, suction in comparison to expiration resulted in a mean increase of 30.51 HU ($p = 0.42$). Central parts of pulmonary arteries presented significantly increased enhancement values (95.74 HU) for suction versus the Valsalva technique ($p = 0.020$), while all other mean densities were in favour of suction (versus inspiration: $p = 0.201$; versus expiration: $p = 0.790$) without reaching significance.
Conclusion: Suction/Inspiration against resistance is a promising technique to improve contrast density within pulmonary vessels, especially in the peripheral parts, in comparison to other breathing maneuvers.

B-1042 10:54

The feasibility of body-weight and BMI based individualised protocol in CT pulmonary angiography

L. Li, J. Gao, J. Liu; *Zhengzhou/CN (perfect1989a@163.com)*

Purpose: To evaluate the feasibility of individualised protocol that body-weight based contrast medium injection combined with BMI adapted tube voltage selection in Pulmonary CT Angiography (CTPA) with Dual-source CT.
Methods and Materials: Eighty patients who underwent CTPA were divided into two groups randomly: Group A, 40 patients, 50 mL contrast medium ,120 kVp; Group B, 40 patients, 0.3 ml/kg contrast medium, with BMI-adapted tube voltage (BMI≤25 kg/m2.80 kVp, otherwise, 100 kVp). The CT attenuation, the differences of CT values in the paired artery and vein, signal-to-noise (SNR) ,contrast-to-noise ratio (CNR), effective radiation dose (ED),the subjective image quality scores were compared.
Results: No statistical difference for image quality scores between two groups (P> 0.05).The CT attenuation [B=(460.5±104.7)A=(395.3±93.7)] and the differences of CT values in the paired artery and vein [B=(255.6±130.1)A=(145.7±139.3)] were of great differences (P0.05). The ED of group B (1.2±0.5) was lower than that of group A (2.4±0.8) ($P < 0.05$).
Conclusion: CTPA in Dual-Source CT with individualised protocol can reduce radiation dose ,minimize the amount of contrast agent while maintaining good image quality and meeting the clinical requirements.

B-1043 11:02

Automated 3D MRI volumetry of the pulmonary arteries for predicting pulmonary hypertension has excellent intra- and interobserver agreement

C. Melzig[1], S. Wörz[1], S. Ley[2], C. Fink[3], S. Partovi[4], K. Rohr[1], H.-U. Kauczor[1], E. Grünig[1], F. Rengier[1]; [1]*Heidelberg/DE*, [2]*Munich/DE*, [3]*Celle/DE*, [4]*Cleveland, OH/US (claudius1.melzig@med.uni-heidelberg.de)*

Purpose: The potential of pulmonary artery volumes as accurate predictors for pulmonary hypertension has recently been demonstrated. We therefore investigated automated 3D segmentation of pulmonary arteries based on magnetic resonance angiography (MRA) in patients with pulmonary arterial hypertension (PAH) and determined its intra- and interobserver agreement.
Methods and Materials: MRA of the pulmonary arteries was acquired at 1.5 T in 20 patients with PAH confirmed by right-heart catheterisation and 21 healthy controls. A 3-dimensional model-fit approach using in-house developed software was applied for segmentation of main, right and left pulmonary arteries (MPA, RPA and LPA). Two radiologists independently initiated segmentation and manually determined start- and end-point for each vessel. One radiologist repeated analysis after 6 months. Vessel volumes and average diameters along each vessel were calculated by the software and corrected for body surface area (BSA).
Results: Mean BSA-corrected volumes of MPA, RPA and LPA for patients/controls were 25569.5/12277.9, 10483.7/3756.8, 7532.8/3663.3 (mm^3/m^2 BSA). Mean BSA-corrected average diameters of MPA, RPA and LPA for patients/controls were 19.7/15.4, 15.7/10.6, 14.8/11.1 (mm/m^2 BSA). Differences between patients and controls were significant in all cases ($p < 0.001$). Intra-/interobserver agreement was for volumes 0.98/0.97 (MPA),

0.96/0.95 (RPA) and 0.82/0.82 (LPA), and for average diameters 0.99/0.99 (MPA), 0.99/0.99 (RPA) and 0.99/0.99 (LPA). Inter- and intraobserver agreements were significant for all correlation coefficients ($p < 0.001$).
Conclusion: Automated MRA-based 3D segmentation of pulmonary arteries revealed significantly increased volumes and diameters for main, right and left pulmonary arteries in patients with PAH compared to healthy controls with excellent intra- and interobserver agreement.

B-1044 11:10

Chronic thromboembolic pulmonary hypertension: cone beam computed tomography vs. 64-row multi-detector computed tomography

J.B. Hinrichs, J. Renne, M.M. Hoeper, K. Olsson, F. Wacker, B.C. Meyer, C. von Falck; *Hannover/DE (hinrichs.jan@mh-hannover.de)*

Purpose: Comparison of pulmonary artery depiction of contrast-enhanced cone beam computed tomography (CBCT) and contrast-enhanced multi-detector computed tomography (MDCT) in patients with suspected chronic thromboembolic pulmonary hypertension (CTEPH).
Methods and Materials: Twenty patients (15 men, 5 women, 63.4±16.3years) underwent CBCT with a catheter advanced in the pulmonary trunk and 64-row MDCT with an appropriate venous access. Contrast-enhancement in the pulmonary trunk, the right and left pulmonary artery and the left atrium was measured. The distance of clear vessel delineation to the pleura was measured. Evaluation of the pulmonary arteries for image quality and pathologic findings in both modalities was performed by two independent readers (R1; R2).
Results: CBCT achieved a higher contrast density in the pulmonary trunk, right and left pulmonary artery ($p < 0.002$) and a lower contrast-density in the left atrium (p=0.001). Distance vessel-pleura was significantly lower on CBCT images ($p < 0.0001$). Inter-observer agreement was good for both CBCT (κ=0.79) and MDCT (κ=0.78), while inter-modality agreement was moderate (R1: κ=0.60, R2: κ=0.59). Both readers detected more webstenoses with CBCT (76; 22%) compared to MDCT (25; 7%).
Conclusion: CBCT with contrast administration directly in the pulmonary arteries shows improved contrast between pulmonary arteries and the left atrium and enables a more detailed depiction of the pulmonary arteries. Therefore, CBCT improves the diagnostic work-up of CTEPH patients.

B-1045 11:18

Contrast-enhanced MRI for quantitative lung perfusion imaging using the dual-bolus approach: comparison of three different contrast agents and recommendation of feasible doses

S. Veldhoen[1], M. Oechsner[2], A. Fischer[1], A.M. Weng[1], A.S. Kunz[1], T.A. Bley[1], H. Köstler[1], C.O. Ritter[3]; [1] *Würzburg/DE*, [2]*Munich/DE*, [3]*Göttingen/DE*

Purpose: To compare three contrast agents and to define feasible doses for lung perfusion imaging using the dual-bolus approach in dynamic contrast-enhanced MRI (DCE-MRI).
Methods and Materials: Ten healthy volunteers underwent DCE-MRI at 1.5 T using a 3D-FLASH sequence. Following a pre-bolus, three doses of Gd-DTPA, gadofosveset and Gd-BOPTA were evaluated. Dose regimes were as follows: Gd-DTPA: 3 ml, 6 ml, 12 ml with 1.5 ml pre-bolus. Due to higher relaxivity, smaller doses of gadofosveset and Gd-BOPTA were chosen: 1.5 ml, 3 ml, 6 ml with 0.8 ml pre-bolus. Pulmonary Blood Flow (PBF), Pulmonary Distribution Volume (PDV) and Mean Transit Time (MTT) were assessed. ROI measurements were used to determine the arterial input function (AIF) in the pulmonary trunk and signal intensities in lung parenchyma.
Results: Dose-dependent saturation effects were observed for all contrast agents concerning AIF and parenchyma measurements. Signal yields were comparable using Gd-BOPTA and Gd-DTPA. Gadofosveset showed significantly lower signal yield ($p < 0.008$). Using Gd-DTPA, mean PBF values for the three doses (3 ml, 6 ml, 12 ml) in ml/min/ml lung tissue were 2.9±1.5, 2.4±1.1 and 1.6±1.0. For the three doses of Gadofosveset (1.5 ml, 3 ml, 6 ml) mean PBF results were 3.1±1.1, 1.9±0.7 and 1.2±0.6. Mean PBF values for Gd-BOPTA (1.5 ml, 3 ml, 6 ml) were 3.4±1.7, 2.8±1.3 and 2.0±0.8.
Conclusion: The dual-bolus approach using a 3D-FLASH sequence is a feasible tool for quantitative lung perfusion imaging. Small boluses of 3 ml for Gd-DTPA, 1.5 ml for Gd-BOPTA and 1.5 ml for gadofosveset provide sufficient signal yield for quantitative parenchyma measurements. Using higher boluses falsely lower perfusion values have to be considered due to saturation effects.
Author Disclosures:
S. Veldhoen: Grant Recipient; Research grant IZKF Würzburg. **A. Fischer:** Employee; GE Healthcare. **T.A. Bley:** Consultant; MSD. Grant Recipient; Research grant IZKF Würzburg; Research Grant DFG. Research/Grant Support; Research agreement Siemens. **H. Köstler:** Patent Holder; Siemens. Research/Grant Support; Research agreement Siemens.

B-1046 11:26

Cardiac and hemodynamic effect of arterial obstruction in cancer-related acute pulmonary embolism

J. Plasencia-Martínez[1], A. Carmona-Bayonas[1], D. Calvo-Temprano[2], P. Jiménez-Fonseca[2], M. Benegas-Urtega[3], M. Sánchez-González[3], D. Varona-Porres[3], D. Martínez-de-la-Haza[3], S. Hernández-Muñiz[4]; [1]*Murcia/ES*, [2]*Oviedo/ES*, [3]*Barcelona/ES*, [4]*Madrid/ES (plasen79@gmail.com)*

Purpose: To analyse the impact of acute pulmonary embolism (PE) on right ventricle (RV), and their hemodynamic effects in patients with cancer.
Methods and Materials: 303 consecutive patients with symptomatic cancer-related PE were ambispectively enrolled in the multicenter (14 hospitals) observational EPIPHANY study. All PEs were diagnosed by computed tomography pulmonary angiography. Arterial obstruction severity was quantified with the Qanadli index (QI). Patients were stratified by PE location as central (trunk, main and/or lobar) or peripheral (only segmentary and/or subsegmentary branches). RV-dysfunction signs were defined as dilated RV (≥39 mm), increased right-to-left ventricle (RV/LV) diameter ratio (≥1) and abnormal (flattened or inverted) interventricular septum (IVS).
Results: Mean QI scores were higher in subjects with dilated RVs (30.4±21.7 vs. 23.6±18.5, P=0.007) and abnormal IVSs (39.5±20.7 vs. 22.1±18.2, $P < 0.001$). QI measurements correlated with the RL/LV ratio and RV diameter (r=0.39 and 0.28, respectively, $P < 0.001$). Correlation between QIs and systemic blood pressure (SBP) was weak overall. However, in subjects with decreased heart adaptive capacity, as expressed by dilated RVs or abnormal IVSs, QI showed an inverse correlation with SBP (r=-0.56, P=0.09; r=-0.998, $P < 0.001$, respectively). Correlations between QI measurements, RV/LV ratios and RV diameters were stronger in hypotensive subjects (r=0.55 and r=0.64, respectively, $P < 0.001$). In subjects with RV-dysfunction, the QI increased from normotensive to hypotensive patients (28.7±21.8 vs. 42.1±17.6, P=0.004). All those effects were unrelated with PE location (central or strictly peripheral).
Conclusion: The hemodynamic effect of acute PE, assessed by the Qanadli obstruction index, is critically influenced by diminished right heart adaptive capacity.

B-1047 11:34

Quantitative evaluation of linear models to estimate CT-perfusion from single-acquisition dual-energy iodine maps acquired at peak tissue enhancement

S. Skornitzke, F. Fritz, M. Koell, P. Mayer, J. Hansen, G. Pahn, M. Klauß, H.-U. Kauczor, W. Stiller; *Heidelberg/DE (Stephan.Skornitzke@med.uni-heidelberg.de)*

Purpose: Earlier research shows high correlation between measured perfusion and absolute iodine concentration. A linear model could thus allow for direct comparison of measured iodine concentrations and perfusion values.
Methods and Materials: For 19 patients with histologically verified pancreatic carcinoma, dual-energy CT-perfusion sequences were dynamically acquired over 51s (34 acquisitions every 1.5s) at tube voltages of 80 kVp and tin-filtered Sn140 kVp. Perfusion maps were calculated with software developed in-house from 80 kVp images using the Maximum-slope model after deformable motion-correction. Additionally, DECT iodine maps were calculated at peak tissue enhancement, identified by an experienced radiologist, and regions of interest (ROIs) placed inside tumour and healthy pancreatic tissue. A linear model estimating perfusion from iodine concentrations (perfusion=β*iodine+a) measured within ROIs was evaluated using twofold cross-validation, randomly partitioning patients into training and test-set (9 vs. 10 patients) and vice-versa. Furthermore, leave-one-out 19-fold cross-validation was performed, using each patient for testing once, training on the other 18 patients.
Results: Average peak tissue-enhancement occurred 43.9±4.1s after starting contrast agent injection. Average perfusion for healthy tissue and tumour were 93.8±29.9 ml/100 ml/min and 38.2±22.1 ml/100 ml/min ($p < 0.0001$); average iodine concentrations were 2.3±0.8 mg/ml and 1.2±0.6 mg/ml ($p < 0.0001$). Correlation between perfusion and iodine concentrations was high (0.75). Differences between trained models during twofold cross-validation were low (31.0 ml²/100 ml/min/mg*iodine+15.1 ml/100 ml/min vs. 33.7 ml²/100 ml/min/mg*iodine+3.3 ml/100 ml/min). Both models achieved moderate-to-high R^2 (0.53 vs. 0.59), with an average error of 20.1±16.5 ml/100 ml/min. Using leave-one-out 19-fold cross-validation, the average error was 20.1±16.6 ml/100 ml/min.
Conclusion: A linear model seems suited to calculate perfusion from iodine concentrations, relating newly obtained iodine concentration measurements to earlier CT-perfusion studies.
Author Disclosures:
H.-U. Kauczor: Research/Grant Support; Bayer, Siemens. Speaker; Almirall, Böhringer Ingelheim, GlaxoSmithKline, Novartis, Siemens.

B-1048 11:42

CT measured pulmonary artery trunk diameter in a rheumatoid arthritis population without pulmonary hypertension: association with disability and disease activity

T.S. Vieira, C. Esteves, M. Bernardes, A. Sá Pinto, D. Gonçalves, J.G. Pereira; *Porto/PT (tiago.sampaio.vieira@gmail.com)*

Purpose: Pulmonary hypertension (PH) associated with rheumatic diseases carries a grim prognosis. Enlargement of the pulmonary artery trunk (PAT) is a characteristic morphologic CT feature of PH. The purpose of our study is to evaluate the correlation of clinical and laboratory features with PAT diameter in a Rheumatoid Arthristis (RA) population with normal LV perfusion and function, without PH.
Methods and Materials: Clinical characteristics and blood samples were collected from 39 RA patients in a monitoring visit. Portuguese version of the Standford Health Assessment Questionnaire (HAQ) and Disease Activity Scores [DAS28-CRP (4v) and DAS28-SR (4v)] were obtained. Patients also performed a tetrofosmin-Tc-99m gated myocardial perfusion SPECT (normal SPECT LV perfusion and ejection fraction) and a thoracic CT, from which PAT diameter was obtained. PAT diameter was adjusted for body surface area (BSA).
Results: Patients had a mean age of 53.2±11.9 years-old (79.5% women). Fifty one percent of the patients were under biologic therapy. Mean PAT diameter adjusted for BSA was 15.954±2.492 mm/m2. Mean BNP was 34.438±28.052 pg/ml. There were no significant correlations of PAT diameter adjusted for BSA with age, age at diagnosis, time of disease duration, C Reactive Protein, Sedimentation Rate or ongoing corticotherapy. However, PAT diameter adjusted for BSA significantly correlated with HAQ (r=0.549; $p < 0.001$), DAS28-SR (4v) (r=0.530; p=0.001), DAS28-CRP (4v) (r=0.455; p=0.004), and BNP (r=0.396; p=0.012).
Conclusion: Pulmonary artery trunk diameter, as measured by CT, correlates with disability and inflammatory disease activity in RA patients without clinical pulmonary hypertension.

B-1049 11:50

Embolisation of pulmonary arterio-venous malformations using hydrogel-coated coils mid-term results

J.-P. Pelage, A. Letellier, V. Le Pennec, M.-A. Jegonday, A. Fohlen; *Caen/FR (pelage-jp@chu-caen.fr)*

Purpose: To report safety and efficacy of embolisation of pulmonary arterio-venous malformations (PAVMs) using hydrogel-coated coils.
Methods and Materials: From September 2010 to May 2015, all patients with PAVMs embolised using hydrogel-coated coils have been included. All PAVMs with a feeding artery larger than 3 mm were considered for treatment.
Results: A total of 27 women and 20 men (47.5 ± 16.5 years) have been embolised. Hereditary haemorrhagic telangiectasia was diagnosed in 87% of patients. Dyspnea was reported in 36% of patients and neurological symptoms in 36% of patients. Localised, multiple and diffuse type of PAVM were reported in 66%, 23% and 11% of patients respectively. A total of 84 PAVMs were embolised. Simple architecture was found in 74% of PAVMs. The dominant PAVM of 5.1 ± 2.0 mm was embolised using 7.0 ± 5.1 coils. No paradoxical embolism was reported. Complete retraction of the aneurismal sac was seen in 91% of patients and 95% of PAVMs. Reperfusion of PAVMs was seen in 7% of PAVMs including catheterisation failure, missed side-branches and central recanalisation. At the latest follow-up (21.9 ± 12.5 months after embolisation), dyspnea was reported in only 20% of patients.
Conclusion: Embolisation of PAVMs using hydrogel-coated coils is safe and effective. A low rate of reperfusion was reported.
Author Disclosures:
J. Pelage: Advisory Board; Keocyt, Merit Medical. Consultant; Terumo, Cook, ALN. Speaker; Boston Scientific, Guerbet. **V. Le Pennec:** Consultant; Cook. **A. Fohlen:** Consultant; Cook. Speaker; Guerbet.

10:30 - 12:00 **Room M 4**

Neuro

SS 1411b

Cerebral tumours (2)

Moderators:
J. Gillard; Cambridge/UK
S. Looby; Dublin/IE

B-1050 10:30

Differentiation between high-grade gliomas and metastatic brain tumours using diffusion tensor imaging metrics

A.E.E. El-Morsy, L.G. El-Serougy, A.A.k.A. Razek, A.E. Mousa, H.F. Eldawoody; *Al Monsoura/EG (dr.a.elmorsy@gmail.com)*

Purpose: The aim of this work was to differentiate between high-grade gliomas and metastatic brain tumours using diffusion tensor derived metrics in the enhancing tumour and peri-tumoural regions.
Methods and Materials: Prospective study was done on 36 patients with provisional MRI diagnosis of high grade gliomas WHO grade III & IV versus metastatic brain tumours, examination was done on 1.5 tesla scanner, patients were divided into two groups based on pathology results, the fraction anisotropy (FA), mean diffusivity (MD), linear coefficient (CL), planer coefficient (CP) and spherical coefficient (CS) were measured in the enhancing tumour parts and immediate peri-tumoural edema and results were compared between the two groups.
Results: Values of FA, CL and CP measured in the peri-tumoural edema were significantly high in the metastatic than primary high malignant glial tumours with high specificity (100%) of the CP and high sensitivity of the CL (76.5%) among the three significant values, and no significant differences in the values of MD and CS. The values of the five metrics measured in the enhancing tumour parts showed no significant differences between the two groups.
Conclusion: Brain metastasis and high-grade gliomas can be differentiated using DTI derived FA, CL and CP measured in the peri-tumoural region.

B-1051 10:38

Evaluation of vascular permeability in gliomas by dynamic susceptibility contrast (DSC) method using "K2" value and histogram analysis

T. Taoka, H. Kawai, T. Nakane, S. Naganawa; *Nagoya/JP (ttaoka@med.nagoya-u.ac.jp)*

Purpose: "K2" value is one of the factors representing vascular permeability of the tumours, which can be calculated by datasets of dynamic susceptibility contrast (DSC) method. The purpose of the current study is to correlate K2 with Ktrans which is one of well-established permeability parameters delivered by dynamic contrast enhance (DCE) method, and access the usefulness of K2 for glioma grading by using histogram analysis.
Methods and Materials: The subjects were 22 glioma cases (Grade II: 5, III: 6, IV: 11) which undergone DSC studies, including 8 cases in which both DSC and DCE study were made within 10 days. We made histogram analysis of ROIs of the tumours by using Sphere v2.3 software (Olea Medical), and acquired 20 percentile values of leakage corrected cerebral blood volume (CBV-20%ile), that of K2 (K2-20%ile) and, for the cases with DCE study, that of Ktrans (Ktrans-20%ile). We evaluated correlation between K2-20%ile and Ktrans-20%ile, and statistical difference of CBV-20%ile and K2-20%ile.
Results: There was statistically significant correlation between K2-20%ile and Ktrans-20%ile, ($r=0.717, p < 0.05$). CBV-20%ile showed significant difference between Grade II and III, and between Grade II and IV, while K2-20%ile showed statistically significant ($p < 0.05$) difference between Grade II and IV, and between Grade III and IV.
Conclusion: K2 value calculated by DSC dataset which can be obtained in short acquisition time showed correlation with Ktrans by DCE method, and seems to be useful for glioma grading when analysed by histogram analysis.

B-1052 10:46

A preliminary study for differential diagnosis of brain mass: quantitative evaluation from asymmetric magnetization transfer ratio (MTRasym) by amide proton transfer imaging

J. Chu[1], X. Li[1], J. Zhao[1], X. Yan[2], Y. Wang[1]; [1]*Guangzhou/CN*, [2]*Shanghai/CN (truechu@hotmail.com)*

Purpose: To investigate the amide proton transfer imaging (APT) in differential diagnosis of brain lesions.
Methods and Materials: Nine cases of brain mass confirmed pathologically were enrolled in our study, including three cases of low-grade gliomas (WHOII grade), three cases of high-grade gliomas (including 1 case in WHO III, 2 cases in WHO IV), lymphoma (n=1), metastatic tumour (n=1) and inflammation lesion (n=1). Preoperative conventional MRI and 2D APT scan were

preformed. For each case, 5-10 selected regions of interest (ROI) were placed and the intralesional amide proton asymmetric magnetization transfer ratio (MTRasym) was calculated, using statistical software SPSS 13.0 (Mann-Whitney-Wilcoxon test). The MTRasym (3.5 ppm) were compared between different groups of brain mass.
Results: The MTRasym values of high-grade gliomas (2.67% ± 0.27%) were higher than the low-grade gliomas (1.82% ± 0.18%), the difference was statistically significant ($P < 0.05$). The MTRasym values of high-grade gliomas were lower than lymphoma (8.51% ± 0.27%, $P < 0.05$). While the MTRasym values of the high-grade glioma were slightly higher than metastases (2.10% ± 0.49%), and there was no statistically significant difference ($P = 0.32$). Moreover, the MTRasym value of lymphoma is higher than the value of inflammation (1.64% ± 0.33%), the difference was statistically significant ($P < 0.05$); and the MTRasym values of lymphoma were also higher than the values of metastases ($P < 0.05$).
Conclusion: The APT imaging can shed light on the differential diagnosis of brain mass.

B-1053 10:54

Brain F-18 Fluorocholine PET and the correlation between MRI in the diagnosis and follow-up of gliomas

S. Bonilla Saborido, E. Granell Moreno, F. Nuñez Marín, A. Lozano Martinez, M. Camacho Marti, A. Fernandez Leon, B. Gomez Ansón; *Barcelona/ES (santibonilla22@gmail.com)*

Purpose: Tumours at different enhance on brain 18-Fluorocholine PET because of increase in membrane lipid synthesis. The main use of brain 18-Fluorocholine PET is diagnosis of local recurrence of prostate tumours. Recently, the value of brain 18-Fluorocholine PET in detecting recurrence of primary brain tumours, in low- and high-grade gliomas. As experience is limited so far, our aim has been to compare brain 18-Fluorocholine PET to MRI in gliomas, both in initial diagnosis and follow-up.
Methods and Materials: Retrospective study of 20 patients aged 32 to 77, having lesions on initial or follow-up MRI, suggested gliomas and they were confirmed histopathologically. All patients had MRI and brain 18-Fluorocholine PET obtained less than 1 month apart.
Results: There was a high concordance between brain 18-Fluorocholine PET uptake was larger in high-grade gliomas (III - IV), low-grade gliomas (II-III) also enhanced on PET, and enhancement was more warhed in those tumours having areas of dedifferentiation on histopathology within then. There was a false-positive case of a bacterial abscess.
Conclusion: Brain 18-Fluorocholine PET seems to be useful in brain tumours, especially assessing recurrence/progression during the follow-up.

B-1054 11:02

Potential role of quantitative MRI assessment in differentiating high from low-grade gliomas

E.A.S. Geneidi, L.A. Habib, N.A. Chalabi; *Cairo/EG (emangeneidi@hotmail.com)*

Purpose: To assess the sensitivity and specificity of fractional anisotropy (FA) values derived from diffusion tensor imaging (DTI) and dynamic contrast enhanced perfusion-weighted imaging (PWI) in differentiating HGGs from LGGs.
Methods and Materials: 24 patients were examined. Mean, Minimal and Maximal FA in tumour, necrotic area and in perifocal oedema, as well as cerebral blood volume (rCBV) ratio were measured and compared between LGG and HGG.
Results: MR DTI was accurate in grading 24 cases of gliomas (sensitivity of 100% and accuracy 100%) regarding Max &Mean FA values & for Min FA (was with sensitivity 93.3% & accuracy 88.9%) in tumour area which were greater than cutoff values (0.085, 0.190 & 0.135) respectively, i.e. increasing with high grade. Also significant finding regarding Min & Mean FA in necrotic area, which were decreasing towards high grade because it approaches isotropic movement with more necrosis, with sensitivity (91.7% &75% respectively) & specificity (83.3% &100% respectively) were below cutoff values (0.035 & 0.051, respectively). No Positive correlation between Max FA & histopathological grade in necrotic areas could not be established. No significant correlation elicited between all measured FA in perifocal areas. Our results show significant difference between histopathological HGG and LGG with mean rCBV ratio (2.62 &0.79 respectively) with best cutoff value (1.2).
Conclusion: Combined use of MR DTI and MR perfusion in this study added to the accuracy of grading of glioma up to 100 %, while the accuracy with the use of conventional MRI alone was only 72.5 %.

B-1055 11:10

Quantification of diminished glioma volume following neurosurgical resection and correlation to survival

A. Blomstergren, A. Rydelius, J. Lätt, J. Bengzon, P.C. Sundgren; *Lund/SE (pia.sundgren@med.lu.se)*

Purpose: The aim of this study was to quantify the preoperative tumour volume (PTV), residual tumour volume (RTV) and extent of resection (EOR) on both T1- and FLAIR sequences and to correlate these with overall survival and progression-free survival in glioma patients.
Methods and Materials: A retrospective study of 63 patients grade II-IV gliomas that underwent neurosurgical resection is included. Pre- and post-operative tumour volumes, RTV, and EOR were measured on high-resolution 3D (mprage) T1-weighted sequences with 1-mm-thick slices and on 2D FLAIR images. The images were co-registered to allow for comparison of tumour volumes between sequences and different examinations. The volumetric in-house-developed software EvalGUI (Evaluation-Graphic User Interface), a MatLab-based program used for measuring areas and volumes of radiographic surveys, was used for analysis. Date of surgery, date of death, date of first seen radiologic progression/recurrence, age, sex, adjuvant radiation, and chemotherapy, corticosteroid therapy, information of fluorescence-guided surgery, MGMT-promoter methylation analysis, and pathological diagnosis was retrieved.
Results: Significant correlations were seen between the overall survival and postoperative tumour volume, RTV and EOR measured on CE-T1-weighted images to the overall survival in the 41 patients with GBM grade IV. Importantly, significant survival benefit in the groups of patients with small postoperative tumour volumes and a great EOR was seen.
Conclusion: A great EOR and a minimised RTV after neurosurgical resection are correlated with longer survival in patients and therefore a careful evaluation by the radiologist is warranted.

B-1056 11:18

A pilot study of differentiating different intraaxial brain tumours: quantitative evaluation of multiparameters from diffusion kurtosis imaging in tumour parenchyma

J. Chu[1], Y. Wang[1], J. Zhao[1], X. Yan[2], X. Li[1]; [1]*Guangzhou/CN*, [2]*Shanghai/CN (truechu@hotmail.com)*

Purpose: To quantitatively evaluate the efficiency of diffusion kurtosis imaging (DKI)in tumour parenchyma (TP) for differentiating different brain tumours.
Methods and Materials: Six patients (M: 4, F: 2, median age: 62y) were evaluated by DKI, including 2 high-grade gliomas (HGG), 2 low-grade gliomas (LGG), 1 lymphoma and 1 metastasis. Ten ROIs were manually placed in the TP and the multiparameters including mean kurtosis (MK), axial kurtosis (Ka), radial kurtosis (Kr), mean diffusivity (MD) and fractional anisotropy (FA) for each ROI were calculated. Mann-Whitney test was performed.
Results: MK, Ka and MD could significantly differentiate HGG and LGG. MK, Ka values were significantly higher in HGG (0.91±0.03HGG and 0.91±0.04HGG vs 0.62±0.03LGG and 0.69±0.03LGG, respectively) while the MD values were significantly lower in HGG (1.00±0.06HGG vs 1.22±0.03LGG). Further, Significant diffusion parameters were found between the HGG and lymphoma, MK, Ka and Kr values were higher in lymphoma (1.07±0.03, 1.09±0.03 and 1.07±0.03, respectively) than in HGG (0.91±0.03, 0.91±0.04 and 0.91±0.03, respectively), whereas the MD and FA values were lower in lymphoma (0.92±0.04 and 0.11±0.01, respectively) than HGG (1.00±0.06 and 0.18±0.02, respectively). In addition, Mk, Ka, Kr and FA could significantly differentiate HGG with metastases and the mean value of MK, Ka, Kr and FA were significantly higher in HGG (0.91±0.03, 0.91±0.04, 0.91±0.03 and 0.18±0.02, respectively) than in metastases (00.51±0.01, 0.55±0.01, 0.49±0.01 and 0.09±0.004, respectively).
Conclusion: Diffusion kurtosis imaging is helpful in grading gliomas and differentiating different brain tumours.

B-1057 11:26

The role of MR-perfusion in the follow-up of primitive cerebral malignant neoplasms: single-center experience on 36 patients

R. Pimentel Silva[1], R. Senese[2], F. Zeccolini[2], F. Giurazza[3], F.M. Giugliano[2], R. Izzo[2], M. Muto[2]; [1]*Lisbon/PT*, [2]*Naples/IT*, [3]*Rome/IT (ricardo.pimentel.silva@gmail.com)*

Purpose: Functional MR sequences allow advanced study of cerebral malignancies. This study aims to evaluate two quantitative perfusion parameters: regional Cerebral Blood Volume (rCBV) and K2, representing respectively CBV in 100 gr of tissue and vascular permeability of primary brain tumour.
Methods and Materials: Perfusion studies have been obtained by applying DSC technique (dynamic susceptibility contrast perfusion magnetic resonance imaging, OLEA MEDICAL) using T2-weighted sequences. 36 lesions were

analysed, including images pre- and post-treatment (surgery and/or radio/chemiotherapy): 27 high-grade gliomas, 6 low-grade gliomas and 3 cerebral gliomatosis. rCBV and K2 values were divided into two groups depending on post-contrast enhancement in correspondance of the regions of interest (ROI) evaluated. High rCBV and K2 values were considered indexes of neoangiogenesis whereas low rCBV and K2 suggested radionecrosis.
Results: Tumour neoangiogenesis was found in 12/27 high-grade gliomas and 2/6 low-grade gliomas; radionecrosis was observed in 15/27 high-grade gliomas and 4/6 low-grade gliomas. 3 gliomatosis showed neoangiogenesis in regions without post-contrast enhancement and radionecrosis in regions with post-contrast enhancement. rCBV was reduced (mean:0.3) in necrotic regions and elevated (mean:4.3) in tumour masses and peripheral contours (mean:5). ROIs in oedema regions were classified into 2 groups on the basis of T2-weighted images signal intensity: "tumour" (isointense to grey matter) and "oedema" (isointense to cerebral liquor). rCBV in "tumour" ROIs was significantly higher than in "oedema" ROIs (mean:2.8 vs 0.5) (p-value< 0.05).
Conclusion: MR-perfusion sequences represent a valuble approach for differential diagnosis between cerebral malignancies progression and post-treatment radionecrosis. rCBV values higher than 2.6 suggest tumour neoangiogenesis.

B-1058 11:34

Place of value of integrated [18 F] FDG-PET/MRI in cerebral staging of NSCLC patients

C. Deuschl[1], F. Nensa[1], J. Grueneisen[1], P. Heusch[2], T. Poeppel[1], M. Forsting[1], L. Umutlu[1], M. Schlamann[3]; [1]*Essen/DE*, [2]*Düsseldorf/DE*, [3]*Gießen/DE (cornelius.deuschl@uk-essen.de)*

Purpose: The objective of this study was to assess the diagnostic value of integrated positron emission tomography/magnetic resonance imaging (PET/MRI) in patients with non-small cell lung cancer (NSCLC) for cerebral metastasis, in comparison to MRI alone.
Methods and Materials: The study was approved by the local institutional ethics committee. Eighty-three patients were prospectively enrolled for an integrated [18 F] FDG-PET/MRI examination. The MRI protocol included a FLAIR sequence (slice thickness 6 mm, TR 9000 ms, TE 94 ms, matrix 0 \ 256 \ 192 \ 0), a ce-T1-MPRAGE (slice thickness 1 mm, TR 1820 ms, TE 3, 15 ms, matrix 0 \ 512 \ 256 \ 0) and FDG-PET. Two radiologists evaluated the data sets in consensus regarding present lesions and lesion detection for FDG-PET/MRI and MRI alone.
Results: Based on MRI only, metastases were detected in 15 out of the 83 patients, comprising a total of 39 metastases. Based on PET only, 6 patients out of the 83 patients were rated positive for metastatic disease, revealing a total of 15 metastases. PET detected no additional metastases. The size of the metastases correlated positively with sensitivity of detection in PET: < 5 mm: 1/13 (8% sensitivity 10 mm: 9/11 (82% sensitivity > 10 mm).
Conclusion: The sensitivity of the PET strictly depends on the size of the metastases. [18 F] FDG-PET/MRI does not lead to an improvement in diagnostic accuracy in cerebral staging of NSCLC patients, as MRI alone remains to be the gold standard.

B-1059 11:42

The role of diffusion tensor imagin (DTI) and dynamic susceptibility perfusion (DSP) MRI in the evaluation of meningioma grades and subtypes

A. Zikou, G. Alexiou, A. Goussia, P. Kosta, V. Xydis, M. Argyropoulou I; *Ioannina/GR (anzikou@cc.uoi.gr)*

Purpose: We prospectively investigated the relationship between diffusion tensor imaging (DTI), dynamic susceptibility perfusion (DSP) MRI metrics and grade, subtype and Ki-67 labeling index of meningiomas.
Methods and Materials: Thirty-three patients operated for meningioma were included in the study. DTI and DSP were performed within a week prior to surgical excision. Lesion/normal tissue ratios and peritumoral area/normal tissue ratios were calculated for the apparent diffusion coefficient (ADC), fractional anisotropy (FA) and relative cerebral blood volume (rCBV). In the tumour specimens Ki-67 antigen expression was evaluated by the MIB-1 immunostaining method.
Results: There were 25 grade I, 7 grade II and 1 grade III meningiomas. The mean Ki-67 index was 2.2%. A significant correlation was observed between meningioma grade and peritumoral area/normal tissue rCBV ratio (p=0.036). Within grade I tumours, meningothelial meningiomas had significant higher lesion/normal rCBV ratio (p=0.039). A rCBV cut-off value of 5.4 could differentiate meningothelial from the other benign meningioma subtypes with 78% sensitivity and 87.5% specificity. No significant correlation was found between meningioma grade and lesion/normal rCBV ratio. There was no significant correlation between ADC and FA lesion/normal and peritumoral area/normal ratios and tumour grade or Ki-67 index.
Conclusion: Dynamic susceptibility perfusion indexes in lesion/normal tissue ratios are useful for the differentiation of meningothelial from the other bening meningioma subtypes. Higher grade meningiomas showed higher peritumoral area /normal tissue rCBV ratios.

B-1060 11:50

Multiparametric analysis of follow-up of low grade gliomas: comparison between perfusion and diffusion MR and F-DOPA PET

M. Rossi Espagnet, A. Romano, V. Mancuso, F. Tavanti, F. Cicone, C. Scaringi, A. Bozzao; *Rome/IT (camilla.rossiespagnet@gmail.com)*

Purpose: The purposes of this study were to compare Magnetic Resonance (MR) imaging using perfusion and diffusion techniques with 6-[18 F]-fluoro-L-3.4-dihydroxyphenylalanine (F-DOPA) Positron Emission Tomography (PET) in the follow-up of low grade gliomas (LGGs) and to identify the best imaging parameter to differentiate patients with different prognosis.
Methods and Materials: Between 2010 and 2014 patients with a pathologically-proven diagnosis of LGG were retrospectively included in our study if they had a MR (with perfusion and diffusion sequence) and a PET study during their follow-up. Cerebral blood volume (CBV) and apparent diffusion coefficient (ADC) maps on MR studies and PET images were evaluated using a ROI-based method. All patients were categorised as stable or progressive disease at 1-year follow-up. Statistical analysis was performed using Pearson correlation and t-test analysis ($p < 0.05$).
Results: 12 patients were included in the study. No spatial or parametric correlation was found between PET parameters and CBV or ADC values. At 1-year follow-up, 6 patients were stable whereas 6 showed progression. Tumour-to-background ratio of SUV values in the hotspot regions had a good sensitivity and specificity to differentiate the two subgroups (p=0.04). ADC values in the same regions were also able to distinguish the two groups but with a worse sensitivity and specificity (p=0.007).
Conclusion: Compared to MR advanced sequences, F-DOPA PET appears to be a better technique for prognosis prediction in LGGs follow-up and shows and indirect relationship with ADC maps. However, these results need to be confirmed with future prospective longitudinal studies.

10:30 - 12:00 **Room M 5**

Breast

SS 1402b

Contrast-spectral mammography and MRI update in background parenchymal enhancement

Moderators:
M. Bernathova; Vienna/AT
L.J. Pina Insausti; Pamplona/ES

B-1061 10:30

Contrast enhanced spectral mammography (CESM) as first exam in symptomatic patients: a monocentric prospective study on 226 patients

J. Smadja, C. Balleyguier, J. Arfi-Rouche, M.-C. Mathieu, C. Mazouni, S. Delaloge, A. Dunant, C. Dromain; *Villejuif/FR (jeremysmadja@gmail.com)*

Purpose: To evaluate CESM in replacement of mammography in breast symptomatic patients.
Methods and Materials: Between January 2013 and July 2014, all consecutive patients with breast symptoms underwent a CESM as first exam (SenoBright, GE Healthcare), followed by targeted ultrasounds. Two radiologists reviewed all images in consensus and provided BI-RADS classification for mammography (low energy images from CESM) and for CESM. Histopathological results (95%) and follow-up > 1 year (5%) served as gold standard. Diagnostic parameters for mammography and CESM were assessed for each lesion and were correlated to histological and CESM parameters.
Results: 226 symptomatic patients (375 lesions) underwent CESM (median age: 49, 25-83). Symptoms included self-reported lump (n=188), breast pain (n=10), nipple abnormalities (n=14), inflammatory skin (n=9), others (n=5). Sensitivity, specificity, NPV, PPV were 78%, 72%, 53% and 88% for mammography and 97%, 79%, 91% and 93% for CESM respectively. Breast pain was the symptom with the lowest CESM sensitivity (90%). Among 208 patients with malignant lesions, 49 had additional malignant lesions better detected with CESM than MG (sensitivity: 97% vs. 43%). Compared to pathology, there was no statistical difference between size assessments with CESM (p=0.48) or mammography (p=0.10) whereas ultrasounds were significantly less accurate ($p < 0.0001$). Intensity of enhancement on CESM was statistically correlated to malignancy ($p < 0001$). No correlation was found between tumour grade and enhancement intensity or kinetics.

Conclusion: CESM has a very high diagnostic performance in symptomatic patients, higher than mammography.

B-1062 10:38

Monitoring neo-adjuvant chemotherapy: comparison of contrast-enhanced spectral mammography (CESM) and MRI versus breast cancer characteristics

V. Iotti[1], S. Ravaioli[1], R. Sghedoni[1], C. Coriani[1], R. Vacondio[1], S. Caffarri[2], A. Nitrosi[1], G. Tondelli[3], P. Pattacini[1]; [1]*Reggio Emilia/IT*, [2]*Guastalla/IT*, [3]*Scandiano/IT (valentina.iotti@asmn.re.it)*

Purpose: To compare Contrast-Enhanced Spectral Mammography (CESM) and Contrast-Enhanced MRI (CE-MRI) in assessing response to neo-adjuvant chemotherapy as a function of breast cancer histological and biological characteristics.
Methods and Materials: 54 consenting women with breast carcinoma and indication of neo-adjuvant chemotherapy (NAC) were enrolled into this prospective study between October 2012 and October 2014. 47 of them completed the study. Histological characteristics were: 40 Infiltrating Ductal Carcinoma (IDC), 5 Infiltrating Lobular Carcinoma (ILC) and 2 Metaplastic Carcinoma. Biological characteristics were: 3 Luminal A, 17 Luminal B, 6 Luminal B HER+, 12 Triple Negative and 9 HER2+. Patients underwent CE-MRI and CESM before, after the first cycle and after the end of NAC. Response to therapy was evaluated using the variation of the largest dimension of malignancies measured on CE-MRI and CESM image sets, according to RECIST criteria. CESM and CE-MRI size measurements were compared to post-operative histopathology through correlation (Pearson's "r") and agreement (Paired t-test p-value).
Results: Overall correlation coefficients for CE-MRI and CESM versus pathology at end of NAC were r=0.728 and r=0.866, with mean underestimations in size of 7.5 mm (p=0.003) and 4.1 mm (p=0.023), respectively. Main variances in correlation were seen in ILC (r=-0.298 for CE-MRI and r=0.628 for CESM) and Luminal B (r=-0.003 for CE-MRI and r=0.750 for CESM).
Conclusion: CESM may be an alternative to CE-MRI in the assessment of NAC response, in particular for challenging histological and biological types of breast carcinomas as ILC and Luminal B.

B-1063 10:46

Comparison of breast cancer screening with contrast-enhanced mammography vs MRI

M.S. Jochelson, D.D. Dershaw, J.S. Sung, M.C. Hughes, D.A. Goldman, C.S. Moskowitz, D.A. Mangino, M.E. Robson, E.A. Morris; *New York, NY/US (jochelsm@mskcc.org)*

Purpose: To compare performance of contrast-enhanced mammography (CEM) to breast magnetic resonance imaging (MRI) for screening women at increased risk for breast cancer.
Methods and Materials: In this prospective, IRB approved HIPAA compliant study written informed consent was obtained from 307 women at > 15% lifetime risk for breast cancer from December 2012 to May 2015. 299 had prior MRI; one a prior CEM. CEM was interpreted by one of 4 readers blinded to MRI results. With biopsy recommendation (BI-RADS 4 or 5) considered positive, proportions are presented together with exact binomial 95% confidence intervals; when estimates of proportions were equal to 100%; one-sided 97.5% confidence intervals are presented. The difference in specificities between the two imaging modalities was tested using an exact McNemar test.
Results: Median age was 52 years (25-76). Unilateral breast cancer was found in the same 2 women by both CEM and MRI. 167 (54%) had one year follow-up with 2 interval cancers. The small number of cancers precluded reliable sensitivity estimates. MRI specificity was 94% (95% confidence interval (CI) (90%, 97%)); false positive rate (FPR) was 6% (95% CI: 3%- 10%). CEM specificity was 95% (95% CI: 91%-98%); FPR was 5% (95% CI: 2%-10%): p= 1.00. Additional imaging work up of CEM patients was required in 25 (8%).
Conclusion: The performance of CEM did not significantly differ from that of MRI in screening women at increased risk for breast cancer.

B-1064 10:54

Contrast-enhanced spectral mammography in recalls from the breast cancer screening program: validation of results in a larger multireader, multicase study

U. Lalji[1], S. Gommers[1], M. van Goethem[2], S. Vanwetswinkel[1], R.M. Pijnappel[3], P. Nelemans[1], M. Smidt[1], J.E. Wildberger[1], M. Lobbes[1]; [1]*Maastricht/NL*, [2]*Antwerp/BE*, [3]*Utrecht/NL (marclobbes@planet.nl)*

Purpose: Contrast-enhanced spectral mammography (CESM) is a promising problemsolving tool in women referred from the breast cancer screening program. We aimed to study the reproducibility of the preliminary results of this technique using a larger panel of radiologists with different levels of CESM experience.
Methods and Materials: All women referred from the Dutch breast cancer screening program were eligible for CESM. 199 consecutive cases were viewed by ten radiologists. Of these, four had extensive CESM experience, three had no CESM experience but were highly experienced breast radiologists, and three were residents with only eight weeks of mammography training. All readers had to provide a BI-RADS score for the low-energy CESM images first, after which the score could be adjusted when viewing the entire CESM exam. BI-RADS 1-3 were considered benign, BI-RADS 4-5 were considered malignant. Based on this cut off, we calculated sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and area under the ROC curve.
Results: For all readers, diagnostic accuracy increased when using CESM. The final performance for all readers using CESM was (with increase compared to mammography in brackets): sensitivity 96.9% (+3.9%), specificity 69.7% (+33.8%), PPV 58.2% (+19.5%), NPV 98% (+6.6%) and area under the ROC curve 0.833 (+0.188).
Conclusion: CESM is superior to conventional mammography and has excellent problem-solving capabilities in women referred from the breast cancer screening program. Previous results were confirmed even in a larger panel of readers with varying CESM experience.
Author Disclosures:
M. Lobbes: Speaker; GE Healthcare.

B-1065 11:02

Pre-operative evaluation of breast cancer by contrast enhanced digital mammography

S.A. Tawfik, N.M. Abdel Razek, Y.M. Tuhamy, O.Z. Youssif, A.E. Eissa; *Cairo/EG (saratawfik1988@gmail.com)*

Purpose: To evaluate the efficacy of preoperative contrast enhanced digital mammography (CEDM) in preoperative assessment of local extent of breast cancer.
Methods and Materials: Institutional approval and informed patient consent were obtained. CEDM images were acquired from 84 high risk breast cancer patients who underwent examination of the ipsi-lateral and contra-lateral breasts. All lesions found at CEDM were classified according to the ACR MRI BI-RADS lexicon morphology descriptors, classified enhancing lesions into non-mass and mass that were further described, and were selected for biopsy where the results were compared with.
Results: Of the Pathology 62.5% were malignant and 37.5% were benign lesions. The sensitivity, specificity, and positive and negative predictive values of prospective classification of lesions detected at CEDM were 90.6%, 97.7%, 98.5% and o.8 respectively. CEDM showed no enhancement in 34.16%, mass enhancement in 55% and non mass enhancement in 10.8%. Out of the no enhancement 82.9% were benign, out of the mass enhancing lesions 90.90% were malignant, out of the non mass enhancing lesions 53.84% were malignant while 46.15% were benign. Spiculated/irrigular shaped, intensily/intermediatly enhancing heterogenous pattern was significantly remarkable with malignant lesion (p value ≤0.001). In anticipation of conservation or no surgery after CEDM, 20 tumours showed multifocal/multicentric invasive growth at pathology. Accuracy for the number of multifocalities was 88%, 94.4% showing the exact size.
Conclusion: CEDM is a promising breast imaging modality not only in malignancy depiction, but also in differentiating benign from malignant lesions, with high accuracy in multifocality and size assessment.

B-1066 11:10

Comparative study between tomosynthesis, contrast enhanced spectral mammography and breast ultrasound as complementary techniques in mammography of dense breasts

M.M.H.H. Hanafy, R.M.K. Fouad, H.A.M.A. Azzam, A.A.Y. Youssef; *Cairo/EG (drmennamhanafy@gmail.com)*

Purpose: The purpose of the study is to compare between Tomosynthesis, Contrast Enhanced Spectral Mammography and breast Ultrasound as complementary techniques to mammography in dense breast parenchyma.
Methods and Materials: The study included 37 patients with 63 inconclusive mammography breast lesions. They all had mammography dense breast classified as 'C' or 'D' according to the American Cancer Society breast density classification. They all performed single MLO view Tomosynthesis, Contrast Enhanced Spectral Mammography and breast Ultrasound.
Results: 34/37 (92%) cases were assigned an ACR score C and 3/37 (8%) cases were assigned an ACR score D. Upon correlation with final diagnosis either by histopathology analysis or close follow-up, there were 27/63 (43%) benign lesions and 36/63 (57%) malignant lesions. The diagnostic indices of mammography, Tomosynthesis, CESM and Ultrasound were calculated. The diagnostic accuracy of Tomosynthesis (84%), CESM (89%) and breast Ultrasound (92%) were higher than mammography (68%). Ultrasound showed the highest sensitivity (97%) and the highest NPV (96%). CESM showed the highest specificity (89%) and the highest PPV (91%). Tomosynthesis showed

higher sensitivity (86%) and specificity (81%) compared to sensitivity (83%) and specificity (48%).
Conclusion: Breast Ultrasound, Tomosynthesis and Contrast Enhanced Spectral Mammography showed better performance compared to mammography in dense breasts. However, Ultrasound being safe with no radiation hazards should be the second step modality of choice after mammography in assessment of mammography dense breast. Adding Tomosynthesis to mammography in screening increases its sensitivity. Contrast Enhanced Spectral Mammography should be reserved for cases with inconclusive sonomammographic results.

B-1067 11:18

Breast MRI background parenchymal enhancement (BPE) correlates with the risk of breast cancer

M. Moschetta, M. Telegrafo, T. Introna, L. Coi, L. Rella, A. Stabile Ianora, G. Angelelli; *Bari/IT (marco.moschetta@gmail.com)*

Purpose: To investigate whether background parenchymal enhancement (BPE) and breast cancer would correlate searching for any significant difference of BPE pattern distribution in case of benign or malignant lesions.
Methods and Materials: 386 patients, including 180 pre-menopausal (group 1) and 208 post-menopausal (group 2), underwent MR examination. Two radiologists evaluated MR images classifying normal BPE as minimal, mild, moderate or marked. The two groups of patients were subdivided into 3 categories based on MRI findings (negative, benign and malignant lesions). The distribution of BPE patterns within the two groups and within the three MR categories was calculated. The $\chi 2$ test was used to evaluate BPE type distribution in the three patient categories and any statistically significant correlation of BPE with lesion type was calculated. The Student t test was applied to search for any statistically significant difference between BPE type rates in group 1 and 2.
Results: The $\chi 2$ test demonstrated a statistically significant difference in the distribution of BPE types in negative patients and benign lesions as compared with malignant ones (p: 0.05).
Conclusion: Normal BPE could correlate with the risk of breast cancer being such BPE patterns as moderate and marked associated with patients with malignant lesions in both pre and postmenopausal women.

B-1068 11:26

Repeated surgery in invasive lobular breast cancer after pre-surgical MRI: role of additional ductal carcinoma in situ and background parenchymal enhancement

H. Preibsch, V. Richter, B.M. Wietek, M. Hahn, A. Staebler, K. Nikolaou, B. Wiesinger; *Tübingen/DE (Heike.Preibsch@med.uni-tuebingen.de)*

Purpose: Pre-surgical breast MRI is recommended in case of invasive lobular carcinoma (ILC). Benign background parenchymal enhancement (BPE) affects tumour detection on MRI. Size assessment of ductal in situ carcinoma (DCIS) is hindered because of discontinuous growth. Aim of our study was to investigate patients with ILC and pre-surgical MRI and to analyse the role of additional DCIS and BPE on re-excisions.
Methods and Materials: After a waiver of the institutional review board, 106 patients with 108 breast cancers were retrospectively reviewed. Mean patient age was 58.6 ± 9.9 years. The degree of BPE (minimal, mild, moderate or marked) was categorised by two readers. The surgical procedure was analysed according to the presence of DCIS and the amount of BPE. We analysed if MRI induced a change of the surgical procedure.
Results: In 49 cases (45.4%) additional DCIS was present. Moderate or marked BPE was present in 20% of the patients. There was no difference in the initial mastectomy rate between the groups with and without additional DCIS (42.9% vs. 50.8%, p=0.69). In 17 cases (15.7%) a re-excision was performed. There were significantly more re-excisions in case of additional DCIS (24.5%) compared to ILC alone (8.5%, p=0.02). Re-excisions did not differ significantly between low (minimal or mild) and strong (moderate or marked) BPE (p=0.27). In 29.6%, pre-surgical MRI induced a change of the surgical procedure.
Conclusion: Pre-surgical MRI planning of re-excision in ILC was significantly influenced by additional DCIS as documented by MRI, but not by the degree of BPE.

B-1069 11:34

Quantitative evaluation of background parenchymal enhancement (BPE) on breast MRI: a feasibility study with a semi-automatic and automatic software compared to observer-based scores

B. Bignotti, A. Tagliafico, G. Tagliafico, L. Gristina, L. Cevasco, F. Valdora, A. Signori, S. Tosto, M. Calabrese; *Genoa/IT (bignottibianca@gmail.com)*

Purpose: To evaluate quantitative measurements of background parenchymal enhancement (BPE) on breast MRI and compare them with observer-based scores.
Methods and Materials: BPE of 48 patients (mean age: 48 years; age range: 36-66) referred to breast MRI between 2012 and 2014 was evaluated independently and blindly to each other by two radiologists. BPE was estimated qualitatively with the standard BI-RADS scale and quantitatively with a semi-automatic and an automatic software interface. To assess intra-reader agreement, MRIs were re-read after a 4-months by the same two readers. The Pearson correlation coefficient and the Bland-Altman method were used to compare the methods used to estimate BPE. P-value< 0.05 was considered significant.
Results: The mean value of BPE with the semi-automatic software evaluated by each reader was 14% (range 2-79%) for reader 1 and 16% (range 1-61%) for reader 2 ($p> 0.05$). Mean values of BPE for the automatic software were 17.5 ± 13.1 ($p> 0.05$ vs semi-automatic). The automatic software was unable to produce BPE values for 2/48 (4%) patients. With BI-RADS, inter- and intra-reader were $\kappa = 0.70$ (95%CI 0.49-0.91); $k= 0.69$ (95%CI 0.46-0.93), respectively. With semi-automated software inter- and intra- reader values were: $\kappa = 0.81$ (95%CI 0.59-0.99) and $\kappa=0.85$ (95%CI 0.43-0.99), respectively. BI-RADS scores correlated with the automatic ($r = 0.55$, $P <.001$) and semi-automatic scores ($r=0.60$, $P <.001$). Automatic scores correlated with the semi-automatic scores ($r=0.77$, $P <.001$). The mean percentage difference between automatic and semi-automatic was 3.5% (95% CI 1.5 to 5.2).
Conclusion: BPE quantitative evaluation is feasible and correlates with radiologist's estimation.

B-1070 11:42

The assessment of background parenchymal enhancement (BPE) in the high risk population: What causes BPE?

C. You[1], C. Kaiser[2], A. Kaiser[2], J. Knaudt[2], Y.J. Gu[1], W.J. Peng[1], S.O. Schönberg[2]; [1]*Shanghai/CN*, [2]*Mannheim/DE (youchao8888@aliyun.com)*

Purpose: To investigate promoting factors for background parenchymal enhancement (BPE) in MR-Mammography (MRM)
Methods and Materials: 146 patients with at least 1 MRM were retrospectively evaluated in this study. These included 91 high risk patients (mean age 45.53y), of which 11 were identified as having breast cancer on the MR imaging, 30 had prior mastectomy with a breast cancer history, and 50 patients served as a high risk control group without suspicious findings. Additionally 55 screening patients, for which MR served as problem-solver, were matched to to the high risk cases on the basis of age. Two experienced radiologists independently rated the level of BPE and fibroglandular tissue (FGT) according to the BI-RADS criteria. As proxy for patient vital parameters during the examination motion was additionally assessed. The correlation of BPE with multiple factors were investigated by linear regression.
Results: BPE positively correlates with FGT ($p < 0.001$) and negatively correlated with age ($r=-0.57$, $p < 0.001$). Cancer did not show an effect on BPEd (p=0.127). A high-risk precondition showed a significant impact on the formation of BPE (p=0.006). However, when corrected for motion, the correlation between BPE and a high risk precondition became insignificant (p= 0.521) and a higly significant association between BPE and motion was revealed (p=0.008).
Conclusion: BPE positively correlates with FGT and negatively with age. When corrected for motion a high-risk precondition completely loses significance. Patient physiology as well as technical examination parameters seem to play an important role in the formation of BPE.

B-1071 11:50

Background parenchymal enhancement as a predictor of breast cancer grade: a pilot study

S. Vreemann[1], A. Gubern-Mérida[1], C. Borelli[2], N. Karssemeijer[1], R.M. Mann[1]; [1]*Nijmegen/NL*, [2]*Rome/IT (Suzan.Vreemann@radboudumc.nl)*

Purpose: Breast MRI background parenchymal enhancement (BPE) has been identified as a risk factor for breast cancer and has been associated to certain tumour characteristics. However, it is not known whether its presence is related to tumour aggressiveness in high risk screening patients. The purpose of this study is to evaluate this association between BPE and tumour grade in high risk screen detected breast cancers.
Methods and Materials: Review of our intermediate and high risk screening program from 2003-2013 identified MRI-scans of 80 cancers in 79 patients (48 ± 9.8 years) with biopsy proven unilateral cancer and no previous breast cancer. The level of BPE in the contralateral breast was scored as minimal, mild, moderate, and marked by two readers (one 5th year resident (R1) and one experienced radiologist (R2)). Odds ratios (OR) were calculated for grade in relation to BPE. Observer variability was computed using kappa statistics.
Results: A significant association was found between tumour grade and level of BPE in the contralateral breast for both readers (the OR for high grade tumour was 0.394 (p=0.007) for R1 and 0.310 (p=0.002) for R2). After adjusting for significant factors, the OR for high grade cancers was 0.924 for R1 and 2.066 for R2. Kappa value for BPE assessment between readers was κ=0.592.

Conclusion: Lower BPE might be associated to higher tumour grade, when only evaluating BPE. However, our results suggest that other factors play a major role in this association. This limits the usefulness of BPE as a parameter for therapy stratification.
Author Disclosures:
N. Karssemeijer: Shareholder; Matakina Ltd Consultant, QView Medical Inc Director, ScreenPoint Medical BV. **R.M. Mann:** Speaker; Bayer AG.

14:00 - 15:30 **Room M 1**

Cardiac

SS 1503
Interventional applications

Moderators:
D. Maintz; Cologne/DE
E. Pershina; Moscow/RU

B-1072 14:00

Preoperative CT evaluation of minimally invasive Leipzig loop repair of the mitral valve apparatus: direct comparison with intra-surgical measurements

S.R. Fuller, D. Caruso, M. Stroebel, P. Burghard, C.N. De Cecco, S. Mangold, C. Tesche, A. Varga-Szemes, U.J. Schoepf; *Charleston, SC/US*
(fullerst@musc.edu)

Purpose: To assess the diagnostic reliability of CT in the preoperative evaluation for minimally invasive Leipzig loop repair of the mitral valve in comparison with intra-surgical measurements.
Methods and Materials: Twenty-three patients scheduled to undergo Leipzig loop repair following rupture of the chordae tendineae and who underwent pre-procedural gated cardiac CT were retrospectively analysed. Two independent readers measured the distance on CT between the tip of the corresponding papillary muscle to the edge of the normal leaflet of the damaged mitral scallop for prosthetic loop length sizing. Corresponding intra-surgical measurements were obtained with a Vernier caliper. CT and surgical measurements were compared and inter-reader agreement was calculated. The time needed for obtaining measurements during surgery and with CT was also recorded.
Results: No significant differences were found between CT and intra-surgical measurements for both the anterior loop (p=0.94) and posterior loop (p=0.82) of the prosthetic chordae replacements. Inter-reader agreement was excellent for both the anterior loop (k=0.93) and posterior loop (k=0.88). The surgical measurement time was significantly higher than that of CT (887.3±98.2 s vs 78.3±8.9 s, $p < 0.0001$).
Conclusion: Cardiac CT is a reliable and efficient technique for pre-procedural planning of minimally invasive mitral valve repair, affording measurements comparable to surgical measurements. Surgical procedure time can be substantially shortened.
Author Disclosures:
U.J. Schoepf: Research/Grant Support; Bayer, Bracco, GE Healthcare, Medrad, Siemens Healthcare.

B-1073 14:08

Aortic valve planimetry by high-resolution 3-dimensional MR image acquisition with a breath-hold

H. Kim, Y. Choe, S. Kim, M. Kim, Y. Kim, S.-J. Park; *Seoul/KR*
(jfhjk12@gmail.com)

Purpose: We intended to evaluate novel application of high-resolution 3-dimensional MR image acquisition to calculate the aortic valve area (AVA).
Methods and Materials: In 88 patients (66.9±9.59 years, 63% men) with aortic stenosis, high-resolution 3D images (3D planimetry; 2.0 mm slice thickness, 20 contiguous slices; image matrix, 256 × 209) were acquired with single breath-hold. SSFP cine MR imaging (2D planimetry) and velocity-encoded cine MRI (slice thickness, 4.5 mm) were also performed. AVA area was measured by two experienced observers. MR imaging measurements and image quality were compared with echocardiographic effective aortic orifices. Sensitivity for accurate measurement and receiver operating characteristic (ROC) curve were calculated. Intra- and interobserver agreements were determined by intraclass correlation coefficient (ICC).
Results: Mean AVA derived by 3D planimetry, 2D planimetry, and echocardiography were 0.77 ± 1.04 cm^2, 0.72 ± 1.16 cm^2, and 0.75 ± 0.32 cm^2, respectively. The ICC value of 3D planimetry was higher than 2D planimetry ([0.799 vs. 0.743). The grade of image quality of 3D planimetry was superior to 2D planimetry (3.65 ± 0.65 vs. 3.17 ± 0.65). The correlation coefficients of maximum peak velocity on velocity-encoded cine MR imaging with 3D planimetry and that with 2D planimetry were 0.42 ($p < 0.05$) and 0.35 ($p < 0.05$). Intra- and interobserver agreements for 3D planimetry were excellent.
Conclusion: Novel application of high-resolution 3D enables planimetry of AVA with aortic stenosis with better image quality than 2D planimetry.

B-1074 14:16

Integrated electroanatomic mapping with three-dimensional computed tomographic images for real-time guided ablations: comparison with standard procedure

A. Palmisano, A. Esposito, S. Antunes, C. Colantoni, C. Bisceglia, F. Baratto, P. Della Bella, F. De Cobelli, A. Del Maschio; *Milan/IT*
(palmisano.anna@hsr.it)

Purpose: DE-CT may be accurate in the identification of myocardial scars, which are often substrate for VT. Our aim was to compare the performance of VT ablation guided by CT/EAM merge and ablation guided by EAM only, which is nowadays the standard procedure.
Methods and Materials: Eighty-seven patients with VT were enrolled. Thirty-two patients underwent standard ablation; fifty-five patients underwent DE-CT before VT ablation, including an angiographic scan and a delayed scan (80 kV). A 3D model of the heart, representing the cardiac cavities, aortic root, left ventricular wall and myocardial scar, was obtained by the fusion of angiographic and delayed scan, separately segmented. The 3D model were uploaded on CARTO® system and co-registered with EAMs using CARTO-merge. Time of procedure (TOP), complication and success rate were recorded procedure and were compared between standard and CT-EAM-guided procedures.
Results: TOP was 258±84 minutes for standard procedures and 204±60 minutes for CT-EAM-guided ablations (p=0.012). Amongst standard procedures, 4 (12%) were performed with epicardial approach (TOP: 342±114 min), 19 (59%) with endocardial approach (TOP: 228±102 min), and 9 (29%) with both endocardial and epicardial approaches (TOP: 270±70 min). Amongst CT-EAM-guided procedures: 6 (11%) were performed with epicardial approach (TOP: 210±70 min), 41 (75%) with endocardial approach (TOP: 204±60 min), and 8 (14%) with both endocardial and epicardial approaches (TOP: 210±40 min). A significant difference was found in the TOP when ablation was performed with both endocardial and epicardial approaches (p=0.04). No significant differences were observed for procedural complication and success rate.
Conclusion: CT merged with EAM may be an effective tool for reduction of TOP and real-time guidance of VT ablation.

B-1075 14:24

Comparison of transthoracic echocardiography versus cardiac magnetic for ICD therapy in primary prevention strategy dilated cardiomyopathy patients

G. Pontone[1], D. Andreini[1], A. Solbiati[1], M. Guglielmo[1], S. Mushtaq[1], A. Baggiano[1], C. Rota[1], A. Guaricci[2], M. Pepi[1]; [1]*Milan/IT*, [2]*Foggia/IT*
(gianluca.pontone@ccfm.it)

Purpose: Implantable cardioverter-defibrillators (ICDs) are indicated for primary prevention in dilated cardiomyopathy (DCM) with left ventricular ejection function (LVEF) < 35%. Cardiac magnetic resonance (CMR) is the gold standard technique for LVEF assessment and it provides information on tissue characterisation with late gadolinium enhancement (LGE). We sought to determine whether LV evaluation and LGE detection by CMR are superior to TTE measurements for risk stratification in DCM for ICD implantation in primary prevention.
Methods and Materials: 270 consecutive DCM patients in evaluation for ICD implantation in primary prevention were enrolled. All patients underwent both TTE and CMR left ventricle end-diastolic (LVEDV) and end-systolic (LVESV) volumes and LVEF estimation. LGE was also detected by CMR. Major adverse cardiac events (MACE) were defined as a combined endpoint of ventricular tachycardia, ventricular fibrillation and sudden cardiac death.
Results: The mean follow-up was 850±330 days. TTE showed a lower LVEDV and LVESD and a higher LVEF as compared to CMR ($p < 0.0001$). MACE occurred in 68 patients (25%). Patients experienced MACE showed a higher LVEDV-TTE, LVESV-TTE, LVEDV-CMR, LVESV-CMR, lower LVEF-CMR (p: 0.0027) and a higher LGE prevalence (p: 0.0009) as compared to patients without MACE. At multivariate analysis, LVEF-CMR and presence of LGE were independently associated with MACE (p35%, the addition of LVEF-CMR and LGE provides a net reclassification improvement (NRI) of 42% and 26%, respectively, in terms of outcomes.
Conclusion: LVEF and LGE estimation by CMR provide additional prognostic stratification as compared to TTE that could identify subjects in whom ICD implantation is indicated despite LVEF-TTE> 35%.

B-1076 14:32

Submillisievert computed tomography with MBIR before pulmonary veins radiofrequency catheter ablation of atrial fibrillation: impact on radiation exposure and outcome

G. Pontone, D. Andreini, A. Annoni, M. Petullà, E. Russo, E. Innocenti, M. Guglielmo, S. Mushtaq, M. Pepi; *Milan/IT (gianluca.pontone@ccfm.it)*

Purpose: The outcome of radiofrequency catheter ablation (RFCA) of atrial fibrillation (AF) has improved thanks to left atrium (LA) anatomy reconstruction by computed tomography with adaptive statistical iterative reconstruction algorithm (CT-ASIR) before the procedure.CT-ASIR strategy is associated to an increase of cumulative effective radiation dose (ED). A model-based iterative reconstruction algorithm (MBIR, GE Healthcare, Waukesha,Wisconsin) has developed (CT-MBIR) for image noise reduction reducing the ED. Aim of this study is comparing the CT and RFCA characteristics, AF recurrence after procedure and radiation exposure between RFCA guided by image integration with CT-ASIR versus CT-MBIR
Methods and Materials: 120 patients were addressed to CT-ASIR (Group 1;N:60;mean age 60.3±10.1yo) or CT-MBIR (Group 2;N:60;mean age 59.7±11.3 yo) for evaluation of LA before RFCA. All patients were subsequently treated by image integration-supported RFCA. Image noise, signal to noise ratio (SNR), contrast to noise ratio (CNR), RFCA procedural characteristics, rate of AF recurrence and CT radiation exposure were measured.
Results: Mean follow-up was similar (578±284 vs. 591±278 days,p:ns).Group 2 showed a higher SNR and CNR of LA as compared to Group 1 ($p < 0.001$).No differences were found in terms of RFCA parameter: procedural duration; fluoroscopy time; pulmonary veins isolated and the rate of AF recurrence between Group 2 vs Group 1. Group 2 showed a 94% reduction of ED as compared to Group 1 (0.4±0.04 mSv vs 6.4±1.8 mSv,$p < 0.01$).
Conclusion: CT-MBIR allows accurate reconstruction of LA anatomy in AF patients undergoing to RFCA with a submillisievert effective radiation and comparable success rate of RFCA with CT-ASIR technique.

B-1077 14:40

Using coronary CT angiography for guiding invasive coronary angiography: Potential role to reduce intra-procedural radiation exposure

C.R.T. Arendt, P. Dewes, J.L. Wichmann, J.M. Kerl, T.J. Vogl, R.W. Bauer; *Frankfurt a. Main/DE (crt.arendt@gmail.com)*

Purpose: To evaluate a potential radiation dose reduction during invasive coronary angiography (ICA) by specifically guiding the procedure to the diseased vessel in patients with coronary artery disease (CAD) as diagnosed on previously performed coronary CT angiography (CCTA).
Methods and Materials: We included 47 consecutive individuals who underwent CCTA and subsequent ICA. Dose-area-product (DAP) of ICA for the right (RCA) and left coronary artery (LCA) were regarded separately. We differentiated between whether stenting of solely the LCA (group 1), RCA (group 2) or both vessels (group 3) was performed. Additionally, we investigated patients with proposed surgical bypass treatment (group 4) and with no specific therapy (group 5) following ICA.
Results: A potential DAP reduction of 16.7±11.5% was estimated in group 1 and 2 (n=13) if ICA had been directed only to the site of disease as described in CT report. Group 3 (n=8) and group 4 (n=3) did not affect savings of radiation dose due to the need of treatment of both coronary arteries or the obligation of two/three-vessel-disease verification by ICA. DPA in group 5 (n= 23) could be decreased by 26.6%, noticing that overestimation of degree of stenosis on CT was present in 11 of 46 coronary arteries. Overall, a potential radiation dose reduction was evaluated in 24 patients with 34 CCTA-diagnosed mild stenoses.
Conclusion: Catheterization of solely moderately and severely stenosed coronary arteries without verifying minimal and mild stenoses diagnosed by CCTA can reduce radiation exposure in more than a half of the performed ICA examinations noticeably.

B-1078 14:48

Routine MDCT results in an increased diagnostic certainty and a therapeutic change in patients with suspected prosthetic heart valve dysfunction

D. Suchá[1], P. Symersky[2], R.B.A. van den Brink[2], W. Tanis[3], M.F.L. Meijs[4], J. Habets[1], S.A.J. Chamuleau[1], L.A. van Herwerden[1], R.P.J. Budde[5]; [1]*Utrecht/NL*, [2]*Amsterdam/NL*, [3]*The Hague/NL*, [4]*Twente/NL*, [5]*Rotterdam/NL (D.sucha@umcutrecht.nl)*

Purpose: Routine work-up in patients with suspected prosthetic heart valve (PHV) dysfunction includes transthoracic (TTE) and transesophageal (TEE) echocardiography (± fluoroscopy). Because of specific limitations, TTE/TEE may fail in identifying the underlying PHV-dysfunction mechanism. In this prospective study we systematically evaluated the role of multidetector-row computed tomography (MDCT) as additional modality in suspected PHV-dysfunction on (A) detecting the cause of PHV-obstruction and leakage, (B) proposing a treatment strategy.
Methods and Materials: We prospectively enrolled patients if one of the following conditions was suspected: abnormal obstruction, abnormal (peri)prosthetic leakage (non-endocarditis) and/or clinical abnormalities based on PHV-dysfunction. All patients underwent routine (TTE,TEE,±fluoroscopy) and additional MDCT imaging during clinical presentation. An expert panel assessed the incremental value of MDCT compared to routine modalities for identifying the underlying pathological mechanism and proposing a treatment strategy, whether MDCT resulted in a treatment change and whether it affected the experts' certainty of diagnosis and therapy.
Results: In total, 42 patients were included: 30 PHV-obstruction and 12 PHV-leakage cases. In 26/30 PHV-obstruction and 7/12 PHV-leakage patients MDCT had incremental value to routine imaging for identifying the dysfunction cause and/or proposing treatment strategy. MDCT changed the treatment in 8/30 and 3/12 patients, respectively. In suspected PHV-obstruction patients, the experts' certainty for both diagnosis and therapy was increased with MDCT.
Conclusion: MDCT in addition to routine echocardiography may have complementary value to identify the underlying PHV-dysfunction cause and change treatment strategy. MDCT as routine imaging tool may be implemented in all suspected PHV-obstruction patients and considered in suspected PHV-leakage patients.
Author Disclosures:
L.A. van Herwerden: Consultant; Clinical research consultant for St. Jude Medical, Inc., St. Paul, Minnesota. **R.P.J. Budde:** Research/Grant Support; Supported by a grant from the Dutch Heart Foundation [Grant number 2009B014].

B-1079 14:56

Ejection fraction and left-atrial diameter are predictors of NT-proBNP recovery after transcatheter aortic valve implantation

J. Schmid, R. Maderthaner, K. Ablasser, T. Stojakovic, J.S. Binder, P. Rainer; *Graz/AT (johannes.schmid@medunigraz.at)*

Purpose: NT-proBNP reflects cardiac filling pressures and is a prognostic marker in patients undergoing transcatheter aortic valve implantation (TAVI). We examined echocardiographic (echo) and cardiac magnetic resonance (cMR) imaging predictors of ventricular recovery reflected by NT-proBNP recovery.
Methods and Materials: Ninety-eight patients (65.7% females, 81.8±6.1 years) that underwent TAVI (CoreValve) 2011-2015 and had a pre-procedural cMR examination were included. Multiple linear regression analysis (MLR) was performed for the outcome variable mean NT-proBNP (log) during a one-year follow-up, adjusting for baseline NT-proBNP (log), cMR left-ventricular mass index, cMR ejection fraction (EF), echo left-atrial (LA) diameter, echo AV mean gradient, sex, and age.
Results: Baseline EF was 61±16%, LA diameter 62±7 mm, LV mass index 84±23 g/m2, and NT-proBNP 1741[660-3522] ng/L. MLR adjusted for baseline NT-proBNP showed significant associations between post-procedural NT-proBNP and LA diameter (ß=0.23; p=0.003), EF (ß=0.24; p=0.003), and AV mean gradient (ß=-0.39; $p < 0.001$).
Conclusion: Our data indicate that LA enlargement is associated with decreased NT-proBNP recovery. AV mean gradient was negatively associated with post-procedural NT-proBNP indicating that patients with higher gradients still benefit in terms of NT-proBNP recovery. The positive association between EF and post-TAVI NT-proBNP is surprising and driven by a higher relative change in NT-proBNP values in patients with depressed EF. Limitations of our study are that NT-proBNP is but a surrogate parameter of LV recovery and that few patients with depressed EF (17 with EF< 50%) underwent TAVI.

B-1080 15:04

Reduction in risk of contrast-induced nephropathy (CIN) in Pre-TAVI CT coronary angiography using a novel low-volume, low-viscosity contrast protocol

M. Crawford Jefferson, P. Donnelly, P. Ball; *Belfast/UK (mcjharp@yahoo.co.uk)*

Purpose: To assess the potential reduction in risk of CIN in pre-TAVI CT coronary angiography using a low-volume, low-viscosity protocol.
Methods and Materials: 150 patients were reviewed over a 3-year period. The eGFR was recorded pre-scan and 3 days post-scan. 90 ml of loversol 240 mg/ml at a rate of initially 5 ml/s reducing to 4 ml/s using bolus shaping dual-head injector. The image quality was assessed by two independent reviewers using a 5-point Likert score for the upper and lower access points and the annulus. CIN was considered to have occurred if there was a greater than 25% reduction in eGFR post-contrast administration. All studies were performed with a fixed protocol of 100 kV, 700 mAs with no alteration for BMI.
Results: All 150 scans were reported as good or excellent image quality. Pre-eGFR ranged from 22 to > 60. 100 of 150 patients had no change in the eGFR.

20 had an improvement in eGFR. 30 had a recorded reduction in eGFR, the most significant reduction was from 22 to 11. This however was the only significant change of greater than 25% in all of the patients.
Conclusion: TAVI insertion is performed in high-risk patients, often with a history of vascular disease and increased risk of renal compromise. This study demonstrates the significant risk reduction of CIN using the low-volume, low-viscosity protocol without compromising image quality or reproducibility.

B-1081 15:12

Left atrial appendage thrombus as a preventable cause of stroke: complex imaging modalities versus prone position MDCT
M. Kantarci, R. Sade, H. Ogul, S. Sevimli, I. Tanboga, A. Colak, L. Karaca; *Erzurum/TR (akkanrad@hotmail.com)*

Purpose: The left atrial appendage (LAA) is the primary source of thrombus formation, especially in patients with AF, and is a very important anatomical structure in cardioembolic strokes. This study aims to assess the diagnostic performance of prone and supine position cardiac multidetector computed tomography (MDCT) in the detection of LAA thrombi and differentiate between thrombus and circulatory stasis in patients who had SEC and/or thrombus upon transesophageal echocardiography (TTE) examination, using TEE as the gold standard imaging modality.
Methods and Materials: From December 2014 to May 2015, 65 consecutive patients who were admitted to the hospital due to cardioembolic stroke risk factors were enrolled in the study. Forty-five patients were excluded because of normal TTE findings, allergy to the contrast agent, or high creatinine levels. The remaining 20 patients were evaluated with supine and prone position MDCT and TTE. MDCT scans in the prone and supine positions were collected and MDCT and TEE sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV) were calculated.
Results: For the MDCT scan in the supine position, the sensitivity, specificity, PPV, and NPV results were 100%, 80%, 62.5%, and 100%, respectively. For the MDCT scan in the prone position, the sensitivity, specificity, PPV, and NPV results were 100%, 100%, 100%, and 100%, respectively.
Conclusion: MDCT scanning in the prone position differentiates SEC and thrombus, is clinically useful for detecting and ruling out LAA thrombus, and may be an alternative to TEE as a diagnostic tool.

B-1082 15:20

Biological aortic heart valves deform after surgical implantation: a multidetector-row computed tomography study
D. Suchá[1], P. Symersky[2], L.M. de Heer[1], W.P.T.M. Mali[1], L.A. van Herwerden[1], R.P.J. Budde[3]; [1]*Utrecht/NL*, [2]*Amsterdam/NL*, [3]*Rotterdam/NL (D.sucha@umcutrecht.nl)*

Purpose: Distortion of the geometry of aortic biological heart valves after surgical implantation may affect leaflet coaptation, alter mechanical stress distribution and impact valve durability. Much has been published on the distortion of transcatheter prostheses, but little is known about the prevalence and degree of distortion of surgical aortic prostheses. The purpose of this study was to assess deformation of aortic bioprostheses using multidetector-row computed tomography (MDCT).
Methods and Materials: We performed a retrospective search in our medical database to acquire all patients with an aortic biological heart valve that underwent MDCT imaging between 2007 and 2014. MDCT images were reconstructed in plane with the prosthesis and systolic and diastolic phases were used to measure minimal and maximal valve diameters. The eccentricity index (EI) was calculated as a measure of deformation. A prosthetic EI of < 5% was considered none or trivial deformation, 5-10% mild deformation and ≥10% non-circular.
Results: Fifty-six aortic bioprostheses were included: 45 Perimount, 7 Mitroflow and 4 Medtronic Mosaic valves. Mild valve eccentricity was found in 16/56 (29%) of cases and non-circularity in 7/56 (13%) of cases. Median prosthetic EI was 4.5% [interquartile range 3.0-7.8%]. Median time from surgical implant to MDCT was 3 months [interquartile range 1-22].
Conclusion: The geometry of aortic bioprostheses after surgical implant was ≥mildly deformed in 42% of cases and considered non-circular in 13% of studied valves. Should valve deformation affect valve durability, these findings may call for evaluation of surgical implant techniques.
Author Disclosures:
L.A. van Herwerden: Consultant; Clinical research consultant for St. Jude Medical, Inc., St. Paul, Minnesota.

14:00 - 15:30 **Room M 2**

Abdominal Viscera

SS 1501

Liver fibrosis: imaging assessment

Moderators:
C. Caseiro-Alves; Coimbra/ PT
S.K. Venkatesh; Rochester, MN/US

B-1083 14:00

Liver stiffness is better than serum biomarkers in liver fibrosis staging: study on surgical specimens in patients with chronic hepatitis B
Q. Lu, Y. Luo, C.-L. Lu; *Chengdu/CN (wsluqiang@126.com)*

Purpose: To evaluate the capabilities of liver stiffness and serum biomarkers on liver fibrosis staging in patients with chronic hepatitis B (CHB) using pathology from large surgical specimens as reference standard.
Methods and Materials: Liver stiffness accessed by ultrasound-based elastography point quantification, biomarkers presented by aspartate aminotransferase platelet ratio index (APRI) and fibrosis index based on 4-factor (FIB-4) were obtained on 386 patients with CHB. Cut-offs of liver stiffness and serum biomarkers were firstly developed in a cohort of 284 patients, and then further validated on another independent cohort of 102 patients using pathological staging of liver fibrosis on large surgical specimen as reference standard.
Results: Liver stiffness showed significantly stronger correlation with fibrosis stages as compared to APRI and FIB-4 (r: 0.738 vs. 0.477 vs. 0.427, all $P < 0.05$). In the development phase, higher AUC was demonstrated for liver stiffness in identifying fibrosis ≥S1, ≥S2, ≥S3 and ≥S4 (0.97, 0.96, 0.91 and 0.87, respectively) than APRI (0.89, 0.84, 0.73 and 0.74, respectively) or FIB-4 (0.82, 0.80, 0.70 and 0.72, respectively). In validation phase, higher AUC was illustrated for liver stiffness in identifying fibrosis ≥S1, ≥S2, ≥S3 and ≥S4 (0.99, 0.95, 0.89 and 0.88, respectively) than APRI (0.83, 0.76, 0.78 and 0.68, respectively) or FIB-4 (0.76, 0.69, 0.75 and 0.67, respectively).
Conclusion: Liver stiffness performs better than serum biomarkers in liver fibrosis staging on patients of CHB.

B-1084 14:08

Real-time elastography (RTE): noninvasive diagnostic tool in evaluation of liver stiffness in patients with chronic viral hepatitis, correlated to biopsy
M. Schiavone, D. Ippolito, C. Talei Franzesi, P. Bonaffini, S. Sironi; *Monza/IT (mvalentinaschiavone@gmail.com)*

Purpose: To determine the value of real-Time elastography (RTE) in assessment of liver stiffness in patients with chronic viral hepatitis, correlating RTE data with the extent of fibrosis based on biopsy findings (Ishak score).
Methods and Materials: We evaluated thirty-four patients (45-75 years) with chronic viral hepatitis (21 HCV, 13 HBV)by using ultrasonography (US) study combined with RTE analysis.In the RTE images, relative tissue stiffness is expressed, according to color scale, with soft areas represented in green/red colors and hard areas in blue. We divided the patients in two groups based on fibrosis degree: soft degree (D1, corresponding to F1-F3 Ishak score) and hard degree (D2, corresponding to F4-F6).Before RTE all patients underwent a US-guided percutaneous liver biopsy (right lobe).
Results: Quantitative RTE data were compared with liver biopsy by using the Spearman's correlation coefficient in order to assess the correlation between the RTE (D) and fibrosis, according to Ishak score (F) at histology. At RTE 18/34patients had degree D1 and 16/34 patients had degree D2; at histological analysis we found: 5 patients with F1, 8 with F2, 7 with F3, 5 with F4, 5 with F5, 4 with F6. The Spearman's coefficient showed significant correlation between D and F degree, obtaining Rho=0.573, p=0.003.
Conclusion: RTE analysis showed high diagnostic accuracy in assessment of fibrosis, and it appears to be useful diagnostic tool for non-invasive quantification of fibrosis in patients with chronic viral hepatitis.

B-1085 14:16

Accuracy of the QElaXto® shear wave technique for staging liver fibrosis
G. Ferraioli, L. Maiocchi, R. Lissandrin, C. Tinelli, C. Filice; *Pavia/IT*

Purpose: To assess the performance of QElaXto®, a new point shear wave elastography method, by comparing the results to that obtained with transient elastography (TE).
Methods and Materials: Consecutive individuals referred for abdominal ultrasound examination were enrolled. Liver stiffness measurements were performed with the QElaXto® point shear wave technique implemented in the Twice system (Esaote, Genoa, Italy) and with the TE method of the FibroScan device (Echosens, Paris, France). The two systems were used in a random

order. For staging liver fibrosis we used the TE cutoffs of 7.0, 9.5 and 12.0 kiloPascal, respectively, for significant fibrosis (F≥2), advanced fibrosis (F≥3), and cirrhosis (F=4). The diagnostic performance of QElaXto® was assessed by calculating the area under the receiver operating characteristic curve (AUC).
Results: Ninety-six patients [62 males, 34 females; mean age, 56.6 (12.1) years] were studied. Thirty-eight individuals were in F0-F1 stage, 13 in F2 stage, 10 in F3 stage, and 35 in F4 stage. The optimal cutoff of QElaXto® for staging significant fibrosis was 8.8 kilopascal [sensitivity, 87.9% (95%CI: 76.7-95.0); specificity, 97.4% (95%CI: 86.2-99.9); LR+, 33.4 (95%CI: 4.8-231.7); LR-, 0.12 (95%CI: 0.06-0.29]. AUC calculations showed values of 0.98 (95% CI, 0.96-1.00) for F≥2; 0.98 (95% CI, 0.95-1.00) for F≥3; 0.97 (95% CI, 0.95-1.00) for F=4.
Conclusion: These preliminary results show that QElaXto® is an accurate method for the staging of the liver fibrosis.
Author Disclosures:
G. Ferraioli: Speaker; Philips Healthcare. **C. Filice:** Speaker; Philips Healthcare.

B-1086 14:24

How many valid measurements are necessary to assess liver stiffness using 2D-SWE.GE?

F.B. Bende, I. Sporea, A. Popescu, R. Sirli, R. Mare, R. Lupusoru; *Timisoara/RO (bendefelix@gmail.com)*

Purpose: According to the manufacturer's recommendations, to obtain reliable liver stiffness values, 10 valid measurements need to be performed. The aim of this study was to evaluate whether 5 liver stiffness measurements are as useful as 10.
Methods and Materials: 77 consecutive subjects with or without chronic hepatopathies were included in the study, in whom liver stiffness (LS) was evaluated by 2D-SWE.GE. 10 valid measurements were performed in each case, and the mean, median, standard deviation (SD), and interquartile range (IQR) were calculated. We compared the first 5 measurement group with the 10 measurement group. We used the following 2D-SWE.GE cut-off values (1): F< 2: 8.3 KPa; F=4 : 12 KPa.
Results: The structure of the cohort study was the following: Group.i. (F < 2: 40/77 (52%), Group II (F2-F3 : 18/77 (23.3%); Group III (F=4: 19/77 (24.7%). We found no significant statistical differences between the LS measurements in the three groups, neither for median (p=0.86), mean (p=0.72), IQR (p=0.59) nor SD (p=0.41). There were also no significant differences between the LS measurements in the 3 groups of fibrosis F 0.05).
Conclusion: 5 valid measurements may be enough to quantify the liver stiffness by 2D-SWE.GE without significant loss of accuracy even in patients with advanced liver disease.

B-1087 14:32

The performance of 2D SWE.GE compared to transient elastography for the evaluation of liver stiffness: preliminary results

I. Sporea, F. Bende, A. Popescu, R. Sirli, R. Mare, R. Lupusoru; *Timisoara/RO (isporea@umft.ro)*

Purpose: The current study's aim is to evaluate the performance of 2D SWE.GE in noninvasive fibrosis assessment and to compare it to a validated method - transient elastography (TE).
Methods and Materials: Our study included 84 consecutive subjects, with or without chronic hepatopathies (only compensated liver disease), in which liver stiffness (LS) was evaluated in the same session by means of 2 elastographic methods: TE (M and XL probes) and 2D SWE.GE. Reliable LS measurements were defined as follows: for TE - the median value of 10 measurements with a success rate of ≥60% and an interquartile range < 30% and for 2D-SWE.GE - the median value of 10 measurements acquired in a homogeneous area and an interquartile range < 30%. Based on TE [1] cut-off values, we divided our lot into 3 groups: F < 2: 35/79 (44.3%); F2-F3: 8/73 (10.1%); F=4: 36 (45.6%).
Results: Reliable LS measurements were obtained in 83/84 (98.8%) subjects by 2D-SWE.GE, and in 79/84 (94%) by TE (p=0.04). We found a strong correlation between the LS values obtained by the 2 methods: r= 0.71, p < 0.0001. The mean values obtained by 2D SWE.GE considering TE cut-off values as reference were: F0-F1: 5.4±1.1 kPa; F2-F3: 9.9±1.9 kPa; F4: 12.9±3.2 kPa (p=0.032).
Conclusion: 2D SWE.GE was feasible in 98.8 % of cases, significantly better than for TE. There was a strong correlation between the two methods, with LS values significantly increasing with the severity of fibrosis.

B-1088 14:40

Quantitative 3 T MR imaging techniques for staging liver fat steatosis and fibrosis in chronic liver diseases: the HEPATOMAP protocol

L. Cuminal[1], O. Beuf[1], B. Leporq[2], J. Dumortier[1], S. Gaillard[1], V. Hervieu[1], O. Guillaud[1], A. Muller[1], P.-J. Valette[1]; [1]*Lyon/FR*, [2]*Villeurbanne/FR (liadeh@hotmail.fr)*

Purpose: To estimate the clinical value of combined innovative MR techniques to generate quantitative maps and to estimate the liver steatosis and fibrosis stage.
Methods and Materials: Between September 2013 and June 2015, 55 patients (mean age: 50.6 years, range: 22-80) with chronic liver disease were prospectively screened by biopsy and liver MRI. Acquisitions were performed on a 3.0 T MR750 (GEHC) system and protocol included: 1) SPGR multi-angle, multi-echo sequence to quantify fat volume fraction (FVF). 2) Dynamic contrast enhanced 3D LAVA sequence with 1.8sec temporal resolution to calculate the hepatic Mean Transit Time (MTT), perfusion index (HPI), portal and arterialflows. 3) Intravoxel Incoherent Motion Imaging (IVIM) to calculate the pure molecular-based (Dslow) and perfusion related (Dfast) diffusion coefficient. All the quantitative parameter values derived from MRI were compared to semi-quantitative biopsy data (Brunt staging for steatosis and Ishak score for fibrosis) using area under the curve (AUC) and Spearman's coefficient correlation (CorrS).
Results: MRI-based FVF values were very significantly correlated with histological steatosis rate (CorrS=0.917, p < 0.0001). AUC for steatosis was respectively 0.956 [IC 0.907-1]; 0.983 [IC 0.958-1] and 0.954 [IC 0.892-1] for stage I (n=35), II (n=20) and III (n=6). MRI-based perfusion parameters were significantly correlated with fibrosis score (CorrS was 0.320 (p=0.021) for MTT, 0.400 (p=0.003) for HPI, and -0.291 (p=0.036) for portal debit. None of the IVIM parametres were correlated with fibrosis score without taking into account the fat content.
Conclusion: MRI-based HEPATOMAP protocol may have the potential to provide a fast and noninvasive approach for fatty liver quantification and liver fibrosis grading.

B-1089 14:48

Feasibility of different b values of MRI diffusion in quantitative assessment of liver fibrosis

M.A. ElRefaei[1], M. Refaat[2], M. ElTohamy[1]; [1]*Zagazig/EG*, [2]*Benha/EG (manal.elrefaei@yahoo.com)*

Purpose: We aimed to assess the accuracy of hepatic ADC and the best b value for DWI-MRI for quantification of liver fibrosis, aiming to improve diagnostic accuracy and achieve a reliable non-invasive marker of hepatic fibrosis.
Methods and Materials: 100 patients with history of chronic hepatitis C virus and 25 healthy adult volunteers control group were investigated by DWI-MRI at different b values of 200, 500, 700 and 1000 s/mm2 on the same day before liver biopsy. ADC maps were generated and the mean hepatic ADC was calculated as the arithmetic mean of the four hepatic ADC values calculated at each b value. Liver ADCs were correlated with fibrosis scores using the Spearman's rank correlation coefficient, while receiver operating characteristic (ROC) curve analysis and the threshold ADC was used to maximise the average of sensitivity and specificity.
Results: The patient group was stratified pathologically according to modified Ishak classification as stage 1 to 6. Negative correlation between the ADC values and the degree of liver fibrosis was found at b values 200 and 1000 s/mm2, with P=0.000. The ROC curve analysis, at b = 1000 s/mm2, revealed significant difference in ADC values between patients with early fibrosis (F≤4) and those with cirrhotic liver (F> 5) (p=0.000), where the best cutoff ADC value to distinguish between these groups was 1.12 x 10-3 mm2/s, with 80.5% sensitivity and 77% specificity.
Conclusion: Liver ADC showed a significant difference in the ADC values of non-fibrotic and cirrhotic patients, with high sensitivity and specificity at b value 1000 s/mm2 with cutoff value 1.12 x 10-3 mm2/s.

B-1090 14:56

Liver fibrosis staging with diffusion-weighted imaging: a systematic review and meta-analysis

J. Chen, R. Gao, B. Song; *Chengdu/CN (937158893@qq.com)*

Purpose: The broad availability of diffusion weighted imaging (DWI) makes it an attractive option for noninvasive liver fibrosis (LF) staging. This study aims to evaluate the diagnostic performance of DWI for staging LF through a quantitative meta-analysis.
Methods and Materials: A comprehensive literature search was conducted to identify relevant articles. Diagnostic data were extracted for each fibrosis stage (F0-F4). A bivariate binomial model was used to combine the sensitivity and specificity. Summary receiver operating characteristic (SROC) curves were derived and areas under SROC curve (AUC) were computed to indicate the

diagnostic accuracy. Subgroup analysis was performed between 1.5 and 3.0-Tesla scanners and different imaging protocols.
Results: 14 studies met the inclusion criteria for the diagnosis of LF ≥F1, 13 for LF ≥F2, 14 for LF ≥F3 and 11 for LF ≥F4. DWI had moderate diagnostic accuracies for LF staging (AUC was 0.8718, 0.8861, 0.8872 and 0.8807 for F1, F2, F3, and F4, respectively). The pooled sensitivity and specificity did not differ significantly between each stage. Subgroup analysis showed that for the diagnosis of liver cirrhosis (F4), sensitivity and AUC of 3.0 T DWI-MRI and the intravoxel incoherent motion (IVIM)-DWI derived pseudo-diffusion coefficient (D*) was significantly higher than that of 1.5 T and conventional apparent diffusion coefficient (ADC).
Conclusion: By including new-generation 3.0-Tesla scanners and the modified IVIM-DWI protocol, this study revealed the currently moderate diagnostic performance of DWI for LF staging, and presented the potential role of high filed strength MRI and IVIM-DWI for future fibrotic liver imaging.

B-1091 15:04

Fractionally encoded 3D MR elastography in non-alcoholic fatty liver disease: comparison with histological grading

J.H. Runge[1], L.P. Smits[1], J. Verheij[1], R. Sinkus[2], A.J. Nederveen[1], U.H. Beuers[1], J. Stoker[1]; [1]*Amsterdam/NL*, [2]*London/UK*
(j.h.runge@amc.uva.nl)

Purpose: Patients with non-alcoholic fatty liver disease (NAFLD) and non-alcoholic steatohepatitis (NASH) are prone to develop liver fibrosis. Liver stiffness measured by transient elastography (TE) or MR elastography (MRE) is a non-invasive biomarker for fibrosis. Current MRE techniques employ only 2D motion encoding gradients (MEG) and long echo times. The latter limits its use in iron overload situations, not uncommon in NAFLD. Fractionally encoded MRE with 3D MEGs and short echo times has hitherto not been compared with liver histology. In this study we compare fractionally encoded MRE and TE with fibrosis stage in NAFLD patients.
Methods and Materials: Consecutive NAFLD patients scheduled for liver biopsy were included, with biopsies scored by a single expert hepatopathologist (SAF-score). All subjects underwent same-day TE (FibroScan®) and 3 T MRI assessment within six weeks of biopsy. When logistics allowed, fractionally encoded MRE was performed (echo time:4.6 ms, vibration frequency:56 Hz, MEG frequency:160 Hz) in four 20s breath holds. Correlations between liver fibrosis grade on biopsy and liver stiffness in kPa obtained with TE and MRE were assessed with Spearman's.
Results: Biopsy and TE and MRE results were available for 45 (F0: 3; F1: 8; F2: 26; F3: 4; F4: 4) and 27 subjects, respectively. NAFLD was present in 40 subjects, of whom 18 had NASH. Correlations between histological fibrosis stage and TE or MRE did not differ (p=0.91) at 0.51 (95%-CI:0.25—0.70, p=0.0004) and 0.53 (95%-CI:0.19—0.76, p=0.0047), respectively.
Conclusion: Fractionally encoded 3D MRE shows similar correlation with histological liver fibrosis as TE and provides localised non-invasive insight in liver fibrosis.

B-1092 15:12

Coefficient of variation as imaging biomarker of hepatic fibrosis in chronic hepatitis B patients on Gd-EOB MRI; feasibility for prediction of HCC and comparison to clinical biomarker

J. Lee, G. Lee, K.-H. Yoon, Y. Lee, J. Ryu, H. Jun, T.-H. Kim; *Iksan City, Jeonbuk/KR (bbag106@naver.com)*

Purpose: To study whether coefficient of variation (CV) as an imaging biomarker for hepatic fibrosis on Gd-EOB MRI might be used to predict small HCC in chronic hepatitis B (CHB)patients and compare with clinical biomarkers.
Methods and Materials: The local IRB approved this retrospective study and waived written informed consent. The CHBpatients (41men, 22women; mean age, 57years) were divided into 2 groups by presence or absence of small HCC (< 3 cm);Group I (n=31, absence of HCC), Group II (n=32, presence of HCC). The MRI were included Gd-EOB-DTPA enhanced T1weighted-image (0.025 mmol/kg). MRI were analysed by MATLAB-based-software for inhomogeneity of signal intensities, calculated by CV map at circular ROI on liver. We investigated aspartate aminotransferase (AST)-to-platelet ratio index (APRI), AST/alanine aminotransferase (ALT) ratio (AAR), and FIB-4. The CV were compared by Mann-Whitney test. The diagnostic performance of CV map for prediction of HCC was evaluated by using receiver operating characteristic (ROC). The comparison of ROC between CV, APRI, AAR, FIB-4 were performed.
Results: On hepatobiliary phase of Gd-EOB enhanced T1-WI, the mean CV in group I, II were 4.84±1.43, 6.86±2.4 (*P=0*.000). On ROC of CV for prediction of HCC in CHB patients, the area under the curve (AUC) were 0.768 (95%CI 0.65-0.86). The sensitivity and specificity were 84.4% and 61.3% at cut-off value > 4.75. The AUC of APRI, AAR, and FIB-4 were 0.787, 0.657, 0.535. On comparison of ROC, the CV was superior to AAR ($p < 0.05$) and FIB-4 ($p < 0.05$) and similar to APRI (p=0.82).
Conclusion: The CV for hepatic fibrosis on Gd-EOB MRI may be used to predict small HCC in chronic hepatitis B.

B-1093 15:20

Gd-EOB-DTPA-enhanced MRI: perfusion and multi-hepatocyte-phase images for the evaluation of liver fibrosis induced by carbon tetrachloride in rats

J. Xu[1], X. Wang[1], Y. You[1], Q. Wang[1], H. Liu[2], J. Lei[1], H.D. Xue[1], Z.Y. Jin[1]; [1]*Beijing/CN*, [2]*Shanghai/CN (xu_jia_2007@yeah.net)*

Purpose: To investigate the potential of Gd-EOB-DTPA-enhanced MRI for detecting different stages of liver fibrosis in rats.
Methods and Materials: Liver fibrosis in rats was induce by carbon tetrachloride intraperitoneal injection for 4-12 weeks (n=45). In control group (n=15) normal saline was applied. The MR protocol contained both dynamic contrast-enhanced (DCE) sequence (sixty continual scans in 3 min, including 3 pre-contrast measurements) and multiple hepatocyte-phase acquisitions (every 5 min after contrast injection, 60 min in total). METAVIR score was used to grade liver fibrosis: normal (F0), mild fibrosis (F1-2), and advanced fibrosis (F3-4). Liver perfusion parameters [e.g. Ktrans, Ve, maximum relative enhancement (REmax) and the time of maximum RE (Tmax)] as well as hepatocyte-phase parameters [e.g. RE at different time point, the decrease of RE (REchange= REmax - RE60 min) and elimination half-life of RE (TRE1/2)] were measured and compared with ANOVA analysis (LSD) and Spearman rank correlation.
Results: Thirty-one rats completed MR exams, included normal (n=10), mild fibrosis (n=10) and advanced fibrosis (n=11). Ktrans, Ve and iAUC decreased as liver fibrosis progressed (r=-0.631, P=0.002; r=-0.503, P =0.017, r=-0.446, P=0.037). There were statistical significant differences of both Ktrans and Ve between normal and advanced group (P=0.001, P=0.009). Compared to normal and mild groups, advanced group had significantly longer Tmax and TRE1/2, and significantly lower REchange (all $P < 0.01$).
Conclusion: Perfusion and multi-hepatocyte-phase parameters such as Ktrans, Ve, Tmax, TRE1/2 and REchange obtained from Gd-EOB-DTPA enhanced MRI may have the potential for detecting and staging of liver fibrosis in rat model.

14:00 - 15:30 **Room M 3**

Vascular

SS 1515

New observations in visceral imaging and therapy

Moderators:
J.I. Bilbao; Pamplona/ES
N.N.

B-1094 14:00

Pelvic artery imaging: comparison of carbon dioxide enhanced digital subtraction angiography (CO_2-DSA) and C-Arm computed tomography (CO_2-CACT)

J. Hinrichs, T. Werncke, F. Wacker, B. Meyer, C. von Falck; *Hannover/DE (hinrichs.jan@mh-hannover.de)*

Purpose: To assess the feasibility and diagnostic performance of CO_2-CACT of the pelvic arteries in comparison to CO_2-DSA in patients with impairment of renal function.
Methods and Materials: Ten patients (9 men, 70±7y) underwent CO_2-DSA and CO_2-CACT using a 4 F catheter placed in the infrarenal aorta. CO_2-DSA and CO_2-CACT were acquired using 100 ml CO_2 per run via a syringe-based CO_2 injection device. Two interventional radiologists (R1; R2) independently assessed image quality and grade of stenosis (4-point-scale) for arterial segments (AS) from the infrarenal aorta to the common femoral arteries in both modalities. Inter-modality and inter-observer agreement was calculated (Cohen´s Kappa).
Results: Overall, 90 arterial segments (AS) were evaluated. In case of CO_2-CACT, 9 arterial segments in 5 patients were out of the field-of-view. A total of 81 AS were covered by both modalities. In CO_2-DSA and CO_2-CACT, 90% (91%) and 93% (93%) of AS were rated to be assessable for pathologic findings by R1 (R2). 96% (96%) of AS were assessable by at least one modality by R1 (R2). 70 AS were evaluated for pathologic findings. Eight patients had relevant pathologic findings in investigated arteries. Agreement of AS stenosis grading in DSA and CACT was observed in 89% (86%) by R1 (R2). In 11% (R1) and 14% (R2), CACT detected additional findings (R1 6/70; R2 5/70) or ruled out stenoses suspected to be relevant on DSA (R1 2/70; R2 5/70).

Conclusion: CO_2-enhanced CACT of the pelvic arteries is feasible and can supplement information to CO_2-DSA in patients with renal insufficiencies.

B-1095 14:08

Dynamic and morphologic evaluation of erectile dysfunction on penile Doppler sonography and contrast cavernosography

A. Ismail, M. Abdulkadir Tabari; *Kano/NG (ibnmalikanas@yahoo.co.uk)*

Purpose: To determine the real-time morphologic vascular abnormalities and clinical correlates in men with erectile dysfunction (ED) using penile Doppler sonography and cavernosography in Kano, Nigeria.
Methods and Materials: Twenty one patients who were referred from urology clinics on account of suspected vasculogenic ED were reviewed. The cavernorsal arteries were examined with 7.5 MHz linear transducer in grey scale and duplex Doppler modes before and after intra cavernosal injection of 60 mg papevarine. Serial peak systolic velocity (PSV), end diastolic velocity (EDV) and diameter measurements were done at five minutes intervals for 30 minutes. Contrast cavernosography was obtained following the preliminary film and intra cavernosal injection of contrast medium and papevarine.
Results: The mean age of the patients was 43.14 + 9.84 years. Out of the 21 patients examined, five showed normal findings while ten had evidence of venous leakage. Five patients had arterial insufficiency; out of which three patients showed calcifications of the tunica albuginea, suggesting Pyeroinier's disease. Interestingly, one patient showed combining features of arterial insufficiency and that of venous leakage. Those with arterial insufficiency are relatively older than other patients. They also had compounding medical conditions of diabetes and hypertension.
Conclusion: Vascular aetiologies are important contributors of ED in our setting. Papavarine-induced Doppler Sonography and cavernosography showed promise in accurate assessment and overall care of these patients.

B-1096 14:16

Prostatic artery embolisation (PAE) for patients with high surgical risk, prostatic hyperplasia and users of permanent urinary catheter

P. Largo Flores, K. Vivancos Costaleite, J. Cuesta Pérez, A. Friera Reyes; *Madrid/ES (plargoflores@gmail.com)*

Purpose: The prostatic hyperplasia is age-related, and can lead to acute retention, incontinence, and urinary tract infections. Treatment options for patients include watchful waiting, medical, minimally invasive, or surgical therapies. Prostatic arterial embolisation (PAE) has been shown to be a safe and effective method of reducing prostatic volume. To evaluate the advantages of the PAE in patients with high surgical risk, prostatic hyperplasia and users of permanent urinary catheter.
Methods and Materials: This was a single-institution prospective study of PAE in 20 patients with prostatic hyperplasia and users of permanent urinary catheter, between January 2014 and September 2015.All patients had prostatic hyperplasia, four of them with a diagnosis of adenocarcinoma. PAE with nonspherical 400 µm PAV particles, bilaterally in 9 patients and unilateral in 6. Clinical treatment success was defined as the presence of spontaneous urination within one month after the procedure was performed.
Results: Eighteen consecutive patients (mean age, 75 years) were included. PAE was successful in 15 of the 18 patients (83%). Follow-up ranged from 2-12 months. The rate of clinical success was 53% (n=8). The remaining patients continue with the need of permanent urinary catheter. One patient had extra peritoneal bladder perforation days after treatment, which was resolved.
Conclusion: PAE is a safe and effective procedure. With an efficiency of 53% in all patients. It is important to note that almost all patients in whom the PAE was effective, where users of indwelling urinary catheter for less than two months, and in patients who failed were users for more than three months old.

B-1097 14:24

Uterine artery embolisation for prevention and treatment of obstetric bleeding

B. Abishev; *Astana/KZ (abishevbnncmd1@rambler.ru)*

Purpose: Usage and evaluation of efficiency of uterine artery embolisation (UAE) in prevention and treatment of obstetric bleeding.
Methods and Materials: UAE as the prevention of obstetric bleeding in adnation and previa of placenta was made on 64 patients. In 61 cases UAE were made on pregnant women in terms of 35-40 weeks in combination with caesarean section. In three cases UAE were made after cesarean section to stop post operation uterine bleeding. UAE had performed after removal of fetus under the control of the fluoroscopy for preventing embolus reflux into other vessels.
Results: The diagnostic angiography and endovascular embolisation performed through the both femoral arteries. The microspheres were diluted with the contrast medium (Visipague 320) and physiological solution. Injecting emboli and their movement into the vascular system were controlled by the fluoroscopy for prevention of reflux and occlusion of other vessels. According to our data in 49 (80.3%) of the 61 cases after bilateral UAE were noticed stable stops of uterine bleeding. In 12 (19.7%) of 61 observations were made hysterectomy due to the low efficiency of UAE. In one case we made decision of hysterectomy after bilateral UAE in 12 hours because of uterine rebleeding. In three cases UAE were made after caesarian section and allowed to achieve haemostasis and save reproductive organ.
Conclusion: As a result, UAE is a quite effective method in preventing measures of massive postpartum bleeding in placenta pathology. In addition, UAE is an effective in stopping of uterine bleeding during postoperative period.

B-1099 14:32

Longitudinal monitoring of hepatic blood flow before and after TIPS implantation using 4D-flow MRI

P. Bannas[1], A. Roldan-Alzate[2], K.M. Johnson[2], O. Ozkan[2], U. Motosugi[2], O. Wieben[2], G. Adam[1], S.B. Reeder[2], H. Kramer[3]; [1]*Hamburg/DE*, [2]*Madison, WI/US*, [3]*Munich/DE (p.bannas@uke.de)*

Purpose: To demonstrate the feasibility of 4D-flow magnetic resonance imaging (MRI) for noninvasive longitudinal haemodynamic monitoring of hepatic blood flow before and after transjugular intrahepatic portosystemic shunt (TIPS).
Methods and Materials: The institutional review board approved this prospective HIPAA-compliant study. Informed consent was obtained from each patient. 4D-flow MRI was performed in 7 patients with portal hypertension and refractory ascites before, and 2 and 12 weeks after TIPS using a time-resolved 3D radial sampled phase-contrast acquisition (PC-VIPR). Flow and peak velocity measurements were performed in the superior mesenteric vein (SMV), splenic vein (SV), portal vein (PV), and in the TIPS stent. Flow volumes and peak velocities in each vessel, as well as the ratio of in-stent to PV flow were compared pre- and post-TIPS using analysis of variance (ANOVA).
Results: Flow volumes increased significantly in the SMV, SV, and PV after TIPS (all P smaller 0.05), without a significant difference between the first and second post-TIPS acquisitions (all $P > 0.11$). The ascites resolved in 6 of 7 patients. In the patients with resolved ascites, the TIPS/PV flow-ratio was 0.8 ± 0.2 and 0.9 ± 02 at the two post-TIPS time points, respectively, while the ratio was 4.6 and 4.3 in the patient with refractory ascites. In this patient 4D-flow MRI demonstrated an arterio-portal-venous fistula, draining into the TIPS.
Conclusion: 4D-flow MRI is feasible for longitudinal noninvasive monitoring of hepatic blood flow before and after TIPS-placement. Further evaluation is warranted to determine whether 4D-flow MRI can reliably identify those patients at risk for TIPS-related complications.

B-1100 14:40

Use of GnRH-agonist therapy in patients affected by uterine fibroids treated with uterine artery embolizstion: MRI evaluation of necrotic area reabsorption time and clinical outcome

F. Smaldone, F. Ferrari, F. Arrigoni, A. Miccoli, S. Carducci, A. Giordano, C. Masciocchi; *L'Aquila/IT (smal.f@alice.it)*

Purpose: To evaluate the effectiveness of gonadotropin-releasing hormone (GnRH) agonist therapy performed immediately after UAE treatment in symptomatic women affected by uterine fibroids.
Methods and Materials: Thirty-two symptomatic women, aged between 38 and 52, affected by uterine fibroids, were treated using UAE. After 1 month from the treatment, 13/32 were submitted to GnRH-agonist therapy (Group A); 19/32 did not received any therapy after UAE (Group B). The patients of each group were submitted to c.e. MRI in order to evaluate the necrotic area extension after 1 month, and 12 months to evaluate the different reabsorption times of the necrotic area. Symptomatology was assessed using SSS-Questionnaire after 12 months.
Results: The mean value of necrotic area extension was 91.5%. Eight patients out of 13 (61.53%) of group A showed a faster necrotic area reabsorption mean value of 85% after 12 months; 5/13 patients (38.46%) of group A showed a mean value of necrotic area reabsorption of 65% after 12 months from UAE. Fourteen patients out of 19 (87.68%) of group B had a mean value of necrotic area reabsorption of 60% after 12 months from UAE. Only 5/19 patients of group B (26.31%) showed a necrotic area reabsorption of 85% after 12 months. All patients presented a similar improvement of the symptoms after 12 months. There were no significant complications.
Conclusion: GnRH-agonists after UAE treatment seems to be an effective therapy with a faster reabsorption of necrotic area and recovery of uterine wall in patients submitted to UAE.

B-1101 14:48

Visceral artery aneurysms (VAA) single center case series in endovascular treatment using up-to-date materials, based on 11 patients during the past 2 years

A. Pellegrin, P. Divis, V. Gavrilovic, M. Puppato, A. Vit, M. Sponza; *Udine/IT (xpelle@gmail.com)*

Purpose: Visceral artery aneurysms (VAAs) are now being diagnosed with increased frequency, endovascular treatment is an emerging alternative to surgical procedures and materials as well as techniques evolved in the recent years. This study aims to assess short-term outcome of treatments using latest materials.
Methods and Materials: In a single Interventional Radiology center 11 Patients from Mar 2013 to Mar 2015 (mean 65.2±sd 6.7y, range 56-76y; M/F ratio 5/6) underwent endovascular treatment for VAA diameter 26.8±sd 11.5 mm diagnosed on CTA; 10/25 incidental findings 7/11; 5 splenic artery aneurysms (SAA), 3 gastroduodenal artery aneurysm (GDA), 2 renal artery aneurysms (RAA), 1 superior mesenteric artery (SMA), 1 hepatic artery aneurysm (HAA); 2/11 were considered pseduoaneurysms. Treatment was coiling or plug deployment 6/25, liquid agents 1/11, coiling and liquid agents 1/11, coiling and stent (jailing technique) 1/11, covered or flow diverter stent 3/11; all coils were controlled detachment coils. Follow-up was available at 6 months for all patients with CTA or MRA.
Results: Immediate technical success was obtained in 10/11 patients (91%), failure was in a GDA with sub-occluded celiac artery that eventually underwent surgical procedure. At 6 months follow-up 1/10 VAAs were at least partially perfused, remaining 9/10 were excluded (90%). No major complications were reported, while minor complications in 1/11 patients (9%).
Conclusion: In this case series, VAA could be safely treated with endovascular techniques most often preserving vascular bed distal to the aneurysm, nevertheless technical success can still result in later reperfusion/failed exclusion, follow-up with cross sectional imaging is mandatory.

B-1102 14:56

The effect of Dexamethasone on inflammatory response after uterine artery embolisation

J. Kim, S. Kim, M. Kim, M. Shin, W. Shin, G. Kim, S. Park, J. Won, D. Lee; *Seoul/KR (jonghkim@yuhs.ac)*

Purpose: To investigate the effect of single-dose intravenous dexamethasone on inflammatory responses, pain, nausea and vomiting after uterine artery embolisation (UAE).
Methods and Materials: This is a prospective, randomised, double-blinded and placebo-controlled study including patients undergoing UAE for the treatment of symptomatic fibroids or adenomyosis. The patients were randomised to receive either intravenous dexamethasone 10 mg (Dexamethasone group) or normal saline (Control group) one hour before UAE. Both groups received fentanyl-based intravenous patient-controlled analgesia (PCA) during the 24 hours after UAE. The primary outcomes were the inflammatory and stress responses measured by white blood cell count, neutrophil count, C-reactive protein (CRP), interleukin-6 (IL-6) and cortisol. Secondary outcomes were severity of pain and incidence of nausea and vomiting.
Results: Sixty-four patients were enrolled and 59 patients completed the study. CRP, IL-6 and cortisol were significantly lower in the dexamethasone group compared to the control group during the 24 hours after UAE. Although the cumulative dose of fentanyl and additional analgesics administered during the 24 hours after UAE were similar between the two groups, pain scores were significantly lower in the dexamethasone group starting from 12 hours after UAE and the incidence of severe nausea and vomiting was less apparent in the dexamethasone group.
Conclusion: Administration of single-dose intravenous dexamethasone as an adjunct to a fentanyl-based intravenous PCA is effective in reducing inflammation and pain during the 24 hours after UAE.

B-1103 15:04

Effects on renal function of transcatheter embolisation in renal bleeding

L. Spezia, C. Sozzi, A. Contro, G. Mansueto, R. Pozzi Mucelli; *Verona/IT (laura.spezia@gmail.com)*

Purpose: To evaluate the impact on renal function of super-selective arterial embolisation in the treatment of renal bleeding.
Methods and Materials: From 2008 to 2015, 18 patients (9 males and 9 females; mean age 63 years) underwent super-selective renal artery embolisation (SRAE) to treat bleeding from renal lesions. Bleeding causes were iatrogenic in 13 cases (7 after nephron-sparing surgery, 3 after nephrostomy and 3 following percutaneous lithotripsy), in 4 patients occurred spontaneously (3 cases following rupture of angiomyolipoma, 1 case due to overdose of anticoagulant therapy); in 1 subject following blunt abdominal trauma. Embolisation was performed using coils in 16 procedures and glue (Glubran-2) in 2 cases. Serum creatinine and eGFR were evaluated before and 7 days after the procedure.
Results: Significant improvement of renal function was observed in all patients, with a mean serum creatinine level of 1.055 mg/dl (range 0.52-1.8 mg/dl) before embolisation and of 0.97 mg/dl (range 0.5-1.68) 7 days after the procedure (p=0.003), and a mean eGFR value of 73.7 ml/min/1.73m2 (range 42.16-123) and 81.756 ml/min/1.73m2 (range 43.21-144.5) respectively before and 7 days after embolisation (p=0.02). Technical success was achieved in 17/18 patients (94.4%); one patient required a second procedure to stop bleeding. No major complications were observed and no patient required surgery.
Conclusion: Comparing our results with the surgical literature we found that renal artery embolisation, when properly performed, improves renal function.

B-1104 15:12

First experiences of prostatic artery embolisation for large benign prostatic hyperplasia ahead of a randomised controlled trial

A. Massmann, M. Saar, G.K. Schneider, M. Stoeckle, S. Siemer, A. Buecker, C. Niklas; *Homburg a.d. Saar/DE (Alexander.Massmann@uks.eu)*

Purpose: To evaluate Prostatic-Artery-Embolisation (PAE) for large benign prostatic hyperplasia (BPH).
Methods and Materials: Eight patients (mean-age 75.8±6.4 (range 68-88) years) with symptomatic BPH and prostate-volume (PV) > 80 ml refractory to oral medication (n=2; 25%) or urinary retention (n=6; 75%) were scheduled for PAE. Pre- and post-procedural International Prostate Symptom Score (IPSS), quality-of-life (QoL), uroflow (Qmax), post-void residual volume (PVRV), prostate-specific-antigen (PSA), PV by transrectal ultrasound (TRUS) and contrast-enhanced dynamic MRI were obtained. Selective embolisation was performed with a 2-French micro-catheter and calibrated 100 µm microspheres until stasis was achieved in the prostatic artery. Procedure-associated adverse events were recorded.
Results: PAE was performed in all patients (bilateral n=6;unilateral n=2). Procedure- and fluoroscopy-time were 158±92 and 81±21 minutes. 80±32 ml of iodinated contrast-agent was used without impact to renal function. In 4 (50%) patients protective selective coil-embolisation was necessary to avoid penile/perineal non-target embolisation. After one month, urinary retention completely resolved in all six afflicted patients. After three months, all patients showed markedly improved target values: PV 148±49 to 92±36 ml (-45±6%) (p=0.0218); PSA 10.1±5.2 to 5.2±3.1 ng/ml (-59±25%) (p=0.0227); PVRV 192±108 to 67±44 ml; IPSS 25±8 to 11±3; QoL 5±1 to 1±1; Qmax 8±1 to 14±5 ml/s. Lack of perfusion with subsequent necrosis in > 50% of the prostate predicted clinically successful embolisation. No PAE-related complications occurred.
Conclusion: PAE proved to be beneficial as a safe and effective treatment for large BPH. Promising results are validated in an ongoing prospective randomised-controlled trial (PIEMONTE study; www.germanctr.de #31052015) comparing PAE versus urologic transvesical adenomectomy.

14:00 - 15:30 **Room M 4**

Neuro

SS 1511
Multiple sclerosis

Moderators:
K.-O. Løvblad; Geneva/CH
R. Woitek; Vienna/AT

B-1105 14:00

Increased cortical grey matter lesion detection in multiple sclerosis with 7T MRI: a postmortem verification study

I.D. Kilsdonk[1], L.E. Jonkman[1], R. Klaver[1], S.J. Van Veluw[2], P.J.W. Pouwels[1], M.P. Wattjes[1], P.R. Luijten[2], F. Barkhof[1], J.J.G. Geurts[1]; [1]*Amsterdam/NL*, [2]*Utrecht/NL (i.kilsdonk@vumc.nl)*

Purpose: To determine the sensitivity of 7T versus 3 T MRI pulse sequences for the detection of cortical multiple sclerosis lesions by directly comparing them to histopathology.
Methods and Materials: We obtained hemispheric brain sections of 19 multiple sclerosis patients and 4 controls after rapid autopsy, formalin-fixed and scanned them on 3 T and 7T MRI. Pulse sequences included T1 weighted, T2 weighted, fluid attenuated inversion recovery (FLAIR), double inversion recovery (DIR) and T2*. Cortical lesions (type I-IV) were scored on all sequences separately by an experienced rater blinded to histopathology and clinical data. Staining was performed with antibodies against proteolipid protein and scored by a second reader blinded to MRI and clinical data. Subsequently, MRI images were matched to histopathology and sensitivity of pulse

sequences was calculated. Sensitivity values were statistically compared between and within the two different field strengths, with a negative binominal multilevel analysis.
Results: Regardless of pulse sequence, 7T MRI detected more cortical lesions than 3 T. 7T FLAIR detected 225% more cortical lesions than 3 T FLAIR ($Z=2.22$, $p < 0.05$) and 7T T2* detected 200% more cortical lesions than 3 T T2* ($Z=2.05$, $p < 0.05$). Sensitivity of 7T MRI was influenced by cortical lesion type: 100% for type I (T2), 11% for type II (FLAIR/ T2), 32% for type III (T2*), and 68% for type IV (T2).
Conclusion: Ultra-high field 7T MRI more than doubles detection of cortical multiple sclerosis lesions, compared to 3 T MRI. Unfortunately (subpial) cortical pathology remains more extensive than what 7T MRI can reveal.
Author Disclosures:
F. Barkhof: Board Member; Brain, European Radiology, Neuroradiology, Multiple Sclerosis Journal, Radiology. Consultant; Bayer-Schering Pharma, Sanofi-Aventis, Biogen-Idec, TEVA, Novartis, Roche, Synthon BV, Jansen Research. **J.J.G. Geurts:** Advisory Board; Dutch MS Research Foundation. Board Member; Neurology, Multiple Sclerosis Journal, MS International, BMC Neurology. Consultant; Merck Serono, Novartis, Biogen-Idec, Genzyme, TEVA.

B-1106 14:08

Presence of central veins and susceptibility weighted imaging for evaluating lesions in multiple sclerosis and leukoaraiosis
U. Lamot, K. Šurlan Popovič, J. Avsenik; *Ljubljana/SI*
(urska_lamot@hotmail.com)

Purpose: The process of demyelination in multiple sclerosis (MS) is reflected in lesions of the central nervous system, which are also found in an abundance of other diseases and are radiographically indistinguishable. Susceptibility weighted imaging (SWI) may have the potential to depict the centrally running veins within MS lesions, which is presumed to be a specific finding for MS.
Methods and Materials: We retrospectively examined 34 subjects with MS and 19 subjects with ischaemic lesions, which underwent a 3 T MRI investigation. According to FLAIR and T2-weighted images the lesions were categorized regarding location: supratentorial peripheral, supratentorial periventricular, or infratentorial. The presence of central veins (CVs) was determined on SWI. Gadolinium enhanced T1-weighted images were included for the evaluation of active lesions in patients with MS.
Results: A total load of 601 MS and 204 ischaemic lesions was identified and we found significantly more lesions with CVs in the group with ischaemic lesions compared to the group with MS lesions ($p < 0.001$). Similarly significantly more supratentorial peripheral ischaemic lesions had a CV ($p=0.011$). For the supratentorial periventricular and intratentorial lesions there was no significant difference between CVs in MS and ischaemic lesions ($p=0.377$ and $p=0.615$). Comparing the active and inactive MS lesions regarding CVs, we found no significant difference between the two groups ($p=0.472$).
Conclusion: We can conclude that CVs are not a specific radiographic diagnostic sign for MS, nonetheless we can use the presence of CVs to exclude some other potential causes of the lesions in the central nervous system.

B-1107 14:16

Comparison of diffusion weighted image and enhanced T1- weighted sequence in patients with multiple sclerosis
A. Abolhasani Foroughi, A. Nikseresht, M. Nazeri, R. Salahi, H. Heidari;
Shiraz/IR (amin.a.foroughi@gmail.com)

Purpose: To evaluate the active from inactive lesions, Gadolinium-enhanced T1-weighted and DWI images were used.
Methods and Materials: the patients with clinically definite MS, where included. Precontrast images included axial T1, then contrast agent was injected and 30 minutes later, sagittal thin cut FLAIR, axial T2, DWI, ADC, and Post contrast axial T1 -weighted were taken.
Results: 160 patients were evaluated of whom Diffusion restriction is noted in 7 (4.6%) patients, and increase diffusion is noted in 108 patients (72%) and in the rest of patient, diffusion was not seen to change. Enhancement of plaques were noted in 38 patients (38 patients out of 160) (23.7%). In 6 out of 38 patients (15.7%) no change in diffusion is seen, however, 25 patients out of 38 (65.7%) increase diffusion is seen, and in 7 patients out of 38 (18.4%) diffusion restriction is seen.
Conclusion: Considering restricted diffusion in some enhancing plaques and normal ADC value in some others, we conclude that in contrary to previous studies, the MS plaques can show diffusion restriction in early stages of development for a short period of time. Then the plaques evolve to increase diffusion. We think the MS plaques change from restricted diffusion to non-restricted diffusion rapidly, then contrast enhancement is fade and ultimately the plaques remain unenhanced with increase diffusion. Considering the low percentage of diffusion restricted plaques, we propose that, diffusion restriction evolve rapidly to normal diffusion and increased diffusion.

B-1108 14:24

Real-time elastography for the assessment of spasticity: our experience in multiple sclerosis patients
G. Illomei, G. Coghe, J. Frau, G. Spinicci, M. Marrosu; *Cagliari/IT*
(giovanni.illomei@radiologiadelcorso.it)

Purpose: The purpose of the study was to investigate the use of real time elastography in evaluating the muscle spasticity. The aim of the study assesses the elastography as new imaging tool for the evaluation of spasticity.
Methods and Materials: Two groups of patient were enrolled. Group A: 101 MS patients. In all this patients group a neurological examination was performed and referred to Ashworth scale score by a neurologist. All patients underwent real time elastography, the muscles examined were quadriceps of both legs. Group B: 40 MS patients inclusion criteria the ability to assume Nabiximol according to medical judgment and the Italian drugs agency (AIFA) criteria. All patients were non-responders to previous spasticity treatments. For each patient were evaluated, NRS. All patients underwent real time elastography, the muscles examined were quadriceps of both legs. The study was a double-blinded one, and it was approved by local Ethic Committee.
Results: GROUP A: here was full concordance between the Ashworth scale evaluation and elastography score. However, patients classified as score 0 in the Ashworth scale can be spitted in 0a (total normality of muscle fibres elasticity) and 0b (initial compromising of muscle fibres elasticity). GROUP B: there was a mean reduction of NRS during Nabiximol of 1.88 (NRS response rate was 65%). All patients showed an improvement at real time elastography examination.
Conclusion: Real time elastography could be the new gold standard to evaluate muscle spasticity.

B-1109 14:32

Association of MR features, clinical presentation and levels of matrix metalloproteinases in patients with clinically isolated syndrome and relapsing remiting multiple sclerosis
D. Stojanov, S. Jjubisavljevic, I. Stojanovic, S. Vojinovic; *Nis/RS*
(drstojanov@gmail.com)

Purpose: To assess association of MRI features, clinical presentation, and levels of matrix metalloproteinases (MMPs) in patients with clinically isolated syndrome of CNS (CIS) and relapsing remitting multiple sclerosis (RRMS).
Methods and Materials: Cross-sectional study included 37 CIS patients, 39 RRMS patients, and 10 control patients with nonspecific neurological symptoms. Clinically, all patients were assessed using Extended Disability Status Scale (EDSS). We calculated the number of T2W hyperintense lesions and load of T1W Gd-enhancing lesions as volume. Patients were divided into those with mild and severe MRI changes. Plasma total MMP-3 and MMP-9 levels were determined using the sandwich enzyme-linked immunosorbent assay (ELISA).
Results: In both study groups, the patients with higher EDSS showed higher MMP-3 levels $p=0.025$ and $p=0.023$ for CIS and RRMS; and higher MMP-9 levels, $p=0.011$ and $p=0.042$ in CIS and RRMS group. The MMP-3 values were significantly higher in both study patients with higher number of T2W brain lesions, $p=0.041$ in CIS, and $p=0.06$ in RRMS patients. Regarding the total number of T2W lesions, MMP-9 values were higher, than those with lower number of T2W lesions, $p=0.046$ and $p=0.04$. Positive correlations were observed inall study patients between MMPs values and radiological features measured through volume of Gd-enhancement brain lesions, $r=0.51$ ($p=0.02$) and $r=0.39$ ($p=0.031$) for MMP-3 and MMP-9 in CIS group; $r=0.34$ ($p=0.04$) and $r=0.41$ ($p=0.03$) for MMP-3 and MMP-9 in RRMS group.
Conclusion: MMPs might serve as a useful marker which is closely correlated with MRI and neurological activity of acute CNS inflammation.

B-1110 14:40

Normal-appearing white matter hypoperfusion in multiple sclerosis: assessment with DCE MRI
M. Ingrisch[1], S. Sourbron[2], M. Schneider[1], S. Herberich[1], T. Kümpfel[1], R. Hohlfeld[1], M.F. Reiser[1], B. Ertl-Wagner[1]; [1]*Munich/DE*, [2]*Leeds/UK*
(birgit.ertl-wagner@med.lmu.de)

Purpose: Previous studies have reported diffuse hypoperfusion in normal appearing white matter (NAWM) in patients with relapsing-remitting multiple sclerosis (MS), using DSC and ASL MRI. The extent of this hypoperfusion is unclear. The present study aims to investigate this issue with yet another technique, using dynamic contrast-enhanced (DCE) MRI.
Methods and Materials: The statistical power of a DCE-MRI acquisition to reveal hypoperfusion in MS was estimated using a Monte-Carlo simulation. In an IRB-approved study, patients with relapsing-remitting MS (n=24, mean age 36 years, 17 female) and patients without history or symptoms of neurological disorder (n=16, mean age 49 years, 9 female) underwent a DCE-MRI examination (3D, 2.1s temporal resolution). Cerebral blood flow (CBF), cerebral blood volume (CBV) and permeability-surface area product (PS) were

quantified in frontal, periventricular and occipital NAWM. Statistical analysis was performed using a linear mixed model using subjects as random effect and controlling for age.
Results: With group sizes of n=16, DCE MRI can detect NAWM hypoperfusion with a statistical power of 89%. Mean CBF was 11.0 and 10.4 ml/100 ml/min in MS and control group, respectively. CBV was 0.50 ml/100 ml in MS and 0.48 ml/100 ml in control group. No significant differences were observed for CBF, CBV and PS between patient groups (p=0.44, p=0.20, p=0.66), PS was not significantly different from zero in all regions. Age had no significant influence.
Conclusion: Despite high statistical power, we could not confirm previous reports of hypoperfusion. This indicates that, in our patient cohort, NAWM hypoperfusion is much less pronounced than in previous DSC studies.

B-1111 14:48

Atrophy and other MRI-parameters as predictors of neurological deficit in relapsing remitting multiple sclerosis: a 3-year follow-up study
I. Krotenkova, V. Bryukhov, M. Zakharova, M. Krotenkova, S. Morozova, L. Askarova; *Moscow/RU (irina.krotenkova@mail.ru)*

Purpose: To determine atrophy rates in relapsing-remitting multiple sclerosis (RRMS) patients over the course of 3 years, to access T2-lesion burden (T2LV) and investigate the relationship between these measures and neurological disability.
Methods and Materials: 25 RRMS patients underwent MRI and neurological examination in follow-up: first one - during relapse and in 12 months after it. And 10 patients (among them) - in 36 months. Neurological deficit was measured with EDSS at submission. VBM was performed to assess GM and WM volume changes in MS patients and T2LV was accessed 3 times in follow-up. Group comparisons were tested with family-wise error correction for multiple comparisons ($p < 0.05$). IBM SPSS Statistics 20 was also used for getting numerical data and evaluate statistically significant associations between MRI and clinical parameters.
Results: Over a period of 12 months patients experienced a decrease in the whole brain volume, total GM and WM volume (especially, corpus callosum), in right precentral and postcentral guri and in spine volume ($p < 0.05$). And in 36 months beside these changes, patients showed pronounced atrophy of parahippocampal guri, left caudate and anterior lobes of cerebellum. A strong correlation between brain and spine atrophy rates was revealed. Subcortical GM volume changes were associated with EDSS score, disease duration and correlated with neurological deficit progression, but showed no association with T2LV.
Conclusion: RRMS patients show rapid brain and spine volume loss and atrophy has distinct patterns of regional distribution. Deep GM volume is associated with disease duration and can predict neurological deterioration.

B-1112 14:56

Longitudinal analysis of imaging biomarkers from MR segmentation of white matter lesion in patients with multiple sclerosis
L. Lajarín Cano, J. Tomás Cucarella, A. Alberich-Bayarri, B. Casanova, L. Marti-Bonmati; *Valencia/ES (angel@quibim.com)*

Purpose: Implementation of an automated method for the longitudinal white matter (WM) lesions segmentation in patients with multiple sclerosis (MS) from magnetic resonance (MR) images and its integration into clinical use in a referral hospital.
Methods and Materials: The study was based on the analysis of longitudinal MR imaging data sets of 10 patients with MS (5 RR and 5 SP; mean age 38 years; mean EDSS 1.6 at baseline and 2.30 at follow-up). Co-spatially 3D-T1-weighted and 3D-FLAIR MR images were obtained twice (mean time between MR scan of 10 months). FLAIR lesion load and brain atrophy rates imaging biomarkers were computed through automatic segmentation (SPM8 and Lesion Segmentation Tool, LST) and expressed as annualised percent brain volume change (annualised PBVC) and change in brain parenchyma fraction (BPF). Lesion volume changes were colour coded.
Results: The annualised PBVC ranged between -1.12% and - 0.30% in RRMS patients, and between -1.9% and -0.70% in SPMS cases. BPF showed moderate correlations with FLAIR lesion volume and EDSS score. BPF values were in common range of MS phenotypes. The automated structured report and parametric maps were successfully integrated in a referral hospital. New Lesion Volume has shown lower values than Enlarging and Decreased Lesion Volume in all patients.
Conclusion: Quantification of different imaging biomarkers, such as longitudinal lesion load changes, was automatically generated and expressed as structured reports improving diagnostic capability and follow-up monitoring of MS patients.
Author Disclosures:
L. Lajarín Cano: Employee; QUIBIM SL. **A. Alberich-Bayarri:** CEO; QUIBIM SL. **L. Marti-Bonmati:** Shareholder; QUIBIM SL.

B-1113 15:04

Assessment of the diagnostic accuracy of double inversion recovery sequence in comparison with FLAIR and T2W_TSE in detection of brain multiple sclerosis plaques
Z. Abidi[1], F. Faeghi[1], Z. Mardanshahi[2]; [1]*Tehran/IR*, [2]*Sari/IR (abidi.z4805@yahoo.com)*

Purpose: The purpose of our study was to find out the diagnostic accuracy of Double Inversion Recovery sequence compared to FLAIR and T2W_TSE in detection of brain MS plaques. Conventional MRI can not show cortical lesions well, so several attempts carried out recently to improve MRI procedures to depict more MS lesions especially in gray matter.
Methods and Materials: Fifty five patients were included in our study, imaging was performed on a 1.5 T Philips MR system using DIR, FLAIR, and T2W_TSE sequences. On DIR sequence it is used two different TI (first TI=3400 ms and second TI=325 ms) in order to suppress CSF and white matters signal. Axial planes performed in these three sequences with same anatomical position, geometric and parameters that influence resolution, including FOV, matrix, Voxel size and Number of signal averaging (NSA).
Results: DIR showed significantly more MS lesion load in all anatomical regions when compared to both FLAIR and T2W_TSE, Also the contrast between GM-WM was excellent in DIR. And DIR sequence had the highest sensitivity and accuracy in demonstrating the cortical and mixed white matter-grey matter lesions compared with FLAIR and T2 sequences.
Conclusion: More MS lesions in number and size can be detected in comparison With FLAIR and T2_W TSE, So we recommend to add DIR sequence in the routine MR protocols of MS patients.

B-1114 15:12

Increased volume of adenoids in patients with multiple sclerosis: a MRI study
A. Pomschar, K. Moritz, F. Schwarz, T. Kümpfel, M.F. Reiser, B. Ertl-Wagner; *Munich/DE (Andreas.Pomschar@med.uni-muenchen.de)*

Purpose: Adenoids (nasopharyngeal tonsils) represent lymphatic tissue in the roof of the nasopharynx. They mediate local and regional immune functions and usually largely regress during later childhood and adolescence. We aimed to evaluate whether adult patients with multiple sclerosis (MS) had a higher prevalence of enlarged adenoid tissue on MRI compared to normal controls.
Methods and Materials: 58 consecutive patients with relapsing remitting MS (age 39.7y±12.9; 38female) who underwent an MRI brain scan at our institution, were retrospectively age and gender matched with a control population whor had undergone MRI for hearing dysfunction (age 40y±12.7; 38f). Datasets were analysed for overall adenoid volume and number of cysts within the adenoids, as well as the number of white matter lesions. Data analysis was performed by an experienced neuroradiologist who was blinded regarding the clinical information. A Wilcoxon test (paired samples) was used for statistical analysis.
Results: Adenoid volumes in MS patients were significantly larger (p=0.0001, range 0 to 19.3 ml, median 2.1) compared to the controls (range 0-8.3 ml, median 0.5). The number of cysts was significantly higher in MS patients (p=0.0001, median 2, range 0 to 24) compared to controls (median 0, range 0-16). There was no significant correlation of adenoid volume and number of T2 lesions (p=0.55).
Conclusion: Adult patients with MS had a significantly larger volume of adenoid tissue and cystic changes within the adenoids than a control cohort. This might potentially constitute an ongoing immune-response. However, the pathomechanism of this finding is unclear and further research is necessary.

B-1115 15:20

Multiple sclerosis imaging at 3-Tesla MR: comparison between 3D-FLAIR sequence and standard T2-TSE for the detection of inflammatory lesions
A.S. Alhasan[1], K. Gaillot[2], P. Bertrand[2], A. Guennoc[2], M. Lauvin[2], J. Cottier[2]; [1]*Madinah/SA*, [2]*Tours/FR (drayman20@hotmail.com)*

Purpose: Magnetic resonance imaging (MRI) is an important part for the work-up of patients with multiple sclerosis (MS). Imaging protocol could be time consuming. The aim of our study was to assess and evaluate the diagnostic performance of 3D-FLAIR compared to T2-weighted Turbo Spin-Echo at 3-Tesla MR for the detection of MS lesions and look for the utility of performing a pre-gadolinium T1-weighted sequence and its detection rate of black holes compared to post-gadolinium 3D-T1WI.
Methods and Materials: 86 patients with definitive diagnosis of MS were included. Numbers of hyperintense lesions on 3D-FLAIR and T2-TSE and numbers of hypointense lesions on pre-gadolinium T1-GE and post-gadolinium 3D-T1 were calculated in the following regions: cortical and juxtacortical, deep white matter, periventricular and infratentorial. The whole brain load was obtained. Spontaneous increased signal intensity and contrast uptake were noted. Pairwise t test was done.

Results: Whole brain lesion load and the number of lesions in each region were significantly higher on 3D-FLAIR compared to T2-TSE ($p < .005$). The 3D-FLAIR did not miss any of the lesions seen on T2-TSE. Total number of black holes and number of black holes per region were significantly higher on post-gadolinium 3D-T1WI compared to the pre-gadolinium T1-GE ($p < .005$). Pre-gadolinium T1 sequence provided no additional information and did not affect the interpretation of post-gadolinium images.
Conclusion: The 3D-FLAIR was superior to T2-TSE in depicting MS lesions. Imaging protocol could be modified to include 3D-FLAIR and post-gadolinium 3D-T1WI and to exclude both pre-gadolinium T1-GE and T2-TSE sequences.

14:00 - 15:30 **Room M 5**

Breast

SS 1502

Breast density: an update

Moderators:
R. Schulz-Wendtland; Erlangen/DE
N.N.

B-1116 14:00

BI-RADS-based subjective estimation of fibroglandular breast tissue with magnetic resonance imaging: comparison to automated quantitative assessment

G.J. Wengert[1], T.H. Helbich[1], R. Woitek[1], P. Kapetas[1], P.A.T. Baltzer[1], W.-D. Vogl[1], M. Weber[1], A. Meyer-Baese[2], K. Pinker-Domenig[1]; [1]*Vienna/AT*, [2]*Tallahassee, FL/US (georg.wengert@meduniwien.ac.at)*

Purpose: To evaluate the inter- and intra-observer agreement of BI-RADS-based subjective visual estimation of FGT with MRI, and to investigate whether FGT assessment benefits from an automated quantitative MRI measurement by comparing both approaches.
Methods and Materials: Eighty women (mean age, 46; range, 21 to 86 years) with no imaging abnormalities on mammography or ultrasound (BI-RADS 1 and 2) were included in this IRB-approved prospective study. All women underwent un-enhanced breast MRI using the Dixon sequence (TR/TE 6 ms/1.45 ms/2.67 ms, 256 slices, matrix 352x352, 1 mm isotropic, TA 3:38 min). Four radiologists independently assessed FGT with MRI by subjective visual estimation according to the revised ACR BI-RADS atlas. Automated quantitative measurement of FGT with MRI was performed using a previously described measurement system. Inter- and intra-observer agreement of qualitative and quantitative FGT measurements were assessed using Cohen's kappa (k).
Results: There was only a moderate inter- and intra-observer agreement for subjective visual estimation of FGT with MRI for inexperienced readers. Experienced readers achieved better results, with a substantial inter-observer agreement and perfect intra-observer agreement. Practice and experience reduced observer-dependency. Automated quantitative measurement of FGT with MRI was successfully performed for every examination and revealed only fair to moderate agreement (k= 0.209-0.497) with subjective visual estimations of FGT.
Conclusion: Subjective visual estimation of FGT with MRI shows moderate intra- and inter-observer agreement, which can be improved by practice and experience. Automated quantitative measurements of FGT with MRI are necessary to allow a standardized risk evaluation, appropriate management, and the assessment of preventive breast cancer measurements.

B-1117 14:08

Breast density measurements with ultrasound tomography: a comparison with non-contrast MRI

E. O'flynn[1], J. Fromageau[1], A. Ledger[1], A. Messa[1], A. D'Aquino[1], M. Schmidt[1], N. Duric[2], A. Swerdlow[1], J. Bamber[1]; [1]*Sutton/UK*, [2]*Detroit, MI/US (elizabeth.oflynn@icr.ac.uk)*

Purpose: High breast density is associated with increased breast cancer risk. 2D mammographic percent density (MPD) quantification is limited, reflecting X-ray attenuation characteristics and is not used in younger women. MRI offers an ionising-radiation free 3D alternative with measurements of water-based tissue in the breast correlating strongly with MPD. Ultrasound tomography (UST) is an emerging whole breast 3D-imaging technique that obtains quantitative tomograms of speed of sound (as well as other properties) of the entire breast. The volume averaged speed of sound (VASS)holds promise for improving on traditional assessment by measuring density at each voxel and offering a cheap, patient-acceptable, ionizing-radiation free alternative. This study evaluated UST by comparing VASS with a measurement of water-based tissue from non-contrast MRI.
Methods and Materials: 50 healthy volunteers from the Generations study (median age 40 years, range 30-64 years) underwent bilateral breast UST, 46 of whom underwent MRI using a 2-point Dixon technique. VASS and percentage water density were measured in both breasts and compared using Pearson's correlation coefficient.
Results: The mean VASS for the cohort was 1446±148 ms-1 (range 1434-1541 ms). There was high similarity between measurements from the right and left breasts (1463±29 ms-1, 1459±29 ms-1 respectively (p=0.516))(ICC=0.98). Mean percentage water density for the cohort was 34.6±14.5% (range 13.5-74.4%) with good right-to-left consistency (35.7±15.3%, 34.4±14.6% respectively (p=0.55)). There was excellent correlation between VASS and percentage water density ($r2= 0.97$, $p < 0.0001$).
Conclusion: UST holds promise as a novel accurate, reproducible and ionising-radiation free technique to evaluate breast density.
Author Disclosures:
E. O'flynn: Grant Recipient; NHS funding to the NIHR Biomedicine Research Centre and the Clinical Research Facility in Imaging. **N. Duric:** Other; CTO at Delphinus Medical Technologies. **A. Swerdlow:** Research/Grant Support; PI for Generations Study.

B-1118 14:16

Mammographic breast density and HER2 overexpression assessment improves the Nottingham Prognostic Index prognostic ability in patients with invasive breast cancer

A.N.J. Masarwah, P. Auvinen, M. Sudah, V. Dabravolskaite, O. Arponen, A. Sutela, S. Oikari, V.-M. Kosma, R. Vanninen; *Kuopio/FI (amro.masarwah@kuh.fi)*

Purpose: To examine the possible additional value of very low mammographic breast density (VLD), HER2, ER and PR statuses in a patient group within matched Nottingham Prognostic Index (NPI) categories. We also aimed to investigate whether those variables could be incorporated into the NPI.
Methods and Materials: Altogether 270 patients with newly diagnosed invasive breast cancer were included in the analysis. Patients with mammographic breast density of < 10% were considered as patients with VLD breasts. We compared the performance of NPI with and without VLD, ER, PR and HER2 statuses. Cox multivariate analysis, time-dependent receiver operating characteristic curve (tdROC), concordance index (c-index) and prediction error (0.632+ bootstrap estimator) were used to derive an updated version of NPI.
Results: Both mammographic breast density (VLD) ($p < 0.001$) and HER2 status ($p=0.049$) had a clinically significant effect on the disease free survival of patients in the intermediate and high risk groups of the original NPI classification. The incorporation of both factors (VLD and HER2 status) into the NPI increased the prognostic power (C-index 0.872 vs 0.779, $p < 0.001$) and provided improved patient outcome stratification by decreasing the percentage of patients in the intermediate prognostic groups.
Conclusion: Very low breast density and HER2 positivity are prognostic factors for breast cancer independent of the NPI. Moreover, their addition to the NPI helps increase its accuracy and thus offers an improved, but still readily available method for the evaluation of patient prognosis.

B-1119 14:24

Error in recorded compressed breast thickness measurement impacts on volumetric density classification

G.G. Waade[1], R. Highnam[2], I.H.R. Hauge[1], M.F. McEntee[3], S. Hofvind[1], E. Denton[4], J.F. Kelly[5], J.J. Sarwar[6], P. Hogg[6]; [1]*Oslo/NO*, [2]*Wellington/NZ*, [3]*Sydney/AU*, [4]*Norfolk/UK*, [5]*Chester/UK*, [6]*Salford/UK (Gunvor-Gipling.Wade@hioa.no)*

Purpose: Mammographic density has been demonstrated to predict breast cancer risk. It has been proposed that it could be used for stratifying screening pathways and recommending additional imaging. Volumetric density tools use the recorded compressed breast thickness (CBT) of the breast measured at the x-ray unit in their calculation, however the accuracy of the recorded thickness can vary. The aim of this study was to investigate whether inaccuracies in recorded CBT impact upon volumetric density classification and to examine whether the current QC standard is sufficient for assessing mammographic density.
Methods and Materials: Raw data from 52 digital screening mammograms were included in the study. For each image, the clinically recorded CBT was artificially increased and decreased to simulate measurement error. Increments of 1 mm were used up to ±15% error of recorded CBT was achieved. New images were created for each 1 mm step in thickness resulting in a total of 572 images which then had Volpara Density Grade (VDG) and volumetric density percentage assigned.
Results: A change in VDG was recorded in 38.5% (n= 20) of mammograms when applying ±15% error to the recorded CBT and 11.5 % (n= 6) were within the quality control (QC) standard prescribed error of ±5 mm.

Conclusion: The current QC standard of ±5 mm error in recorded CBT creates the potential for error in mammographic density measurement. This may lead to inaccurate classification of mammographic density. The current QC standard for assessing mammographic density should be reconsidered.

B-1120 14:32

Disagreement between the 4th and 5th editions of the BI-RADS density lexicon

M. Abdolell[1], K.M. Tsuruda[1], S.E. Iles[1], J. Caines[1], C.B. Lightfoot[1], P. Brown[1], S.A. Raza[2], G.H. Schaller[1]; [1]*Halifax, NS/CA*, [2]*Sydney, NS/CA (Sian.Iles@nshealth.ca)*

Purpose: The American College of Radiology BI-RADS4 quantitative breast density scale differs from the BI-RADS5 qualitative scale, which emphasises both the amount and the masking effect of dense tissue. This study evaluates the agreement between these two classification scales.
Methods and Materials: Six radiologists assessed breast density composition on a set of 375 cases from four standard screening views using the 4th and 5th editions of the BI-RADS density composition scale (labeled 1/2/3/4 and A/B/C/D, respectively). Overall between-rater agreement was evaluated using the multi-rater weighted kappa statistic. A consensus (majority) assessment was used to measure between-scale agreement using the two-rater weighted kappa statistic, and to calculate observed proportions in each density category for both scales.
Results: The observed proportions for the 1/2 and 3/4 density categories were 63% and 37% respectively, virtually identical to the A/B and C/D density categories which were 62% and 38% respectively Correspondence within the 1&A, 2&B, 3&C and 4&D pairs was not as close: of studies classified as 1, only 78% were classified as A, for 2 only 85% were classified B, for 3 only 89% were classified C, and for 4 only 51% were classified D. Between-rater agreement was substantial for BI-RADS4 (Kappa=0.76) and BI-RADS5 (Kappa=0.79) and agreement between the two scales was excellent (Kappa=0.89).
Conclusion: BI-RADS5 has high agreement with BI-RADS4, but a small proportion of patients who had previously been classified as having "dense" breasts using BI-RADS4 may no longer be classified as "dense" using BI-RADS5 and vice versa.
Author Disclosures:
M. Abdolell: CEO; Densitas Inc. Shareholder; Densitas Inc. **K.M. Tsuruda:** Employee; Densitas Inc.

B-1121 14:40

Decrease of breast density in BRCA patients following oophorectomy, using Volpara software

A. Lecler, A. Dunant, C. Dromain, S. Delaloge, O. Caron, C. Balleyguier; *Paris/FR (alecler@fo-rothschild.fr)*

Purpose: BRCA1/2 mutations account for 30-50% of hereditary breast cancers and bilateral oophorectomy is associated with a reduced risk of BC in these patients. Breast density is a well-established breast cancer risk factor and is also associated with increased risk in BRCA carriers. The relationship between oopherectomy and breast density and which method of breast density interpretation is best for temporal change has not been investigated.
Methods and Materials: Retrospective study of 50 BRCA1/2 patients who underwent oophorectomy and had at least a baseline and post surgery mammogram. Mammographic breast density was determined by Volpara and visual assessment by a single radiologist.
Results: At baseline, there was a trend to decreased density with increasing age which was not significant. Patients with a family history of breast cancer also had increased breast density but this difference was not statistically significant. Breast density significantly decreased after oopherectomy with an average 2.1% absolute decrease (p value < 0.001). There was a higher absolute decrease in breast density in patients aged between 40-50 due to the higher baseline density. Using Volpara Density Grades (analogous to BI-RADS density categories), 84% of women displayed a decrease in density category over the study period compared to only 76% using the radiologist visual classification.
Conclusion: Oopherectomy is associated with a decrease in breast density and younger patients exhibit a larger absolute decrease. Volpara is more sensitive to change over time compared to visual assessment.

B-1122 14:48

The impact of breast density on radiologist fixation time in mammography

W. Alomaim[1], D. O'Leary[2], J. Ryan[1], L. Rainford[1], S. Foley[1]; [1]*Dublin/IE*, [2]*Hertfordshire/UK (WIJDAN.1984@HOTMAIL.COM)*

Purpose: Literature has established a strong association between mammographic density and breast cancer, as well as the difficulty in evaluating the breast with increased mammographic density. Perception studies are an important component of radiology, these provide an understanding of the scan patterns and the interpretation behaviour of the reporting Radiologists.
Methods and Materials: Breast radiologists from the UK were voluntarily recruited to review sets of anonymized mammographic images (n=170) and to subjectively rate the breast density according to the BI-RADS categorisation. The images were used along with the use of a TOBII eye-tracker (TOBII Technologies, Sweden) to track the eye movement of the Radiologists while assessing the images. Images were reviewed using standardized viewing conditions and Ziltron software. The results were analysed using a paired sample T-test and ANOVA.
Results: Complete data was obtained for 17 radiologists (1-10+years experience) and results showed radiologists spent significantly more time observing MLO (MLO: 1.67sec vs CC: 1.32sec; mean values) and right images (right: 1.63sec vs left: 1.36sec; mean values) on the mammographic images ($p < 0.05$). Radiologists spend significantly more time observing images with BI-RAD 3 (mean=1.71sec) density than the other 3 BI-RADs ($p < 0.001$).
Conclusion: The impact of breast density on radiologist fixation time in mammography varies according to the density. The variation in how radiologists viewed projections and different sides of the breast warrants further research as does potential impact upon abnormality identification. An understanding of radiology review patterns will inform training and support the amelioration of potential interpretation differences.
Author Disclosures:
W. AlomAim: Research/Grant Support; Ministry of Higher Education - Saudi Arabia.

B-1123 14:56

Is mammographic breast density related to breast cancer risk based on personal/family history?

I. Ioan[1], A. Pisani Mainini[1], C. De Angelis[1], I. Riva[2], G. Di Leo[2], F. Sardanelli[2]; [1]*Milan/IT*, [2]*San Donato Milanese/IT (ileana.ioan@libero.it)*

Purpose: Mammographic breast density and breast cancer personal/family history are independent risk factors in the general population. Our aim was to evaluate the association between these factors.
Methods and Materials: From August to September 2015, we prospectively enrolled women presenting for screening mammography, excluding those with history of cancer or short life expectancy. Each patient was proposed the questionnaire for the breast or ovarian cancer family history using the IBIS RISK EVALUATOR based on Tyrer-Duffy-Cuzick model (Stat Med 2004), providing the individual lifetime risk (LTR) and 10-year risk (10YR). An expert radiologist visually evaluated mammographic breast density using the American College of Radiology classification: a (lowest quartile), b, c, d (highest quartile). Data were given as median and percentiles. Association between breast density and risks or patient age was estimated using the Kruskall-Wallis test; multivariate linear regression analysis was also performed.
Results: In the study period, 207 women were enrolled (median age 59 years; percentiles 49-66 years). Median 10YR was 3%(2-4%); median LTR was 7% (4-11%). From density class a to d, median patient age was 62, 63, 52 and 50 years ($p < 0.001$); the median 10YR was 3% for all (p=0.938); the LTR was 5%, 6%, 9% and 8% (p=0.005). Multivariate linear regression analysis using LTR as dependent variable showed a highly significant contribution for age ($p < 0.001$) but only a borderline significant contribution for mammographic density (p=0.066).
Conclusion: Our data suggest that the association between breast density and cancer risk based on personal/family history is mediated by the patient age.
Author Disclosures:
G. Di Leo: Other; Congress sponsored by Bracco SpA. **F. Sardanelli:** Speaker; Bracco; Bayer.

B-1124 15:04

Classification of mammographic densities and breast cancer risk: results from the Egyptian national breast screening study

N.A.M. Chalabi; *Cairo/EG (nivine.chalabi@gmail.com)*

Purpose: Our objective was to determine the relation between breast ca and the recent ACR classification of mammographic densities in our Egyptian screening population
Methods and Materials: From the medical records of the National screening program, 48 407 women assigned to digital mammography screening were collected, 561 cases of breast cancer were detected. Mammograms were classified into four, ACR-A, B, C & D categories of density, by 2 senior radiologists.
Results: From 2007 to 2015, 48407 women were outreached for screening by digital mammography ,age between 40 and 65.They were all included in the study.The calculated total frequency of cancer was 0.046.Densities were ranked in descending pattern in the following order according to their frequency of positive cases:D (2.31%); C (1.62%); B (1.09%); A (0.71%).The frequency of breast cancer in ACR-A density group was 0.007 and in ACR-B group was 0.010, in the ACR-C group was 0.016 and in the ACR-D group was 0.023.

Statistically, highly significant increased frequency of positive cases among in ACR Mammographic density (MD) B compared to A. The same between each 2 groups except class C versus D where there was no statistically significant change in the frequency of positive cases in one versus the other.There is positive significant risk among each higher MD compared to the lesser MD, except in ACR- classes C and D where the significant risk is equal.
Conclusion: In our population,increase in the mammographic breast density is associated with increase in risk for breast cancer.

B-1125 15:12

Agreement between radiologists' visual assessments and automated software: BI-RADS 5th edition density classifications

M. Abdolell[1], K. Tsuruda[1], S.E. Iles[1], J. Caines[1], C.B. Lightfoot[1], P. Brown[1], S.A. Raza[2], G. Schaller[1]; [1]*Halifax, NS/CA*, [2]*Sydney, NS/CA (mo@dal.ca)*

Purpose: Many automated breast density tools have been validated in the context of breast density quantification, however their ability to qualify the likelihood of dense tissue masking a lesion has been less studied. This study aims to quantify the agreement between radiologists' assessments of breast density and those from an automated algorithm that considers the amount and appearance of breast density consistent with the 5th edition of the BIRADS density lexicon.
Methods and Materials: Six radiologists assessed breast density composition from four de-identified standard screening views using the 5th edition of the BI-RADS density composition scale on a set of 375 cases. Agreement between each rater and the automated breast density measurement software (DM-Research, Densitas Inc). was measured using the weighted kappa statistic. Agreement between the radiologists' consensus assessment and the algorithm was measured using the weighted kappa statistic.
Results: Overall agreement between the algorithm and each of the radiologists was excellent, Kappa = 0.81 to 0.90. Agreement between the algorithm and the consensus assessment was also excellent, Kappa = 0.89. Of the 375 cases reviewed, the algorithm scored A, B, C, and D in 21%, 38%, 36%, and 5% of cases, while the consensus radiologist assessment scored A, B, C, and D respectively in 28%, 34%, 34%, and 4% of cases.
Conclusion: Automated breast density software that accounts for the amount and dispersion of dense breast tissue can reduce the subjectivity of radiologist-assigned density scores and can have substantial agreement with radiologists' visual assessments of density.
Author Disclosures:
M. Abdolell: CEO; Densitas Inc. Shareholder; Densitas Inc. **K. Tsuruda:** Employee; Densitas Inc.

B-1126 15:20

Background parenchymal enhancement is not associated with breast cancer in a non-high-risk population

B. Bennani-Baiti[1], M. Dietzel[2], P.A.T. Baltzer[1]; [1]*Vienna/AT*, [2]*Erlangen/DE (barbara.bennani-baiti@meduniwien.ac.at)*

Purpose: Previously, an association between BPE and breast cancer was reported in high-risk populations. We sought to determine, whether this was also true for non-high-risk patients.
Methods and Materials: 668 consecutive patients unterwent breast MRI for assessment of breast findings (BI-RADS 0-5, no high-risk screening) and subsequent histological work-up. For this IRB-approved study, BPE and FGT were retrospectively assessed by two experienced radiologists according to the BI-RADS lexicon. Pearson correlation coefficients were calculated to explore associations between BPE, FGT, age and final diagnosis of breast cancer. Subsequently, mulitvariate logistic regression analysis considering covariate colinearities was performed, using final diagnosis as the target variable and BPE, FGT and age as covariates.
Results: Age showed a weak negative correlation ($r<=-0.25$) with FGT and BPE ($p < 0.001$). BPE correlated moderately with FGT ($r= 0.35$, $p < 0.001$). Final diagnosis displayed weak negative correlations with FGT and BPE ($<=-0.18$, $p < 0.004$) and weak positive correlation with age ($r=0.18$, $p < 0.001$). On logistic regression analysis, the only independent covariate for prediction of final diagnosis was age (OR 1.011, 95%-CI:1.004-1.018, p=0.001).
Conclusion: Based on our data, neither BPE nor FGT do independently correlate with breast cancer risk in non-high-risk patients. Our model retained only age as an independent risk factor for breast cancer in this setting.

Sunday, March 6

10:30 - 12:00 **Room C**

Breast

SS 1802

Digital breast tomosynthesis: an update

Moderators:
T. Knogler; Vienna/AT
A. Selim; Cairo/EG

K-27 10:30

Keynote lecture
T.H. Helbich; *Vienna/AT*

B-1127 10:39

A comparison of FFDM and synthetic 2D images with DBT: which images do readers prefer for assessment of different radiological features?
L. Tucker[1], S. Ramasundara[1], J. Myles[2], S.W. Duffy[2], F.J. Gilbert[1];
[1]*Cambridge/UK*, [2]*London/UK (fjg28@medschl.cam.ac.uk)*

Purpose: To evaluate reader preferences and determine which image format best demonstrates different radiological features.
Methods and Materials: The sensitivity and specificity of three imaging combinations - FFDM alone; FFDM with DBT and synthetic 2D with DBT - were compared in a retrospective reading study (the TOMMY Trial). As part of the study readers compared FFDM with DBT and synthetic 2D with DBT and scored the images for lesion visibility, lesion extent, discrimination and overall opinion on a 5-point scale and state whether or not DBT was better or worse than 2D or synthetic 2D. 7060 cases were categorised by dominant radiological feature: microcalcification (1006); circumscribed mass (1814); spiculated mass (712); asymmetric density (1837), distortion (514) or none (137). Statistical analysis of reader preferences was made using McNemar methods.
Results: DBT images were preferred in all categories of radiological feature for lesion visibility, lesion extent and discrimination between benign and malignant ($p < 0.01$ for all) compared with both FFDM and synthetic 2D images. The only exception was for microcalcification where there was no preference for DBT over synthetic 2D for lesion extent. Readers' scores for overall opinion also showed a significant preference for DBT ($p < 0.01$) for all radiological features except microcalcification where, again, there was no preference for DBT over synthetic 2D.
Conclusion: Readers prefer DBT when assessing lesion visibility, lesion extent and when discriminating between malignant and benign lesions for all types of radiological feature. The only instance where no preference is demonstrated is for microcalcification using synthetic 2D.

B-1128 10:47

The influence of inmuhistochemical patterns of breast tumours in the detection of additional cancers by digital breast tomosyntesis and ultrasound
J.M. Madrid[1], M. Caballeros[1], P. Matínez-Miravete[2], N. Rodriquez-Spiteri[1], A. Elizalde[1], L. Pina[1]; [1]*Pamplona/ES*, [2]*Zaragoza/ES (jmadrid@unav.es)*

Purpose: To assess the influence of inmuhistochemical patterns of breast tumours in the detection of additional cancers by Digital Breast Tomosyntesis (DBT) or ultrasound (US).
Methods and Materials: A retrospective study was performed (November 2011-June 2015). 204 biopsy-proven breast malignant lesions, in 194 patients were diagnosed at our institution. All of them underwent mammography, DBT and US. A blinded reader to the final diagnosis reviewed all the cases clasifying them according to the BI-RADS categories (1-2 negative, 3-5 positive). We calculated the rate of additional cancers detected by US and DBT after negative mammography regarding to the inmunohistochemical patterns of breast tumours (luminal = luminal A or B; non luminal= HER 2 or triple negative). McNemar test was used.
Results: DBT detected 109 cancers and overlooked 83. US detected 67 additional cancers not seen in mammography while DBT detected 40. The detection of additional cancers by US was not statistically significant regarding to IHC pattern (55 additional luminal tumours vs. 12 non luminal;p=0.773). However the detection by DBT was significant (38 luminal tumours vs 2 non luminal;p=0.026). On both IHC patterns, US worked significantly better than DBT (Luminal A: US detected 55 additional tumours vs 38 by DBT, p=0.005; non luminal: US detected 12 additional tumours vs 2 by DBT; p=0.002)
Conclusion: According to our results DBT detects less additional tumours in the non luminal group, while US detects a similar rate in both groups. US is significantly better tan DBT in the detection of additional tumours in this series.

B-1129 10:55

Digital breast tomosynthesis: is peritumoral fat an ally in breast cancer detection?
J.M. Madrid, F.M. Caballeros, P. Garcia-Barquin, M. Millor, L. Pina, A. Elizalde; *Pamplona/ES (jmadrid@unav.es)*

Purpose: To study if the quantity of fat surrounding breast cancers could be relevant for the detection by DBT.
Methods and Materials: We retrospectively reviewed 142 breast cancers. All of them underwent DM (using conventional 45º MLO and CC views), complementary DBT (45º MLO view, wide angle acquisition technique), US and MRI. 77 cancers were detected using only DM. The remaining 65 cancers were detected by additional techniques (DBT, US, MRI or surgical specimen). These 65 cancers were evaluated by one single reader, blinded to the final diagnosis. Initially the reader evaluated all DBT studies as positive or negative. Secondly, the reader evaluated the 65 cancers on MRI, dividing them in two groups: tumours with more than 50% of surrounding fat (group 1) and those with 50% or less (group 2). A Chi square test (SPSS 20.0) was used to calculate the differences between the additional tumours detected by DBT regarding the two groups.
Results: Out of the 65 additional cancers not seen on DM, DBT detected 25/65 (38.46%). The remaining 40/65 (61.53%) were detected by US, MRI or in the surgical specimen by the pathologist. Regarding the fat surrounding the lesion, there were statistically significant differences between the two groups: in group 1, DBT detected 14 cancers while 6 tumours were missed. In group 2, DBT detected 11 tumours while it missed 34 cancers (p=0.001).
Conclusion: In our experience there were more cancers missed by DBT in the group of tumours surrounded by 50% of fat or less.

B-1130 11:03

Synthetic mammography (SM) reconstructed from digital breast tomosynthesis (DBT): has anything changed in the BI-RADS category assignment?
M. Fasciano, M. Durando, G. Mariscotti, F. Esposito, C. Casella, P. Campanino, P. Fonio, G. Gandini; *Turin/IT (allerimfasciano86@yahoo.it)*

Purpose: To compare the SM reconstructed from DBT to Full-Field Digital Mammography (FFDM) in the BI-RADS category assessment of breast lesions.
Methods and Materials: A retrospective analysis was conducted on 203 patients (mean age: 58.6 years), who underwent FFDM and DBT between September 2014 and June 2015. Informed consent was obtained and SM was reconstructed from each set of DBT slices. The sample included 227 biopsy-proven breast lesions: 147 (65.2%) malignant, 66 (29.1%) benign and 13 (5.7%) high risk. Examinations were reviewed in consensus by two dedicated breast radiologists, blinded on clinical history and histology. Readings were performed with SM alone, then with FFDM. Performances of SM and FFDM were rated subjectively on 3-score scale (-1.0,+1) and objectively using BIRADS categories (BI-RADS 4-5 as positive and BI-RADS≤3 as negative). Statistical analysis was performed ($p < 0.05$) and 95% CI was calculated.
Results: SM compared to FFDM was scored equal in 50.7% of cases and superior in 39.5%. The agreement in BI-RADS assessment between SM and FFDM was 92.0% (CI95%:87.6-94.9%); there was no significant difference in the agreement by stratifying according to the mammographic features (asymmetries 94.7%, architectural distortions 87.0%, microcalcifications 98.0%, masses 90.0%;p=0.25). For correct BI-RADS classification, there was no significant difference between SM (78.5%; CI: 72.6-83.4%) and FFDM (78.3%; CI: 72.3-83.3%); the agreement was greater for masses (SM: 87.6% versus FFDM: 89.2%) and microcalcifications (51.9% versus 48%), than for architectural distortions (80.6% versus 87.0%) and asymmetries (89.5% versus 78.9%), but not statistically significant.
Conclusion: SM compared to FFDM showed similar performances for BI-RADS category assignment, confirming its emerging role in addition to DBT allowing a reduction in radiation exposure.

B-1131 11:11

Reduction in digital breast tomosynthesis interpretation time by slabbing of the reconstructed slices
G. Agasthya[1], C.J. D'Orsi[1], A. Holbrook[1], C. Ho[1], M. Piraner[1], M. Newell[1], L. Gilliland[1], I. Sechopoulos[2]; [1]*Atlanta, GA/US*, [2]*Nijmegen/NL (ioannis.sechopoulos@radboudumc.nl)*

Purpose: To determine the reduction in interpretation time and impact on clinical performance of combining digital breast tomosynthesis (DBT) images by slabbing the 1-mm slices into 8-mm slabs.
Methods and Materials: A set of 167 two-view DBT cases of patients undergoing diagnostic work-up was acquired with a DBT system (Selenia Dimensions, Hologic, Inc). The DBT slices reconstructed with 1 mm separation were combined using the softMIP (Maximum Intensity Projection) algorithm into groups of eight slices with an overlap of 3 mm. Four radiologists scored each case in both forms independently, providing the location and a probability of

malignancy rating for each suspicious lesion. The reading times for each image format were compared for each reader with a paired t test. Initial receiver operating characteristics (ROC) analysis was performed on a per-case basis to determine the impact on detection.
Results: The interpretation time for the 8-mm slabbed DBT images was statistically significantly lower than that for the 1-mm slice images for all readers, with an average reduction of 27.9% (range: 20.9%-40.4%) of the interpretation time of the 1-mm slice cases. The ROC analysis resulted in no statistically significant difference in the interpretation performance between the two case sets.
Conclusion: Interpretation of DBT images in slabbed form using softMIP has the potential to substantially reduce the reading time of DBT images with no negative impact on detection performance. In future work, the performance will be analysed per lesion and the number of readers will be increased.
Author Disclosures:
I. Sechopoulos: Consultant; Fujifilm Medical Systems, USA. Research/Grant Support; Barco, Inc., Hologic, Inc.

B-1132 11:19

Digital breast tomosynthesis: thick vs thin slices - clinical performance and reading time

A. Stork, D.F. Seitz, E. Wegjan, P. Begemann, J. Kemper; *Düsseldorf/DE (astork@roentgeninstitut.de)*

Purpose: To compare clinical performance and reading time of digital breast tomosynthesis (DBT) reviewed in thick slices alone versus the combination of thick and thin slices.
Methods and Materials: 276 consenting women with indication of work-up were enrolled in a HIPAA-compliant prospective trial and imaged with DBT on the suspected breast (s). 49 patients had malignancies and 227 benign lesions, all proven through histopathology or 1-year follow-up. DBT volumes were reconstructed from 9 exposures equally distributed around a 25° angle. DBT image sets for review included 0.5 mm-spaced (thin) slices and 1 cm-thick slices. Thick slices were obtained by combination of 20 adjacent thin slices. Five independent breast radiologists (experience 5-25 years), blinded on truth, assessed each case using BI-RADS® categories (1-5) in two sequential consecutive steps: thick slices (DBTS) alone were scored first, then with thin slices (DBTSS). Areas under the ROC curves (AUCs) and reading times were evaluated and paired t-test used to check differences.
Results: AUCs across readers were 0.816 and 0.817 for DBTS and DBTSS, respectively. Mean AUC difference and related 95% confidence interval (CI) were 0.001 [-0.009, 0.012]. The difference was not statistically significant (p=0.738). Mean reading times per case across readers for DBTS and DBTSS were 1 min 28s and 1 min53s, respectively. The difference (mean=25s) was statistically significant with 95% CI [18.9s-30.5s] and $p < 0.001$. The average time saving across readers when using only thick slices for assessment was 56.2%.
Conclusion: DBT interpretation may be potentially limited to thick slices only, with a significant reduction in reading time.

B-1133 11:27

Comparison of lesion detection and characterisation of benign and malignant masses with digital mammography, synthesised 2D mammography (SM) and digital breast tomosynthesis (DBT)

L. Sinn, K. Wong, T. Lam, S. Lam, V. Lau, J. Ip, G. Ho, J. Leung, W. Lam; *Hong Kong/HK*

Purpose: To compare the ability of lesion detection and characterisation of benign and malignant masses in DM, SM, and DBT.
Methods and Materials: IRB-approved study on women attending their mammography screening with moderate risk of developing breast cancer was recruited with informed consent. 9 radiologists reviewed the DM, SM, and DBT images without access to prior examinations or clinical history. The number and characterisation of the lesions, and level of confidence with 5-point scale are documented.
Results: Ongoing prospective study with interim analysis of 467 data sets in 298 women shows total of 104.92,99 benign/probably benign lesions detected by DM, SM, and DBT, respectively. Amongst the lesions that were detected in all three modalities, increase in confidence level is evident in 43% in DBT group. 32 additional lesions were being found by DBT compared to DM, which all of them are confirmed to be either cysts or fibroadenoma on subsequent imaging. Additional 21 and 16 lesions detected in DM and SM groups compared with the rest of modalities were subsequently found non-genuine after further imaging and follow-up. The number of suspicious masses detected by DM, SM, and DBT are 5, 6, and 7 lesions, respectively. 3 confirmed malignancies are present, with 1 of them only detected by tomosynthesis. There is no significant change in confidence level in all three modalities (p=0.99).
Conclusion: The lesion detection by DM and SM is comparable. There is significant increase in number of benign/probably benign masses detected, as well as increase in confidence level in the DBT group.

B-1134 11:35

Assessment of the extent of microcalcifications to predict the size of a DCIS: comparison between tomosynthesis and conventional mammography

N. Berger, S. Dubach-Schwizer, Z. Varga, C. Rageth, T. Frauenfelder, A. Boss; *Zurich/CH (nicole.berger@usz.ch)*

Purpose: Ductal carcinoma in situ (DCIS) is a noninvasive cancer of the breast, which can be detected using mammography (MG) or the new modality of digital tomosynthesis of the breast (DTB) by evaluating groups of microcalcifications. This study investigated whether DTB could predict the extension of DCIS with higher precision than MG compared to the histologic proven size after total surgical resection.
Methods and Materials: An IRB approved retrospective study was performed, with inclusion of 33 cases histologically proven and totally resected DCIS (out of 32 patients), which received DTB and MG of the affected breast prior to surgery. Three radiologists analysed the maximal extension of the microcalcifications in the MG and DTB. Statistical evaluation was performed using the intraclass correlation (ICC) for inter-reader agreement and the Pearson's Correlation for correlation of MG and DTB with the actual size of the histologic proven DCIS.
Results: In principle, DTB allowed a better assessment of microcalcifications due to the lack of superimposed soft tissue and the location of microcalcifications compared to MG, however DTB also required a longer reading time. Histological sizes of DCIS ranged between 1 and 124 mm (median 20 mm). Intraclass correlation of the readers was excellent (0.923 for MG and 0.912 for DTB). Correlation between MG and histology was 0.872 ($p < 0.01$) and for DTB and histology 0.914 ($p < 0.01$).
Conclusion: DTB provides a 3D-impression of the underlying DCIS and a slightly better correlation to histological extension of DCIS, however at notably longer reading time.

B-1135 11:43

Digital breast tomosynthesis vs mammography: which modality provides more accurate prediction of margin status in specimen radiography?

H. Amer[1], F. Schmitzberger[1], J. Kussmaul[1], M.F. El Tohamy[2], H.I. Tantawy[2], E.M. Fallenberg[1]; [1]*Berlin/DE*, [2]*Zagazig/EG (dr.h.amer@hotmail.com)*

Purpose: To evaluate tumour margin assessment in specimen radiography (SR) performed by digital breast tomosynthesis (DBT) and digital mammography (MG) in comparison to postoperative histopathology results as the gold standard.
Methods and Materials: After ethics-board approval, 102 patients undergoing breast surgery for non-palpable breast lesions were included. All patients underwent ultrasound/mammography guided wire localization of their proven breast carcinoma. After excision, specimens were marked for orientation and imaged intraoperatively with MG (2-view) and DBT (1-view). Two blinded radiologists (R1, R2) retrospectively reviewed images from both modalities independently. They defined the type of lesions, identified which direction the lesion is most close to the specimen margin and measured that distance. All results were compared to the final histopathological results. True positive margin status was defined by measurement of < 1 mm (invasive) and < 5 mm (DCIS) by imaging and pathology.
Results: For MG, correct margin direction was identified in 45 cases (44%) by R1 and 37 cases (36%) by R2. For DBT, 69 cases (68%) were correctly identified by R1 and 70 cases (69%) by R2. The average accuracy was 40% for MG and 69% for DBT, a statistically significant difference ($p < 0.0001$). For all cases where orientation was correctly detected, MG achieved average accuracy of 73% and DBT 77% in terms of correct margin status. Also average sensitivity was significantly better for DBT (77%) versus MG (62%).
Conclusion: DBT showed significant improvement of accuracy of SR regarding orientation of the closest margin and improved sensitivity regarding identification of margin status compared to MG.

B-1136 11:51

Does previous reader performance in a test set of DBT images predict performance in a retrospective reading trial using DBT in addition to mammography?

E.F. Harkness[1], S. Astley[1], L. Tucker[2], S. Duffy[3], F.J. Gilbert[2]; [1]*Manchester/UK*, [2]*Cambridge/UK*, [3]*London/UK (fjg28@medschl.cam.ac.uk)*

Purpose: To investigate whether sensitivity and specificity of readers using Digital Breast Tomosynthesis (DBT) in addition to mammography can be predicted from their previous performance reading a test set of DBT images.
Methods and Materials: Nineteen readers from five centres read the same 80 previously unseen DBT images (41 cancers, 32 benign, 7 normal). Ground truth was confirmed by histology. Readers subsequently participated in a retrospective reading trial with cases read in three ways (FFDM alone; FFDM with DBT; synthetic 2D image with DBT). Sensitivities and specificities were calculated for each reader.

Results: Readers read a total of 4765 assessment cases (908 cancers), of which 2197 were marked for recall (823 cancers) in the FFDM with DBT arm of the prospective trial. In the test set the proportion of cancer cases recalled based on a suspicion score of 4 or 5 was 76% compared to an overall sensitivity of 92% in the FFDM with DBT trial arm (difference 16%, 95% CI 11 to 21, $p < 0.001$). Specificity decreased from 83% in the test set to 64% in the FFDM with DBT trial arm (difference -19%, 95% CI -24 to -14%, $p < 0.001$). Sensitivity increased for the majority of readers in the trial compared to the test set, but specificity decreased. One reader had both increased sensitivity and specificity in the trial compared to the test set.
Conclusion: The lack of clear relationship between performance in the test set and trial suggests this approach cannot be used to identify readers requiring additional training.

10:30 - 12:00 **Room Z**

Computer Applications

SS 1805
Image processing techniques (2)

Moderators:
A. Alberich-Bayarri; Valencia/ES
U. Bick; Berlin/DE

B-1137 10:30

Automated volumetric lesion quantification in automated 3D breast ultrasound: comparison of 5 breast lesion segmentation algorithms
O. Diaz[1], R. Agarwal[1], A. Gubern-Merida[2], J. van Zelst[2], Y. Diez[3], R. Martí[1]; [1]*Girona/ES*, [2]*Nijmegen/NL*, [3]*Sendai/JP (oliver.diaz@udg.edu)*

Purpose: Lesion growth is an important feature used for breast lesion characterisation. In automated 3D breast ultrasound (ABUS), lesion size is typically performed by measuring the longest lesion axis without accounting for more accurate measurements such lesion volume. This work presents a comparison of five breast lesion segmentation algorithms for ABUS that can be used in clinical practice to quantify lesion volume.
Methods and Materials: 20 ABUS volumes with a total of 16 benign lesions (BI-RADS 2) and 4 malignant lesions (BI-RADS 4/5) were used. The average lesion size was 9.03 mm. Five segmentation algorithms were investigated: an in-house Markov Random Field-Maximum A Posteriori (MRF-MAP) segmentation framework and four widely known image segmentation methods that were optimised for ABUS lesion segmentation: confidence connected (CC), connected threshold (CT), neighbourhood connected (NC) and watershed (WAT) algorithm. Dice Similarity Coefficient (DSC) was used to quantify the overlap between automated and ground truth (GT) segmentations. Pearson correlation between lesion volumes computed with the most accurate segmentation algorithm and GT was calculated.
Results: Best results were obtained for the WAT algorithm with a mean DSC value of 74±10.4%. MRF-MAP, CC, CT and NC obtained a DSC of 51.7±30.1%, 55.9±22.3%, 45.3±24.6% and 2±5.3%, respectively. Correlation between lesion volumetric measures computed on WAT and GT segmentations was 0.97.
Conclusion: The watershed algorithm showed the most similarities with the radiologists' annotations. The integration of such an algorithm into clinical workflow has the potential to aid radiologists in quantitatively measuring tumour changes over time in ABUS.

B-1138 10:38

Computerised image quality assessment in automated 3D breast ultrasound images
J. Schwaab[1], A. Malavé Dos Santos[1], Y. Diez[2], R. Martí[2], J. van Zelst[3], A. Bensouda Mourri[4], J. Gregori[1], M. Günther[5]; [1]*Heidelberg/DE*, [2]*Girona/ES*, [3]*Nijmegen/NL*, [4]*Brussels/BE*, [5]*Bremen/DE (j.schwaab@mediri.com)*

Purpose: Although automated 3D breast ultrasound (ABUS) acquisition is highly standardised, image quality depends on correct transducer positioning and ultrasound parameter setting. High image quality is an essential prerequisite for diagnostics and image processing. A computerised approach for online ABUS image quality assessment at the time of acquisition is proposed.
Methods and Materials: 369 anonymised ABUS images acquired from 37 women were manually annotated by two clinicians with respect to image quality, especially focusing on the position of the nipple in the breast, the nipple shadow, and the shape of the breast contour in the image. Image processing was employed to extract meaningful features from each image and Random Forest classifiers were implemented to reproduce the manual ratings. 10-run 10-fold cross validation was applied to estimate sensitivity, specificity and AUC values.
Results: The automatic detection of cases where the nipple position was too close to the breast contour, the nipple shadow was too prominent, or the breast contour was very irregular achieved AUC values of 0.962±0.002 (95% CI), 0.835±0.005, and 0.889±0.005, respectively, with sensitivities of 0.926±0.013, 0.728±0.022, and 0.787±0.042, at specificities of 0.905±0.009, 0.817±0.021, and 0.822±0.044. The combination of all aspects yielded an AUC of 0.909±0.002 with 0.810±0.012 sensitivity and 0.909±0.012 specificity.
Conclusion: A classifier based approach can rapidly provide ABUS image quality ratings to support the technicians. Online feedback at the same time that the patient is being scanned is undergoing clinical evaluation but these experimental results show the potential for easy detection (and subsequent repetition) of low-quality scans.
Author Disclosures:
M. Günther: CEO; mediri GmbH, Heidelberg, Germany.

B-1139 10:46

Displaying inguinal lymph nodes prior to transplantation in a deep inferior epigastric perforator flap breast reconstruction using an innovative projection method
S. Hummelink, L.J. Schultze Kool, D.J.O. Ulrich; *Nijmegen/NL (stefan.hummelink@radboudumc.nl)*

Purpose: Lymphedema of the arm is a common postoperative complication as a result of breast cancer surgery. One of the surgical treatments comprise modification of a deep inferior epigastric perforator (DIEP) flap breast reconstruction to facilitate additional lymph node transplantation from the inguinal area. Using Computed Tomography Angiography (CTA) the distribution of these lymph nodes can be assessed. We present a virtual planning based on this CTA created for the DIEP flap and with the inguinal lymph nodes included, followed by preoperatively projecting this information on the patient's abdomen.
Methods and Materials: A total of 10 patients underwent the standard imaging protocol: a preoperative CTA to assess the vascular anatomy of the lower abdomen. A three-dimensional (3D) model of the blood vessels was produced, with the addition of including the inguinal lymph nodes in this reconstruction. Preoperative projection of the 3D model onto the patients abdomen and inguinal area was performed, followed by tracing of this image. Intraoperatively found lymph nodes were identified by touch and compared to the markings on the skin.
Results: In all 10 patients, all lymph nodes located preoperatively were found intraoperatively within a 1 cm radius of the marking on the skin; and these were more easily located according to two operating surgeons.
Conclusion: Virtual planning of lymph node transplantations in a deep inferior epigastric artery perforator flap breast reconstruction seems feasible and can be performed quickly. This additional visual support aids the surgeon in locating the lymph nodes in the inguinal area.

B-1140 10:54

Automated nipple detection in 3D breast ultrasound scans
M. Costa[1], D. Ermacora[2], S. Pesente[3], A. Nicolucci[4], S. Kus[1], R. Longo[1]; [1]*Trieste/IT*, [2]*Udine/IT*, [3]*Turin/IT*, [4]*Firenze/IT (matilde.costa@phd.units.it)*

Purpose: 3D automated breast ultrasound systems do not provide a single scan of the whole breast and partially overlapped adjacent volumes are acquired. To compare adjacent scans a rigid registration is necessary. It is done manually by the radiologist, increasing the time for each exam evaluation. We propose a fast method for an automated alignment of breast scans which takes advantage of the fully automated detection of the nipple, that is an effective breast landmark.
Methods and Materials: As the nipple attenuates the ultrasound signal, the underlying region exhibits a decreased intensity. Using the Maximally Stable Volumes (MSV) algorithm, dark stable regions inside the volume can be determined. A specific feature descriptor has been developed for a reliable characterisation of the areola region. The nipple was located analysing the connections of the selected region within the MSV component tree.
Results: The efficiency and accuracy of the proposed method were tested on a test dataset of 90 ultrasound scans. The nipple was detected with a detection rate of 90% inside a range of 15 mm with respect to the ground truth manually annotated by an expert. The procedure succeeded also when the nipple was not completely scanned in the field of view. The average distance between the automated detected nipple position and the reference is 5.1 ± 3.1 mm. The computation time is 3 seconds on a 2.5-GHz processor.
Conclusion: Our method is very fast and efficient and can be used as first step in inter- and intra-modal image registration.

B-1141 11:02

1D-histogram feature analysis of the apparent diffusion coefficient improves diffusion-weighted imaging for lymph node characterisation in cervical cancer

I.F. Vieira[1], M. Koole[1], F.D. Keyzer[1], E. Dresen[1], S. Han[1], I. Vergote[1], F. Amant[1], F.R.A. Lima[2], V. Vandecaveye[1]; [1]*Leuven/BE*, [2]*Recife/BR (igor.vieira@student.kuleuven.be)*

Purpose: To evaluate whether statistical classification of 1D-histogram apparent diffusion coefficient (ADC) features allows lymph node characterisation in patients with cervical cancer.
Methods and Materials: Thirteen patients with cervical cancer underwent pelvic magnetic resonance imaging (MRI) including diffusion-weighted imaging (DWI) with 6 b-values ranging between 0 and 1000 s/mm2. All pelvic lymph nodes of 4 mm or greater in short axis diameter were delineated and quantified by eighteen 'first order statistics' histogram features. A recursive feature selection algorithm was used to provide the best individual as well the best combination of features based on their performance. Cross-validation was carried out by interchanging the nodal data in training and testing datasets to avoid overfitting in the used classifiers: logistic regression (LR) and support vector machine (SVM). Both approaches were compared on a per-node basis for sensitivity, specificity and accuracy with conventional ADC and conventional MRI in correlation with histopathology after surgical sampling.
Results: Radiological-pathological correlation was possible for 80 lymph nodes (15 positive and 65 negative at histopathology). Combining the 1D-histogram features Mean and Skewness of the ADC (ADCmean+Skew) using LR classifier resulted in 71% sensitivity, 100% specificity and 95% accuracy while using SVM classifier resulted in 85% sensitivity, 93% specificity and 90% accuracy for detecting nodal metastases. In comparison, conventional ADC showed 60% sensitivity, 90% specificity and 80% accuracy while conventional MRI showed 27% sensitivity, 80% specificity and 69% accuracy.
Conclusion: Advanced statistical classification of ADCmean+Skew improved characterisation of lymph nodes in cervical cancer compared to conventional ADC and MRI.

B-1142 11:10

Texture analysis with CT in GIST tumours: correlation with mitotic index and risk's assessment

F. Carbonetti[1], G. Quarta Colosso[1], C. Briani[1], A. Laghi[2], M. Rengo[2], V. David[1], E. Iannicelli[1]; [1]*Rome/IT*, [2]*Latina/IT (francescocarbonetti799@hotmail.com)*

Purpose: To assess whether texture analysis findings of GISTs' could be related with the mitotic index and with the Miettinen's classes of risk.
Methods and Materials: CECT scans of 44 patients with histologically proven diagnosis of GISTs were retrospective investigated for Texture Analysis. Analysis was performed using a commercial research software algorithm (TexRAD Ltd, Somerset, England, United Kingdom) on CECT venous phase manually delineating a region of interest around the tumour outline for the largest cross-sectional area. Kurtosis, entropy, skewness, mean value, standard deviation were calculated by the software on five different spatial scale filter (SSF): 0.1.1.5.1.8.2. Patients (n44) were divided into two groups according to the mitotic index (33 patients with ≤5/50 HPF and 11 with > 5/50 HPF mitoses) and stratified into five classes of risks according to the latest Miettinen's classification: none (n12), very low risk (n9), low risk (n9), moderate risk (n7), high risk (4). To evaluate any correlations Spearman's test and ROC curves were performed.
Results: Parameter "mean" was significantly correlated with the mitotic index with SFF at 1.1.5.1.8, 2 and with the classes of risks in all the five SSF. Mean parameter had a sharply lower HU value in GISTs with mitotic index > 5 and in the moderate and high classes of risks with a direct tendency to grow with the increase of the SSF. No other significant correlations were found.
Conclusion: Texture analysis could be a useful tool in GISTs evaluation being the parameter "mean" significantly related with the mitotic index and with the classes of risk.

B-1143 11:18

A new ultrasound-based method to detect liver steatosis using CT as reference standard

L.C. Pescatori[1], R. Casale[2], C. Messina[1], F.M. Doniselli[1], G. Di Leo[3], F. Sardanelli[3], L.M. Sconfienza[3]; [1]*Milan/IT*, [2]*Rome/IT*, [3]*San Donato Milanese/IT (lorenzo.carlo.pescatori@gmail.com)*

Purpose: Our aim was to develop a new method based on ultrasound measurements in the liver and the right kidney allowing to detect steatosis using the CT method as reference standard.
Methods and Materials: We retrospectively reviewed images of patients who performed both ultrasound and CT within 10 days. For each patient, we measured CT density of both liver and spleen by placing a region of interest (ROI) of 100 pixel in the same slice; the liver:spleen ratio was calculated. Similarly, measurements on both liver and right kidney in a single ultrasound image were obtained using ImageJ software (Java; developed by the National Institute of Health); the kidney: liver ratio was calculated. The correlation between ratios obtained on CT and ultrasound was estimated using the Spearman correlation coefficient, while the diagnostic performance of the new method based on ultrasound was calculated using ROC analysis. Patients with a CT ratio < 0.9 were considered as affected by steatosis. Thresholds were given for nearly-95% sensitivity and nearly-95% specificity.
Results: A total of 45 patients [median age 56 years (IQR 50-74)] were analysed, 14 (31%) having steatosis according to CT ratio. The median CT ratio was 1.10 (IQR 0.87-1.24), while the ultrasound ratio distribution was 0.98 (0.82-1.13). The correlation between the two ratios was 0.524 (P <.001). At ROC analysis, AUC was 0.840. Thresholds for nearly-95% sensitivity and nearly-95% specificity were 1.16 (25% specificity) and 0.75 (50% sensitivity), respectively.
Conclusion: We developed a new ultrasound-based method to detect liver steatosis showing a high diagnostic performance.

B-1144 11:26

Software for CT-based quantification of abdominal adipose tissue: preliminary evaluation in normal weight patients

A. Schaudinn, A. Hudak, N. Linder, N. Garnov, G. Stocker, U. Hacker, T. Kahn, H. Busse; *Leipzig/DE (Alexander.Schaudinn@medizin.uni-leipzig.de)*

Purpose: Retrospective CT quantification of visceral and subcutaneous adipose tissue (VAT, SAT) is increasingly used for risk assessment in patients with metabolic disease or cancer, or prior to abdominal surgery. The aim of this study was to present and validate a custom-made tool (dcmTool) for assisted AT quantification.
Methods and Materials: Twenty normal weight patients underwent IRB-approved abdominal CT (Somatom Sensation 64, Siemens, slice thickness 5 mm) as part of a multicenter cancer trial. Total volumes of VAT (V-VAT) and abdominal SAT (V-SAT) between diaphragm and pelvic floor were determined with dcmTool using histogram-based visualisation and segmentation (under IDL, Exelis VIS). AT was assumed between -190 and 30 HU (default). Analyses were repeated with a common commercial tool (SliceOmatic, TomoVision). Agreement was determined by coefficients of determination (R^2) and standard deviations (SD) of the volume differences (Bland-Altman).
Results: Mean volumes were V-VAT=3.5 L and V-SAT=5.1 L. Processing involved an average of 83 slices and took a mean time of 48 min (dcmTool) and 50 min (SliceOmatic) per patient. Coefficient R^2 was 0.99 in both compartments while bias and SD (SD%=SD/AT) were 48 ml and 91 ml (2.6%) for V-VAT and 312 ml and 274 ml (5.4%) for V-SAT. The unique feature of dcmTool is that all ROIs are safely stored within the DICOM file and can be retrieved for documentation, validation or future adjustments.
Conclusion: The presented tool provides a reliable and powerful option for CT quantification of adipose tissue with processing times comparable to commercial tools (here, 0.6 min/slice).

B-1145 11:34

Automatic segmentation of visceral fat in 7T MRI of mice

P. Marra, S. Antunes, T. Canu, F. De Cobelli, C. Tacchetti, A. Esposito, A. Del Maschio; *Milan/IT (marra.paolo@hsr.it)*

Purpose: The quantification of visceral fat volume (VFV) in mice is useful in different fields of research (endocrinology, oncology) but it is time-consuming. Our aim was the development and validation of a new software to perform automatic VFV quantification on MR images.
Methods and Materials: Ten laboratory mice underwent our standard 7T-MRI protocol for assessment and quantification of VFV: T1w sequences, both with and without fat saturation, were acquired under inhalation anaesthesia covering a body region between the diaphragmatic dome and the thigh. Fat-sat T1w sequences were then subtracted from T1w series to obtain a pure fat image stack. VFV segmentation, excluding subcutaneous fat tissue, was performed manually with ROI function (MIPAV v.7.2) by a resident radiologist with experience in mouse imaging. Four mice were used for training and six for test set. VFV was calculated in all the mice manually, semi-automatically, using fuzzy C-mean algorithm on pre-segmented fat image stacks, and automatically, using an in-house-developed software based on elastic registration and fuzzy C-mean algorithm. Semi-automatic quantification was performed to understand the proportion of VFV variability explained by software errors of segmentation. Bland-Altman analysis was performed and intraclass-correlation-coefficient (ICC) was calculated.
Results: Mean VFV was 732±128 cc, 748±192 cc and 772±158 respectively with manual, semi-automatic and automatic segmentation. Bland-Altman plot showed good agreement between manual and automatic VFV quantification: mean volume difference was -40±56 cc (ICC=0.924; p=0.001).
Conclusion: The proposed software was able to perform accurate and quick VFV quantification in small rodents, demonstrating good concordance with the time-consuming manual analysis.

B-1146 11:42

A novel method for the assessment of joint space width and subchondral bone micro architecture

R. Ljuhar[1], H. Canhão[2], J. Branco[2], A. Rodrigues[2], N. Gouveia[2], J. Hladuvka[1], T. Haftner[1], D. Ljuhar[1], B. Norman[1], S. Nehrer[3], A. Fahrleitner-Pammer[4], H.-P. Dimai[4]; [1]*Vienna/AT*, [2]*Lisbon/PT*, [3]*Krems/AT*, [4]*Graz/AT*
(rljuhar@gmail.com)

Purpose: Assessment of osteoarthritis (OA) usually involves radiographs to evaluate medial and lateral knee joint spaces, but perspective errors and low reproducibility are limiting factors. In addition, the subchondral bone area may provide important information on the status of OA. However, no adequate standard has been developed so far to quantify subchondral changes in combination with changes of joint space width (JSW).
Methods and Materials: 274 knee radiographs were included (110 cases/164 controls). Computer-assisted knee joint space analysis was performed at the medial/lateral compartment. Furthermore, subchondral bone texture was assessed by using fractal analysis at predefined regions of the proximal tibia. Self-similarity of the texture, reflecting 2D projection of the 3D trabecular structure, has been used to calculate the Bone Structure Value (BSV) which provides indirect information on bone quality.
Results: Comparing mean BSVs case vs. controls, a statistical significant deviation of 7.04% ($p < 0.01$) in values was determined with an odds-ratio of 2.89 (95% CI, 1.2-6.89). A combination of JSW & BSV showed a further increase in discriminative power. Differences in BSV were found between left/right knee and male/female.
Conclusion: The novel method described here is sufficient to discriminate between case and controls. Furthermore, fractal analysis alone may provide information on bone quality aspects. Future work should focus on the potential role of bone micro architecture to serve as a fracture risk assessment tool. Such algorithms could serve as early predictor of not just OA but also additional degenerative bone diseases.

B-1147 11:50

Joint space mapping: a novel platform for multiparametric quantitative 3D joint analysis from multimodal cross-sectional imaging data

T.D. Turmezei, A.H. Gee, K.E.S. Poole, G.M. Treece; *Cambridge/UK*
(tom@diagnosticradiology.eu)

Purpose: Multiparametric quantitative joint assessment could set a new standard for detecting important structural changes in osteoarthritis. A novel image analysis pipeline called 'joint space mapping' (JSM) is presented at the hip.
Methods and Materials: JSM can be applied to CT and MR imaging. First an approximate threshold is selected to pick out the femoral head. A smooth set of contours is then automatically generated. Hough transforms are used on these contours to automatically fit a sphere. An acetabular shadow is cast onto a triangulated mesh of the sphere, followed by novel 3D segmentation of the shadow. The resulting surface patch contains ~6,000 vertices, each of which is used as a measurement point. A 1D measurement line is generated at the normal to each vertex across the joint. Using a model-based fitting algorithm, CT data delivers subchondral bone density, thickness, and joint space width (JSW). Using a hybrid full-width-half-maximum and threshold technique, MR delivers cartilage thickness. The same patch can be used to compare cross-modality data by finding the appropriate rigid body transform from intensity-based registration.
Results: 3D joint space maps from 20 cadaveric female right hips are presented on a canonical patch for each parameter (mean and SD). Correlations were shown between JSW and cartilage thickness (0.57), femoral cortical thickness and trabecular density (0.17) and acetabular cortical thickness and trabecular density (-0.27).
Conclusion: JSM can build a cross-modality multiparametric model of the hip joint. This will be extended to include further parameters such as MR T2* and T1rho mapping.
Author Disclosures:
T.D. Turmezei: Speaker; to the AMGEN Global Advisory Board in educational fora. **A.H. Gee:** Grant Recipient; from AMGEN and Eli Lilly & Company for unrelated work. **K.E.S. Poole:** Advisory Board; for AMGEN and UCB Pharma. Grant Recipient; from AMGEN and Eli Lilly & Company for unrelated work. Patent Holder; inventor on a related patent application GB0917524.1. Speaker; for AMGEN and Eli Lilly & Company in educational fora. **G.M. Treece:** Grant Recipient; from AMGEN and Eli Lilly & Company for unrelated work. Patent Holder; inventor on a related patent application GB0917524.1.

10:30 - 12:00 **Room N**

Cardiac

SS 1803

MR (1)

Moderators:
K. Pagonidis; Iraklion/GR
N.N.

B-1148 10:30

4D flow MRI in stented versus stentless aortic valve bioprosthesis at 1 year after surgery

F. van Kesteren, L.W.L.M. Wollersheim, J. Baan Jr., A. Nederveen, B.A.J.M. de Mol, P. van Ooij, R.N. Planken; *Amsterdam/NL*
(nilsplanken@gmail.com)

Purpose: Surgical aortic valve replacement (SAVR) using a bioprosthetic valve is the standard treatment option for patients with symptomatic aortic valve stenosis. Traditional bioprostheses have a stented framework, facilitating easy implantation. It is suggested that this stent obstructs laminar blood flow, increasing peak systolic velocity and energy loss over the valve. As an alternative, stentless bioprostheses have been introduced. We aimed to evaluate the hemodynamic performance of stented and stentless bioprostheses using 4D-flow MRI.
Methods and Materials: 30 patients treated by stented (Mitroflow = MS) or stentless bioprosthesis (Freedom Solo = FS) underwent non-contrast enhanced 4D-flow MRI at 1.5 T at 9-15 months after implantation. Pre- and postprocessing were performed using commercial and home-built software (Mimics and Matlab). Data analysis included quantitative comparison of hemodynamic parameters in the ascending aorta during peak systole.
Results: 28 MRI scans (14 MF, 14 FS) were available for analysis. Two patients were excluded due to claustrophobia or atrial fibrillation. Baseline characteristics (age, gender, valve size) were equally distributed. No statistical differences in hemodynamic parameters were found; mean velocity was 0.60 m/s (0.53-0.73) for MF versus 0.62 m/s (0.49-0.73) for FS (p=.89), peak velocity 2.45 m/s (2.06-2.73) versus 2.11 m/s (1.84-2.61)(p=.09), mean wall shear stress 0.60 Pa (0.50-0.81) versus 0.59 Pa (0.45-0.79)(p=.55) and energy loss due to viscous dissipation 10.17 MW (6.86-13.36) versus 7.82 MW (4.84-10.68) (p=.10) for MF and FS, respectively.
Conclusion: Hemodynamic performance, peak systolic velocity and energy loss in the ascending aorta, of stented and stentless aortic valve bioprosthesis are comparable at 1-year after implantation, as determined by 4D-flow MRI.

B-1149 10:38

Myocardial alterations in grating-based phase-contrast computed tomography (gb-PCCT)

S. Notohamiprodjo[1], N. Webber[1], L. Birnbacher[2], M. Willner[2], J. Herzen[2], D. Mayr[1], H. Bartsch[1], T. Saam[1], H. Hetterich[1]; [1]*Munich/DE*, [2]*Garching/DE (Susan.Notohamiprodjo@med.uni-muenchen.de)*

Purpose: gb-PCCT relies on X-ray refraction to generate high-contrast images in biological soft tissue. The potential of gb-PCCT for the depiction of structural changes in different cardiomyopathies was evaluated.
Methods and Materials: Four human heart samples from patients with hypertensive, ischemic and dilated cardiomyopathy and cardiac lipomatosis were examined. The gb-PCCT set-up consists of X-ray tube (40 kV, 70 mA), grating-interferometer and detector and allows the calculation of phase- and absorption-contrast data. Normal myocardium (MC), fibrotic scars (FS), interstitial fibrosis (IF) and fatty tissue (FT) were evaluated by visual inspection and quantitative absorption- and phase-contrast Hounsfield units (HUabs and HUp, respectively) with histopathology as standard of reference. Systematic differences in HUabs and HUp were assessed by ANOVA and sensitivity and specificity were calculated.
Results: From a total of 35 corresponding cross-sections, MC was found in 35 (100%), FS in 6 (17.1%), IF in 7 (20%) and FT in 25 (71.4%) cross-sections, accurately detected by gb-PCCT (sensitivity and specificity > 90%). For MC, FS, IF and FT mean HUp were 52.5, 86.6, 62.4 and -38.6, respectively 54.1, 69.7, 62.3 and -258.9 mean HUabs. An overlap in HUabs was observed for MC and IF (p=0.84) but not for HUp ($p < 0.01$). Contrast-to-noise ratio was significantly higher in phase- than in absorption-contrast for MC/FT (32.7 vs. 7.2; $p < 0.01$) and for MC/FS (3.6 vs. 0.2; $p < 0.01$).
Conclusion: Given its superior soft tissue contrast, gb-PCCT is able to depict structural changes in different cardiomyopathies, which can currently not be obtained by X-ray absorption based imaging methods.
Author Disclosures:
S. Notohamiprodjo: Research/Grant Support; DFG Cluster of Excellence Munich-Centre for Advanced Photonics (MAP), Hans and Klementia Langmatz Foundation.

B-1150 10:46

Real-time SPARSE-SENSE cine imaging in atrial fibrillation: a feasibility study

J. Goebel, E. Tezgah, F. Nensa, H.P. Schemuth, S. Maderwald, M. Gratz, H.H. Quick, T. Schlosser, K. Nassenstein; *Essen/DE (Kai.Nassenstein@uk-essen.de)*

Purpose: Cardiac magnetic resonance imaging (CMR) relies on correct ECG-gating, which is hampered in arrhythmic patients. Real-time CMR may overcome this problem. Hence, a prototype free-breathing real-time cine sequence using SPARSE-SENSE was investigated for clinical feasibility and for reliable left ventricular (LV) volume quantification in patients with atrial fibrillation.
Methods and Materials: LV short axis stacks of a real-time SPARSE-SENSE cine (SPARSE) and of a "reference standard" steady state free precession (SSFP) sequence with arrhythmia rejection were acquired from 20 patients with atrial fibrillation on a 1.5 T MR system. Two radiologists independently rated motion artifact severity in both sequences using a 4-point Likert-type scale. Coefficients of variation of the interventricular septum signal intensity and LV volumetric parameters were measured twice by one reader. Comparison between both sequences was performed by modified Fisher's exact test, paired t-test, and intraclass correlation as appropriate.
Results: Median motion artifact severity was significantly lower for SPARSE ($p < 0.001$). Mean coefficient of interventricular septum signal intensity variance was significantly smaller in the SPARSE images (0.11±0.04) compared to the SSFP images (0.22±0.13, p=0.003), verifying lesser motion artifacts in SPARSE. Only a small difference of 9±15 ml was seen for ESV (p=0.019) between both sequences, otherwise no significant volumetric data difference was detected (ESV, p=0.200; SV, p=0.332; EF, p=0.136; myocardial mass, p=353). Intraclass correlation between both sequences was good to excellent (range, 0.80 to 0.97).
Conclusion: Real-time CMR with SPARSE data sampling reduces motion artifacts and enables reliable assessment of LV volumes in patients with atrial fibrillation.

B-1151 10:54

Conception and realisation of a amagnetic pulsatil flow phantom to compare 2D phase contrast post treatment software

K. Warin-Fresse[1], P. Guérin[1], B. Guyomarc'h Delassale[1], D. Le Touze[1], T. Senage[1], J. Dacher[2]; [1]*Nantes/FR*, [2]*Rouen/FR (Karine.WARINFRESSE@chu-nantes.fr)*

Purpose: MRI is a non invasive and functional imaging technique. The 2D phase contrast (2D PC) sequence allows flow quantification. Thereafter images are post treated by software. The aim of the study was to compare with control values, 3 of these available softwares: Argus® (Siemens), Syngo® (Siemens) and CVI® (Circle distributed by Olea medical).
Methods and Materials: Pulsaltil flow was generated in a amagnetic flow phantom to obtain control values. Output, volumes and velocity are measured by 2D PC with increasing output from 1.6 l/mn to 6 l/mn and on different vessel diameter 1.7 cm, 2 cm and 3.5 cm. Each measure was performed with different velocity encoding from 100 cm/s to 500 cm/s three times. Finally, each measure was post treated independently by the three Softwares.
Results: Percentage changes between software results and control value were Argus® 12.4%±14.8 (0-67%), Syngo 9.9%±10.4 (0-56%), CVI® 15.5%±11.3 (0-67%). The Friedman test showed a significant difference ($p < 0.001$) between softwares and control value. CVI® overestimated mean outflow and anterograde volume (Wilcoxon test p=0.001 and Bonferroni test p=0.0084). There was non significant difference between the 3 softwares for the maximal velocities.
Conclusion: Our study shows a significant difference between the 3 softwares for the mean outflow and a overestimation of the mean outflow by CVI® comparatively control values.

B-1152 11:02

SPARSE-SENSE cine imaging with high spatial and high temporal resolution for left ventricular functional assessment

J. Goebel, F. Nensa, H.P. Schemuth, S. Maderwald, M. Gratz, H.H. Quick, T. Schlosser, K. Nassenstein; *Essen/DE (Kai.Nassenstein@uk-essen.de)*

Purpose: Cardiac magnetic resonance cine imaging currently bases on time consuming steady-state free precession (SSFP) cine sequences with limited spatial and temporal resolution. New technical developments like compressed sensing allow a considerable image acquisition time reduction due to k-space undersampling. Hence, we investigated two SPARSE-SENSE cine sequences with high spatial or high temporal resolution for reliable quantification of left ventricular (LV) volumes.
Methods and Materials: LV short-axis stacks of two breath-hold SPARSE-SENSE cine sequences with high spatial (sparse 1; temporal resolution (TR), 40 ms; spatial resolution (SR), 1.0x1.0x8 mm³) and high temporal resolution (sparse 2; TR, 11 ms; SR, 1.7x1.7x8 mm³) and of a "reference standard" SSFP cine sequence (TR, 40 ms; SR, 1.7x1.7x8 mm³) were acquired on a 1.5 T MR system in 16 healthy volunteers. LV parameters were analysed semi-automatically twice. Measurement agreement between sequences was analysed using intraclass correlation, Bland-Altman plots, and Passing-Bablock regression.
Results: Small differences were observed between standard SSFP and sparse 1 for EDV (4 ml; p=0.044), SV (7±10 ml; p=0.013), EF (1%; p=0.029), and myocardial mass (-8±7 g; $p < 0.001$), but not for ESV (p=0.135). No significant differences were observed between standard SSFP and sparse 2 regarding EDV (-1±5 ml, p= 0.528), ESV (-3±5 ml, p=0.058), SV (2±5 ml, p=0.139), and EF (1±3%, p=0.105), but for myocardial mass (-6±8 g, p=0.017). Comparing standard SSFP and SPARSE-SENSE sequences, intraclass correlation coefficients were at least 0.95 and Bland-Altman analysis and Passing-Bablock regression showed good agreement. Intraobserver agreement was good to excellent (kappa: 0.76-0.90).
Conclusion: Compressed sensing cine sequences with improved spatial or temporal resolution enable reliable LV functional assessment.

B-1153 11:10

Native slice-averaged T1 mapping as screening tool for diffuse cardiac pathologies

J. Goebel, I. Seifert, F. Nensa, H.P. Schemuth, S. Maderwald, T. Schlosser, C. Jensen, K. Nassenstein; *Essen/DE (Kai.Nassenstein@uk-essen.de)*

Purpose: Native T1 mapping allows quantitative myocardial assessment. It was proposed as diagnostic tool in the work-up of cardiac patients, but its value remains unclear. We investigated slice-averaged native T1 values as global diagnostic classifier between healthy hearts and diffusely diseased myocardium.
Methods and Materials: Native T1 mapping of 1.5 T CMR was conducted in 54 persons with healthy hearts and 150 patients with coronary artery disease (CAD, n=76), myocarditis (n=45), hypertrophic cardiomyopathy (n=12), or dilated cardiomyopathy (n=17). T1 values of all midventricular segments were measured using the Segment software. T1 mapping was compared to the gold standard of combined CMR (cine + late gadolinium imaging) and clinical criteria. The ability of T1 mapping to unequivocally differentiate between healthy hearts and diffuse cardiac diseases was assessed using Mann-Whitney U-test and receiver operating characteristic analysis (ROC).
Results: Median T1 values of persons with healthy hearts differed significantly from patients with dilated cardiomyopathy ($p < 0.001$; ROC: area under the curve (AUC), 0.814; $p < 0.001$) or patients with hypertrophic cardiomyopathy (p=0.043; ROC: AUC, 0.688; p=0.067), but not between persons with healthy hearts and CAD or myocarditis. However, single slice-averaged T1 values varied strongly within the group of persons with healthy hearts, DCM, and HCM and overlapped broadly between all groups.
Conclusion: Although median T1 values differed significantly between the groups "healthy hearts", DCM, or HCM, the variance of single T1 values in all three groups did not allow definitive diagnosis on a case-by-case basis by native T1 mapping alone.

B-1154 11:18

Myocardial T1 mapping in asymptomatic subjects: variations according to left ventricular segments and correlation with cardiovascular risk factors

Y. Kim, M. Kim, H. Kim, Y. Choe, S. Cho, S. Kim, S.-C. Lee; *Seoul/KR (stillout@yuhs.ac)*

Purpose: To evaluate precontrast and postcontrast myocardial T1 time (prT1 and poT1) and extracelluar volume fraction (ECVF) according to left ventricular (LV) segments and correlation with cardiovascular risk factors.
Methods and Materials: We included 198 asymptomatic subjects (180:18=M:F,54.4 ± 6.12 years) who underwent cardiac MR imaging. Pre and postcontrast T1 mapping were performed using ShMOLLI sequence at 1.5 T MR. Short-axial cine imaging was performed with SSFP. T1 values and ECVFs were calculated in 16 AHA myocardial segments. Those values were compared among LV segments and correlated with hypertension (n = 52), diabetes mellitus (DM, n =15), or both (n = 17). ECVF was correlated with LV mass.
Results: PrT1 and poT1 values and ECVF were 1006 ± 291.5 ms, 454.2 ± 38.5 ms, and 0.24 ± 0.04. There was significant difference between apical and mid-basal segments in poT1 value and ECVF ($p < 0.03$), between mid-septal/mid-lateral segments in T1 values and ECVF ($p < 0.04$). ECVF showed reverse correlation with LV mass (p=0.002). There was significantly lower poT1 value (449 ± 35.6 ms) and higher ECVF (0.24 ± 0.04) in subjects with hypertension compared with those (459 ± 43.3 ms and 0.23 ± 0.02) of subjects without hypertension ($p < 0.05$). Subjects with DM showed no difference in all T1 values from subjects without DM or hypertension, except poT1 values in mid-septal segments.

Conclusion: Septal wall showed higher prT1 value and ECVF but lower poT1 value than lateral wall of mid- and basal levels. PoT1 value and ECVF are significantly affected by hypertension and LV mass.

B-1155 11:26

Magnetic resonance evaluation of myocardial and liver iron deposition using T1 and T2* mapping methods: a phantom study

T. Kaasalainen, J. Peltonen, M. Soikkeli, S. Heikkinen, M. Timonen, O. Sipilä; *Helsinki/FI (touko.kaasalainen@hus.fi)*

Purpose: Iron excess is regarded as an important cofactor in the morbidity of chronic liver disease and cardiovascular diseases. The T2* relaxation time has commonly been used as a golden standard for estimating iron deposition noninvasively and managing chelation therapies in patients, whereas T1 myocardial mapping has mostly been used for evaluating diffuse myocardial fibrosis. This phantom study compared the T1 and T2* mapping techniques in the evaluation of iron deposition.
Methods and Materials: Two different phantoms made of carrageen, agarose, NaCl, NaN3 and GdCl3 were constructed. The bulk of the phantoms simulated the normal T1 and T2 relaxation times of the liver and myocardium and 16 smaller inserts inside the phantom contained different Fe2+ concentrations (0-20 mg Fe2+/g dry weight) mixed into the bulk material. T1 (ShMOLLI) and T2* mapping sequences were scanned with a Siemens Avanto 1.5 T MR system. Image analysis was performed in the Medis QMass MR Software.
Results: Both the T1 and T2* relaxation times were shown to decrease with increasing iron concentrations. The T1 mapping was able to delineate higher iron concentrations better than the T2* relaxation times, which saturated approximately to the value of 10 ms with high iron depositions. Our phantom contained only Fe2+, which has longer relaxation times than Fe3+. The image quality of the T1 images was visually rated superior to the T2* images.
Conclusion: According to the phantom results, T1 mapping could potentially be used to support T2* imaging when estimating iron deposition in clinical patients, especially in borderline cases.

B-1156 11:34

Reproducibility of native and contrast-enhanced CMR techniques to measure lesion size following acute myocardial infarction

E. Tahir, M. Sinn, M. Avanesov, J. Vienna, D. Saering, U.K. Radunski, K. Muellerleile, G. Adam, G.K. Lund; *Hamburg/DE (e.tahir@uke.de)*

Purpose: To analyse the reproducibility of native and contrast-enhanced CMR techniques to measure lesion size after acute myocardial infarction (AMI).
Methods and Materials: Lesions were independently quantified by 2 experienced observers in total of 120 consecutive CMRs obtained in 30 patients within the first 6 months after AMI using native and contrast-enhanced sequences. A threshold method (cutoff > 2SD of remote normal myocardium) was used on basal, midventricular and apical short-axis left ventricular slices. Bland-Altman analysis was performed to determine the agreement between the two observers. Non-parametric Levene's test was used to compare the variances of the relative differences.
Results: The relative median difference of the native CMR techniques were -1.95% (-12.7% and 9.8%) for T2w, -5.3% (-19.6% and 14.8%) for native T1 and -4.0% (-23.9% and 9.9%) for native T2 (Figure 1). Results for contrast-enhanced CMR imaging were: 2.9% (-4.5% and 10.5%) for LGE, 7.5% (-2.4% and 21.5%) for post-contrast T1 and -2.9% (- 11.4% and 9%) for ECV measurement. Bland-Altman analysis revealed a better agreement for all post-contrast sequences indicated by lower limits of agreement (Figure 1). The increased variability of native imaging was caused by higher interobserver differences in small lesions. This bias was not observed for post-contrast imaging.
Conclusion: There was a good agreement between the two observers to measure lesion size after AMI. However, all post-contrast sequences had a better agreement compared to the native sequences. The low agreement of native imaging was mainly caused by higher interobserver differences in small lesions compared to lager lesions.
Author Disclosures:
E. Tahir: Other; Partially founded by the "Deutsche Forschungsgemeinschaft".

B-1158 11:42

Patients without aortic disease and with aortic dissection using velocity encoding 4D MRI: assessment of wall shear stress and peak velocity

A. Huber, J. Rudolph, M. Rasper, A. Sträter, M. Settles, C. Reeps, H.-H. Eckstein, E.J. Rummeny; *Munich/DE (armin.huber@tum.de)*

Purpose: To determine weather patients with aortic dissection have an increased or reduced peak average wall shear stress magnitude compared to patients without aortic disease.
Methods and Materials: 25 patients (14 patients without aortic disease and 11 patients with aortic dissection underwent velocity encoding time resolved 3D MRI (4D PC MRI) of the aorta after contrast material (0.15 mmol/kg gadobenate dimeglumine) application during high resolution contrast-enhanced MR angiography of the aorta. 4D PC MRI was performed using ECG Gating and navigator echo based respiratory gating. Data acquisition was accelerated by SENSE in two directions (AF 1.5 x 2.5). The spatial resolution was 1.5 x 1.5 x 1.5 mm3. The temporal resolution was 40 ms. The peak velocity and the peak average wall shear stress magnitude were determined using the software GT-Flow (Version 2.0.10, Gyrotools, Switzerland).
Results: The peak average wall shear stress magnitude was 0.67 ± 0.17 N/m2 in patients without aortic disease, 0.16 ± 0.05 N/m2 in patients with aortic dissection. The peak velocity was 73.2 ± 11.6 cm/s in patients without aortic disease and 22.2 cm/s ± 3.8 cm/s in patients with aortic dissection. Patients with aortic dissection showed lower mean values for peak velocity ($p < 0.00001$) and peak average wall shear stress magnitude ($p < 0.0001$) compared to patients without aortic disease.
Conclusion: Compared to patients without aortic disease peak velocity and wall shear stress were reduced in patients with aortic dissection.

10:30 - 12:00 **Studio 2016**

Oncologic Imaging

SS 1816

Gastrointestinal cancer: prediction and assessment of therapeutic response

Moderators:
S. Battisti; Rome/IT
N.N.

B-1160 10:30

Long-term follow-up features on rectal MRI during 'wait-and-see' in clinical complete responders after chemoradiotherapy: an update of 68 patients

M.M. van Heeswijk[1], D.M. Lambregts[1], B.J.P. Hupkens[1], R.C.J. Beckers[1], M. Maas[1], M.E. van der Sande[2], G.L. Beets[1], R.G.H. Beets-Tan[1]; [1]*Maastricht/NL, Amsterdam/NL*, [2]*Amsterdam/NL (miriam.heeswijk@mumc.nl)*

Purpose: Non-operative treatment with stringent follow-up ('wait-and-see') is emerging as a potential alternative to surgical resection in clinical complete responding rectal cancer patients after chemoradiotherapy. MRI is one of the main follow-up tools. Aim of this study was to describe the long-term (evolution in) morphology of the rectal wall in clinical complete responders undergoing wait-and-see.
Methods and Materials: 68 patients with a sustained complete response during a wait-and-see policy were analysed. Patients underwent follow-up MRIs 3-monthly during the first year and 6 monthly during the following years. Two readers in consensus analysed the morphology of the rectal wall on the initial post-CRT scan and the evolution in morphology on the sequential follow-up MRIs.
Results: Median follow-up time was 30 months (range 6-98). A total number of 512 MRIs was analysed (median 7, range 3-15 / patient). In 7% of the patients a completely normalised rectal wall was observed. The other 93% showed a fibrotic remnant (60% minimal fibrosis limited to the bowel wall; 21% thick/mass-like fibrosis and 12% irregular/spicular fibrosis). In 94% the rectal wall morphology did not change during long-term follow-up, in 1.5% initial fibrosis was present which later developed into a normalised rectal wall, in 3% the fibrosis slightly thickened (without evidence of recurrence).
Conclusion: In the majority of patients with a complete response residual fibrosis is present after CRT, which remains unchanged during long-term follow-up in almost all patients. A completely normalised wall is observed in about 1 in 10-20 patients.

B-1161 10:38

Comparison of perfusion parameters calculated from dynamic volume perfusion CT and perfusion MRI in patients with rectal cancer

S. Sudarski, T. Floss, T. Gaa, U. Attenberger, H. Haubenreisser, S.O. Schönberg, T. Henzler; *Mannheim/DE (sonja.sudarski@medma.uni-heidelberg.de)*

Purpose: To prospectively compare quantitative perfusion parameters calculated from dynamic volume perfusion CT (dVPCT) and perfusion MRI in patients with rectal cancer.
Methods and Materials: In this IRB-approved study, 12 patients who underwent perfusion MRI in the framework of their staging during 3 Tesla MR of the pelvis as well as dVPCT on a 2 x 192 slice dual-source CT system were enrolled. Blood flow (BF), blood volume (BV) and mean transit time (MTT) and permeability (PERM) were assessed in representative areas of interest within the tumour as well as within areas of non-diseased rectal wall on dVPCT. With perfusion MRI, BF, BV and MTT could be calculated within the identical areas

of interest. The deconvolution model was used for perfusion calculation. Linear regression analysis and paired student's t-testing were performed to determine concordance of MR and CT perfusion in tumour tissue as well as possible differences between non-diseased rectal wall and tumour tissue with dVPCT.
Results: MR and CT values for BF, BV and MTT did not correlate with poor correlation coefficients r of BF: 0.07, p=0.84; BV: 0.04, p=0.90; and MTT: 0.48; p=0.11. However, all dVPCT parameters could differentiate tumour tissue and non-diseased rectal wall (mean BF: 72.3 vs. 20.7 mL/100 mL/min; BV: 5.0 vs. 1.3 mL/100 mL; MTT: 4.8 vs. 4.3 s and PERM: 20.4 vs. 4.7 ml/100 mL/min (all p values < 0.05).
Conclusion: Deconvolution model-derived absolute dVPCT measurements do not correlate with perfusion MRI. Yet, rectal cancer tissue and non-diseased rectal wall can be differentiated by dVPCT measurements.

B-1162 10:46

Application of texture analysis based on ADC maps in discriminating different stages of rectal cancer

L. Liu; *Beijing/CN (llh9821@163.com)*

Purpose: To explore the potential of texture features on ADC maps in predicting the local invasion depth (pathological stage T1-2 vs T3-4) and nodal status (N0 vs N1-2) of rectal cancer.
Methods and Materials: Sixty-eight rectal cancer patients were enrolled.Texture features based on ADC maps (skewness, kurtosis, entropy, contrast, correlation) and routine ADC parameters (ADCmean, ADCmin, ADCmax) were calculated and compared between T1-2 and T3-4 stage as well as between N0 and N1-2 stage.
Results: Significant differences were found in skewness (p=0.015), entropy (p=0.004) and contrast (p=0.017) when T1-2 and T3-4 tumour were compared. All of the 3 texture features were significantly lower in stage T1-2 than in stage T3-4 (skewness, 0.166 vs 0.476; entropy, 3.212 vs 3.441; contrast, 10.773 vs 13.596). Higher skewness and higher entropy were significant independent predictors for locally advanced rectal cancer (stage T3-4). By using the logistic regression model consisted of the 2 texture features to differentiate T3-4 tumour from T1-2 tumour, we achieved a moderate accuracy (AUC, 0.743). When comparing between N0 and N1-2 stage tumour, significant differences were found in ADCmean (p=0.023), ADCmax (p=0.005) and entropy. ADCmax and entropy can be used as independent predictors for positive nodal status cases. An AUC of 0.750 was achieved by using this logistic model.
Conclusion: Texture features based on ADC maps could provide valuable information for discriminating tumour stages in rectal cancer.

B-1163 10:54

Clinical assessment of diffusion-weighted MRI for restaging rectal cancer: is there a learning curve?

M.M. van Heeswijk[1], D.M. Lambregts[2], L. Andrade[3], M. Maas[1], G.L. Beets[1], R.G.H. Beets-Tan[1]; [1]*Maastricht/NL, Amsterdam/NL*, [2]*Maastricht/Amsterdam/NL*, [3]*Coimbra/PT, Maastricht/NL (miriam.heeswijk@mumc.nl)*

Purpose: Diffusion-weighted MRI (DWI) is increasingly adopted as part of the routine MRI protocol for rectal cancer, particularly for restaging after chemoradiotherapy (CRT). Aim of this study was to investigate whether there is a learning curve for restaging of rectal cancers using DWI.
Methods and Materials: A single reader subsequently evaluated the restaging MRIs (1.5 T) of 105 locally advanced rectal cancer cases undergoing CRT. The reader was asked to score the likelihood for residual tumour vs. complete response on DWI (highest b-value b1000), using the T2-weighted images for anatomical reference. The first 5 cases were used as training cases. The reader was given expert and histopathological feedback directly after each single case in the first 30 cases and after every ten cases thereafter. A learning curve was constructed based on the moving averages (sensitivity, specificity, area under the curve) per 20 cases.
Results: Results: Evolution in sensitivity (to predict a complete response) for the 5 consecutive sets of 20 patients was as follows: 75%, 86%, 88%, 100% and 100%. Specificity was 85%, 100%, 92%, 85% and 83%. Areas under the curve were 0.82, 0.97, 0.93, 1.0 and 0.94.
Conclusion: A learning curve exists for the restaging of rectal tumours after CRT using DWI. Specifically the sensitivity for identification of complete responders improves as a result of training and expert feedback.

B-1164 11:02

MRI of rectal cancer: pathologic correlation of preoperative tumour staging

T. Rostovtseva, N. Ananyeva, S. Vasilyev, E. Smirnova, R. Ezhova; *St. Petersburg/RU (rostovtsevat@mail.ru)*

Purpose: To evaluate the accuracy of high resolution pelvic MRI in the preoperative tumour staging in patients with rectal cancer.
Methods and Materials: 95 patients ages 36-88 years with histologically proved rectal adenocarcinoma underwent pre-treatment pelvic MRI using 1.5 T GE Optima scanner (phased array coil). No endorectal filling or contrast enhancement were used. Exam protocol included: sagittal 3D FSE CUBE (3 mm., FOV 16-18 cm), axial and coronal T2 TSE HR (slice thickness 3 mm., FOV 16-18 cm) perpendicular to the tumour axis and along the anal canal, DWI (multi b-values, slice thickness 6 mm., FOV 30-40 cm). DCE-Coronal LAVA - for venous invasion analisys. Staging criteria were based on MERCURY study and TNM 7th addition. 7 patients received neoadjuvant chemoradiotherapy and were excluded from this study. Results were compared with post-operational pathomorphological analysis.
Results: The most frequent tumour stage was T3, nodal stage- N1.T stage was estimated correctly for 80% of T1 tumours, 74% of T2 ,87% of T3 and 86% of T4. T downstaging happened in 7% of patients, T overstaging- in 13%. Nodal involvement was assessed successfully in 61% of patients (overestimation in 39%). DCE Coronal LAVA allowed to estimate venous invasion (EMVI), which was seen in 14 patients.
Conclusion: MRI is highly informative preoperative non-invasive method of tumour T staging. Nodal involvement remains to be a challenge. DWI allows better tumour and lymph node detection although was not helpful in predicting depth of invasion or nodal involvement. DCE Coronal LAVA can be useful in the assessment of venous invasion.

B-1165 11:10

Dynamic contrast enhanced MRI in rectal cancer: tumours with poor prognosis show low vascularity

M. Maas[1], G. Shakirin[2], D.M. Lambregts[1], M. Weibrecht[2], M. Perkuhn[2], M. Martens[1], R. Dijkhoff[1], G. Beets[3], R.G.H. Beets-Tan[3]; [1]*Maastricht/NL*, [2]*Aachen/DE*, [3]*Amsterdam/NL (moniquemaas@live.nl)*

Purpose: Dynamic contrast-enhanced (DCE) MRI has shown promise for response evaluation after chemoradiation for rectal cancer. Conflicting results have been reported regarding predictive value of DCE-MRI for tumour aggressiveness. Aim was to explore the value of DCE-MRI with gadofosveset trisodium for the distinction between patients with and without poor prognostic factors.
Methods and Materials: 19 patients with primary rectal cancer underwent DCE-MRI with gadofosveset trisodium. DCE-MRI was processed using the Intellispace Discovery research platform (Philips Healthcare). One reader delineated whole-tumour volumes. Semi-quantitative DCE-parameters based on the enhancement-curve (initial slope, wash-in, wash-out, initial signal excess, wash-in time to peak (TTP), final slope, TTP, maximum enhancement, mean transit time, AUC) were compared between patients with and without a prognostic unfavourable factor (primary metastasis, lymphangio-invasion, carcinoembryonic antigen (CEA), cT&cN-stage, cMRF-stage and differentiation grade). $P < 0.05$ was statistically significant.
Results: Patients with metastasis (n=2) had significantly lower peak enhancement, washin time and AUC60. Patients with high CEA (> 5,n=9) had significantly lower peak enhancement and total AUC. Patients with lymphatic invasion had significantly higher maximum slope. A trend to higher washin time was found in patients with unfavourable characteristics at histopathology (high differentiation grade or angio/lymphatic invasion) (n=12,p=0.076).
Conclusion: Indicators of low vascularity at DCE-MRI with gadofosveset trisodium indicate a risk of poor prognosis. This might reflect a very poor vascular organisation/efficiency in patients with metastasis, angio-invasion and high CEA. Possibly this is due to rapid tumour growth. The presence of poor vascularity can be of importance in guiding treatment decisions with regard to chemotherapy and/or radiotherapy.
Author Disclosures:
G. Shakirin: Employee; Philips Research. **M. Weibrecht:** Employee; Philips Research. **M. Perkuhn:** Employee; Philips Research.

B-1166 11:18

Multiparametric functional imaging assessment of primary rectal cancer: correlation between diffusion, perfusion, magnetisation transfer and signal intensity measurements

D.M. Lambregts[1], G. Shakirin[2], M. Maas[1], M. Weibrecht[2], M.J. Lahaye[3], M.M. van Heeswijk[1], G.L. Beets[1], M. Perkuhn[2], R.G.H. Beets-Tan[1]; [1]*Maastricht/NL, Amsterdam/NL*, [2]*Aachen/DE*, [3]*Amsterdam/NL (doenja.lambregts@gmail.com)*

Purpose: Different functional MRI-techniques have shown promise in rectal cancer assessment, but limited data exist on how various quantitative measurements relate to each other. Aim was to evaluate how different components of multiparametric MRI are related in primary rectal tumours.
Methods and Materials: 19 patients with primary rectal cancer underwent a multiparametric MRI including a diffusion-weighted imaging (DWI), dynamic contrast-enhanced (DCE), magnetisation transfer (MT), T2-weighted, and contrast-enhanced 3DT1-weighted sequence (with gadofosveset-trisodium). Sequences were processed using the Intellispace Discovery research platform (Philips Healthcare). One reader delineated whole-tumour volumes on b1000 DWI, which were then subdivided into three equal subvolumes (high, intermediate and low DWI-signal). The following parameters were compared

between these 3 DWI signal groups: MT-ratio, apparent diffusion coefficient (ADC), signal intensity on T2W and contrast-enhanced MRI, and various DCE parameters (initial slope, wash-in, wash-out, initial signal excess, wash-in time to peak (TTP), final slope, TTP, max enhancement, mean transit time, AUC).
Results: Significant differences were found in the DCE parameters initial slope and initial signal excess between the 3 DWI-signal groups (both higher with increasing DWI signal; P=0.008 and 0.026): Additionally, ADC, wash-in TTP, TTP and AUC60 were significantly different for the high DWI-signal compared to the low DWI-signal areas with lower ADC, higher wash-in TTP, lower TTP and higher AUC60 in the high DWI-signal group.
Conclusion: Corresponding differences in perfusion exist between areas of different DWI signal intensities within rectal tumours. DCE and DWI measurements may thus be of complementary value in the functional imaging assessment of rectal cancer.
Author Disclosures:
G. Shakirin: Other; Employee of Philips Research. **M. Weibrecht:** Other; Employee of Philips Research. **M. Perkuhn:** Other; Employee of Philips Research.

B-1167 11:26

Anal cancer: local response assessment using MRI at 3 and 6 month post chemoradiotherapy
R. Kochhar, A.G. Renehan, D. Mullan, B. Chakrabarty, B.M. Carrington;
Manchester/UK (rohit.kochhar@christie.nhs.uk)

Purpose: To evaluate the role of magnetic resonance imaging (MRI) in assessing local response of anal squamous cell carcinoma (ASCC) to chemoradiotherapy (CRT) using an MRI tumour regression grading (TRG) system.
Methods and Materials: We retrospectively related MRI changes from baseline to 3- and 6-months post-CRT with outcomes in 74 patients with biopsy proven ASCC, managed through a centralised anal cancer multi-disciplinary team (2009 to 2012). Tumour regression grades [TRG: 1 (complete response) to 5 (no response)], were assigned and treatment response was determined by examination under anaesthesia (with or without biopsy) and follow-up of at least 2 years.
Results: Seven patients had early local relapse (≤ 12 months); four patients relapsed locally after a disease-free period (> 12 months). TRG 1 and 2 scores at 3- and 6-months post-CRT MRI had a 100% negative predictive value for early relapse, whereas TRG 4 and 5 scores at 6-months had a 100% positive predictive value for early relapse. We identified a novel 'tram-track' sign in anal canal tumours; 38 of 39 patients with this sign had a complete local response.
Conclusion: The use of 3- and 6-month post-CRT MRI, scored by TRG, correlated strongly with local tumour response in patients with ASCC.

B-1168 11:34

Assessment of rectal tumour height and length on MRI: effect of using DWI instead of T2-weighted MRI
M.M. van Heeswijk[1], D.M. Lambregts[1], L. den Ouden[2], M.C. Ageitos-Casais[3], M. Maas[1], G.L. Beets[1], R.G.H. Beets-Tan[1]; [1]*Maastricht/NL, Amsterdam/NL*, [2]*Maastricht/NL*, [3]*Santiago de Compostela/ES, Maastricht/NL (miriam.heeswijk@mumc.nl)*

Purpose: MRI is the primary tool used to assess tumour height (distance from anorectal junction) and length, both factors that influence treatment planning: larger, more distally located tumours often require neoadjuvant chemoradiotherapy (CRT) and more extensive surgery. Diffusion-weighted MRI (DWI) is known to improve tumour conspicuity and may thus influence assessment of tumour height/length. Aim was to compare DWI to standard (T2-weighted) MRI for assessment of rectal tumour height and length.
Methods and Materials: 72 patients were included: 23 underwent only a primary staging MRI followed by (5x5 Gy +) surgery, 49 were treated with CRT and underwent a staging + second restaging MRI after CRT. All MRIs (1.5 T) included T2W-MRI and DWI (b1000) sequences. On each MRI, tumour length and height were measured by two readers: [1] using T2W-MRI and [2] using DWI. Measurements were compared between the two reading sessions.
Results: Mean tumour length (mean of two readers) pre-CRT was 4.8 cm on T2W-MRI and 4.5 cm on DWI (P=0.01), post-CRT it was 3.1 cm on T2W-MRI and 2.2 cm on DWI ($P < 0.001$). Mean tumour height pre-CRT was 5.0 cm for both T2W-MRI and DWI (P=0.86), post-CRT it was 5.4 cm on T2W-MRI and 5.9 cm on DWI (P=0.006).
Conclusion: Use of T2W-MRI may systematically overestimate rectal tumour length on MRI both pre- and post-CRT and overestimate the distal tumour margin, particularly after CRT. Since these factors influence treatment planning, it may be more appropriate to use DWI to assess tumour height and length for clinical decision making.

B-1169 11:42

Preoperative CT and MRI prediction of non-resectability in patients treated for pseudomyxoma peritonei from mucinous appendiceal neoplasms
B. Menassel[1], A. Duclos[1], G. Passot[1], A. Dohan[2], C. Payet[1], S. Isaac[1], P.-J. Valette[1], O. Glehen[1], P. Rousset[1]; [1]*Lyon/FR*, [2]*Paris/FR (menassel_badis@yahoo.fr)*

Purpose: To evaluate CT and MRI findings for signs of hepatoduodenal ligament and small bowel non-resectability in patients with pseudomyxoma perironei (PMP) syndrome, and to compare assessments made by the radiologist based on their experiences.
Methods and Materials: Between January 2009 and June 2014, all consecutive patients with PMP selected for curative surgery underwent CT and MR examinations within two days before surgery. Several imaging findings of hepatoduodenal ligament and small bowel involvements were retrospectively evaluated by a senior and a junior radiologist and compared with surgical findings.
Results: Among the 82 patients who comprised the study population, 11 had non-resectable lesions with hepatoduodenal ligament infiltration (n=4) and/or extensive small bowel involvement (n=9). All 82 patients underwent CT and 73 underwent MRI. Infiltration of the adipose tissue of the hepatoduodenal ligament was a sign associated with non-resectability. The specificity was 100% on both techniques and the sensitivity was 75% and 67% on CT and MRI respectively, for the senior radiologist. Interobserver agreement was good on CT and fair on MRI. Diffuse involvement of the mesentery and/or the small bowel serosa was a sign associated with non-resectability. The specificity was 100% on both techniques and the sensitivity was 67% and 88% on CT and MRI respectively, for the senior radiologist. Interobserver agreement was excellent on CT and moderate on MRI.
Conclusion: CT and MRI can both provide specific signs associated with non-resectablity in patients with PMP. MRI in experienced hands optimises assessment of small bowel involvement.

10:30 - 12:00 **Room L8**

Vascular

SS 1815

Abdominal aortic and other aneurysms

Moderators:
I. Bargellini; Pisa/IT
E. Brountzos; Athens/GR

K-32 10:30

Keynote lecture
E. Brountzos; *Athens/GR*

B-1170 10:39

Investigation of reference levels and radiation dose associated with abdominal EVAR (endovascular aneurysm repair) procedures across several European centres
E. Tuthill[1], L. O' Hora[1], M. O' Donohoe[1], S. Panci[2], D. Campion[3], R. Trenti[4], E. Fox[1], D. Catania[5], L. Rainford[1]; [1]*Dublin/IE*, [2]*Florence/IT*, [3]*Turin/IT*, [4]*Bologna/IT*, [5]*Milan/IT (emma.tuthill@ucdconnect.ie)*

Purpose: Endovascular aneurysm repair (EVAR) is considered the treatment of choice for abdominal aortic aneurysms with suitable anatomy. EVAR procedures have reduced short-term morbidity and mortality compared with open repair, however, concern exists regarding procedural radiation dose. Currently, EVAR reference levels have not been established universally. Reference levels are a radiation dose exposure level, set at the 75th percentile, for radiological examinations/procedures for average-sized patients and are used to identify consistently high patient radiation exposures. This study aimed to establish local Reference Levels for EVAR procedures.
Methods and Materials: Retrospective dose data was collected for 180 standard EVARs performed between January 2014-July 2015 from five specialist centres in Ireland (n=2) and Italy (n=3), following institutional confirmation of participation. Data capture included: Dose-area product or kerma-area product (PKA), total air kerma at the reference point (Ka,r), fluoroscopic time (FT), number of acquisitions, frame rate of acquisition, type of acquisition, operator experience, patient height, weight and gender.
Results: The mean values for each site A, B, C, D and E were PKAs of 4343±994 µGym2, 18200±2141 µGym2, 11423±1390 µGym2, 7796±704 µGym2, 31897±5798 µGym2; FTs of 816±92sec, 950±150sec, 708±70sec, 972±61sec, 827±118sec and number of acquisitions were 6.72±0.56, 10.38±1.54, 4.74±0.19, 5.64±0.36, 7.28±0.65 respectively. The

overall 75th percentile PKA was 15849 µGym2 (all centres). Two of 180 procedures registered a Ka,r > 5Gy.
Conclusion: Local reference levels were identified and the data from five established cardiovascular centres are proposed as initial European EVAR reference values. The variation in radiation exposure between sites highlights the need for routine radiation exposure audit both at local and national level.

B-1171 10:47

Does dynamic volumetric CT angiography of endoleak after endovascular aortic aneurysm repair using 320-detector row CT add additional information with dynamic CT angiography?
M. Inoue, Y. Yamada, M. Tamura, S. Nakatsuka, S. Oguro, M. Jinzaki; *Tokyo/JP (inomasa@mac.com)*

Purpose: To evaluate additional information by dynamic volumetric computed tomography angiography (DV-CTA) for the classification and management of endoleak after endovascular aortic aneurysm repair (EVAR), compared to only conventional CT angiography (c-CTA).
Methods and Materials: Forty patients who underwent both DV-CTA and c-CTA after EVAR were included. All patients were diagnosed as having endoleak on three-phase c-CTA. DV-CTA using 320-detector row CT was performed after c-CTA. The protocol of DV-CTA consists of continuous low-dose images (one scan per 0.5 sec, 15 seconds) followed by intermittent low-dose images (one scan per 1.4 sec, 10 seconds). The classification of endoleak by DV-CTA was compared with that by c-CTA.
Results: All DV-CTA data sets were diagnostic. The classification of endoleak by c-CTA was as followed; type Ia, n = 1; type Ib, n = 1; type Ia + type II, n= 2; type II, n = 30; type III, n =2; type IV, n = 3; type V, n = 1. According to the results of DV-CTA, the classification of endoleak was changed in 5 (12.5%) of 40 patients; from type Ia to type Ia + type II, type II to type Ia + type II, type II to type Ib, type II to type III, type II to type II + type III. Of 5 patients, 4 patients with type Ia, Ib or type III endoleak underwent additional treatment.
Conclusion: DV-CTA visualized dynamic flow of endoleak and provided additional information about classification of endoleak, which influenced on the management of endoleak.

B-1172 10:55

Preliminary validation of a new protocol in EVAR follow-up: digital tomosynthesis and CEUS vs computed tomography angiography
S. Guerrini[1], M.A. Mazzei[1], F.G. Mazzei[1], N. Cioffi Squitieri[1], G. de Donato[1], G. Galzerano[1], F. Setacci[2], C. Setacci[1], L. Volterrani[1]; [1]*Siena/IT*, [2]*Rome/IT (guerrinisus@gmail.com)*

Purpose: To validate a new cost-effective and dose-sparing protocol for assessing EVAR complications, comparing digital tomosynthesis of the abdomen (DTA) combined with contrast-enhanced ultrasound (CEUS) vs computed tomography angiography (CTA).
Methods and Materials: 113 patients referred to our department for EVAR follow-up (93 men, mean age 70.7 years) were enrolled. All patients prospectively underwent CTA, DTA and CEUS, performed at 1 and 12 months after EVAR, with a time interval at maximum of 2 days.
Results: Amongst 113 patients 23 presented complications at CTA. DTA and CTA correlated for the presence of complications in 22/23 patients (sensitivity, specificity, PPV, NPV and accuracy of 94%, 97 %, 89%, 97%, and 98%, respectively). CEUS and CTA correlated for the presence of complications in 9/23 patients (sensitivity, specificity, PPV, NPV and accuracy of 61%, 96%, 93%, 89%, and 91% respectively). Sensitivity, specificity and accuracy in detecting EVAR complications combining DTA and CEUS were 83%, 97% and 93%, respectively.
Conclusion: Combining DTA and CEUS in EVAR follow-up has the potential to limit the use of CTA only in doubtful cases.

B-1173 11:03

Low kV CT-angiography (CTA) with low contrast medium volume using a 256 MDCT scanner in the evaluation of abdominal aorta disease: diagnostic quality and radiation dose reduction
C.R.G.L. Talei Franzesi, D. Ippolito, D. Fior, C. Cangiotti, G. Brembilla, S. Sironi; *Monza/IT (ctfdoc@hotmail.com)*

Purpose: To reduce the radiation dose exposure and the contrast medium volume by using low-kV CT-angiography (CTA) protocol, in the evaluation of abdominal aorta disease.
Methods and Materials: Eighty-two patients (mean age 62.3years)with abdominal aorta disease were prospectively enrolled and examined with 256MDCT scan (Brilliance-iCT,Philips,NL). Forty-five patients were evaluated using low-dose protocol (100 kV; automated tube current modulation) performed with low-contrast medium volume (30 mL;4 mL/s;350 mgI/mL). A control group of thirty-seven patients underwent standard CTA protocol (120 kV; automated tube current modulation), with 80 mL of contrast medium volume. Intravessels density measurements (HU) were performed manually drawing a region of interest (ROI) in the lumen of abdominal aorta,renal arteries and common iliac arteries. The radiation dose exposure (dose-length product, DLP; CT dose index, CTDIvol) and signal-to-noise-ratio (SNR) were calculated. The obtained data were compared between the two groups and statistically analysed.
Results: All exams showed high diagnostic quality, permitting to correctly visualise and evaluate lumen and wall of main aortic branches. In the study group we obtained higher density measurements as compared with control group: mean attenuation value of abdominal aorta (332 HU vs 318 HU), renal arteries (341 HU vs 305 HU) and common iliac arteries (324 HU vs 311 HU). No significant noise increase was observed in study group (mean SNR 14.3) in comparison with control group (mean SNR 18.2).A significant ($p < 0.05$) radiation dose exposure reduction was achieved using low-kV protocol (DLP335 mGy*cm,CTDIvol5.8 mGy), as compared with control group (DLP973 mGy*cm; CTDIvol19.4 mGy), with an overall radiation dose reduction of 65%.
Conclusion: Low-kV 256 MDCT angiography permits to correctly evaluate the main abdominal arteries, with significant reduction of radiation dose exposure (over 65%) and amount of contrast medium volume injected (over 72%), as compared to standard protocol, reducing the risk of contrast-induced nephropathy.

B-1174 11:11

CT angiography in long-term follow-up after endovascular aneurysm repair (EVAR) - combined dose reduction techniques
R.A. Rotzinger, J. Kahn, G. Böning, B. Hamm, F. Streitparth; *Berlin/DE (roman.rotzinger@charite.de)*

Purpose: Endovascular aneurysm repair (EVAR) requires lifelong surveillance by CT angiography (CTA). This is attended by a substantial accumulation of radiation exposure. Iterative reconstruction has been introduced to approach dose reduction at lowered tube potential. This study evaluates adaptive statistical iterative reconstruction (ASIR) for follow-up after EVAR at different levels of tube voltage concerning diagnostic quality and dose reduction potential.
Methods and Materials: 100 CTAs in 67 patients with EVAR were examined using 5 protocols: group A (n=40) as biphasic standard using filtered back projection (FBP) at 120 kV, groups B (n=40), C (n=10) and D1 (n=5) biphasic using ASIR at 120, 100 and 80 kV, respectively, group D2 (n=5) with a monophasic split-bolus ASIR protocol at 80 kV. Image quality was assessed quantitatively by calculating signal- and contrast-to-noise ratios (SNRs, CNRs) and qualitatively by two experienced observers (5-point Likert-scale). CTDIvol (mGy), total DLP (mGy x cm) and effective doses (mSv) were determined.
Results: Applied doses in ASIR groups were significantly lower than FBP standard (B: 37.4%, C: 48.6%, D1: 61.4%, D2: 75%). Compared to group A, SNRs and CNRs in group B were equal and in groups C and D equal to partially inferior, however, not decisive for diagnostic quality. Subjective image quality ratings in all groups were good to excellent without impairments of diagnostic confidence, with high inter-rater agreement.
Conclusion: ASIR contributes to significant dose reduction without decisive impairments of image quality or diagnostic confidence in CTA after EVAR. We recommend an adapted follow-up introducing ASIR and combined low kV to EVAR surveillance.

B-1175 11:19

CT vs. PET-CT: correlations and differences in the diagnosis of aorto-iliac prosthetic vascular graft infections
D. Klug, W.J. Hofmann, A. Becherer, M. Cejna; *Feldkirch/AT (Dominik.Klug@student.i-med.ac.at)*

Purpose: Retrospective analysis to correlate the likelihood of detecting aorto-iliac prosthetic vascular graft infections between computed tomography (CT) with contrast media administration and fluoro-2-deoxy-D-glucose positron emission tomography (FDG PET with native low dose CT).
Methods and Materials: 18 men and 5 women (mean age 78.2 years) with surgical verified prosthetic vascular graft infection were included between March 2005 and June 2014. The likelihood of a vascular graft infection in examinations prior to surgical exploration was graded between 0 (no likelihood) and 3 (high likelihood).
Results: Prosthetic vascular graft infection was surgically verified in all patients (100%, 23/23). In all patients CT-scans were performed. The most common CT-scan related findings for the detection of graft infections were peri-graft soft tissue thickening (78.3%, 18/23), peri-graft fluid accumulation and/ or abscess formation (73.9%, 17/23). The sensitivity of CT was 95.65% and the specificity was 100%. FDG-PET scans were performed in 47.8% of patients (11/23) with a sensitivity of 72.72% and a specificity of 100%. In 47.8% of patients (11/23) CT-scans could be correlated to FDG PET-CT scans (examinations < 7 days). An agreement in the likelihood of diagnosis was found in 45.5% of patients (5/11), with a kappa value of 0.25.
Conclusion: CT showed a better diagnostic accuracy than FDG-PET scanning for the detection of prosthetic vascular graft infections. FDG-PET is an additional diagnostic procedure with high specificity.

B-1176 11:27

Isolated iliac artery aneurysms: a single centre experience

G. Leale, R. Fossaceca, G. Guzzardi, P. Cerini, I. Divenuto, G. Parziale, A. Carriero; *Novara/IT (giacomoleale@libero.it)*

Purpose: This paper reviews our experience in endovascular treatment of isolated iliac artery aneurysms (IIAAs) with a large number of patients
Methods and Materials: From May 2005 to September 2013, 45 patients (43 men and two women; mean age, 74 ± 10 years) with a total of 59 IIAAs underwent endovascular treatment at our institute. We evaluated technical success, long-term patency, early and late complications and overall mortality. Patients were divided into two groups: emergency-treatment group and elective-treatment group.
Results: At a median follow-up of 34.3 months, we achieved a technical success of 97.8 %, a primary patency of 95.5 % and a secondary patency of 100 %, with complete exclusion of the aneurysm in 84.5 % of cases. The incidence of endoleaks was of 15.5 %: eight were type II and one was type III; perioperative mortality was 4.7 %.
Conclusion: Our study documents the effectiveness, in both emergency and elective settings, of the endovascular treatment of iliac aneurysms (EVIAR), which has become the first-choice treatment at our institute. In particular cases, it is also possible to avoid embolisation of the internal iliac artery.

B-1177 11:35

The evaluation of different tube voltages multidetector CT angiography in assessment of aorta and lower peripheral arterial occlusive disease

D. Zhang, H. Xue, X. Wang, Z. Jin; *Beijing/CN (cadina1984@163.com)*

Purpose: To investigate the ionizing radiation dose, image quality, and diagnostic performance of computed tomographic (CT) angiography of the peripheral arteries using low tube voltage compared with which using routine tube voltage.
Methods and Materials: The authors performed a prospective, single-center, randomised comparison of two different CT acquisition protocols using 80 or 120 kVp as tube voltage in 34 randomised patients with peripheral arterial occlusive disease referred for dual source dual engergy multidetector CT angiography of the lower limb. The acquisition protocols were performed with tube voltage in group 1 80 kVp and group 2 120 kVp. Axial and three-dimensional (3D) images were qualitatively and quantitatively compared. The attenuation values of those vessels were measured and the CNR then was calculated. The technical adequacy, artifacts, image quality, image noise were also evaluated.
Results: The attenuation values obtained in the vessels with the 80-kVp tube voltage were 220 to 260 HU higher than which obtained in the vessels with the 120-kVp tube voltage. There were no significant difference of CNR between two groups, so did the quantitative evaluation to the 3D reconstruction images. The effective dose for group 1 with 80-kVp was 3.91±0.39 mSv, while the effective dose for group 2 with 120-kVp was 14.73±1.57 mSv. The effective dose reduced by 73%.
Conclusion: Reductions of radiation dose can be achieved by using low tube voltage at multidetector CT angiography of the peripheral arteries with higher attenuation value and uncompromised image quality.

B-1178 11:43

Comparison of different virtual monoenergetic and linear-blended algorithms for dual-energy CT angiography of the thorax and abdomen: effects on contrast and image quality

M.H. Albrecht[1], S.S. Martin[2], J.-E. Scholtz[2], N.-E.A. Nour-Eldin[2], S. Fischer[2], R.W. Bauer[2], U.J. Schoepf[1], T.J. Vogl[2], J.L. Wichmann[2]; [1]*Charleston, SC/US*, [2]*Frankfurt a. Main/DE (MoritzAlbrecht@gmx.net)*

Purpose: To perform an objective and subjective image analysis of basic and advanced virtual monoenergetic series and standard linearly blended images in 3rd generation dual-energy CT angiography (DE-CTA) of the thorax and abdomen.
Methods and Materials: DE-CTA series of 55 patients (36 male; mean age, 64.2±12.7 years) were reconstructed using linearly blended M_0.6 (60% low kV spectrum), traditional basic monoenergetic (Mono), and advanced monoenergetic plus (Mono+) algorithms, while Mono series were calculated with 10 keV increments from 40-120 keV. Attenuation and standard deviation of various arteries and anatomical landmarks of the thorax and abdomen were measured to calculate Contrast-to-noise-ratio (CNR) values. 2 radiologists assessed image quality, contrast conditions, noise, and visualisation of small arterial branches using 5-point Likert scales.
Results: Mono+ 40 keV series revealed the significantly highest CNR for both thoracic and abdominal DE-CTA ($p < 0.001$) and were subjectively rated best for visualisation of small arterial branches ($p < 0.109$). Mono+ images at 70 keV were found to have superior subjective image quality ($p < 0.031$) with significance except in comparison to 60 and 80 keV Mono+ series ($p < 0.587$). Contrast conditions at 50 keV Mono+ were rated superior compared to 60-100 keV Mono and Mono+ ($p < 0.01$) reconstructions. Mono+ images at 100 keV+ were rated best regarding image noise ($p < 0.843$).
Conclusion: Image quality of DE-CTA examinations can be increased using the Mono+ algorithm at 70 keV, while 40-50 keV reconstructions allow for superior contrast and improved visualisation of small arterial branches compared to basic Mono and standard linearly blended images.
Author Disclosures:
R.W. Bauer: Speaker; Speakers' bureau of Siemens, Computed Tomography division. **U.J. Schoepf:** Consultant; Bayer, Bracco, GE, Medrad, and Siemens. Research/Grant Support; Bayer, Bracco, GE, Medrad, and Siemens.

B-1179 11:51

The prevalence of posterior circumflex humeral artery aneurysms in elite volleyball players

D. van de Pol, P.P.F.M. Kuijer, M. Pannekoek-Hekman, A. Terpstra, M. Maas, R.N. Planken; *Amsterdam/NL (nilsplanken@gmail.com)*

Purpose: Elite overhead athletes, like volleyball players, are at risk of finger ischaemia due to arterial emboli originating from an injured and aneurysmal proximal posterior circumflex humeral artery (PCHA) in the spiking arm. We aimed to (1) determine the prevalence of PCHA aneurysms in elite volleyball players using B-mode ultrasonography and (2) to describe PCHA and Deep Brachial Artery (DBA) characteristics that can be used to accurately identify and assess the PCHA.
Methods and Materials: Prospective cohort study of 280 elite volleyball players who underwent ultrasound assessment of the PCHA and DBA in the spiking arm by two experienced vascular technologists using a standardised protocol. Assessment included determination of PCHA and DBA anatomy, branching pattern, vessel course and diameter, and PCHA aneurysms (defined as segmental vessel dilatation ≥150%).
Results: The PCHA was identified in 100% of cases. The prevalence of PCHA aneurysms was 4.6% (13/280). All aneurysms were detected in proximal PCHA originating from the axillary artery (AA). The PCHA originated from the AA in 81% of cases (228/280) and showed a curved course dorsally towards the humeral head in 93% of these cases (211/228). The DBA was identified in 93% of cases (260/280), all without aneurysms. The DBA originated from the AA in 73% of cases (190/260) and showed a straight course parallel to the AA in 93% of these cases (177/190).
Conclusion: PCHA aneurysm prevalence in elite volleyball players is substantial and associated with a specific branching type, namely a PCHA that originates directly from the axillary artery.

10:30 - 12:00 **Room E1**

Musculoskeletal

SS 1810

Ligaments, tendons and joints

Moderators:
A.H. Karantanas; Iraklion/GR
A. Sachs; Vienna/AT

K-29 10:30

Keynote lecture

M.F. Reiser; *Munich/DE*

B-1180 10:39

MRI of the painful carpal boss: variations at the extensor carpi radialis brevis insertion and imaging findings in regional traumatic and overuse injuries

M.T. Nevalainen[1], J.B. Roedl[2], W.B. Morrison[2], A.C. Zoga[2]; [1]*Oulu/FI*, [2]*Philadelphia, PA/US (mikaneva@paju.oulu.fi)*

Purpose: To describe patterns of MRI findings involving the carpal boss and the extensor carpi radialis brevis (ECRB) tendon insertion in individuals with overuse-related or post-traumatic dorsal hand pain.
Methods and Materials: 84 MRI exams (2006 - 2015) in 79 subjects with carpal bossing were reviewed by two radiologists. Bone marrow edema (BME) at fused boss, os styloideum or at the 2nd or 3rd metacarpal base, extent of coalition of os styloideum, and anatomic insertion of the ECRB (3rd metacarpal, carpal boss, or both) and ECRB tenosynovitis were recorded. Patterns of MRI findings were correlated with clinical history and physical examination.
Results: Mean subject age was 38 years, and 63% were males. Fused carpal bossing was present in 21% (18/84), partial coalitions in 35% (29/84), and unfused os styloidea in 44% (37/84). Regional BME was observed in 64% (54/84). The ECRB inserted on stable carpal boss in 20% (17/84), partial coalition in 35% (29/84), and on unfused os styloideum in 45% (38/84). ECRB tenosynovitis was present in 38% (32/84). Of 48 patients with documented

activity related dorsal wrist pain, 36 (75%) had BME within carpal boss that served as the insertion site for the ECRB (p=0.023).
Conclusion: Both the degree of coalition between an os styloideum and the 3rd metacarpal, and the insertion site of the ECRB are variable. We describe a new MRI injury pattern including BME at an ECRB insertion on a carpal boss in subjects with localized dorsal hand pain related to overuse or forced extension trauma.

B-1181 10:47

Cone-beam CT in diagnosis of scaphoid fractures
R. Edlund, M. Skorpil, G. Lapidus, J. Backlund; *Stockholm/SE (rolf.edlund@capiostgoran.se)*

Purpose: This prospective study investigated the sensitivity of cone beam computed tomography (CBCT), a low-dose technique recently made available for extremity examinations, in detecting scaphoid fractures. MRI was used as gold standard for scaphoid fractures.
Methods and Materials: 95 patients with a clinically suspected scaphoid fracture were examined with radiography and CBCT in the acute setting. A negative CBCT exam was followed by a magnetic resonance imaging (MRI) within 2 weeks. When a scaphoid fracture was detected on MRI a new CBCT was performed.
Results: Radiography depicted 7 scaphoid fractures, all of which were also seen with CBCT. CBCT detected another 4 scaphoid fractures. With MRI another 5 scaphoid fractures were identified that were not seen with radiography or with CBCT. These were also not visible on the reexamination CBCT. Sensitivity for radiography was 44%, 95% confidence interval 21-69%, and for CBCT 69%, 95% confidence interval 41-88% (p=0.12). Several non-scaphoid fractures in the carpal region were identified, radiography and CBCT depicted 7 and 34, respectively ($p < 0.0001$).
Conclusion: CBCT is a superior alternative to radiography, entailing more accurate diagnoses of carpal region fractures, and thereby requiring fewer follow-up MRI examinations. However, CBCT cannot be used to exclude scaphoid fractures, since MRI identified additional occult scaphoid fractures.
Author Disclosures:
R. Edlund: Author; The cone beam CT equipment was provided for free for the first 2 months of the study. **M. Skorpil:** Author; The cone beam CT equipment was provided for free for the first 2 months of the study. **G. Lapidus:** Author; The cone beam CT equipment was provided for free for the first 2 months of the study. **J. Backlund:** Author; The cone beam CT equipment was provided for free for the first 2 months of the study.

B-1182 10:55

Structured reporting vs free-text reporting of MRI examinations of the shoulder: impact on surgical planning
W.H. Sommer, M. Armbruster, M.F. Reiser, F. Haasters, T. Helfen, N. Sommer; *Munich/DE (wieland.sommer@med.uni-muenchen.de)*

Purpose: To analyse structured and free-text reports of MRI examinations of the shoulder and to evaluate satisfaction of referring physicians, quality of reports and potential effects for surgical planning.
Methods and Materials: 28 patients with an MRI of the shoulder were included. Both standard free-text reports and structured reports were acquired. The latter were performed with an online software with dedicated templates and clickable decision trees with concomitant generation of semantic structured reports. We used a specific template for MRI of the shoulder after trauma and/or degenerative lesions which contained specific information relevant for surgical planning. All reports were evaluated with regard to their impact on clinical decision making, content for surgical planning, convenience of information extraction and referring physicians' satisfaction.
Results: 28 structured and 28 free-text reports were reviewed by two experienced shoulder surgeons (6 and 9 yrs). 14% of structured and 46% of free-text reports were considered to be incomplete. The effort of information extraction from the reports was considered to be time consuming in 18% of structured and 46% of free-text reports ($p < 0.001$). A decision regarding surgery vs. conservative therapy was possible without further consultations in 87% of structured and 73% of free-text reports. In case of surgery, the provided information was considered to be sufficient for surgical planning in 89% of structured and 75% of non-structured reports.
Conclusion: Structured reporting of MRI of the shoulder can facilitate clinical decision making and potentially may lead to higher satisfaction of referring physicians.
Author Disclosures:
W.H. Sommer: Founder; QMedify GmbH. **M. Armbruster:** Founder; QMedify GmbH.

B-1183 11:03

MRI features of acute gouty arthritis on top of chronic gouty involvement in different joints
Y. Ragab, Y. Emad; *Cairo/EG (yragab61@hotmail.com)*

Purpose: The aims of the current study are to describe MRI features of an acute flare of established gouty arthritis in different joints and to examine a possible association between serum uric acid and MRI signs indicative of ongoing inflammation.
Methods and Materials: 27 male patients with established chronic gout agreed to participate, mean age 47.6 years, and mean disease duration in months 43.2 (±31.8). For all patients, detailed demographic, disease characteristics, and laboratory findings were obtained and correlated with MRI findings. In 27 patients with established gout, a total of 50 MRI studies were performed of the following joints: feet joints (n = 23), ankles (n = 18), knees (n = 5), and hand and wrist joints (n = 4).
Results: MRI revealed capsular thickening in 19 patients, bone marrow edema (BME) in 15, soft tissue edema (STE) in 20, joint effusion in 21, bone erosions in 17, cartilaginous erosions in 4, and tenosynovitis in 9 cases. In 17 cases, tophaceous lesions were found. Post contrast MRI showed synovial thickening in seven cases. Positive correlations were observed between serum uric acid levels and the following MRI findings: capsular thickening ($r = 0.552$, $p = 0.003$), BME ($r = 0.668$, $p \leq 0.0001$), STE ($r = 0.559$, $p = 0.002$), and tenosynovitis ($r = 0.513$, $p = 0.006$).
Conclusion: Using MRI in chronic gout, important features can be detected like BME, minute cartilaginous erosions, and hypertrophic synovial inflammation. Uric acid was positively correlated with capsular thickening, BME, STE, and tenosynovitis.

B-1184 11:11

Diagnostic value of CT arthrography at the ankle
P.M. Jungmann, J.S. Bauer, T. Baum, S. Braun, C. Holwein, E.J. Rummeny, A.B. Imhoff, K. Wörtler; *Munich/DE*

Purpose: To retrospectively determine the diagnostic value of computed tomography arthrography (CTA) at the ankle in the evaluation of chondral defects in comparison to conventional magnetic resonance imaging (MRI).
Methods and Materials: A total of N=97 patients received CTA at the ankle (age, 32.9±13.3 years; n=52 male, n=45 female). MRI was performed in 78/97 cases; consecutive surgery was performed in 35/97. Cartilage lesions at the talus and at the tibia were scored according to defect depth (no, partial, full) and defect size by two radiologists. Changes in the therapeutical/surgical approach resulting from CTA findings were noted by a specialised orthopaedic surgeon. Statistical analysis included sensitivity and specificity analyses and interclass correlation coefficients (ICC).
Results: On CTA 67/97 patients had cartilage defects at the talus, of which 54/67 were graded as full thickness defects. MRI was able to detect 68.7% of these defects (53.7% of full thickness defects; Specificity, 77.1% and 69.6%). Interrater agreement for the presence of full thickness cartilage lesions was excellent for CTA (ICC, 0.88) and fair for MRI (ICC, 0.56). Interrater agreement for defect size was excellent for CTA (ICC, 0.92) and good for MRI (ICC, 0.63). CTA findings changed the theurapeutical/surgical approach in 7.7% of cases. In surgical reports (n=35 for CTA, n=17 for MRI), only 64% of full thickness defects detected by CTA and 45% of defects detected by MRI were described.
Conclusion: As compared to conventional MRI, CTA improves detection of cartilage defects at the ankle and is a relevant tool regarding treatment decisions.
Author Disclosures:
J.S. Bauer: Grant Recipient; European Research Council (ERC). **S. Braun:** Consultant; Arthrex Inc. (Naples, FL, USA). **A.B. Imhoff:** Consultant; Arthrex Inc. (Naples, FL, USA).

B-1185 11:19

The importance of the talonavicular ligament in ankle sprain
M. De Dea, G.M. Allen, M. Watson, D.J. Wilson; *Oxford/UK (miriamdedea@yahoo.com)*

Purpose: To assess the incidence of talonavicular ligament (TNL) damage in soft tissue injuries following ankle sprain and relate it to the damage to other ligaments.
Methods and Materials: 100 patients attending the Emergency Department for ankle sprain with normal radiographs were recruited. These patients underwent ultrasound examination (US) within five days from the injury. Anterior talofibular ligament (ATFL), anterior tibio-fibular (ATiFL), calcaneo-fibular ligament (CFL), deltoid, spring, calcaneo-cuboid (CC), TNL, joints and tendons were assessed by an experienced consultant musculoskeletal radiologist.
Results: As expected the most frequently damaged ligament is ATFL with 81 patients (66 complete lesions, 9 partial and 7 sprains). In Lateral Ligamentous Complex (LLC) injury, the incidence of CFL damage is significant (26%) and

always associated with ATFL injury. Deltoid involvement is also frequent (39%) with mainly sprains (25%) and 3 complete tears. Pure TNL injuries occurred in 20 patients; in 17 of them ATFL injury was concomitant; in 10 of these deltoid ligament damage was associated. CC ligament damage is rare, with just 3 ruptures observed.
Conclusion: Ligamentous injuries following ankle sprain may lead to chronic instability. The LLC is the most often damaged even though patterns may overlap. From our study there is a significant incidence of injury of the TNL. Clinical assessment is often difficult. The TNL should be part of routine in ankle ligament examination. Further work is required to determine the significance of these injuries in predicting clinical outcome.

B-1186 11:27

Assessment of hindfoot malalignment using MRI: evaluation of the apparent moment arm measurements (Saltzman view) on non-weight-bearing coronal MR images

N.E. Bueber[1], A. Frigg[2], M. Zanetti[2], N. Mamisch-Saupe[2]; [1]*Grabs/CH*, [2]*Zurich/CH (nydiaunic@yahoo.com)*

Purpose: The measurement technique by Saltzman and El-Khoury on hindfoot alignment view (HAV) radiographs using the apparent moment arm is a commonly used technique in clinical practice to assess malalignment of the hindfoot. The purpose of this study was to assess the known measurements obtained in HAV radiographs and on MR images for evaluating hindfoot malalignment.
Methods and Materials: The apparent moment arm measurement technique (Saltzman-El-Khoury) based on weight-bearing conventional radiographs (Saltzman views) and MRI of the ankle was applied on 40 patients. Hindfoot alignment was measured independently by three radiologists on conventional radiographs and on coronal MR images using analogous reference points. For statistical analysis, the Pearson correlation coefficient (PCC) was calculated to quantify the correlation between the measurement results on conventional radiographs and MR images. The mean values of apparent moment arms on HAV radiographs and MR images and the percentage agreement (values within 5 mm on HAV radiographs and MR) were determined.
Results: The Pearson coefficient for reader 1/2/3 was 0.74, 0.56, and 0.61. The means of apparent moment arms were +2.9 mm, +1.8 mm, and -0.5 mm on HAV radiographs; +4.4 mm, +6.1 mm, and +5.0 mm on MRI. The percentage agreements were 82%, 62%, and 50%.
Conclusion: Hindfoot alignment can be estimated on MRI. However, based on an only moderate correlation between the values on HAV radiographs and MR images as well as a tendency to increase positive values (valgisation) on MRI measurements, HAV radiographs (Saltzman views) cannot be replaced by the MRI measurements.

B-1187 11:35

Magnetic resonanace imaging findings in early stage diabetic foot and correlation with etiologies vasculopathy and neuropathy

I. Karalok, L. Ulusoy; *Istanbul/TR (dr.igulcan@hotmail.com)*

Purpose: Determine the value of MRI in early stage diabetic foot, the place of contrast media use and various MRI sequences, investigate the relationship between MRI findings with etiologies of vasculopathy and neuropathy.
Methods and Materials: 26 early stage (Wagner 0 and 1) diabetic foot patients clinically diagnosed and 17 nondiabetic patients suffering from foot pain without history of trauma went into contrast-enhanced MRI investigation.1.5 Tesla MRI device was used, pre contrast T1W, T2W, FATSAT T2W, STIR FSE and postcontrast T1W FSE sequences, in three planes were taken. Neuropathy (with electromyography) and vasculopathy (with Doppler ultrasonography) were investigated in diabetic group. Statistical analysis was performed using Statistical Package for Social Sciences (SPSS) program. Pearson chi-square test and Fisher's exact test was used for the evaluation of results. The p-values below 0.05 were considered statistically significant.
Results: In early stage diabetic foot patients (n:26), bone marrow edema (n:11), atrophy of small muscles (n:14), sellulitis (n:10), tenosynovitis (n:19), soft tissue edema presence (n:17) was significantly higher ($p < 0.05$) compared to the nondiabetic patients.Vasculopathy (n:17) was found to have statistically significant relationship with MRI findings of soft tissue edema (n:13) and cellulitis (n:9).
Conclusion: Bone marrow edema, atrophy of the small muscles of the foot, cellulitis, soft tissue edema and tenosynovit are more frequently seen in early stage diabetic foot patients compared to nondiabetic population. Patients with vasculopathy seems to have more soft tissue edema and cellulitis. MRI findings were indicating worse situation from clinical stage.Use of contrast-enhanced MRI in patients with early diabetic foot allows early identification of infectious complications.

B-1188 11:43

CAIPIRINHA acceleration for rapid high-spatial-resolution isotropic 3D MRI of the ankle

V. Kalia[1], G.K. Thawait[2], R. Johnson[3], W.D. Gilson[2], E. Raithel[4], J. Fritz[2]; [1]*South Burlington, VT/US*, [2]*Baltimore, MD/US*, [3]*Cary, NC/US*, [4]*Erlangen/DE (vivekkalia@gmail.com)*

Purpose: CAIPIRINHA is an MR parallel imaging technique that has been shown to more efficiently use coil sensitivities for reconstruction, allowing for reduced aliasing artifacts and noise when compared to GRAPPA/SENSE-type parallel imaging methods. Our objective is to test the feasibility of a 3D SPACE sequence prototype integrated with 2D CAIPIRINHA acceleration for high-spatial resolution MRI of the ankle.
Methods and Materials: Eight volunteers underwent 3 T Siemens Skyra MRI of the ankle. The CAIPIRINHA SPACE sequence prototype protocol consisted of an intermediate-weighted, 0.5 mm isotropic, sagittal sequence (acquisition time, 4:28 min; 4-fold acceleration) and a SPAIR fat-suppressed, T2-weighted, 0.6 mm isotropic, sagittal sequence (acquisition time, 5:28 min; 4-fold acceleration). Two experienced observers independently evaluated the data interactively on workstations for edge sharpness, contrast resolution, image noise, fat suppression, image quality of interactive multiplanar evaluation, and visibility of bone, cartilage, ligaments, tendons, muscles, vessels, and nerves using Likert scales.
Results: Both CAIPIRINHA SPACE sequence prototypes received excellent scores for image quality of interactive multiplanar evaluation, and good to excellent scores for visibility of bone, cartilage, ligaments, tendons, muscles, vessels, and nerves. Good ratings were given for edge sharpness, contrast resolution, and fat suppression. Image noise was negligible on intermediate-weighted images and acceptable on fat-suppressed T2-weighted images.
Conclusion: A high quality, 10-minute, comprehensive, isotropic, high-spatial resolution orthopedic MRI protocol of the ankle consisting of intermediate-weighted and fat-suppressed T2-weighted imaging was achieved using 3D SPACE with 2D CAIPRINHA acceleration.
Author Disclosures:
E. Raithel: Employee; Siemens Healthcare GmbH. **J. Fritz:** Consultant; Siemens AG. Grant Recipient; Siemens AG. Speaker; Siemens AG.

B-1189 11:51

MR finding of peroneal tendon subluxation: a key structure of fibrous ridge

Y. Kobashi, A. Baba, Y. Nozawa, S. Yamazoe, T. Mogami; *Chiba/JP*

Purpose: The fibrous ridge is a triangular-shaped fibrous cartilage originating from a posterior aspect of the distal fibula close to the origin of the superior peroneal retinaculum. FR contributing 2-4 mm depth of the fibular groove plays an important role to prevent the peroneal longus tendon from its subluxation/dislocation. We paid an attention to the fibrous ridge and investigated MR signs of peroneal tendon subluxation.
Methods and Materials: A review of our medical archives was clinically diagnosed in 13 ankles of 13 athletic patients. MR images of each ankle were evaluated about the morphology and location of Figrous ridge, and the existence and extent of bone marrow oedema in the distal fibula, and peroneal longus tendon subluxation/dislocation.
Results: Normal fibrous ridge was detected on MR images in none of 13 ankles. The fibrous ridge was not detected in 4 ankles. All 5 patients who underwent MR within 43days after the injury showed bone marrow edema in distal fibula without MR evidence of avulsion fracture. The bone marrow oedema was not noted in all 7 ankles of which MR images obtained 2 months and more after the injury.
Conclusion: With combined MR criteria of the fibrous ridge abnormality and existence of bone marrow oedema patients can be stratified by a stage of the disease. Such stratification would greatly help triage patients to undergo appropriate treatment.

10:30 - 12:00 **Room E2**

Neuro

SS 1811

Spine

Moderators:
S. Morozova; Moscow/RU
J. Van Goethem; Antwerp/BE

K-30 10:30

Keynote lecture
J. Van Goethem; *Antwerp/BE*

B-1190 10:39

Correlation of age- and gender-dependent bone marrow fat of the lumbar spine with body fat measures: an MRI study using water-fat separation MRI in a healthy population with normal BMI
E. Dappa, L. Filli, D. Nanz, M.A. Fischer, E.J. Ulbrich; *Zurich/CH (evelyn.dappa@usz.ch)*

Purpose: Age- and gender-dependent MR normative values of fat signal fractions (FSF) of lumbar spine bone marrow fat (BMF).
Methods and Materials: Lumbar spine section from 80 healthy volunteers with normal BMI (18.5 to 25.5 kg/m2) of four age group decades (20-60 years) undergoing whole body MRs with 2-point DIXON sequences at 3 Tesla was analysed for FSF of the BMF. FSFs were calculated from fat and water signal gained from regions of interest of each of the five lumbar vertebrae. Pearson and Spearman correlations between FSFs and several body fat measures were found. ANOVA testing FSF differences amongst age subgroups and gender was performed.
Results: Total mean FSF±SD of lumbar BMF: 60.3±3.6% for women, 59.3±3.1% for men. In women, FSF was significantly higher in the 50-60y group (63.4±3.2%) compared to the 30-39y group (58.0±2.3%) (p=0.001) and the 20-29y group (58.7±2.5%) (p=0.006). In men, the age groups 40-49y (61.2±2.3%) and 50-60y (60.4±3.1%) had significantly higher FSF values than those aged 20-29y (56.7±2.5%) (p=0.003 and 0.020). There was a general trend to increasing FSF values from L1 to L5. In men, L5 showed significantly higher FSF values than L2 (p=0.008). All single lumbar spine levels correlated significantly with total FSF ($p < 0.001$) whereas L1 correlated best (R=0.98). Body fat measures correlated significantly with total FSF in men only (R> 0.4).
Conclusion: Lumbar BMF showed a significant age and level dependency for both genders, but no significant gender difference until the age of 50 with higher values for women thereafter. Only male BMF correlated significantly with body fat measures.
Author Disclosures:
E.J. Ulbrich: Grant Recipient; "Research Time for clinical research at the Medical Faculty of University Zurich" (Grant number: RT-13-014).

B-1191 10:47

Dynamic lumbar myelography using EOS imaging: validation against computed radiography (CR)
F.P. Kuhn, S. Hammoud, G. Corcos, S. Charlon, N.-E. Regnard, M.-M. Lefèvre-Colau, J.-L. Drapé, A. Feydy; *Paris/FR (felix.kuhn@usz.ch)*

Purpose: Dynamic lumbar myelography adds important information in suspected lumbar spinal canal stenosis and may reveal dynamic spondylolisthesis. The EOS slot-scanning technique (EOS® system, France), providing non-magnified images at low radiation doses, is commonly used in preoperative planning to assess the spinal static. The present study assesses the feasibility of lumbar myelography using EOS.
Methods and Materials: Twenty-three symptomatic patients underwent fluoroscopy guided intrathecal contrast injection with subsequent computed radiography (CR) as well as EOS imaging in neutral position, flexion, and extension. Inter-reader consistencies for maximal stenosis level, normalized spinal canal diameter and degree of spondylolisthesis were qualitatively and quantitatively assessed. Potential dynamic spondylolisthesis accentuation was evaluated separately.
Results: Qualitative evaluation revealed no significant difference in Image quality for detection of the most severely affected lumbar segments. Quantitative assessment of the spinal canal diameter and potential spondylolisthesis showed high inter-rater reliability for both EOS (ICC = 0.95-0.96) and CR (ICC = 0.96-0.98). No inter-reader difference was found for the detection of dynamic spondylolisthesis. Lin's concordance coefficient ρ_c between EOS and CR revealed substantial agreement (ρ_c = 0.95) and Bland-Altman analysis included all measurement within the ±1.96 standard deviation range.
Conclusion: Dynamic lumbar myelography using the EOS system yielded qualitative and quantitative measurements in good agreement with CR. The slot-scanning technique obviates the need for measurement normalization due to inherent magnification effects in CR. Furthermore, EOS images allow for assessment of spinal canal stenosis and overall spinal posture in a single examination.

B-1192 10:55

Early cervical spine degenerative changes in MS patients under 35 years of age
T. Almansoori, R. Glikstein, P. Hamagandi, S. Patro, C. Torres, B. Schwarz; *Ottawa, ON/CA (taleb.almansoori@mail.mcgill.ca)*

Purpose: 1- Review the cervical spine imaging findings in patients with Multiple Sclerosis who are less than 35 years of age. 2- Determine the incidence and probable cause of cervical spine degenerative changes in patients with Multiple Sclerosis. 3- Compare the results with cervical spine degenerative changes in non MS population described in the literature.
Methods and Materials: A retrospective study of 82 patients (53 Female and 29 Male) less than 35 years. The data was retrieved from the Picture Archiving Communication System in our institution from January 2009-June 2012. Exclusion criteria included; patients with known history of trauma or cervical degenerative disc disease. The cervical spine MR images were analysed by three Neuroradiologists. The severity of degenerative changes was graded and correlated with the presence or absence of cord lesions using Chi-Square test.
Results: 1- No difference in the proportion of men and women across DDD levels (P=0.71), across DDD severity (P=0.93), across Cord Signal categories (P=0.41). 2- Significant difference in the proportion of cord signal changes among the DDD severity categories ($P < 0.0001$). 3- Rank correlation between level of DDD & Cord signal change was not significant (Spearman's rho=0.18, P=0.10)
Conclusion: Degenerative cervical spine disease in MS patients is an unusual finding noticed in our retrospective study and has not been described in the literature. The exact cause is not known but could be attributable to altered biomechanics and morbidity due to MS leading to development of degenerative changes

B-1193 11:03

CT findings predict clinical outcome after dynamic posterior stabilisation in patients with painful segmental instability of the lower spine
B.J. Schwaiger, A.S. Gersing, M. Behr, C. Zimmer, F. Ringel, J.S. Bauer; *Munich/DE*

Purpose: To identify CT imaging parameters predicting post-surgical outcome of patients with painful degenerative segmental instability of the lower spine after dynamic posterior stabilization.
Methods and Materials: Preoperative MDCT scans of 63 patients (age 66±11.7; 38 women) treated with dynamic stabilization for painful segmental instability with/without spinal stenosis were assessed for quantitative and qualitative parameters defining degenerative changes. BMD was measured in asynchronously-calibrated MDCT. After 24 months, visual analogue scale (VAS), Oswestry Disability Index (ODI), SF36 physical (PCS) and mental (MCS) component summaries were assessed. For statistics, classification and regression trees, linear regression and non-parametrical tests were used.
Results: At follow-up, clinical performance was significantly better than preoperatively (delta-VAS 4.1±2.9, delta-ODI 32.1±17.2, delta-PCS 4.9±2.3 and delta-MCS 4.2±1.7; each, $P < 0.001$). PCS improvement was significantly lower in patients with higher grades of disc herniation ($P < 0.001$) and spondylolisthesis (P=0.011) and with larger dural tube cross-sectional area (CSA) at disc level (P=0.043). PCS improvement was significantly higher in patients with high intervertebral disc height (P=0.006) and high grades of vertebral body sclerosis (P=0.002). Patients with high BMD and initially low AP diameter of intervertebral foramina showed a significantly higher improvement of ODI ($P < 0.05$).
Conclusion: Clinical improvement after dynamic posterior stabilization was predicted by the following CT findings: high grades of vertebral body sclerosis, spondylolisthesis or disc herniation, high BMD and disc space height, larger CSA of the dural tube and AP diameter of intervertebral foramina. Preoperative evaluation of these parameters may improve therapy selection for patients with degenerative disease of the lower spine.

B-1194 11:11

MRI criteria for disease management decision in patients with herniated intravertebral discs
A. Smirnova[1], A. Tkachev[2], N. Plakhotina[1], D. Archakov[2]; [1]*St. Petersburg/RU*, [2]*Volgograd/RU (mikhail.a.cherkashin@gmail.com)*

Purpose: To assess in parallel groups clinical and MRI criteria for management decision in patients with herniated intravertebral discs (HIVD).

Methods and Materials: In prospective trial 120 patients with MRI-confirmed HIVD (0.7 - 1.1 cm, mean 0.9 cm) were included. On Visit 0 patients were split in two arms by MRI criteria - group A (n=60) with hyper intensive and heterogeneous signal (T2 WI and STIR) and disease history less than 6 months without non-steroid anti-inflammatory drugs (NSAID); group B (n=60) - hypointensive signal and disease history more than 6 months with regular NSAID. Visit 1 - start of rehabilitation (non-pharmacologic treatment), Visit 2 (after 30 days) - MRI (1.5 T, sagittal T1 WI (TR, 520 ms; TE, 13 ms), sagittal and axial T2 WI (TR, 3500-9000 ms; TE, 116-130 ms)), sagittal T2 WI FS (TR, 5380 ms; TE, 116 ms) slice 3 mm) and VAS pain scoring, assessment for potential neurosurgery.
Results: On Visit 2 in group A positive MRI changes were detected - HIVD dimensions mean decreasing 0.45 cm. In group B we have not find any changes. In both groups VAS scoring has decreased on Day 30 (mean delta 2.7 points).
Conclusion: Based on study result we suggest heterogeneous and/or hyper intensive signal on primary MRI (T2 WI), HIVD resorption on Day 30 and positive clinical dynamics are very important criteria for further disease management, supporting choice to avoid aggressive neurosurgery in this group of patients.

B-1195 11:19

Dynamic DTI of the cervical spine shows diffusivity changes in healthy subjects

F.P. Kuhn, A. Feydy, N. Launay, M.-M. Lefèvre-Colau, S. Poiraudeau, S. Laporte, P. Lindberg; *Paris/FR (felix.kuhn@usz.ch)*

Purpose: To assess the influence of cervical spine movements on the diffusivity within the cervical spinal cord.
Methods and Materials: IRB approved study in 23 healthy volunteers. All subjects underwent anatomical MR and diffusion tensor imaging (DTI) at 1.5 T. The cervical cord was imaged in neutral position and extension. Segmental vertebral rotations were analysed on sagittal images using the SpineView® software. Spinal cord diffusivity was measured in cross-sectional regions of interests at multiple levels (C1-C5).
Results: As a result of non-adapted coil geometry for spinal extension, 12 subjects had to be excluded. Image quality of the remaining 11 subjects was good without any deteriorating artifacts. DTI during extension revealed increased apparent diffusion coefficient (ADC) and decreased fractional anisotropy (FA) at the C3 level (p=0.001 Bonferoni corrected). Radial diffusivity (RD) was increased at C3 ($p < 0.001$) during extension and no changes were found in axial diffusivity. This increase of RD correlated positively with the degree of extension, i.e. the summed vertebral rotation angle between C1 and C5 (R=0.77, p=0.006). Vertebral rotation angle measurements showed good intra-rater reliability (ICC=0.84). Neither Pavlov's ratio nor the space-available-for-the-cord measurements yielded any significant changes.
Conclusion: DTI is able to detect and quantify changes in the diffusivity during cervical spine extension in healthy subjects. The maximal difference between neutral position and extension was found at the C3 level with RD as the most sensitive parameter to detect dynamic cord alterations. Dynamic DTI may be useful to assess the effect of cervical spinal canal stenosis on the myelon.

B-1196 11:27

Anterior screw fixation of traumatic type 2 odontoid fractures with Xper-CT and fluoroscopic. Our preliminary experience in angiographical suite

D. Leni, F. Vacirca, D. Fior, A. Vimercati, D. Ippolito, P. Allegranza, R. Corso; *Monza/IT (daleni@tin.it)*

Purpose: we aim to present our preliminary experience in the treatment of traumatic type 2 odontoid fractures with anterior screw fixation with Xper-CT guidance in angiographical suite.
Methods and Materials: we consider 5 patient (2 female and 3 male) in the period June 2012/September 2015 presenting traumatic type 2 odontoid fractures.All patients had fragment displaced posteriorly with no spinal cord injury;one of them was in ExtraCorporealMembraneOxigenation due to a ARDS secondary to the traumatic accident and received an high dose of anticoagulant therapy.Procedures were performed in angiographical suite by a neurosurgeon and an interventional radiologist under fluoroscopic control and Xper-CT guidance with general anaesthesia.After a minimally invasive approach through a small cutaneous incision, Xper-CT guidance was then used for planning path of the Kirschner wire, to control the positioning of it and to assess the correct position of the screw.Other surgical maneuvers were performed under fluoroscopic guidance. Length of surgery,complications and clinical outcomes were evaluated.
Results: Screw fixation was performed with no complications in four patients.In one case we had a rupture of Kirschner wire whose fragment remained inside the odontoid body without any clinical complications.Length of surgical procedures lasted from about 60 minutes to about 100 minutes (patient in ECMO). Patient in ECMO remained 40 days in the ICU due to ARDS;the others had a rapid recovery.
Conclusion: Anterior screw fixation with Xper-CT guidance in angiographical suite is a safe procedure and can be propose as a valid alternative to surgical approach in the operating room with simple fluoroscopic guidance

B-1197 11:35

Automated adaptive multiplane-multiangle oblique (AAMO) rendering of volumetric spine CT

N. Titelbaum, I. Corcuera-Solano, A. Doshi, P. Pawha, L.N. Tanenbaum; *New York, NY/US (nuromri@gmail.com)*

Purpose: Orthogonally reconstructed volumetric spine CTs rarely depict the ideal plane for diagnostic interrogation or clinical perception of normal and pathologic curvature. Automated adaptive multiplane-multiangle oblique (AAMO) rendering enhances display and communication by continuously orthogonalizing the reconstructed image to the axis of the spine in all planes. To establish the impact of AAMO interrogation, a retrospective side-by-side review with orthogonal data was performed with attention to ease of interpretation, effectiveness of image-based communication and accuracy of rendering of spinal canal dimensions.
Methods and Materials: Thirty lumbar and thirty cervical spine CT examinations obtained with AAMO techniques (FAST spine. Siemens. Forcheim, Germany) on clinical Siemens CT scanners (AS+, FLASH and FORCE) were retrospectively reviewed by two neuroradiologists side-by-side with orthogonal isotropic data on a review workstation (Advantage Workstation 4.6 GE Waukesha, WI) with attention to depiction of spinal canal dimensions at multiple disc levels. Attention was given to ease of interpretation, effectiveness of image-based communication and accuracy of rendering of spinal canal dimensions. Technique preference was also ranked.
Results: We found that compared to orthogonally reconstructed axial imaging, automated adaptive multiplane-multiangle idealized oblique short axis rendering offered a significant improvement in ease of interpretation, accuracy of depiction of canal dimensions and greater effectiveness of communication by disc level in cervical and lumbar spine CT.
Conclusion: Automated adaptive multiplane-multiangle oblique idealized short axis rendering offers improved ease of interpretation, accuracy of canal dimension depiction and greater effectiveness of communication in spine CT.
Author Disclosures:
L.N. Tanenbaum: Speaker; Siemens, GE.

B-1198 11:43

Changes of mental imaginary motor task fMRI activation in chronic spinal cord injury treated by intrathecal baclofen

J. Keller, R. Jech, I. Stetkarova; *Prague/CZ (keller.public+ecr2016@gmail.com)*

Purpose: Spasticity is a frequent sign of upper motor neuron lesion in chronic spinal cord injury (SCI). In severe cases intrathecal baclofen (ITB) is administered. This GABAB agonist modulates cortical and spinal inhibitory circuits. The aim of our study was to evaluate changes in cortical activation during mental motor task after continuous ITB delivery.
Methods and Materials: Seven subjects (5 males, 2 females, average age 42 years) with chronic post-traumatic SCI (4 in cervical and 3 in thoracic level) underwent ITB pump implantation (Synchromed II, Medtronic). For pump safety, only 1.5 T was used with two mental motor fMRI tasks: imaginary movement of right-hand fingers (Roland paradigm) and imaginary foot flexion. Tasks were performed before and 12 weeks after pump implantation. Analysis was carried out using FEAT, higher level analysis was carried out using FLAME. Z-statistic images were thresholded at P=0.05.
Results: None of patients had active movements of lower limbs. After 3 months, an increase of activation was present in the right leg primary motor cortex during right lower-limb task. In upper-limb task, an increase of the activation is visible in the left motor cortex as well as in the superior frontal gyrus.
Conclusion: ITB administration relieving spasticity was associated with an increased activation of the sensorimotor cortex already three months after the beginning of the treatment. Baclofen may cause distant functional reorganisation of the sensorimotor network probably by an increased GABAB-mediated inhibitory activity at cortical level. Supported by PRVOUK-P34, UNCE 204010/2012 and IGA NT12282.

B-1199 11:51

Magnetic resonance image findings of adjacent segment degeneration in isthmic and degenerative spondylolisthesis

O. Elibol[1], B. Guclu[1], M. Tiryaki[1], K.Y. Safak[1], A.Y. Demirci[2], B. Kömür[1], E. Gur[1], D. Gulabi[1], T. Baysal[1]; [1]*Istanbul/TR*, [2]*Bursa/TR (ozlemelibol@ymail.com)*

Purpose: The purpose of this study was to assess the degree of degeneration of adjacent superior and inferior segments in isthmic and degenerative spondylolisthesis through Magnetic Resonance Imaging studies.

Methods and Materials: The lumbar spine of 51 subjects with isthmic spondylolisthesis and 55 subjects with degenerative spondylolisthesis were retrospectively evaluated with 1.5 tesla Magnetic Resonance Imaging. In each examination superior and inferior adjecent intervertebral segments were evaluated for disc degeneration, Schmorl's nodules, Modic changes, disc height, stenosis, disc protrusion, facet hypertrophy, thickness of ligamentum flavum.
Results: There were 72 adjacent superior and inferior segments in isthmic spondylolisthesis and 92 adjacent superior and inferior segments in degenerative spondylolisthesis. Disc height was 0.48±0.13 mm in adjacent segments of isthmic spondylolisthesis, 0.41±0.14 mm in adjacent segments of degenerative spondylolisthesis, and there were statistically significant difference between them (< 0.001). Cross sectional area of the spinal canal was 138.34±45.40 mm² in adjacent segments of isthmic spondylolisthesis, 123.00±47.92 mm² in adjacent segments of degenerative spondylolisthesis, and there were statistically significant difference between them (0.039).
Conclusion: Disc height measurements and cross sectional area of the spinal canal were worse in adjacent segments of degenerative spondylolisthesis compared to adjacent segments of isthmic spondylolisthesis. This may be due to long time effect of degeneration in all segments of lumbar spine, and eventually it may cause spondylolisthesis at one segment. It may alter surgical approach in patient with spondylolisthesis.

10:30 - 12:00 **Room F2**

Physics in Radiology

SS 1813

Practical radiation risk management

Moderators:
M. Koutalonis; Colchester/UK
R.W.R. Loose; Nürnberg/DE

B-1200 10:30

Effect of the topogram projection angle on organ dose in chest CT with tube current modulation
N. Saltybaeva, H. Alkadhi; *Zurich/CH (Sanata5@yandex.ru)*

Purpose: It was recently suggested to use postero-anterior (PA) topogram instead of antero-posterior (AP) to reduce radiation dose to the breast. However, it must be mentioned that in addition to the dose from the topogram, the choice of projection affects tube current modulation (TCM) and thus the dose from the actual CT examination. Our study investigates cumulative effect of the topogram projection angle on organ doses.
Methods and Materials: All measurements were performed on third-generation CT scanner (Somatom Force) using an anthropomorphic Rando-Alderson phantom with attached breasts. A standard chest CT protocol at tube voltages of 100 kV and 120 kV with TCM was used after different topograms (PA, AP) were applied.
Dose distributions were obtained by Monte Carlo simulations (ImpactMC) based on phantom 3D-voxelized data. For topogram simulations tube position was fixed at 0° and 180° for AP and PA projections, respectively. For CT examinations spiral trajectory with TCM extracted from the raw data was simulated. Organ positions were overlaid and total doses for lungs, heart and breast were calculated as a sum of topogram- and CT-dose values.
Results: In all investigated scans, organ doses from the AP-topogram were higher than from the PA. However, using the AP-topogram yielded lower TCM values in subsequent chest CT, resulting in a lower overall organ doses. Dose reductions were 16%, 14% and 8% for breast, lungs and heart, respectively, when using an AP instead of a PA topogram.
Conclusion: Using AP-topogram in chest CT with TCM is associated with substantial lower total radiation dose.

B-1201 10:38

Impact of the scout view orientation on the radiation exposure and image quality in thoracic and abdominal CT
S. Suntharalingam, A. Wetter, N. Guberina, J. Theysohn, A. Ringelstein, T. Schlosser, M. Forsting, K. Nassenstein; *Essen/DE (Saravanabavaan.Suntharalingam@uk-essen.de)*

Purpose: To assess the impact of the scout view orientation on radiation exposure and image quality in thoracoabdominal CT, when automated tube voltage selection (ATVS) and automated tube current modulation (ATCM) are used in combination with scan planning on a single scout view.
Methods and Materials: 50 patients underwent two thoracoabdominal CT examinations, one planned on an anteroposterior scout view, one planned on a lateral scout view. Both examinations included contrast-enhanced imaging of chest (CH) and abdomen (AB) and non-contrast-enhanced imaging of the liver (LI). For all examinations the same imaging protocol was used on the same dual-source CT scanner. The radiation exposure was recorded and objective as well as visual image quality was assessed for all examinations.
Results: The median dose-length product was significantly lower in scans planned on a lateral scout view (CH: 179 vs. 218 mGy*cm, LI: 148 vs. 178 mGy*cm, AB: 324 vs. 370 mGy*cm, $p < 0.0001$). Objective image quality was marginal lower in scans planned on a lateral scout view, whereas the visual image quality was rated as equal.
Conclusion: At the tested radiation doses, the orientation of the scout view has a significant impact on the radiation exposure, but no clinically relevant impact on the image quality.

B-1202 10:46

Scan direction and scout acquisition influences the dose reducing effect of automatic tube current modulation in CT
C. Franck, K. Bacher; *Ghent/BE (caro.franck@ugent.be)*

Purpose: We investigated the influence of the scout acquisition and the actual CT scan direction on the dose reducing effect of automatic tube current modulation (ATCM).
Methods and Materials: Using ATCM, craniocaudal and caudocranial chest CT scans were made of an anthropomorphic RANDO phantom, containing thermoluminescent dosimeters (TLDs). The scans were based on AP, PA, LAT or dual AP/LAT scouts. Five CT scanners from 3 different vendors were evaluated: Siemens Flash, AS and Biograph; GE Discovery 750HD and Toshiba Aquilion. TLD readings were converted to lung and thyroid doses. A second dose estimation was performed, based on Monte Carlo simulations. Image quality was assessed by calculating noise in roi's within the phantom.
Results: Higher and lower tube currents were selected by the ATCM, when the scan was based on a PA or AP/LAT scout respectively. Compared to AP, tube currents of PA and AP/LAT scans were respectively on average 20% higher and 40% lower, for the Siemens systems. Consequently, thyroid and lung doses increased with 60% with a PA instead of a AP/LAT scan, with significant differences in image noise. A caudocranial scan gives less current to the neck, compared to a craniocaudal scan based on the same scout. Therefore thyroid dose halves by taking the scan in caudocranial direction. Noise values were not significantly different when changing scan direction.
Conclusion: Orientation of scout and scan direction influences the dose reducing efficacy of ATCM. Optimisation of CT protocols has to be done with respect to scan direction and scout acquisition.

B-1203 10:54

Impact of automated attenuation-based tube voltage selection on radiation dose at CT: an observational study on a global scale
F. Meinel[1], J. Spearman[2], U.J. Schoepf[2], M. Rottenkolber[1], I. Driesser[3], C. Canstein[4], K. Thierfelder[1], A. Krazinski[2], C. De Cecco[5]; [1]*Munich/DE*, [2]*Charleston, SC/US*, [3]*Forchheim/DE*, [4]*Malvern, PA/US*, [5]*Rome/IT (felix.meinel@med.uni-muenchen.de)*

Purpose: This study aimed to evaluate the impact of automated tube voltage selection (ATVS) on radiation dose at CT worldwide encompassing all body regions and types of computed tomography (CT) examinations.
Methods and Materials: Data from 86 centers across the world were analysed. All CT interactions were automatically collected and transmitted to the CT vendor during two six-week periods immediately before and two weeks after the implementation of ATVS. 164,323 unique CT acquisitions were analysed. Acquisitions were categorized by body region and type of examination. The tube voltage choice and volume CT dose index (CTDIvol) were compared between examinations performed with ATVS compared to the period before ATVS implementation. Descriptive statistical methods and multilevel linear regression models were used for the analysis.
Results: Across all types of CT examinations and body regions, CTDIvol was 14.7% lower in examinations performed with ATVS (n=30,313) compared to the period before ATVS implementation (n=79,275). Relative reductions in mean CTDIvol were most notable for temporal bone CT (-56.1%), peripheral run-off CT angiography (-48.6%), CT of the paranasal sinus (-39.6%), cerebral/carotid CT angiography (-36.4%), coronary CT angiography (-25.1%) and head CT (-23.9%). An increase in mean CTDIvol was observed in renal stone protocols (+26.2%) and thoracic or lumbar spine examinations (+6.6%). In the multilevel model, a significant influence of ATVS on CTDIvol was revealed (p=0.0031).
Conclusion: ATVS significantly reduces radiation dose across most, but not all, body regions and types of CT examinations.
Author Disclosures:
U.J. Schoepf: Grant Recipient; Siemens, GE, Medrad, Bayer, Bracco.

B-1204 11:02

Variable SD scanning for dose reduction in chest, abdomen and pelvic CT

M. Paravasthu, S. Kandel, C. Farrell, P. Rogalla; *Toronto, ON/CA (psmadhusudan@gmail.com)*

Purpose: Dose modulation is based on a target image noise expressed as Standard Deviation (SD). We aimed to develop a CT protocol with different target SDs for chest and abdomen and analyse its impact on dose and image quality.
Methods and Materials: 40 patients undergoing staging whole body CT (Toshiba Vision) were enrolled (ethics board approval). Following the scout, 2 different target SDs were defined for chest (SD16) and abdomen (SD13), and assigned to the respective anatomy (P1). A single helical CECT was performed. Two further protocols were then planned (not executed): single helical scan using 1 SD for the entire scan range (P2), and two separate scans with a lower dose chest scan (SD=16) followed by a helical for the abdomen (SD=13) with an overlap through the liver (P3). DLPs for all protocols were recorded. Qualitative assessment was by a clinically established feedback tool (image noise, artefacts, adequacy for diagnosis); quantitative assessment of image quality was performed by measuring image noise in 4 ROIs of 0.5 cm2 in fat, muscle, spinal canal and air. As a control, 40 patients scanned with P2 were analysed using the same metrics.
Results: The DLP (mean/SD) for P1, P2 and P3 were 846.6/389.1, 1031.5/513.9, and 1016.7/470.3. Protocol P1 (variable SD) offered a mean dose reduction of 17.9% compared to P2 ($p < 0.0001$) and 16.7% when compared to P3 (p0.3, n.s).
Conclusion: Variable SD scanning with different target SDs for chest and abdomen result in approx. 17% dose reduction without compromising quantitative or qualitative image quality.
Author Disclosures:
C. Farrell: Employee; Employee, Toshiba Corporation. **P. Rogalla:** Research/Grant Support; Research Grant, Toshiba Corporation Speakers Bureau.

B-1205 11:10

Breast bismuth shielding in coronary CT angiography: is it worth it?

N. Moraitis, K. Perisinakis, K. Pagonidis, A. Tzedakis, J. Damilakis; *Iraklion/GR (Kostas.Perisinakis@med.uoc.gr)*

Purpose: There are conflicting opinions in literature regarding the use of breast bismuth shielding in thoracic CT. The aim of this study was to evaluate the radiation dose reduction and diagnostic quality degradation associated with the use of bismuth shields in women undergoing coronary CT angiography (CCTA).
Methods and Materials: The ImPACT MC software was employed to determine the dose to breast, lung and esophagus from CCTA exposures performed on a Philips 256 iCT with or without the use of breast bismuth shields. Standard prospective and retrospective CCTA exposures were simulated on the patient-specific 3d voxelized mathematical phantoms corresponding to 52 examined female patients. The effect of breast and thorax size on the achieved dose reduction was investigated. Diagnostic quality degradation associated with breast bismuth shielding was assessed by two experienced radiologists.
Results: The mean reduction of breast dose achieved by bismuth shielding was found to be 6.2% and 5.2% for prospective and retrospective CCTA exposures, respectively. The dose reduction for lung and esophagus was found to be similar and equal to 4% for prospective and 3% for retrospective CCTA exposures, respectively. The clinical value of CCTA examinations performed with the use of breast bismuth shields was found to remain unaffected.
Conclusion: The reduction of breast dose achieved by using breast bismuth shields from CCTA examinations were found to be much lower than corresponding values reported in literature. Nevertheless, the use of breast bismuth shields in CCTA is not disapproved since the associated image quality degradation is clinically insignificant.

B-1206 11:18

Assessment of diagnostic low dose CT chest protocols in the province of Nova Scotia

E. Tonkopi, D. Manos, M. Abdolell; *Halifax, NS/CA (elena.tonkopi@nshealth.ca)*

Purpose: To evaluate diagnostic low dose chest CT protocols and to identify hospital sites which require protocol optimisation.
Methods and Materials: The dose data were collected prospectively from all 15 CT scanners in the province of Nova Scotia. The sample from each scanner included fifteen average size patients (70±20 kg). The differences in dose between hospitals were evaluated with one-way ANOVA. Factors potentially affecting the dose were assessed by Pearson's Correlation Coefficient. Thirty studies performed on two identical scanners were blinded and randomised for an evaluation by an experienced radiologist who graded the imaging quality with binary ratings. Mean image noise and CT numbers were measured in the subcutaneous fat within the subaxillary region and aorta. A paired two-tailed Student's t-test was used to determine the significance of differences between the means.
Results: Analysis included data for 225 patients. The effective doses from different scanners were in the range of 0.9-4.7 mSv. The difference between the means of the dose distributions was statistically significant ($p < 0.05$). A very weak correlation was found between the dose and the scanner age or the number of slices with Pearson's Correlation Coefficients of 0.148 and -0.078. The blinded analysis of image quality demonstrated all studies were diagnostic with no significant difference in CT numbers. The mean effective dose in one group was 2.5 times higher.
Conclusion: Our study demonstrated that wide variations in dose between hospitals, and even identical scanners, suggested a large potential for the optimisation of examinations without degradation of image quality.

B-1207 11:26

Low dose CT protocol optimisation for the assessment of acute appendicitis: a phantom study

H. Niiniviita, J. Virtanen; *Turku/FI (hapalo@utu.fi)*

Purpose: To evaluate the effect of tube voltage, iterative reconstruction and automatic tube current modulation on the radiation dose and diagnostic performance, and to find an optimal diagnostic low dose protocol for the assessment of acute appendicitis.
Methods and Materials: An anthropomorphic phantom containing 14 test tubes with different iodine concentration and one test tube with an appendicolith were scanned using three voltage (80, 100 and 120 kV) and two iteration levels (standard and strong). The six protocols were scanned with 11 different noise input values. The dose and noise of the consecutive 66 protocols, HU, contrast-to-noise ratio (CNR), and figure of merit (FOM) values of the test tubes in each protocol were determined. Semiquantitative four-grade visual analyses of the different test tubes in each protocol were evaluated by two experienced blinded readers.
Results: 100 kV with both standard and strong iteration offered higher FOM and CNR than the standard protocol. The highest CNR was observed with 80 kV and standard iteration, but when the dose was reduced and noise increased to15.5, the 100 kV and standard iteration offered higher CNR. The HU levels were voltage-dependent, highest at 80 kV, but not iteration-dependent. The protocol-based CTDIvol varied between 2.1 and 8.4. The 100 kV low dose protocol (CTDI of 4.6, 3.45 mSv) yielded diagnostically comparable semiquantitative results to the standard protocol (CTDI of 6.0, 4.5 mSv).
Conclusion: The voltage of 100 kV can offer an efficient CT protocol to study the abdomen with a dose reduction yet maintaining good diagnostic performance.

B-1208 11:34

An investigation into the impact of the 'anode heel effect' on patient gonadal dose in AP pelvis radiographic examination

H.A.A.B. Mraity, A. England, P. Hogg; *Salford/UK (p.hogg@salford.ac.uk)*

Purpose: The aim of this work was to explore the anode heel effect on male and female gonadal dose during anteroposterior (AP) pelvis radiography.
Methods and Materials: An experiment was undertaken to investigate the radiation dose profile in the anode-cathode plane. An ATOM dosimetry phantom was used together with high sensitivity thermo-luminescent dosimeters (TLDs). The ATOM phantom was positioned for a standard AP pelvis examination. TLDs were inserted in the predefined holes for both testes and ovaries. The radiation dose received by male and female gonads was then measured with the feet placed towards the anode and with feet placed towards the cathode. A factorial design was adopted to generate the combination settings of kVp, mAs and SID that were used to produce a series of x-ray exposures. TLDs were removed, read and annealed between exposures.
Results: There was a marked decrease in dose intensity from the central measurement toward anode, and gradual increase in dose toward the cathode. A significant reduction in radiation dose received by the testes was found when the feet were orientated towards the anode (31%; $P < 0.001$) compared with the feet placed towards the cathode. A non-significant reduction was observed for ovarian dose, when the feet position was towards the anode ($P > 0.05$). All exposure factors (kVp, mAs and SID) were shown to have an effect on both male and female gonadal doses.
Conclusion: The exploitation of anode heel effect can reduce significantly male gonadal dose when the feet are placed toward the anode during AP pelvis radiography.

B-1209 11:42

Ultra-low dose chest CT: lung dose and radiation-induced cancer risk reduction

N. Saltybaeva, H. Alkadhi; *Zurich/CH (Sanata5@yandex.ru)*

Purpose: Computed tomography (CT) can significantly reduce lung cancer mortality. However, the radiation dose from CT must be kept as low as possible to reduce the potential stochastic risks associated with x-rays. The aim of this study was to calculate individual patients' lung doses and the radiation-induced cancer risk of ultra-low dose chest CT in comparison with a standard chest CT protocol.
Methods and Materials: This retrospective study included 44 adult patients (mean age 57 years). Twenty-seven of these patients (61%) were scanned using a standard chest protocol on a third-generation dual-source CT scanner. For the other 17 patients (39%) we used an ultra-low dose protocol with 100-kVp and a 0.6 mm Sn-filter to eliminate lower-energy photons. 3D dose distributions were obtained by using Monte Carlo simulations (ImpactMC) individually for each patient, taking into account their physical parameters and individual CT protocol parameters. Based on the 3D dose distributions, patient-specific lung doses were calculated and relative cancer risk values were estimated according to BEIR VII recommendations.
Results: Ultra-low dose CT reduced the dose to the lungs from 8 mGy to 0.3 mGy on average as compared to the standard CT protocol, which is associated with lowering of the estimated risk of cancer from 9.5 to 0.4 per 100000 cases. Image quality was diagnostic in all patients.
Conclusion: Using an ultra-low dose protocol for lung CT allows for significant organ dose and cancer-risk reduction while maintaining acceptable diagnostic image quality.

B-1210 11:50

Comparison of radiation exposure associated with intraoperative CBCT and follow-up MDCT for evaluating EVAR procedures

A. Steuwe, P. Geisbüsch, C.J. Schulz, D. Böckler, H.-U. Kauczor, W. Stiller; *Heidelberg/DE (andrea.steuwe@med.uni-heidelberg.de)*

Purpose: Endovascular aortic repair (EVAR) has become the primary treatment option in anatomically suitable patients with infrarenal abdominal aortic aneurysms. The aim of this study was to compare the radiation exposure associated with intraoperative contrast-enhanced C-arm cone-beam CT (ceCBCT) acquisitions to a standard postoperative three-phasic follow-up multi detector-row CT (MDCT) examination used for assessing technical success after EVAR.
Methods and Materials: Effective doses (EDs) of n=66 EVAR patients that received intraoperative ceCBCT and postoperative three-phasic MDCT were retrospectively calculated. Additionally, EDs were directly determined using thermoluminescent dosimeters embedded in Rando Alderson phantoms (BMI 22 and 30). For examinations using both modalities, EDs were compared to each other as well as to thermoluminescent dosimetry.
Results: Average EDs of the patient collective were 4.9±1.1mSv for ceCBCT versus 2.6±1.2mSv for single-phase MDCT (46% decrease, covering solely the area of the implanted endograft) and versus 13.6±5.5mSv for comprehensive three-phasic MDCT examinations (178% increase, anatomical coverage: aortic arch-femoral bifurcation). EDs determined in phantom measurements range from 3.1-4.5mSv for ceCBCT, and amount to 2.6mSv for a single MDCT phase using ICRP60 conversion factors. Applying ICRP103 factors results in higher values for ceCBCT and slightly lower ones for MDCT.
Conclusion: ceCBCT offers the chance for intraoperative revisions of endograft-related problems. It is associated with a relevant reduction of ED (50-75%) compared to standard three-phasic MDCT follow-up after EVAR. MDCT enables using a larger field of view and is associated with less radiation exposure for a single phase (reduction of 20-140%), if solely the stented region is covered.
Author Disclosures:
A. Steuwe: Research/Grant Support; Siemens. **P. Geisbüsch:** Research/Grant Support; Siemens. Speaker; Siemens. **C.J. Schulz:** Research/Grant Support; Siemens. **D. Böckler:** Research/Grant Support; Siemens. **H.-U. Kauczor:** Research/Grant Support; Siemens, Bayer. Speaker; Siemens, Böhringer Ingelheim, GSK, Novartis, Almirall. **W. Stiller:** Research/Grant Support; Siemens.

10:30 - 12:00 **Room D1**

Chest

SS 1804

COPD and infiltrative lung diseases

Moderators:
D. Kienzl-Palma; Vienna/AT
N.N.

K-28 10:30

Keynote lecture

P.A. Grenier; *Paris/FR*

B-1211 10:39

Long-term effect of smoking cessation on emphysema progression in smokers-at-risk in a lung cancer screening population

B. Jobst, M. Trauth, O. Weinheimer, N. Becker, S. Delorme, H.-U. Kauczor, M. Wielpütz; *Heidelberg/DE*

Purpose: To longitudinally evaluate effects of smoking-cessation on intra-individual emphysema progression in a well-characterised subcohort of heavy-smokers at risk of COPD or diagnosed with COPD from the German Lung Cancer Screening and Intervention (LUSI) trial over 5 years.
Methods and Materials: 509 subjects were enrolled into the substudy. Low-dose chest computed tomography (CT) was acquired at baseline and annually for 4 consecutive years, and CT data was subjected to software-based densitometry. At baseline, 225 subjects had quitted smoking > 12 months before study inclusion (ex-smokers), and 284 were active smokers. Of the latter 284, 26 quitted smoking within 2 years after study onset (recent quitter).
Results: At baseline, mean lung density (MLD) was significantly higher in active smokers compared to ex-smokers (-821±35 vs. -831±31 HU, $p < 0.01$), as well as the 15th percentile of lung density (15TH) (-936±25 vs. -947±22 HU, $p < 0.001$). At year 5, active smokers showed significantly higher MLD (-800±31 vs. -807±28 HU, $p < 0.01$) and 15TH (-896±24 vs. -905±21 HU, $p < 0.001$) compared to ex-smokers, and also to recent quitters (-813±22 HU, $p < 0.01$ and -910±16 HU, $p < 0.001$). Thus, there is an insignificant trend towards lower MLD and 15TH in recent quitters compared to ex-smokers ($p > 0.05$). Of note, year 1 and 5 are not directly comparable due to a scanner change.
Conclusion: Lung density was significantly increased in active smokers, with significant decrease after smoking-cessation. The observed effect is presumably based on smoke-induced inflammation with edema formation in the pulmonary interstitium and small airway walls.

B-1212 10:47

Endobronchial valve treatment in pulmonary emphysema: is objective evaluation of the best target lobe with quantitative CT beneficial for outcome?

F. Doellinger[1], A. Poellinger[2], R.-H. Huebner[1], J.-M. Kuhnigk[3], D. Herzog[1], C. Thomsen[1], V. Schreiter[1], D. Theilig[1]; [1]*Berlin/DE*, [2]*Berne/CH*, [3]*Bremen/DE (felix.doellinger@charite.de)*

Purpose: Evaluation of the target lobe for endobronchial valves can be performed visually or with quantitative CT (qCT). Aim of this retrospective study was to find out whether objective evaluation with qCT leads to improved outcome.
Methods and Materials: 63 patients with pulmonary emphysema underwent CT in full expiration and pulmonary function test before and four to nine months after valve implantation. All CT scans were performed with identical scanning parameters. Quantitative analysis of CT data was performed with MeVisPULMO 3D v3.42 (Fraunhofer MEVIS, Bremen, Germany) to detect total lung volume (LV), target lobe volume (TLV) and the ratio of normal and emphysematous lung parenchyma with a density below -950 HU (i.e. emphysema score). The lobe with highest emphysema score in expiration was defined as the best target lobe for treatment.
Results: In 35 patients, the recommended lobe with highest ES was treated. Mean changes after valve implantation were +26.1% (SD 25.5) for FEV1, -471.9 ml (SD 580.0) for LV and -65.2 ml (SD 34.6) for TLV. In 28 patients, another lobe was treated. Mean changes were +14.9% (SD 27.5, p=.100) for FEV1, -364.0 ml (SD 671.6, p=.497) for LV and -50.7 ml (SD 38.6, p=.117) for TLV.
Conclusion: Changes of lung volume and pulmonary function (FEV1) after endobronchial valve treatment showed slightly higher yet not significant improvements, if the target lobe for treatment was evaluated with objective quantitative CT. Emphysema score in expiration might not be the best parameter to evaluate the target lobe with qCT.

B-1213 10:55

Association between 18 F-FDG-PET/CT metabolic activity and CT density of the aortic wall and severity of lung emphysema

A. Marin, A. Gangi, J. Murchison, W. MacNee, E.J.R. van Beek, S. Mirsadraee; *Edinburgh/UK (aleksander.marin@gmail.com)*

Purpose: Amongst various markers of cardiovascular risk, arterial wall inflammation and stiffness are important predictors of cardiovascular disease. Changes in collagen structure can be found in both emphysematous lungs and stiff arteries, but it is not known whether the severity of arterial stiffness or arterial wall inflammation in patients with COPD is associated with the severity of emphysema. The aim of this study was to identify whether the CT density and 18-FDG metabolic activity in the thoracic aorta are associated with the severity of emphysema.
Methods and Materials: We retrospectively identified 50 patients, who underwent 18 F-FDG-PET/CT for suspected early-stage bronchus carcinoma. We analysed all initial chest CT images and visually graded emphysema severity as 0=no emphysema, 1=mild, 2=moderate and 3=severe emphysema. All PET/CT images were analysed and measurements of the maximum and mean standardised uptake values (SUVmax and SUVmean) and maximal attenuation values (HUmax) of the thoracic aorta were obtained.
Results: With the increasing severity of emphysema, there was a significant decrease of aortic SUVmax values (p=0.0417) and SUVmean values (p=0.0073) and increase of HUmax values (p=0.0015).
Conclusion: With increasing severity of emphysema, there is reduction in 18-FDG uptake indicating less metabolic activity and less inflammation in the aortic wall of the patients with moderate and severe emphysema. Increasing density of the aortic wall in these patients is associated especially with calcification and this is expected to increase aortic stiffness.

B-1214 11:03

Rib fractures: a common comorbidity in COPD

A. Rai, R. Rubtsov, C. Brunner, M. Wielpütz, T. Muley, R. Eberhardt, M. Eichinger, H.-U. Kauczor, C.P. Heußel; *Heidelberg/DE (archanarai10@gmail.com)*

Purpose: Patients with COPD are at an increased risk of osteoporosis because of limited physical activity,low BMI, smoking,cough,fall and use of corticosteroids, therefore they may suffer from rib fractures which may reduce pulmonary function or enhance exacerbation. The purpose of this retrospective analysis was to determine the incidence of rib fractures in COPD patients according to the severity of disease.
Methods and Materials: 814 patients with almost uniform distribution over COPD stages GOLD I-IV who underwent thin section CT at a 3rd level dedicated chest hospital between 2012 and 2015 were included. CT was assessed by two independent radiologists for rib fractures. Rib fracture scores (RFS) from 1-6 were attributed according to Pressley et al. AJS 2012.
Results: Rib fractures were present in 235 patients (29%), whereof 26 patients were in GOLD I: (11%); 59 GOLD II (25%); 65 GOLD III (28%); and 85 GOLD IV (36%). RFS 1 was found in 145 patients (62%), 2 in 21 (9%), 3 in 28 (12%), 4 in 27 (11%), 5 in 9 (4%) and 6 in 5 (2%). Depending on the GOLD- stage, the mean RFS was 0.19 for GOLD I, 0.46 for GOLD II, 0.54 for GOLD III and 0.96 for GOLD IV patients.
Conclusion: Single rib fractures were frequently observed. Multiple rib fractures were more prevalent in higher GOLD stages. Higher incidence of osteoporosis in COPD might explain these observations. As rib fractures can further impair lung function, early prevention, diagnosis and treatment of osteoporosis in COPD is important.

B-1215 11:11

Chemotherapy induced interstitial pneumonitis: thin-section CT characteristics and longitudinal CT follow-up

L. Han Na, M. Kim; *Seoul/KR (mpbjk@hanmail.net)*

Purpose: To describe the CT features of chemotherapy-induced interstitial pneumonitis (CIIP) with longitudinal follow-up.
Methods and Materials: One hundred consecutive patients with CIIP between May 2005 and March 2015 were retrospectively enrolled. The initial CT was reviewed by two independent chest radiologists and categorized into one of four CT patterns : nonspecific interstitial pneumonia (NSIP), organizing pneumonia (OP), hypersensitivity pneumonitis (HP) mimicking desquamative interstitial pneumonitis, and diffuse alveolar damage (DAD). We assessed semi-quantitative analysis on a 5% scale to assess the extent of parenchymal abnormalities (emphysema, reticulation, ground-glass opacity [GGO], consolidation, honeycombing cyst) and their distribution on initial (n=100), subsequent CT (n=87) and second follow-up CT (n=48). Interval changes in extent on follow-up CT were compared using paired t-test. The clinic-radiologic factors were compared between Group 1 (NSIP and OP patterns) and Group 2 (HP and DAD patterns) using chi-square and independent t-tests.
Results: The most common pattern of CIIP on the initial CT was HP (51%), followed by NSIP (23%), OP (20%), and DAD (6%). Diffuse GGO was the most common pulmonary abnormality. The predominant distribution was bilateral (99%) and symmetric (82%), with no craniocaudal (60%) or axial (79%) dominance. Subsequent and second follow-up CTs showed decreased extent of total pulmonary abnormalities ($P < 0.001$, respectively). In comparison with Group 1 CIIP, Group 2 CIIP were more likely to be caused by molecularly-targeted drugs (P=0.030), appeared earlier (P=0.034) and underwent more complete resolution ($P < 0.001$).
Conclusion: Use of a CT pattern-recognition approach to CIIP is appropriate and practical in interpreting radiological findings.

B-1216 11:19

Influence of exposure parameters and iterative reconstruction on automatic airway degmentation and analysis on MDCT: an ex-vivo phantom study

P. Leutz[1], O. Weinheimer[1], M. Lederlin[2], H.-U. Kauczor[1], C.P. Heussel[1], M.O. Wielpütz[1]; [1]*Heidelberg/DE*, [2]*Rennes/FR (P.Leutz@gmx.de)*

Purpose: To evaluate the influence of exposure parameters and raw-data-based iterative reconstruction (IR) on fully-automatic quantification of the tracheobronchial tree on multidetector computed tomography (MDCT) by dedicated Software.
Methods and Materials: 10 porcine heart-lung-explants were prepared in a dedicated ex vivo chest phantom. MDCT scans were performed with 120 kV and 80 kV, each combined with 120, 60, 30 and 12 mAs, and reconstructed with filtered back projection (FBP) and IR, resulting in 16 datasets per lung. Generation-specific airway wall thickness (WT), normalised wall thickness (pi10), air density, number of detected airway segments and most peripheral airway generation detected were compared for each reconstruction.
Results: Air density remained unchanged amongst all exposure parameters, and between FBP and IR. The number of detected airway segments decreased with lower dose (4268.3±914.7 at 120 kV 120 mAs vs. 3616.4±1285.3 at 80 kV 12 mAs with FBP; $p < 0.05$), and was not changed by IR, and the most peripheral generation detected remained constant at 20th. There was no significant difference between generation-specific WT amongst all exposure parameters, and between FBP (range 1st generation 2.4-2.7 mm, 5th generation 1.0-1.1 mm, 10th generation 0.7 mm) and IR (1st 2.3-2.4 mm, 5th 1.0-1.1 mm, 10th 0.7-0.8 mm), with few unsystematic outliers. pi10 also was constant for all reconstructions (range 0.32-0.34 mm).
Conclusion: Although fewer airway segments were detected with decreasing dose, probably due to increasing noise, exposure parameters and IR had no relevant influence on measured airway parameters even for WT< 1 mm. Thus, automatic airway analysis may be applied to low-dose MDCT and IR as currently practiced in airways disease.

B-1217 11:27

Relationship between CT patterns of lung injury and serum N-terminal-peptide type III procollagen (NT-PCP-III) in patients with severe acute respiratory distress syndrome (ARDS)

A. Nair, L. Camporata, N.A. Barrett, N. Sharma, S.R. Desai; *London/UK (arjun7764@gmail.com)*

Purpose: NT-PCP-III is a proposed biomarker of fibroproliferation in ARDS. We aimed to evaluate associations between NT-PCP-III and CT patterns of lung injury and of potential fibrosis.
Methods and Materials: We evaluated 39 patients (mean age 44.5 ± 15.5 years) with severe ARDS requiring extracorporeal membrane oxygenation (ECMO). 21 clinical variables, including NT-PCP-III, were prospectively recorded. Patients underwent volumetric CT thorax at low (5 cm H20, CT5) and high (45 cm H20, CT45) pressure to assess lung recruitability and disease distribution. Two thoracic radiologists independently scored CT45 datasets retrospectively for CT patterns, including severity (graded 0-3) and varicosity (absence/presence) of airway dilatation. CT45 was compared to CT5 to assess per-lobe recruitability (an increase in the ground-glass to consolidation ratio, GGO:consol), and increase in airway dilatation (airway-D). Univariate and multivariate associations of clinical and imaging parameters with NT-PCP-III were tested.
Results: NT-PCP-III (mean 22.2 ± 14.4 µg L-1) significantly correlated with C-reactive protein, duration on ECMO, total CT extent of parenchymal abnormality, and interlobular septal thickening (ILST) (Spearman's rho 0.37-0.43, $p < 0.05$). On multivariate analysis, total parenchymal abnormality (p=0.0008) and ILST (p=0.0001) were significantly associated with NT-PCP-III. Severity of airway dilatation and varicosity showed a trend towards association with NT-PCP-III on univariate (Spearman's rho 0.29-0.30, $p < 0.01$) but not multivariate analysis. NT-PCP-III did not correlate with GGO:consol or airway-D.
Conclusion: In severe ARDS, the extent of parenchymal abnormality and interlobular septal thickening on CT, but not the severity of airway dilatation or the extent of recruitable lung, may be associated with fibroproliferation.

B-1218 11:35

The identification of systemic integrin activation in idiopathic and systemic sclerosis pulmonary fibrosis using 18F-fluciclatide positron emission tomography

S. Mirsadraee, A. Marin, W. Jenkins, M. Connell, A. Tavares, A. Fletcher, N. Hirani, E.J.R. van Beek; *Edinburgh/UK (smirsadraee@gmail.com)*

Purpose: Integrin pathways (especially αvβ3 and αvβ5) are activated in lung fibrosis. 18 F-fluciclatide is a highly selective ligand for the αvβ3 and αvβ5 integrin receptors. The aim of this study was to evaluate 18 Ffluciclatide uptake in lung fibrosis as a potential biomarker of integrin activation in these patients.
Methods and Materials: Healthy volunteers and patients with systemic sclerosisinterstitial lung disease (SScILD) or idiopathic pulmonary fibrosis (IPF) were recruited. SUV (standardised uptake value) images for 50 to 60 minutes after tracer injection were reconstructed using an optimised iterative time-of-flight reconstruction algorithm. To estimate total lung 18 Ffluciclatide uptake, whole lung segmentation masks were generated from CT images, the masks were then morphologically eroded to reduce uptake from the liver, and the resulting volumes of interest (VOIs) were transferred to the PET images to determine mean lung SUVs. Qualitative assessment of uptake was performed on fibrotic and normal looking lung regions, based on low dose CT images.
Results: Five (M=4) healthy volunteers and 14 (M=9) patients with SScILD (n=5) or IPF (n=9) were recruited. The mean whole lungs SUV for fibrotic and control lungs were 1.4 g/mL (+ 0.5) and 0.7 g/mL (+ 0.3) (Figure 1; Mann-Whitney Test, p=0.002). Qualitative review of images demonstrated higher uptake in fibrotic areas compared to normal looking lung regions.
Conclusion: 18 Ffluciclatide PET imaging is a promising biomarker for abnormal αvβ3 and αvβ5 expression in patients with pulmonary fibrosis. The technique may be used to monitor response to treatments that target integrin receptors in these patients.

B-1219 11:43

Diagnostic contribution of HRCT in the diagnosis and differentiation of interstitial lung diseases using ICOERD visual grading score and Bayes' rule for post hoc probability prediction

C. Weber[1], K. Peldschus[1], G. Adam[1], K.F. Rabe[2], L. Welker[2], T.H. Schroeder[1]; [1]*Hamburg/DE*, [2]*Grosshansdorf/DE (c.weber@amalie.de)*

Purpose: To evaluate the diagnostic relevance of HRCT in the alteration of a posteriori likelihood of different subtypes of interstitial lung diseases (ILD).
Methods and Materials: 62 patients with a clinically and/or histologically established final diagnosis of ILD (eight subgroups: idiopathic pulmonary fibrosis (IPF), sarcoidosis, hypersensitivity pneumonitis (HP), chronic eosinophilic pneumonia (CEP), respiratory bronchiolitis-ILD (RB-ILD), collagen-vascular diseases (CVD), cryptogenic organizing pneumonia (COP) and non-specific interstitial pneumonia (NSIP) were evaluated in consensus for semi-quantitative characterisation of lesion pattern and extent based on the criteria of the International Classification for Occupational and Environmental Respiratory Diseases (ICOERD) visual grading score (VGS). The relative frequencies of final diagnoses were taken as estimates for a priori probabilities (a priori p). A posteriori probabilities (a post. p). were calculated with post hoc analysis according to Bayes'rule.
Results: 62 patients (16f/46m, mean±SD age, 64.0±13.7 yrs) were evaluated. For IPF a priori p. was 38.7% with a post. p. increasing to 80.0% if a high degree of honeycombing was detected. Sarcoidosis (a priori p. 29.0%) should be favored if a moderate degree of nodules were present (a post. p. 100.0%); HP (4.8%) was characterised by a high degree of ground glass (a post. p. 25.0%) and absence of linear/irregular opacities (50.0%). For CEP (a priori p. 1.6%), CVD (9.7%), COP (4.8%) and NSIP (3.2 %), no specific pattern clearly outlines diagnoses.
Conclusion: Standardized evaluation of HRCT using ICOERD and Bayes'rule are a major contribute to final diagnoses in ILD if histopathological assessment is not applicable.

B-1220 11:51

Chest x-ray and CT aspects of lung involvement in microscopic polyangiitis

M. Robella, R. Placido, G. Cortese, G. Quattrocchio, D. Roccatello; *Turin/IT (mattia.robella@hotmail.it)*

Purpose: To evaluate radiological manifestations of lung involvement in Patients with Microscopic Polyangiitis (MPA) at the diagnosis and during the follow-up.
Methods and Materials: We identified all Patients diagnosed with MPA between January 2010 and August 2015 (29 Patients, 13 males, 16 females; mean age: 67.82 years ± 13.48). The diagnosis was based on clinical suspect, laboratory analysis and was confirmed by renal biopsy. 27 Patients underwent at least 1 chest X-ray and 1 CT, while for 2 Patients only X-Ray exams were available. We retrospectively reviewed every examinations at the diagnosis and during the follow-up searching for signs of lung involvement, which, according to the literature, are: interstitial/alveolar oedema (due to fluid retention in the phase of acute renal failure), alveolar haemorrhage (due to capillaritis) and interstitial fibrotic lung diseases.
Results: 17/29 (58.62%) Patients had at least one sign of lung involvement at the diagnosis or during the follow-up, which were distributed as follows: 7/29 (24.14%) interstitial/alveolar oedema, 6/28 (20.69%) alveolar haemorrhage, 8/29 (27.59%) interstitial fibrotic lung diseases with UIP pattern, 1/29 (0.034%) drug induced interstitial fibrotic lung disease (Rituximab). 5/29 /17.24%) had at least two of these manifestation.
Conclusion: Lung involvement in MPA is frequent, being present in more than 50% of our Patients, and has different aspects. In particular, we found an high prevalence of interstitial fibrotic lung disease with UIP pattern (27.59% in our records vs 0.06% in general population), as already highlighted by few recent articles; the reason of this association is still unknown.

10:30 - 12:00 **Room D2**

Interventional Radiology

SS 1809

Peri- and postprocedural imaging

Moderators:
A.D. Kelekis; Athens/GR
N.N.

B-1222 10:30

Dynamic 4D-CT angiography of the upper abdomen for guiding TACE: impact on reduction of contrast material, operator radiation exposure, catheter consumption and diagnostic confidence

M.H. Albrecht, T.J. Vogl, J.L. Wichmann, S. Fischer, R. Hammerstingl, M. Harth, A. Thalhammer, S. Zangos, R.W. Bauer; *Frankfurt a. Main/DE (MoritzAlbrecht@gmx.net)*

Purpose: To assess the impact of 4D computed tomography angiography (4D-CTA) prior to transarterial chemoembolisation (TACE) regarding administered contrast media, operator radiation exposure, catheter consumption, and diagnostic confidence.
Methods and Materials: 4D-CTA examinations prior to initial TACE of 29 patients (20 men; mean age, 65.7±11.5 years) with malignant liver tumours were analysed. Multiplanar-reformate (MPR), volume-rendering-technique (VRT) and maximum-intensity-projection (MIP) series were reconstructed enabling a direct selective catheterization of the tumour-supplying artery without prior conventional digital subtraction angiography (DSA) of the abdominal aorta, coeliac trunk, superior mesenteric artery, and indirect portography. 29 patients who underwent traditional TACE served as the control group. The amount of administered contrast media, operator radiation exposure, and catheter consumption was compared between the different TACE workflows. Diagnostic confidence in the exclusion of portal vein thrombosis was assessed by two radiologists using 5-point Likert scales.
Results: 4D-CTA TACE resulted in a significant overall contrast media reduction of 12.8 ml (-13.8 %, $p < 0.001$) and 61.0 ml less contrast were administered arterially (-66.3%, $p < 0.001$) compared to traditional TACE. Scattered radiation could be reduced by 50.5% for 4D-CTA compared to standard TACE ($p < 0.001$). 4D-CTA TACE was performed using 0.7 less catheters on average (p=0.063). Diagnostic confidence in the exclusion of portal vein thrombosis could be significantly increased using 4D-CTA compared to traditional DSA images (scores, 3.9 and 2.4, respectively; $p < 0.001$).
Conclusion: 4D-CTA enables TACE with substantially reduced amount of contrast material, decreases operator radiation exposure, and increases diagnostic confidence in the exclusion of portal vein thrombosis.
Author Disclosures:
R.W. Bauer: Speaker; Speakers' bureau of Siemens Healthcare, Computed Tomography division.

B-1223 10:38

A novel approach to predict local tumour progression for hepatocellular carcinoma after radiofrequency ablation: 3D measurement of tumour area exposed to post-ablation margins

A. Hocquelet[1], H. Trillaud[1], P. Balageas[1], N. Frulio[1], C. Salut[1], B. Denis de Senneville[2]; [1]*Bordeaux/FR*, [2]*Talence/FR (nonobdx@gmail.com)*

Purpose: To propose a post-processing pipeline to measure tumour area exposed to insufficient ablative margins (TAEM ≤5 mm) on MRI and to assess its potential to predict local tumour progression following radiofrequency ablation (RFA) for patients with hepatocellular carcinomas with ablative margins 5 mm.
Methods and Materials: We propose a novel diagnostic method based on the measurement of the TAEM using magnetic resonance imaging (MRI). The

Sunday

post-processing pipeline includes fully automatic registration of the pre- and post-RFA MRI, a semi-automatic segmentation of the pre-RFA tumour and the post-RFA ablation volume, and a subsequent calculation of the 3D exposed tumour surface area. The ability to use TAEM to predict local recurrence at 2 years was then tested on 16 cirrhotic patients treated by RFA with margin ≤5 mm in 2012: 8 with local tumour progression matched according to tumour size, number and Alpha-Foeto-Protein (AFP) level to 8 without local recurrence.
Results: No significant differences between the groups with and without local tumour progression remained for tumour size, number and AFP level after matching. Error on the estimated TAEM was below 12%. The results of the log-rank test showed that patients with TAEM > 425 mm2 had a 2-year local tumour progression rate of 77.5% versus 25% for patients with TAEM ≤425 mm2 (P=0.018).
Conclusion: This proof of concept study proposes an accurate and reliable post-processing pipeline to estimate the TAEM and underscores the potential usefulness of this TAEM measure to stratify patients with HCC treated by RFA according to their local tumour progression risk.

B-1224 10:46

Real-time 3D MPI-guided angioplasty using an MRI road map and blood pool agent approach: next steps towards interventional MPI

J. Salamon, M. Hofmann, C. Jung, M.G. Kaul, R. Reimer, A. vom Scheidt, G. Adam, T. Knopp, H. Ittrich; *Hamburg/DE (j.salamon@uke.de)*

Purpose: Evaluation of the feasibility of in-vitro 3D real time guidewire and PTA-catheter tracking as well as stenosis treatment with a magnetic particle imaging (MPI) / magnetic resonance imaging (MRI) road map approach and an MPI-guided approach using a blood pool contrast agent.
Methods and Materials: A standard guide wire and balloon catheter were labelled with a thin layer of magnetic lacquer at the tip or on both sides of the balloon. For real-time image reconstruction a self-developed high performance software application was used. A vessel phantom with a stenosis was either filled with saline or super paramagnetic iron oxide particles (MM4) and equipped with fiducial markers for co-registration in preclinical 7T MRI (Bruker, Billerica) and commercial MPI (Philips, Amsterdam/Bruker). In-vitro angioplasty was performed inflating the balloon either with MM4 or with saline. MPI data were acquired using a field of view of 37.3x37.3x18.6 mm3 and a frame rate of 46 frames/sec.
Results: In both approaches the progress of PTA was monitored online by MPI and successful PTA verified by MPI and MRI. Magnetic makers allowed for guidance of interventional devices in the road map approach. Fiducial markers enable MRI / MPI image fusion for anatomical orientation.
Conclusion: 3D real-time tracking of interventional instruments, MPI guided instrument positioning and PTA is feasible. The combination of MPI / MRI for an anatomical road map in addition to interventions with a blood pool agent might emerge as a promising tool for radiation free 3D intervention.

B-1225 10:54

CT-guided radiopharmaceutical marking of lung nodules: technical and results

C. Grassi Zamora, M. de Albert, G. Solana Tubau, F. Martinez Torrens, E. Carreño G, L. Farras Roca, D. Nova Vaca; *Barcelona/ES (cm.grassi@bellvitgehospital.cat)*

Purpose: To describe the technique and evaluate the results of CT-guided radiopharmaceutical marking of lung nodules in patients potentially subject to surgical treatment.
Methods and Materials: Prospective study of 38 patients with pulmonary nodules less than 25 mm, single or multiple, potentially resectable, located within more than 0.5 centimeters of the pleura. Staining was performed with needle 22G, intra or peritumoral, in 47 nodules of 38 patients, 28 of them with cancer history. Average age: 65 years (35-81a). After injection, planar imaging and SPECT-CT chest were recorded to confirm the correct location of the radiopharmaceutical. Radioguided surgery was performed with a gammadetectora probe to 4-19h. We analysed: scintigraphic and surgical detection of lung nodules using gammadetectora probe (Technical ROLL "Radio-guided occult lesion localization"), complications of marking and free resection margins of disease, histological results and the surgery performed.
Results: All nodes were accessible for fine needle marking. Postpuncture pneumothorax occurred in 15 patients who did not require preoperative drainage. The preoperative scan and probe showed intrapulmonary gammadetectora focal uptake in all patients. There was disease-free resection margins in 46 of 47 nodes. Pathology reported malignancy in 32 (24 metastases and 8 primary) and benign in 15. 34 patients underwent atypical segmentectomy and 4 of them lobectomies.
Conclusion: The CT-guided radiopharmaceutical labeling of small lung nodules is a safe procedure, with few complications, which improves intraoperative localization and allows more conservative surgical techniques.

B-1226 11:02

MRI evaluation of uterine morphology and clinical response in women treated by MRgFUS: 4 year follow-up

F. Smaldone, F. Ferrari, A. Miccoli, F. Arrigoni, S. Iafrate, I. Capretti, C. Masciocchi; *L'Aquila/IT (smal.f@alice.it)*

Purpose: C.e. MRI study of the uterine structure in women affected by symptomatic uterine fibroids, 4 years after MRgFUS treatment.
Methods and Materials: Forty-five patients affected by symptomatic uterine fibroids were treated with MRgFUS. The patients were subjected to c.e. MRI immediately after treatment and every 6 months for a 4 year period of time. We considered the c.e. MRI exam taken immediately after treatment in order to evaluate the non perfused volume (NPV) and the other one made 4 years after treatment to assess recovery of the uterine wall morphology. Symptomatology was assessed through the UFS-QOL correlating the clinical response to the MRI results.
Results: All patients presented a mean value of NPV extension ranging between 85% and 96%. 17/45 (38%) showed complete resolution of pathology with good recovery of the uterine wall morphology and complete resolution of symptomatology. 16/45 (35.5%) showed progressive reabsorption of the necrotic area with evidence of residual necrotic area after 4 years with improvement of the symptomatic score ranging between 70 and 85%, if compared to the pre-treatment score. 10/45 (22%) presented a new fibroid localisation and were submitted to a new treatment session. 2/45 (4.5%) underwent myomectomy.
Conclusion: MRgFUS efficacy adds to the possibility to repeat the treatment as a valid alternative therapy in those pathological conditions that can recur.

B-1227 11:10

Dose reference levels in paediatric interventional radiology

B. Habib Geryes[1], A. Bak[2], O. Naggara[1], F. Brunelle[1], G. Saliou[2]; [1]*Paris/FR*, [2]*Le Kremlin-Bicêtre/FR (bouchra.habib-geryes@aphp.fr)*

Purpose: To evaluate patient dose and propose reference levels in paediatric interventional radiology.
Methods and Materials: Between 2012 and 2015, 607 children who underwent an interventional radiology procedure in two hospitals were included. Procedures were done on an Innova-IGS530 single plane (GEMS) or an Artis-Zee biplane (Siemens). Four age groups were identified: < 2 (A1), 3-7 (A5), 8-12 (A10), and 13-18 years (A15). Five paediatric interventional radiology procedures were investigated: cerebral diagnostic angiography, intracranial aneurysms embolisation, brain arteriovenous malformations embolisation, head and neck superficial vascular malformations and bone cysts aneurysms sclerotherapy. Demographic and dosimetric data were collected from the dose manager software (Radiation Dose Monitor, Medsquare), the PACS or patient charts.
Results: Mean weight (kg), BMI (kg.m-2) and head circumference (cm) were 10-16-41 for A1, 19-15-52 for A5, 37-18-53 for A10, and 57-21-56 for A15, respectively. For cerebral angiography, 75th-percentile values of Dose Area Product (DAP in cGy.cm²) were 359 for A1 (22 procedures), 1769 for A5 (41 procedures), 1236 for A10 (50 procedures), and 3145 for A15 (49 procedures). For brain AVM embolisation, 75th-percentile values of DAP (cGy.cm²) were 3280 for A1 (115 procedures), 6948 for A5 (50 procedures), 10540 for A10 (50 procedures), and 8807 for A15 (43 procedures). For head and neck superficial vascular malformations sclerotherapy, 75th-percentile values of DAP (cGy.cm²) were 35 for A1 (34 procedures), 79 for A5 (43 procedures), 49 for A10 (24 procedures), and 248 for A15 (29 procedures).
Conclusion: Enough data were available to propose reference levels for paediatric interventional radiology procedures.

B-1228 11:18

Value of contrast-enhanced ultrasound in guidance of percutaneous biopsy of anterior mediastinal lesions

Y. Dong, W.-P. Wang, F. Mao, Z.-B. Ji; *Shanghai/CN (dr_mimi@163.com)*

Purpose: To investigate the value of contrast-enhanced ultrasound (CEUS) in guidance of percutaneous biopsy in anterior mediastinal lesions.
Methods and Materials: The study focused on 90 patients (male 55, female 35, mean age, 46 years ± 4) with 90 single anterior mediastinal lesions detected on contrast-enhanced CT. Before biopsy, patients were randomly divided into CEUS group (n = 45) and conventional ultrasound group (n = 45). CEUS were performed with injection of 2.4 ml SonoVue® (Bracco, Italy). Core needle (16 Gauge) percutaneous biopsies were performed in all lesions. The display rate of internal necrotic (unenhanced) areas, active (obviously enhanced) areas and internal mammary arteries, biopsy success rate and pathological diagnosis rate were recorded and compared between two groups.
Results: The mean maximum diameter of anterior mediastinal lesions was 55.2 ± 7.4 mm (mean ± SD), all lesions were proved histologically. In CEUS group, 88.9 % (40/45) lesions showed unenhanced internal necrotic areas, which was higher than conventional ultrasound (46.7 %, 21/45, P < 0.05).

Internal mammary arteries were effectively avoided during biopsies in 68.9 % (31/45) cases of CEUS group. Biopsies sampling the active areas demonstrated on CEUS had 100 % success rate and 95.6 % pathological diagnosis rate, which were higher than conventional ultrasound guided group (88.9 % and 84.4 %, $P < 0.05$).
Conclusion: By depicting internal necrotic areas, active areas and internal mammary arteries, CEUS guided biopsy of anterior mediastinal lesion is a promising technique with accuracy, safety and success.

B-1229 11:26

Preliminary in vitro and in vivo results of a MR-safe guidewire
A. Massmann, A. Buecker, G.K. Schneider; *Homburg a.d. Saar/DE (Alexander.Massmann@uks.eu)*

Purpose: To evaluate a MR-safe guidewire (GW) for endovascular purposes.
Methods and Materials: The used GWs (MaRVis, Germany) are composed of glass- and aramid-fibres embedded in resin doped with metal particles and a hydrophilic PTFE shrinktube. The diameters/length were 0.89 mm (0.035")/260 cm in a standard and stiff version and 0.36 mm (0.014")/300 cm. After in vitro evaluation of visualisation and handling in a flow-model, all GWs were used in a swine-model (n=9; mean weight, 65±5 kg). Under MR-guidance, iliac arteries, abdominal/thoracic aorta, renal arteries, iliac and inferior cava vein were catheterized using real-time GRE-sequences (temporal resolution 5 images per second; FOV 150 mm; matrix 128x128) in an 1.5 Tesla scanner (Magnetom Aera Siemens, Germany). Balloon-dilatation and stent-implantation were performed using the GWs. Visualisation, handling and catheterization-time for vessel-regions were obtained.
Results: MRI depicted the GWs with a well-visualized continuous artefact of the shaft with a diameter of 2 mm and 4.5 mm at the tip. Precise handling and sufficient stiffness achieving adequate transfer of traction and torsion allowed accurate navigation to the target vessels (mean time for the abdominal/thoracic aorta/inferior vena cava 4 s; visceral/renal arteries 7 s and contralateral iliac arteries 7 s). All procedures were technically successful. No GW-associated complications occurred. Handling regarding stiffness, flexibility and guidance were similar to usual standard angiographic GWs.
Conclusion: Preliminary results of this newly available MR-guidewire are a basis for future clinical application for MR-guided endovascular interventions in humans.

B-1230 11:34

MRI-guided biopsies and MR-guided wire localisation biopsies of soft tissue tumours based on contrast-enhanced images
G. Schneider, J. Stroeder, A. Raguwaran, A. Buecker; *Homburg a.d. Saar/DE (dr.guenther.schneider@uks.eu)*

Purpose: Diagnostic biopsies of soft tissue masses are sometimes difficult in CT or US due to problems in identifying relevant tumour areas. With the advent of large-bore MR-system routine biopsies, comparable to the techniques used in CT are nowadays possible. Due to the better tissue contrast, MRI allows for easy depiction of lesions and contrast medium can be used to identify the most aggressive parts of tumours.
Methods and Materials: 45 patients with different soft tissue tumours underwent MR-guided biopsy. Tissue sampling areas were chosen based on contrast enhancement of different tumour areas (MultiHance 0.1 mol/kg BW). Tissue samples underwent histopathologic examination and grading based on biopsies were compared with the final tumour grading.
Results: In 29 out of 45 patients, complete resection of tumours was performed and final grading was identical with the grading-based MR-guided biopsies. In 6 patients either lymphoma or metastases of different primary tumours were diagnosed and chemotherapy was initiated. The remaining tumours were benign and follow-up studies were recommended.
Conclusion: MR-guided biopsies with tissue sampling based on maximum contrast enhancing areas of soft tissue tumours allow for correct grading of even large, heterogeneous tumours and thus enable optimal planning of final tumour therapy.
Author Disclosures:
G. Schneider: Investigator; Bracco. Research/Grant Support; Siemens, Bracco. Speaker; Siemens, Bracco. **A. Buecker:** Research/Grant Support; Siemens, Bracco.

B-1231 11:42

FDG PET/CT guided biopsy
S. Brocchi, A. Cappelli, C. Mosconi, M. Renzulli, F. Modestino, C. Nanni, T. Balbi, S. Fanti, R. Golfieri; *Bologna/IT (stefano.brocchi85@gmail.com)*

Purpose: Biopsy of suspect tissues is required to reach a diagnosis and to plan adequate treatment. However, imaging-guided biopsies (US, CT) have an accuracy between 70-90%, with several non-diagnostic procedure. FDG PET/CT detects abnormal signals even before cancer-related morphological changes occur, and can potentially be used to drive the biopsy to the most active area within a suspect malignant mass. The aim of this study is to preliminary assess FDG PET/CT guided biopsy feasibility and accuracy in the diagnosis.
Methods and Materials: 10 patients with suspect hypermetabolic findings were enrolled. 8/10 had a suspect malignancy relapse and 2/10 had suspect findings without a previous significant clinical history. 5/10 had a previous non-diagnostic CT-guided biopsy. They underwent a FDG PET/CT real-time guided biopsy performed by experienced personnel. 5/10 patients underwent also contrast media injection to depict vessels surrounding the suspect lesion. The needle was tracked by driving its progression into the area with the highest SUVmax through repeated PET/CT acquisition. The procedure was performed under cytological extemporaneous exam guide.
Results: 10/10 patients had a definitive pathological diagnosis after PET/CT biopsy : 1 tuberculosis, 1 sacral chordoma, 2 rectal cancer relapse, 1 serous papillary ovarian cancer, 2 intermediate lymphoma, 1 Langerhans cell histiocytosis, 1 node metastasis of uterine neoplasm, 1 post RT scar tissue. No patients had complications.
Conclusion: These preliminary results prove that FDG PET/CT guided biopsy is feasible in the clinical practice. Furthermore it positively impacted on the time to treatment onset in those patients with a previous non-diagnostic biopsy.

10:30 - 12:00 **Room K**

Genitourinary

SS 1807

Tumours of the urinary tract and adrenals

Moderators:
G. Heinz-Peer; St. Pölten/AT
R. Huzjan Korunić; Zagreb/HR

B-1232 10:30

CT prediction of histologic grade of small clear cell renal cell carcinoma
K. Sim, D. Sung, S. Choi, N. Han, B. Park, M. Kim, S. Cho; *Seoul/KR (ha2sky@hanmail.net)*

Purpose: To evaluate the association between CT findings and histologic grade of small (≤ 4 cm) clear cell renal cell carcinoma (ccRCC).
Methods and Materials: CT scans of 101 patients with small ccRCC were reviewed retrospectively and independently by two radiologist for tumour size, shape, margin, encapsulation, enhancement pattern on and visual relative enhancement. Enhancement patterns were defined according to the percentage of uniform enhancement (pattern 1, homogeneous ≥ 90%; pattern 2, relatively homogeneous ≥75 and < 90%; pattern 3, heterogeneous < 75%). Quantitative parameters representing attenuation and degree of enhancement were calculated. Histologic grade was divided as low (Fuhrman grade I or II) and high (Fuhrman grade III or IV). CT imaging variables were analysed by using univariate and multivariate analysis.
Results: 63 low-grade and 38 high-grade small ccRCCs were assessed. Low-grade tumours differed from high-grade tumours in enhancement pattern 1 or 2 ($P < 0.001$ and $P = P < 0.001$), smaller size ($P = 0.002$ and $P = 0.001$), and lower attenuation on unenhanced scan ($P < 0.001$ and $P = 0.008$). In multivariate logistic regression analysis, enhancement pattern 1 or 2 and low attenuation (≤30 HU) were identified as independent predictors of low-grade ccRCC. The sensitivity, specificity and accuracy of the model derived on the logistic regression analysis were 92.1%, 57.9%, 79.2% for reader 1 and 69.8%, 71.1%, 70.3% for reader 2, respectively.
Conclusion: CT imaging features including tumour attenuation and enhancement pattern can be useful to predict the biologic behavior of small ccRCC for adequate treatment strategy.

B-1233 10:38

Evaluation of enhancement degree in small renal masses using multiphasic CT scan: can we discriminate between renal cell tumours and oncocytomas?
M. Di Carlo, C. Gaudiano, F. Busato, A. Poerio, S. Pucci, R. Golfieri; *Bologna/IT (magda.dicarlo@hotmail.it)*

Purpose: To evaluate the role of morphological characteristics and enhancement degree using multiphasic computed tomography (CT) for differentiating renal cell carcinoma (RCC) subtypes and oncocytomas in small renal masses (≤4 cm).
Methods and Materials: We retrospectively reviewed the CT of 81 SRMs with a confirmed pathological diagnosis of oncocytoma or RCC subtypes (clear cell, ccRCC; papillary, pRCC; chromophobe, chRCC). The morphological features, the pattern of enhancement and the quantitative analysis of the degree of enhancement were assessed for each lesion. Comparison between the radiological features, the mean values of the enhancement parameters (absolute attenuation, relative enhancement and tumour-to-cortex

enhancement) and the histological subtypes were assessed by means of the Chi-square test and the Student-Fisher t test. The ROC analysis was used to determine the accuracy of differentiating the "Hypervascular" group from the "Hypovascular" group, subdivided based on the enhancement degree.
Results: The SRMs were subdivided as follows: 30 (37.1%) oncocytomas, 22 (27.1%) ccRCCs, 16 (19.8%) pRCCs and 13 (16%) chRCCs. Of the morphological features, only necrosis significantly correlated with ccRCC (p=0.014). Quantitative analysis of the degree of enhancement showed that oncocytomas and ccRCCs had higher enhancement (Hypervascular group) and pRCC and chRCC had a lower enhancement (Hypovascular group), especially during the arterial phase. The ROC analysis confirmed the differentiation between the two groups.
Conclusion: Our study demonstrated the necessity of the careful analysis of the enhancement degree, in particular in the arterial phase, to distinguish hypervascular from hypovascular tumours. This observation has important implications for the clinical practice.

B-1234 10:46

Clear cell adenocarcinoma of the urethra: MR image findings for differentiation from non-adenocarcinomas

T. Kim, S. Kim, K. Moon, S. Woo, J. Cho, S. Kim; *Seoul/KR (kth1205@gmail.com)*

Purpose: To evaluate the differential MRI findings of clear cell adenocarcinoma of the urethra (CCAU) from non-adenocarcinomas of the urethra (NACU).
Methods and Materials: Six patients with CCAU and six patients with NACU (four transitional cell carcinomas and two squamous cell carcinomas) who underwent MRI and procedures for pathologic confirmation were recruited. MR images were retrospectively reviewed in consensus by two genitourinary radiologists who were blinded to the pathologic information. The comparison of MRI findings between CCAU and NACU was performed using Mann-Whitney U test and Fisher's exact test. The evaluation of the distinctive MR image findings for diagnosis was performed using Univariate and multivariate logistic regression analyses with Firth's bias.
Results: All cases of CCAU were associated with urethral diverticulum. CCAU showed lower height to width ratio, more frequent intratumoural septa and larger the proportion of the preserved normal urethra than NACU with statistical significance. The prominent T2 dark SI rim sign and the preserved tendency of the bladder neck on CCAU were other meaningful MR image findings for differentiation.
Conclusion: CCAU showed the distinctive MR image findings for differentiation from NACU. All CCAU were associated with urethral diverticulum and CCAU showed lower height to width ratio, more frequent intratumoural septa and more preserved normal urethra than NACU. The prominent T2 dark SI rim sign and the preserved tendency of the bladder neck on CCAU may be meaningful MR image findings for differentiation.

B-1235 10:54

Can quantitative CT texture analysis be used to differentiate between low- and high-grade urothelial carcinoma?

G.-M. Zhang, H. Sun, H.-D. Xue, Z.-Y. Jin; *Beijing/CN (zhang_stacey@163.com)*

Purpose: To determine the capability of CT texture analysis to differentiate between low- and high-grade urothelial carcinoma
Methods and Materials: A total of 105 patients with pathologically approved high-grade urothelial carcinoma (HG-UrCa, n=106) and low-grade urothelial carcinoma (LG-UrCa, n=18) were included in this retrospective study. Both non-enhanced CT (NECT) and contrast-enhanced CT (CECT) images of the largest tumour cross-sectional area were analysed, with quantification of entropy, mean of positive pixels (MPP), mean gray-level intensity (Mean), standard deviation (SD) of the histogram, for fine to coarse textures (filters 0-6, respectively). The value of each texture feature was compared; receiver operating characteristic (ROC) curves were performed and the area under the ROC curve (AUC) was calculated for differentiation of HG-UrCa and LG-UrCa.
Results: Compared to LG-UrCa, HG-UrCa has significantly higher entropy quantified from medium to coarse texture on UECT and fine to coarse texture on CECT images with a maximum AUC of 0.73±0.06 (CECT: filter 6), higher MPP quantified from fine or coarse texture on UECT and fine texture on CECT images with a maximum AUC of 0.78±0.07 (UECT: filter 0), and higher mean gray-level intensity quantified from fine texture on both UECT and CECT images with a maximum AUC of 0.74±0.07 (UECT: filter 0). SD quantified from coarse texture on CECT images was also significantly higher in HG-UrCa with an AUC of 0.65±0.07.
Conclusion: CT texture analysis could be used as a reliable method to differentiate between LG-UrCa and HG-UrCa.

B-1236 11:02

Qualitative assessment and quantitative assessment for evaluation of optimal linear blending image in dual-source dual-energy CT for detection of renal solid mass

P. Lei[1], X. Wang[1], X. Wang[2], J. Jiao[1]; [1]*Guiyang/CN*, [2]*Beijing/CN (pingguilei@foxmail.com)*

Purpose: To evaluate the image quality of various dual-energy CT linear blending image in the patient with solid renal mass at nephrographic phase compared with 120 kVp Acquisition.
Methods and Materials: Eighteen patients underwent DECT examination. Image fusion was calculated using linear blending method with following weight factors (0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, and 0.9).The CT values of solid renal mass, mornal renal parenchyma, aorta, psoas muscle were measured for each dataset. Each area was measured 4 times and the mean value was calculated. The CT value and standard deviation (SD) of the retroperitoneal fat was also measured to determine the image noise, CNR and SNR were calculated. Subjective image quality evaluated using five scale method for a standard 120 kVp acquisition and optimal linear blending image.
Results: The mean CT values of renal parenchyma, aorta, psoas muscle, renal lesion increase when increasing weighting factors used, however, the mean CT value of retroperitoneal fat decreases when increasing the weighting factors. The highest CNR and SNR values of renal lesion were found in blending image when the weighting factor 0.5. All the overall image quality (weighting factor 0.5 and a standard 120 kVp acquisition) could be provided satisfactory clinical diagnosis (≥3). There was significant difference in image quality score between mixed energy images with weight factor 0.5 and a standard 120 kVp acquisition ($Z=-3.000$, $P < 0.05$).
Conclusion: The mixed energy images with weighting factor 0.5 can improve the image quality of DE nephrographic phase in patient with solid renal mass.

B-1238 11:10

Complementary value of contrast-enhanced ultrasound (CEUS) in the diagnostic algorithm of complex renal cysts

E. Raimondi, M. Bassi, Z. Ferrante, M. Tilli, S. Dall'ara, R. Rizzati, M. Giganti, G. Benea; *Ferrara/IT (dr.edoardo.raimondi@gmail.com)*

Purpose: To assess the role of CEUS in the diagnostic algorithm of complex cysts, classified following the Bosniak system, compared with CE-CT.
Methods and Materials: From March 2011 to September 2013 we selected 42 patients that underwent CE-CT after US finding of complex renal cysts (Bosniak ≥IIF). All patients were also evaluated with CEUS within a week. Two indipendent radiologists analysed results of both techniques. Therapeutic approach was planned based on the highest grading CE-CT or CEUS.
Results: CE-CT images found 14 B-II, 8 B-IIF, 9 B-III, and 11 B-IV, while CEUS images found 12 B-II, 13 B-IIF, 8 B-III, and 11 B-IV. CEUS upgraded CE-CT Bosniak grading from B-II to B-IIF in 2 cases, from B-IIF to B-III in 3 cases and downgraded from B-III to B-IIF in 6 cases. Complete concordance between CEUS and CE-CT was observed in B-IV graded cysts. All B-III and B-IV cysts (23/42) underwent surgery and pathological findings documented 4 benign lesions and 19 malignant lesions. CE-CT overstimated all benign lesions and understaged 3 malignant lesions. CEUS overstimated only 1 malignant lesion resulting Minimal-fat angiomiolypoma with no case of downstaging. All other patients were under imaging follow-up, showing morpho-dimentional stability at 2 years.
Conclusion: CEUS showed promising results evaluating renal complicated cysts, especially differentiating B-IIF from B-III with better results than CE-CT; therefore CEUS should be considered in diagnostic algorithm of renal complex cysts as a second step imaging tool after B-mode US to better screen lesions that will require CE-CT planning before surgery.

B-1239 11:18

Peritoneal seeding of renal cell carcinoma: analysis of histologic characteristics and prognosis

S. Park, H. Jang, S. Park, Y. Oh, D. Jung; *Seoul/KR (popupia@yuhs.ac)*

Purpose: We retrospectively analysed histologic characteristics and prognosis of peritoneal seeding in patients with renal cell carcinoma (RCC).
Methods and Materials: Between January 2005 and June 2015, a total of 25 patients who have histologically confirmed RCC and histologically or radiologically diagnosed peritoneal seeding were analysed. No patient had another type of malignancy. Histologic subtype, Fuhrman grade, sarcomatoid differentiation, and T-stage of the initial tumour were assessed. Pre- or postoperative presentation of seeding and status of surgical margin were investigated. Kaplan-Meier survival curve was conducted to assess median survival time and overall survival rate (1, 2, and 3-year survival rates) since the detection of peritoneal seeding.
Results: Of 25 patients, 15 (60%) expired and 4 (16%) hopelessly discharged (median follow-up time, 6 months; range, 1-62 months). Histologic subtypes were clear cell (76%, 19/25), papillary (16%, 4/25), chromophobe (4%, 1/25),

and poorly differentiated (4%, 1/25). Fuhrman grades were 4 (48%, 12/25), 3 (36%, 9/25), 2 (12%, 3/25), and unknown (4%, 1/25). For all of the three patients with Fuhrman grade 2, T-stage was T3a. Sarcomatoid differentiation was found in 32% (8/25). Although there was a single patient with positive surgical margin, peritoneal seeding occurred postoperatively in 76% (19/25). Median survival time and 1-year, 2-year, and 3-year overall survival rates were 13 months, 51%, 41%, and 31%, respectively.
Conclusion: Peritoneal seeding can occur in various subtypes of RCC with high Fuhrman grade (3-4), sarcomatoid differentiation, or T-stage≥ 3a. It appears to be related to poor prognosis.

B-1240 11:26

Diffusion-weighted MRI of the bladder as a biomarker for prediction of bladder cancer aggressiveness
L. Ponhold[1], S. Sevcenco$_2$, G. Heinz[1], P.A.T. Baltzer[2]; [1]*St. Pölten/AT*, [2]*Vienna/AT*

Purpose: Testing the utility of diffusion-weighted magnetic resonance imaging (DW-MRI) for bladder cancer (BCA) staging and grading.
Methods and Materials: 51 consecutive patients (median age = 64 y, range: 30-90y) with suspected BCA with or without gross haematuria received a 3-T DW-MRI before transurethral resection of the bladder. Parametric apparent diffusion coefficient (ADC) maps were automatically calculated from DW-MRI. ADC values (given in × 10 (-3)mm (2)/s) of bladder lesions were independently measured by 2 radiologists blinded to histopathology. Comparisons of ADC values with histopathologic features were performed using unpaired t tests. Diagnostic performance was calculated by means of receiver operating characteristics (ROC) statistics.
Results: We excluded 8 patients: 1 presenting with metastatic melanoma to the bladder, 1 who had an incomplete examination, and 6 without BCA. In the 43 remaining patients (median age = 68 y, range: 41-85 y), the ADC values were lower in high-grade (n = 19, ADC = 0.787) compared with low-grade (n = 24, ADC = 1.233) tumours ($P < 0.0001$) and in muscle-invasive tumours (n = 10, ADC = 0.759) compared with non-muscle-invasive tumours (n = 33, ADC = 1.120, P = 0.0004). The area under the ROC curve was 0.884 for prediction of muscle invasion and 0.906 for prediction of high grade by using ADC values. Rule-in ADC criteria for high-grade lesions and rule-out ADC criteria for muscle invasion were identified by ROC analysis.
Conclusion: ADC measurements obtained by DW-MRI are a promising imaging biomarker for prediction of BCA stage and grade providing high sensitivity and specificity.

B-1241 11:34

The value of chemical shift MRI in characterising adrenal incidentalomas found in routine contrast-enhanced CT
Y.-W. Wu, C. Tan; *Singapore/SG (yiwei.wu@mohh.com.sg)*

Purpose: This study aims to assess whether adrenal incidentalomas found in routine contrast-enhanced CT can be characterised using chemical-shift MRI rather than dedicated adrenal CT.
Methods and Materials: Between January 2010 and December 2014, 62 adrenal tumours (50 adenomas and 12 non-adenomas) underwent contrast-enhanced CT (CECT) in portal venous phase and chemical-shift MRI (CSMRI). Attenuation on portal venous phase CECT, adrenal-to-spleen chemical shift ratio (ASR) and signal-intensity index (SII) were obtained for each adrenal mass.
Results: The sensitivities and specificities for diagnosing adrenal adenoma using SII vs ASR were 84.0% (42/50) and 91.7% (11/12) vs 70.0% (35/50) and 100% (12/12). There was significant correlation between the adenoma attenuation on CECT and quantitative measurements on CSMRI. The sensitivity of SII in diagnosing adenomas decreased when the CECT attenuation increased. The sensitivities and specificities of SII were up to 96.3% (26/27) and 100% (7/7) for those measuring < 80 HU, but reduced to 69.6% (16/23) and 80.0% (4/5) for those ≥ 80 HU.
Conclusion: CSMRI shows high diagnostic accuracy for adrenal incidentalomas measuring < 80 HU on CECT and is recommended as the first line study for lesion characterisation in order to reduce radiation exposure and risk of contrast reactions from the standard CT adrenal protocol.

B-1242 11:42

Radiological formula for differentiating between secreting and non secreting adrenal adenomas
C. Mosconi, V. Vicennati, D. Papadopoulos, R. Pasquali, R. Golfieri; *Bologna/IT (papadopoulos.dmtrs@gmail.com)*

Purpose: To find a correlation between radiological characteristics of adrenal adenomas and functional parameters to predict subclinical glucocorticoid secretion.
Methods and Materials: This retrospective study included 55 patients with adenomas, investigated through CT with adrenal protocol assessing diameters, HU values of the unenhanced and contrast enhanced phases (enhanced-E, and 15 min delayed enhanced-D). Patients underwent blood cortisol, ACTH, 24h urinary free cortisol evaluation and dexamethasone overnight suppression test (DST). Post-DST cortisol > 50 nmol/L identified subclinical cortisol secretion. We identified 28 subjects with typical non secreting adenomas (NSA), 9 with typical secreting adenoma (SA), 11 with atypical NSA and 7 with atypical SA.
Results: The post-DST cortisol was significantly and positively related to mass diameters. At univariate analysis the maximum, the minimum diameters and D were significantly related with the presence of SA or NSA; at multivariate analysis only the minimum diameter and E entered the stepwise regression. Only the minimum diameter and E emerged also at the multivariate stepwise regression between radiological parameters and post-DST cortisol. The radiological score to discriminate SAs versus NSAs resulted in 0.2034 × minimum diameter + 0.0378 × E. Diagnostic accuracy in differentiating SAs from NSAs was 86.0%, sensitivity 90.9% and specificity 71.8%, considering SA in patients having a score > 7.21 and NSA if < 7.16.
Conclusion: This is the first work showing relationship between radiological parameters and glucocorticoid secretion. We observed that to a better nodular pattern and a higher vascularisation of the lesion, a higher functional activity corresponded using a radiological predicting score.

10:30 - 12:00 **Room G**

Radiographers

SS 1814

Getting the radiation dose as low as possible

Moderators:
H. Ståhlbrandt; Eksjö/SE
F. Zarb; Msida/MT

K-31 10:30

Keynote lecture
P. Bezzina; *Msida/MT*

B-1243 10:39

Positioning for a conventional skyline patella projection: evaluation of torso position and its relationship with eye lens and thyroid dose
J. Li, K. Szczepura, A. Tootle, A. England; *Manchester/UK (A.England@salford.ac.uk)*

Purpose: Numerous techniques exist for acquire a skyline projections of the knee. Within these techniques it is common for the x-ray field to be directed towards the eyes and thyroid. The position of the torso may play a role in the dose received to these organs and this was investigated.
Methods and Materials: A full body adult anthropomorphic phantom was positioned supine for a conventional skyline projection, the torso at 90 degrees in relation to the hip joint. Data for surface skin dose was recoded using a solid state dosimeter at the level of the eyes and thyroid gland. The angle of the torso was then adjusted in 15 degree increments and the phantom was re-imaged. Dose measurements were recorded and this continued until the torso angle was 180 degrees.
Results: When moving from 90 degrees to 180 degrees the dose to the eyes and thyroid was shown to increase, peaking at 135 degrees for the eyes and 105 degrees for the thyroid and then fell. Dose differences ranged from 0.0 to 0.168 microGy for the lens of the eye and 0.0 to 1.3 microGy for the thyroid, between torso positions.
Conclusion: Torso position has been shown to effect the skin dose at the eye and thyroid levels during traditional skyline knee projections. Further work is needed to understand the effects of different exposure factors and also across a range of technique variations.

B-1244 10:47

The use of secondary lead rubber protection in paediatric extremity radiographic examinations
C. Bloomfield, A. England; *Manchester/UK (A.England@salford.ac.uk)*

Purpose: Although diagnostic X-ray examinations provide great benefits their use carries a small but not insignificant risk. For some radiographic examinations lead rubber shields are available to limit exposure. The use of lead rubber shields often varies between countries, departments, radiographers and can depend on the patient. The aim of this study was to evaluate the utility of a lead rubber shield in paediatric patients undergoing upper limb radiography.

Methods and Materials: A full body paediatric anthropomorphic phantom was position for an antero-posterior (AP) elbow examination and exposed to ionising radiation using standard acquisition parameters. The skin dose was measured at five different anatomical locations (eyes, thyroid, flank and testes). Lead rubber was then placed over the pelvis and abdomen and the phantom was re-imaged. For each situation (with/without shielding) the exposure factors were sequentially increased.
Results: The skin dose received at the orbit, right flank and testes increased with increasing exposure factors when no shielding was applied. When shielding was applied no skin dose was measured at either the flank sites or testes for any exposure factor combinations. Eye and thyroid does were marginally higher when shielding was applied.
Conclusion: Secondary lead rubber may provide an option for reducing scattered radiation to the abdomen and pelvis during skeletal radiography in paediatrics. A more detailed understanding of the effects of this intervention on all organs and tissues is essential.

B-1245 10:55

The impact of paediatric computed tomography tube current and tube voltage modulation intensity in organ dose and image quality

M. Alves, P. Fernandes, D. Costa, G. Paulo, J. Santos; *Coimbra/PT (marinapatricia.alves@hotmail.com)*

Purpose: Taking into account that head and chest Computed Tomography (CT) examinations are the most frequently performed in paediatric the aim of this study is to analyse the impact of the different tube current and tube voltage modulation intensities in dose values and image quality.
Methods and Materials: Head and trunk CT examinations (n=22) were performed in a Siemens® Somatom Definition AS CT scanner (64 detector row) using a 5 years old paediatric anthropomorphic phantom (ATOM-705-CIRS). A thee channel Patient Skin Dose (PSD Unfors) detector (right eye lens, the left mammary gland and gonads) was used to analyse the organ dose (μSv). The CT dose values in terms of CT Dose Index (CTDIvol - mGy) and Dose Length Product (DLP - mGy.cm) were directly collected on the CT scanner. Objective image analysis was based on the image noise measured in homogeneous regions of interest. Phantom quality control kit images were subjective analysed by 3 radiographers with more than 10 years of experience.
Results: The combination tube current and tube voltage modulations allowed examination dose reduction of 19% and 75% for head and trunk CT, respectively. The organ dose decreased 46% and 72% for the same procedures. No significant differences were founded for dose values and image noise using the different modulation intensities in head and trunk paediatric CT examinations.
Conclusion: Considering the results for dose values (examination and organ) and image quality, the average modulation intensity was considered the most suitable for head and trunk CT examinations.

B-1246 11:03

Radiation dose reduction on lens and thyroid in orthopantomography exams

R.P.P. Almeida, J.R. Santos, S. Rodrigues, P. Sousa, L.P. Ribeiro, K.B. Azevedo, J.P. Pinheiro, A.F.C.L. Abrantes; *Faro/PT (jppinheiro@ualg.pt)*

Purpose: To assess the entrance skin dose reduction in the eye lens and thyroid by using radiation protections in orthopantomography exams, in adults.
Methods and Materials: In this experimental quantitative research, a full body anthropomorphic phantom for radiographic training was placed in the orthopantomography equipment, according to the correct positioning criteria. An optically stimulated luminescence (OSL) dosimeter was placed in the left eye and another was placed over the thyroid region. Five radiation expositions with standard parameters were done. The dosimeters were replaced and 1 lens barium protection (equivalent to 0.125 mm of lead) and 1 thyroid lead protection (0.5 mm) were appropriately placed, outside the region of interest. Five radiation expositions with standard parameters were repeated.
Results: Without radiation protection, the radiation dose was 0.022 mGy in the lens and 0.013 mGy in the thyroid. With the lens barium protection and the thyroid lead protection, radiation doses were 0.034 mGy and 0.009 mGy, respectively. So, the use of lens barium protection increases the radiation dose in the lens by 54.5% and the use of thyroid lead protection reduced the radiation dose by 30.8%.
Conclusion: The use of thyroid lead protection is highly recommended since it can reduce the radiation dose in this radiosensitive organ during orthopantomography exams, attending the ALARA principle. Nonetheless, the use of lens barium protection is not recommended once a dose increase was observed in this organ.

B-1247 11:11

An investigation of how to improve recall and awareness of radiation dose levels associated with cardiovascular interventional procedures

S. Mullen, J. Mc Nulty, L. O'Hora, V. Mc Guire, T. Buchanan, P. Gilligan, L. Rainford; *Dublin/IE (sorcha.mullen@ucdconnect.ie)*

Purpose: Staff awareness of cardiovascular (CV) interventional radiation dose is essential. This study tested a protocol involving real-time recall and review of procedural dose, evaluating its impact upon staffs' awareness level of radiation dose.
Methods and Materials: A pre-intervention survey (22 questions) was completed by radiographers (n=29) and cardiologists (n=15) in 3 centres (2 adult/1 paediatric). A "Record and Report" intervention was implemented for a two-week period. A poster portraying agreed reference levels for common CV interventional procedures (adult/paediatric) was displayed at CV exposure consoles. Following procedures, radiographers verbally informed clinicians of dose/procedure time. Clinicians classified procedures as routine, slightly complex, complex. Verbal confirmation of the procedural dose as low, comparable or high compared to displayed references was affirmed. A post-intervention survey determined the impact on recall/awareness of dose.
Results: 31% of participants stated increased awareness of dose levels, 21% reporting increased radiation safety culture in their CV suite. Post-intervention, 50% correctly ranked the four most common procedures according to average doses, a 5% improvement noted post-intervention. 59% stated dose responses closer to provided reference values post-intervention, a 23% increase on pre-intervention figures. Clinicians and radiographers reported increases in dose discussion (55%), 73% reporting that consideration of high/middle/low dose had a positive impact on their practice. 54% stated they would make changes to build into their own practice in the future.
Conclusion: Overall, cardiac clinicians and radiographers benefited from the "Record and Report" intervention. Implementation of this intervention as routine practice requires further review and this is recommended.

B-1248 11:19

Additional copper filtration for adult chest imaging and it's impact on dose and image quality

N. Mekiš[1], S. Foley[2], G. Paulo[3], T. Starc[1], L. Rainford[2], J. Santos[3]; [1]*Ljubljana/SI*, [2]*Dublin/IE*, [3]*Coimbra/PT (joanasantos@estescoimbra.pt)*

Purpose: To investigate the impact of additional copper filtration on dose and image quality for adult chest radiography. Limited literature incorporates digital imaging technology and the impact of copper filtration tested on both anthropomorphic phantoms and patient cohorts.
Methods and Materials: Based on anthropomorphic phantom (PBU-60) findings which tested 38 potential imaging combinations derived from current Slovenian practice (10 centres) optimal exposure parameters were determined for adult chest imaging; postero-anterior projection, these were 125 kV, with lateral chambers selected, SID 180 cm and additional 0.2 mm Cu filtration. These experimental imaging parameters were then applied to 100 patients, with a second group of patients (n=100) imaged using current practice: 150 kV, with lateral chambers selected, SID 180 cm and additional 0.1 mm Cu filtration. A cohort of the patients (n=10) were imaged with both parameters, at two separate outpatient clinic reviews within a 3 month time frame. This subset of patient images was reviewed by three radiologists who performed visual grading analysis to facilitate visual characteristic comparisons.
Results: No statistically significant difference was found in BMI between two groups or in DAP measurement (p=0.552). A statistically significant difference (p=0.018) in image quality was noted in favour of the current imaging parameters. No significant differences were founded for global radiologist acceptability and fair inter-observer agreement (K=0.391) was verify.
Conclusion: Anthropomorphic phantom experiments identified optimal imaging protocols based on dose and SNR/CNR findings. When tested on a patient cohort image quality was reduced compared to current practice. This study highlights the importance of patient imaging in optimisation research.

B-1249 11:27

Radioprotection in thorax CT: an approach with the application of bismuth breast shield

R.P.P. Almeida, E. Santos, P. Sousa, S. Rodrigues, L.P. Ribeiro, K.B. Azevedo, N.M. Pinto, A.F.C.L. Abrantes; *Faro/PT (lpribeiro@ualg.pt)*

Purpose: To assess the viability of bismuth breast shield in thorax CT scans.
Methods and Materials: Dose measurements on phantom (Cardinal Health 76 415) with an ionization chamber were performed with and without bismuth breast protection and in different configurations using the routine thorax CT protocol. Image quality control tests were performed using the phantom (Gammex 464) with and without bismuth breast protection in different configurations.
Results: In all measurement with bismuth protection (no sponges) we observed dose decrease by 22.6%, 19.9% with protection (one sponge),

17.6% with protection (two sponges) and 28.2% with protection coupled to the gantry. Regarding the image quality, with bismuth protection, these have improved when compared to scans with and without sponges.
Conclusion: We obtained acceptable results for both image quality and dose reduction in the phantom. It´s appropriate to implement this protection configuration coupled to the gantry as a protective measure of patients in thorax CT scans.

B-1250 11:35

Does radiation awareness of CT technologists change, when a dose monitoring software is used for real-time monitoring of patient dose?
C. Heilmaier, N. Zuber, D. Weishaupt; *Zurich/CH*
(christina.heilmaier@triemli.zuerich.ch)

Purpose: Radiation protection is an important part of quality assurance in radiology department and can be ensured by a patient dose monitoring software. The purpose of the present study was to evaluate whether real-time monitoring of patient dose increases dose awareness of computed tomography (CT)-technologists.
Methods and Materials: Study was split in 2 periods: in period 1 (p1) dose monitoring software ran in the background, in period 2 (p2) technologists were instructed to check software for dose alerts (dose values above diagnostic reference levels) after each scan (=real-time dose monitoring of patient dose). Dose data from 2 scanners (clinical routine CT, mainly out-patients; emergency CT, mainly emergency/intensive care patients) was compared in both periods using chi-square tests.
Results: Total of 6,413 scans were performed (p1=3,214; p2=3,199) and 330 alerts occurred (p1=210; p2=120). Significantly more alerts were detected on clinical routine CT in p1 ($p < 0.001$), while no difference between scanners was evident in p2 (p=0.135). Most dose alerts were due to overweight (p1=35%; p2=49%), patient miscentering (p1=45%; p2=23%), and scan repetition (p1=10%; p2=14%). Overall, number of alerts significantly declined in p2 ($p < 0.001$). Miscentering was more often seen on clinical routine CT and significantly decreased in p2 on both scanners and for both scanners together (p&lt0.05). Relative values of dose notifications from overweight or scan repetition were higher in p2, but differences were not significant (p&gt0.05).
Conclusion: Real-time monitoring of patient dose with dose monitoring software increases CT technologists' dose awareness, thereby leading to decline of dose alerts due to human error.

B-1251 11:43

Radioprotection in mobile x-ray examinations
A.F.C.L. Abrantes, C. Rebelo, P. Sousa, S. Rodrigues, R.P.P. Almeida, J.P. Pinheiro, K.B. Azevedo, L.P. Ribeiro; *Faro/PT (jppinheiro@ualg.pt)*

Purpose: To quantify the scatter radiation exposure from mobile x-ray examinations and determine what radioprotection procedures should be adopted in order to adequately protect both radiographers and patients.
Methods and Materials: A survey of technical parameters used in the mobile x-ray examinations was performed using a sample of 199 patients to determine the average parameters (77 kVp and 2.5 mAs). Using these parameters, quality control of the mobile equipment was made with a semiconductor detector (Unfors Xi). Then, 163 exposures were made using a full body anthropomorphic phantom in 3 different configurations: (1) chest AP projection in supine position and (2) semi-sitting position, and (3) tangential projection of the abdomen in supine position. The scattered radiation was measured considering different combinations of voltage, current-time product, angle, height and distance of the dosimeter (Atomtex AT1123) to the anatomical region under study.
Results: Considering the legal dose limits for occupational radiation exposures, to distances less than 1 meter, the dose limit for exposed workers was not exceeded (12 mSv/year) but for the general public it was (2 mSv/year). Furthermore, the isodose curves obtained allowed to determine the distance, safer location and the type of radiological protection that we should use in each configuration.
Conclusion: Exposed workers should use personal dosimeter and they must employ protective measures and stand behind the mobile equipment. It is important to use radiological protection measures (e.g. increase the distance to the source and use a protector shield) to not exceed the dose limits, attending the ALARA principle.

B-1252 11:51

Paediatric imaging radiation dose awareness and use of referral guidelines amongst radiology practitioners and radiographers
J.L. Portelli[1], J. McNulty[2], P. Bezzina[1], L. Rainford[2]; [1]*Msida/MT*, [2]*Dublin/IE*
(jonathan.portelli@um.edu.mt)

Purpose: To investigate radiologists' and radiographers' awareness of radiation doses associated with paediatric MI examinations and their use of referral guidelines.
Methods and Materials: This study followed a prospective cross-sectional survey design whereby 168 questionnaires were handed out to 22 radiology practitioners and 146 radiographers performing duties at the primary Maltese referral centre for paediatric patients. Participants were asked to indicate the typical effective dose (ED) for several commonly performed paediatric imaging examinations, answer five true-false statements about radiation protection principles, and indicate their use of referral guidelines for paediatric imaging.
Results: A total of 112 questionnaires were returned resulting in an overall response rate of 66.7%. In general a poor level of awareness concerning the ED associated with paediatric imaging examinations was demonstrated. Indeed, only 20% of imaging practitioners provided a correct ED estimate for the given radiation-based paediatric imaging examinations; 35% indicated that they 'did not know'; 24% underestimated the ED, and the remaining 21% overestimated the ED. Nearly all participants had undertaken radiation protection training, with the type and duration of training undertaken varying across the sample. When asked about the use of referral guidelines for paediatric imaging, 77.3% claimed that they 'did not' or 'were not sure' if they made use of them.
Conclusion: Poor awareness of the doses associated with paediatric imaging examinations and the non-use of referral guidelines may limit imaging practitioners' role in the justification and optimisation of paediatric imaging examinations. Education and training activities to address such shortcomings are therefore encouraged.

14:00 - 15:30 **Room A**

Breast

SS 1902a

Multiparametric breast MRI, PET

Moderators:
E.M. Fallenberg; Berlin/DE
G. Forrai; Budapest/HU

K-34 14:00

Keynote lecture
K. Pinker-Domenig; *New York, NY/US*

B-1253 14:09

Correlation between 3 T multiparametric MRI and prognostic indicators in breast cancer
L. Camera, C. Cavedon, I. Baglio, G. Meliadò, G. Barbazeni, S. Montemezzi; *Verona/IT (camera.lfmad@gmail.com)*

Purpose: To test whether multiparametric magnetic resonance (MR) could be correlated to the breast cancer prognostic indicators.
Methods and Materials: 370 patients (379 lesions) were studied with 3.0 T MR. We considered lesion volume; apparent diffusion coefficient (ADC) provided by diffusion-weighted imaging; dynamic curve and total choline (tCho) peak obtained from spectroscopy (single-voxel technique, volume 10x10x10 mm3). tCho signal-to-noise ratio (SNR) was used as an index of tCho concentration. For malignant lesions, we considered the histopathological breast tumour features (histological type, nuclear grade, ki-67 expression and axillary nodal status) and the expression of oestrogen receptor [ER], progesterone receptors [PgR] and HER2, categorised as intrinsic subtypes (Luminal A, Luminal B, HER2-enriched, triple-negative). Correlations were analysed using the Kruskal-Wallis test and Chi-squared test.
Results: 58/379 lesions were benign and 321/379 malignant; 92 lesions showed tCho SNR≥2. We found a statistically significant correlation between high tumour volume and invasive ductal histotype (P=0.0003), high grade and positive nodal status (P=0.0001). Low ADC values (median=0.806x10-3 mm2/s) were correlated with invasive ductal histotype (P=0.0001). Rapid-washout curve was correlated to invasive ductal carcinoma (P=0.0001), high grade (P=0.04), ki-67 overexpression (P=0.009) and positive nodal status (P=0.020). tCho was statistically correlated to histotype (P=0.001), grade (P=0.006), ki-67 (P=0.005) and the various hormonal categories (P=0.05). Tumours with tCho≥2 were more likely invasive ductal, high-grade, high-proliferating, triple-negative cancers. tCho SNR values showed this trend but did not reach statistically significance.
Conclusion: Multiparametric breast MR, including spectroscopy, could predict the assessment of cancer prognostic indicators. Future research, with larger patients groups, should aim to confirm these results.

B-1254 14:17

3T MR spectroscopy in the multi-parametric MRI evaluation of breast lesions: a pattern recognition approach

C. Cavedon, L. Camera, I. Baglio, G. Meliadò, F. Caumo, S. Montemezzi; *Verona/IT (carlo.cavedon@ospedaleuniverona.it)*

Purpose: To assess the role of 3 T-MR spectroscopy (MRS) in the multi-parametric MRI evaluation of breast lesions, using a pattern recognition analysis.
Methods and Materials: 288 patients (299 lesions, range 0.34-115.45 cm3, mean 8.24 cm3, median 2.12 cm3) were enrolled in the study (Feb 2012-Jun 2015, age 18-85 y, mean 54.2 y). All patients had breast abnormalities on mammography or sonography, confirmed by cytology and/or micro-biopsy. T1-TSE (TR/TE=400/10 ms) and T2-STIR imaging (TR/TE=5000/60 ms), dynamic contrast-enhanced MRI (DCE-MRI), apparent diffusion coefficient (ADC) (b=0-800 sec/mm2), and single-voxel MRS (10x10x10 mm3, pencil-beam shimming, PRESS, TR/TE=3000 ms/135 ms) were performed by means of a 3-T scanner (Philips Achieva STx). MRS results were accepted if the FWHM of the water peak was < 45 Hz. Total choline (tCho) was considered detected if the signal-to-noise ratio (SNR) of the 3.2 ppm peak was ≥2. A classifier-based analysis (support vector machines, SVM) was performed with 4-dimensional patterns including margin type (smooth spiculated), kinetic curve type (1-3), ADC mean value, and tCho SNR. A comparison with 3-dimensional patterns (excluding MRS) was performed to assess MRS impact on sensitivity, specificity, and positive-negative predictive values (PPV-NPV) for malignancy.
Results: 226 lesions (178 malignant-48 benign) showed acceptable spectra. Comparison of classification results with histopathological examination of surgical specimens (or micro-biopsy for 29/48 benign lesions) showed sensitivity=93.8% (95% C.I.=88.5-97.2%), specificity=85.0% (71.4-93.6%), PPV=95.3% (90.4-98.0%), NPV=81.6% (67.8-91.2%) without the inclusion of MRS in SVM analysis. When MRS was included, the figures increased to 95.2% (C.I. 90.4-98.1%), 90.8% (78.1-97.2%), 97.2% (93.0-99.1%), and 85.1% (71.5-93.7%), respectively.
Conclusion: Inclusion of 3 T-MRS in the multi-parametric MRI evaluation of breast lesions improved the performance of the classifier.

B-1255 14:25

Multiparametric analysis of morphologic and functional MRI signs with correlation to degree of nuclear atypia at DCIS

L. Vanovcanova, V. Lehotska, K. Rauova; *Bratislava/SK (lucia.vanovcanova@ousa.sk)*

Purpose: Aim of this study is to analyse morphological and functional characteristics of ductal carcinoma in situ (DCIS) in breast MRI to assess the signs correlating with degree of nuclear atypia and to differentiate between high- and low-grade lesions.
Methods and Materials: From 636 malignant lesions, 114 were identified as DCIS (17.92 %). According to the nuclear grade, 44 of 114 (38.6 %) were diagnosed as high grade, 37 of 114 (32.45%) intermediate, 33 of 114 (28.95%) as low-grade DCIS. Morphological and functional MRI characteristics—signal intensity (SI) in T2w, shape and margins, contrast enhancement, peripheral and ductal enhancement, shape of time-to-intensity curve (TIC), SI in diffusion-weighted imaging (DWI), restriction of diffusion in apparent-diffusion coefficient map (ADC map) and ADC value—were retrospectively correlated with the nuclear grade of DCIS. Logistic regression analysis was performed for these MRI characteristics with regard to nuclear grade of the lesions: statistical significance (p) and odds ratio were calculated.
Results: Significant signs of high-grade DCIS: hypointensity in T2w (p=0.042), non-homogeneous contrast enhancement (p=0.012), wash-out phenomenon (p=0.04), hyperintensity in DWI ($p < 0.0001$), restriction of diffusion in ADC map ($p < 0.0001$). The highest odds ratio (56.000 at 95% confidence interval 11.1691-280.7735) was reached by DWI, and wash-out phenomenon (Odds ratio 9.7593 at 95% CI 2.0644- 46.1360).
Conclusion: Breast MRI with DWI helps to diagnose DCIS and to predict the degree of nuclear atypia, especially high- and low-grade lesions, which is considered to be an important prognostic factor of potential invasiveness.

B-1256 14:33

Time-signal intensity curve analysis in breast MRI: still a role for lesion characterisation?

M. Telegrafo, T. Introna, L. Coi, L. Rella, A. Stabile Ianora, G. Angelelli, M. Moschetta; *Bari/IT (mikitele@hotmail.it)*

Purpose: To assess the role of time-signal intensity curve (TIC) obtained from dynamic post-contrast subtracted MRI in the differential diagnosis of breast lesions by comparing TIC analysis results with unenhanced and post-contrast MRI findings, having the histological data as the reference standard.
Methods and Materials: 298 breast lesions were evaluated by MRI. Both pre and post-contrast MR sequences without TIC analysis and TIC analysis were evaluated for lesion characterisation in two different reading sessions. Sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV), and diagnostic accuracy for both imaging methods were calculated, having histological findings as the reference standard. The obtained values were then compared using the Mc Nemar test.
Results: 168 out of 298 (56%) mass-like enhancing areas resulted benign and the remaining 130 (44%) malignant. Sensitivity, specificity, accuracy, PPV and NPV values of 96%, 89 %, 92%, 87% and 97%, and 87%, 24%, 51%, 47% and 70% were obtained respectively for MRI without TIC analysis and for TIC analysis. The Mc Nemar test indicated a statistically significant difference between the two imaging methods ($p < 0.0001$).
Conclusion: TIC analysis does not seem to add a significant contribution to differential diagnosis between malignant and benign lesions and could therefore represent a time-consuming and nondiscriminatory additional evaluation for lesion characterisation causing a decrease of MR specificity.

B-1257 14:41

The impact of incorporating Dynamic Contrast-Enhanced MRI in the diagnostic workup of inflammatory breast disorders

R.M. Kamal, E. Faker, R. Farouk, D. El Messeidy, A. Hatw; *Cairo/EG (rashaakamal@hotmail.com)*

Purpose: The purpose of this study is to evaluate the role of MRI in the diagnosis and management of inflammatory breast disorders and to assess its efficacy in differentiating benign from malignant forms of mastitis; namely inflammatory breast carcinoma.
Methods and Materials: MRI and Ultrasound were performed for 90 patients presenting with clinical signs of mastitis who were resistant to treatment. The presence of ill-defined collections or abscess cavities, associated mass lesions, prominent subdermal lymphatics and the lymphnode status were reported. Areas of abnormal enhancement were subjected to further kinematic analysis and were correlated with the corresponding T2 signal. In reference to pathology reports, comparison between the diagnostic indices of ultrasound alone and after adding MRI were calculated. Cut off values for specific diagnostic parameters were calculated by measuring the area under the ROC curve.
Results: The absence abscess cavities ($p < 0.01$) strongly correlated with a malignant pathology. A cut off value of skin thickening 1 mm also indicated malignancy. A corresponding dark T2 signal correlated with a malignant pathology ($p < 0.05$). The calculated sensitivity, specificity and efficacy were 63.3%, 81.6% and 75.5% for US as compared to 86.7% to 96.6% and 93.3% after adding MRI.
Conclusion: MRI should be incorporated in the diagnostic work up of patients with inflammatory breast symptoms that are resistant to treatment.

B-1258 14:49

Evaluating the diagnostic sensitivity of computed diffusion-weighted MR imaging in the detection of breast cancer

E.A.M. O'Flynn, M. Blackledge, D. Collins, K. Downey, S. Doran, S. Dumontiel, W. Mok, M.O. Leach, D.-M. Koh; *Sutton/UK (elizabeth.oflynn@icr.ac.uk)*

Purpose: To evaluate the diagnostic sensitivity of computed diffusion weighted (DW)-MR imaging (cDWI) for the detection of breast cancer.
Methods and Materials: 61 women (median 48 years) underwent dynamic contrast enhanced (DCE)- and DW-MR between January 2011 and March 2012, including 27 with breast cancer and 34 normal cases. Standard ADC maps using all 4 b values (0, 350, 700, 1150) were used to generate computed DW-MR images (cDWI) at 1500 s/mm2 and 2000s/mm2. Four image sets were read sequentially by two readers: acquired b=1150s/mm2, computed b=1500s/mm2 and b=2000s/mm2, DCE-MR at an early time point. Cancer detection was rated using a five-point scale; image quality and background suppression were rated using a four-point scale. The diagnostic sensitivity for cancer detection was compared using the McNemar test and inter-reader agreement with a Kappa value.
Results: cDWI resulted in a higher overall diagnostic sensitivity for both readers. Reader 1 favoured b 1500s/mm2 with a sensitivity of 88.8% (p=0.0001), while reader 2 favoured b 2000s/mm2 with a sensitivity of 70.4% (p=0.0065) over the standard acquisition at b 1150s/mm2 with a sensitivity of 44.4%. cDWI images produced better image quality and background suppression (mean scores for readers 1/2: 2.6/2.5 and 3.2/2.6 for b 1500s/mm2; 2.6/2.5 and 3.4/2.9 for b 2000s/mm2) than acquired b value 1150s/mm2 images (mean scores for readers 1/2: 2.1/2.7 and 2.3/2.6 2.7 and 2.6).
Conclusion: Computed DW-MR imaging has the potential to improve the diagnostic sensitivity of breast cancer detection compared to acquired DW-MR.

B-1259 14:57

Combined evaluation of contrast-enhanced magnetic resonance imaging and diffusion weighted imaging of the breast: a multi-reader study

M.A. Marino, P. Clauser, R. Woitek, G. Wengert, P. Kapetas, M. Bernathova, K. Pinker-Domenig, T.H. Helbich, P.A.T. Baltzer; *Vienna/AT (mariaadele.marino@meduniwien.ac.at)*

Purpose: To assess diagnostic performance and reproducibility of a combined evaluation of Contrast-enhanced Magnetic Resonance Imaging (CE-MRI) and Diffusion Weighted Imaging (DWI) of the breast in a multi-reader study.
Methods and Materials: 118 histologically verified breast MRI lesions (52 malignant; 66 benign; mean size 2.3±2 cm) detected in 98 consecutive patients (mean age 53±13 years) were included in this IRB-approved retrospective single-center study. Four differently experienced radiologists independently assigned a BI-RADS category to each lesion. Subsequently, BI-RADS categories were adapted to Apparent Diffusion Coefficient (ADC) values (BI-RADSADC) assessed by each individual reader applying a predefined threshold to rule-out breast cancer (1.4*10-3 mm2/s). Thus, BI-RADS scores > 3 were downgraded to ≤3 in BI-RADSADC if ADC was above this threshold. If ADC-values were below this threshold, BI-RADS was equal to BI-RADSADC. Reader performance of BI-RADS and BI-RADSADC was compared by ROC-analysis.
Results: Sensitivity did not differ between both methods (P> 0.05). BI-RADSADC showed higher specificity than BI-RADS, especially in less experienced readers (R1 and R2 each P < 0.05; R3 P=0.06). Specificity improvements using BI-RADSADC were observed in both mass and non-mass lesions, however only reaching significance in non-mass lesions in R1 (P=0.03). Kappa agreement was similar moderate to substantial for BI-RADS (0.413-0.627) and BI-RADSADC (0.490-0.607).
Conclusion: The additional evaluation of ADC values improves reading specificity of breast MRI, especially for less experienced readers.

B-1260 15:05

Diffusion tensor imaging parametric 1 maps are more accurate than grey-scale parametric ADC maps in evaluating early response to neoadjuvant chemotherapy

E. Taberner López, J. Camps Herrero, C. Martinez Rubio, J. Cano Gimeno, J. Cuevas Sanz, M. Taberner Bonastre, J. Lorca Chapa; *Alzira/ES (etaberner@Hospital-Ribera.com)*

Purpose: To evaluate the accuracy of colour-coded DTI parametric 1 maps compared to grey-scale parametric ADC maps.
Methods and Materials: 20 consecutive patients with 26 lesions treated with neoadjuvant chemotherapy were studied with DTI (spatial resolution 2.5 mm, b values 0 and 700 and 15 directions) in a 1.5-T Intera Achieva Philips MRI after two cycles of anthracyclines. Image analysis was performed with Dr. DTI software (Weizmann Institute, Israel). Parametric maps for lambda 1 were evaluated (1) qualitatively for response estimation using colour-coded pixels and (2) quantitatively using ROIs and calculating percentage of change pre- and post-treatment. These findings were compared to response evaluation with parametric grey-scale ADC maps and correlated with UICC response criteria. Miller & Payne pathological evaluation criteria were used as the gold standard.
Results: Pathological evaluation confirmed response in 22/26 lesions (complete in 12/26, partial major in 5/26, partial minor in 5/26) and no response in 3 patients as well as progression of disease in one patient. Qualitative analysis with lambda 1 (1) maps predicted absence or presence of response in 23/26 lesions (88%) and exact type of response (partial major, minor, no response) in 19/26 lesions (73%), Quantitative analysis predicted absence or presence of response in 23/26 lesions (88%) and exact type of response (partial major, minor, no response) in 9/26 lesions (34.6%). ADC grey-scale maps predicted response in 12/26 lesions (46%) and type of response in 4/26 patients (15.3%).
Conclusion: Colour-coded DTI parametric 1 maps are more accurate than grey-scale ADC maps in early response evaluation.
Author Disclosures:
J. Camps Herrero: Advisory Board; Bayer.

B-1261 15:13

Accuracy of diffusion kurtosis imaging in characterisation of breast lesions

A. Christou[1], A. Ghiatas[2], D. Priovolos[2], K. Veliou[3], H. Bougias[3]; [1]*Doncaster/UK*, [2]*Athens/GR*, [3]*Ioannina/GR (alexandrachristou@gmail.com)*

Purpose: The aim of this study is to evaluate the accuracy of the diffusion kurtosis in the characterisation and differentiation of the breast lesions.
Methods and Materials: 36 women with 37 breast lesions underwent breast MRI. The MRI magnetic field is 1.5 Tesla and the protocol we follow is standard MRI sequences, dynamic sequences pre and after contrast agent administration and diffusion images. Further evaluation of the diffusion images was done using kurtosis (Kapp) to characterise and classify the breast lesions in benign and malignant categories. For that purpose measurements of several parameters were taken. Also the corrected ADC (Dapp) was taken and compared.
Results: The benign lesions were 17 and the malignant were 20. The lowest and the highest kurtosis values of the malignant lesions are significantly higher than those of the benign lesions. The average rank of the malignant lesions is higher than that of the benign lesions. A cutoff of 0.71 provided specificity of 94.1% and sensitivity 100% and the AUC is 0.988. The lowest and the highest corrected ADC values of the malignant lesions are lower than those of the benign lesions. The average rank of the malignant lesions is lower than that of the benign lesions. A cutoff value of 1.56 provided specificity of 92.3% and sensitivity is 94.1% and the AUC is 0.947 (P < 0.0001 for both parameters).
Conclusion: Diffusion kurtosis imaging is an accurate additional tool for the characterisation and the differentiation of the breast lesions with specificity of 94.1% and sensitivity 100%.

B-1262 15:21

Analysis and correlation of 18 F-FDG uptake in different immuno-histochemical subtypes of breast carcinoma

H.S. Mohanty, G. Rajan Mj, K. Shirodkar, S. Kumar Gg, S. Nandikoor; *Bangalore/IN (himansu.m97@gmail.com)*

Purpose: •To analyse the 18 F-FDG uptake in different immunohistochemical subtypes of Ca-breast. •To compare the uptake among these subgroups. •To compare the uptake with reference to different parameters.
Methods and Materials: This was a retrospective study in which PETCT imaging of 61 female patients diagnosed to have Ca-breast were analysed.The mean age of the study group was 54.7 years (range 28-89 years).These patients were grouped on the basis of presence or absence of oestrogen receptor, progesterone receptor & human epidermal growth factor 2.(Group A-TRIPLE POSITIVE, Group B-TRIPLE NEGATIVE, Group C-ER+,PR+,Her2 negative, Group D-ER+,PR-,Her2+,Group E-ER-,PR-,Her2+, Group F-ER+,PR-,Her2-). Marker of cell proliferation Ki-67 was determined in each patient and divided into high value (≥10%) and low (< 10%) value groups.
Results: The mean tumour size was 35.9 mm (range 8-89 mm). PET uptake (SUVmax) was highest in Group B (Triple Negative) followed by Group D (ER+,Her2+ and PR-),Group A, Group E,GroupC & Group F.Highest SUV max in Triple negative group calculated as 19.2±13.36 (median 16.5).Lowest uptake in group F with SUV max 5.5±1.9.There was a weak correlation between tumour size and SUVmax uptake (P=0.062).Larger the tumour size more was the uptake. However there was strong correlation noted between lymphnode size and SUV uptake.(P=0.001).Strong association also was noticed in Ki-67 expression,higher group demonstrating high uptake (mean 15.9±10.4) lower group with low uptake (mean 9.9±5.1) and histological grading (Grade1,Grade2 & Grade3) showing the same results.
Conclusion: Triple negative subtype is one of the highest PET uptake group among all histochemical subtypes of breast cancer.Ki-67 expression and histological grading are strongly associated with tumour SUVmax.

14:00 - 15:30 **Room B**

Abdominal Viscera

SS 1901a

Benign and malignant pancreatic diseases

Moderators:
J.M. Lee; Seoul/KR
M. Spirovski; Sremska Kamenica/RS

K-33 14:00

Keynote lecture

J.M. Lee; *Seoul/KR*

B-1263 14:09

Nonhypervascular pancreatic neuroendocrine tumour: differential diagnosis from pancreatic ductal adenocarcinoma on MR imaging

S. Jeon, J. Lee, I. Joo, E. Lee, H. Park, J. Han, J. Park; *Seoul/KR (wnolf2@gmail.com)*

Purpose: To determine useful imaging features in the differential diagnosis between nonhypervascular pancreatic neuroendocrine tumour (PNET) from pancreatic ductal adenocarcinoma (PDAC).
Methods and Materials: Thirty-six patients with surgically-confirmed PNETs which showed iso- or hypointensity on the arterial phase of preoperative gadobutrol-enhanced MRI were included as a study group. In addition, 82 patients with PDACs were selected as a comparison group. Two radiologists evaluated qualitative imaging features including morphologic characteristics and enhancement patterns (Type 1: portal hyperenhancement, 2: persistent isoenhancement, 3: delayed enhancement, 4: persistent hypoenhancement) of

each tumour in consensus. Quantitative imaging parameters including tumour size, maximal distal parenchymal thickness (MDPT), contrast-to-noise ratio, and ADC value were measured. MR imaging features were compared, and diagnostic performance of MR imaging criteria for differentiating PNETs from PDACs was evaluated.
Results: Nonhypervascular PNETs showed significantly higher frequencies of a well-defined margin, types 1 or 2 enhancement, and MDPT > 11 mm; lower frequencies of ductal dilatation, vascular invasion, and peripancreatic infiltration, than PDACs (all Ps <.05). On the multivariate analysis, a well-defined margin, type 1 or 2 enhancement, and MDPT > 11 mm were significant differentiators of PNETs than PDACs (Exp (B)=14.5, 13.5 and 6.9, respectively). When applying the criteria of either well-defined margin or type 1 or 2 enhancement, it resulted in 69.44% sensitivity and 98.78% of specificity in the differential diagnosis of PNETs from PDACs.
Conclusion: For nonhypervascular PNETs, MR imaging features including tumour margin, enhancement pattern, and MDPT are useful in preoperative differential diagnosis from PDACs.

B-1264 14:17

MDCT features of pancreatic neuroendocrine tumours correlate with intratumoral microvascular density and predict tumour grade
E. Belousova, A. Glotov, D. Kalinin, G. Karmazanovsky; *Moscow/RU*
(mestre@inbox.ru)

Purpose: To determine whether it is possible to predict pancreatic neuroendocrine tumour (pNET) grade and microvascular density (MVD) according to contrast-enhanced MDCT findings.
Methods and Materials: 25 patients with preoperative contrast MDCT examination and histologically confirmed pNET were included in this study. Pathology slides were reviewed to assess the percentage of vessels area (which reflects MVD) and to determine tumour grade according to the WHO classification (2010). 12 tumours were classified as Grade1 (G1) and 13 as Grade2 (G2). Arterial tumour enhancement ratio was defined as the HU value of the tumour divided by the HU value of the pancreas measured on arterial phase. Arterial enhancement ratio was compared with MVD using the Spearman correlation coefficient. MDCT-features (tumor enhancement ratios, size, homogeneity, margin, cystic change, pancreatic duct dilatation, metastases, vascular invasion) were compared between tumour grades using Fisher's exact test and Mann-Whitney U test. Accuracy in predicting tumour grade was measured for each MDCT-finding and their combinations.
Results: Mean arterial enhancement ratio was 1.66 (0.42) in G1 and 1.04 (0.39) in G2 pNET ($p < 0.01$); and correlated with intratumoral MVD ($r=0.61$, $p < 0.005$) and tumour grade ($p < 0.01$). Vascular invasion, metastases and pancreatic duct dilatation were observed in two cases, both in G2 tumours. Arterial enhancement ratio < 1.1, size≥20 mm, ill-defined borders and tumour non-homogeneity showed 83%, 74%, 70% and 56% accuracy in diagnosing G2 tumour respectively, while the accuracy of two of these criteria used in combination was 91%.
Conclusion: Contrast-enhanced MDCT-features of pNETcorrelate with MVD and can predict tumour grade during preoperative staging.

B-1265 14:25

Insulinoma localisation with cross-sectional imaging: head-to-head comparison of CECT, DCE-CT and multi-sequence MR
L. Zhu, H.-D. Xue, Z.-Y. Sun, H. Sun, X. Wang, Z.-Y. Jin; *Beijing/CN*
(zhuliang_pumc@163.com)

Purpose: To compare the performance of insulinoma localisation with dual-phase contrast-enhanced CT (CECT), dynamic contrast-enhanced CT (DCE-CT) and multi-sequence MR (mp-MR) including T1-weighted imaging, T2-weighted imaging and diffusion-weighted imaging (DWI), in the same patients.
Methods and Materials: Patients with endogenous hyperinsulinemic hypoglycemia were prospectively enrolled. All patients gave informed consent. CECT, DCE-CT and mp-MR at 3.0 T were performed in all patients, using standard protocols. Two readers independently evaluated the presence/absence of tumour within the pancreatic head, neck, body and tail region, using a 5-scale scoring system. CECT, DCE-CT and mp-MR were independently evaluated, irrespective of findings on other imaging work-ups. When a tumour was considered present (score 4-5) on imaging, tumour size was recorded. Surgical results served as reference standard. Receiver operating characteristic analysis was performed.
Results: Eighteen tumours were surgically removed in 18 patients, all in sporadic forms. The mean tumour size was 1.3±0.5 cm. CECT revealed a lower area under the curve (AUC)(0.78) compared to DCE-CT (0.99,$p < 0.01$) and mp-MR (0.97,$p < 0.01$). A sum score combining CECT and MR yielded an AUC of 0.99, whereas a sum score combining CECT and DCE-CT yielded an AUC of 0.96. For tumours less than 1 cm in size (n=8), CECT+DCE-CT showed the highest AUC (0.92). Tumour size measured on DWI (b=800) was most accurate, followed by arterial phase CT images.
Conclusion: A combination of CECT and mp-MR (including DWI) showed good diagnostic performance for insulinoma localisation. DCE-CT may be reserved for small tumours that were indeterminate on CECT and MR, before more invasive procedures.

B-1266 14:33

Localisation of CT-equivocal insulinomas: value of multi-sequence pancreatic MR
L. Zhu, H.-D. Xue, Z.-Y. Sun, X. Wang, H. Sun, Z.-Y. Jin; *Beijing/CN*
(zhuliang_pumc@163.com)

Purpose: To determine the performance of multi-sequence pancreatic MR in localisation of CT-equivocal insulinomas.
Methods and Materials: This study was proved by our institutional review board, and all patients gave informed consent. Patients with endogenous hyperinsulinemic hypoglycemia and equivocal findings on dual-phase enhanced CT were prospectively enrolled. All patients underwent 3.0 T pancreatic MRI comprising of T2-weighted imaging with/without fat suppression, Dixon sequence, and diffusion-weighted (DW) imaging (b value 50, 200, 400, 800). MR images were interpreted prospectively. Two radiologists independently identified tumour location, firstly on T2+T1 weighted images, then on DW images, and finally with information from all sequences. Signal contrast between tumour and pancreatic parenchyma were determined with a 5-point scale on each sequence. Surgical pathology was taken as reference standard.
Results: Ten insulinomas were surgically removed. The mean tumour size was 1.4±0.5 cm. CT attenuation difference between tumour and pancreatic parenchyma were all less than 15 HU in any phases. Seven lesions and nine lesions were detected on conventional MR sequences (T2+T1) by reader 1 and reader 2, respectively. Eight lesions and nine lesions were detected on high-b value DWI by reader 1 and reader 2, respectively. All ten tumours were detected with a combination of conventional sequences and DWI by both readers (sensitivity 100%). High b-value DW images has the highest tumour-parenchyma signal contrast, followed by T1 in-phase images.
Conclusion: Multi-sequence pancreatic MR has high sensitivity for CT-equivocal insulinomas, and should be considered when CT fails to accurately localise the lesion.

B-1267 14:41

Quantitative assessment of the pancreatic tumours by means of perfusion-related parameters derived from low-dose CT perfusion
Y.I. Nerestyuk, G. Karmazanovsky, Y. Gepalova; *Moscow/RU*
(nerestyuk@gmail.com)

Purpose: To evaluate CT perfusion values for cystic and solid tumours of the pancreas.
Methods and Materials: 22 patients with known pancreatic mass (cystic and solid tumours) underwent whole pancreas perfusion by a 256-slice CT (Brilliance iCT; Philips). 80-kVp/100 mAs (low-dose) image data were reconstructed with iDose5 iterative reconstruction. Perfusion parameters were calculated with maximum-slope and dual-input one-compartment model methods. The parameters generated by software included the blood flow (BF, ml/min/100 ml tissue), blood volume (BV, ml/100 ml tissue), arterial blood flow (AF, ml/min/100 ml tissue), portal blood flow (PF, ml/min/100 ml tissue) and perfusion index (%) [PI = AF/(AF + PF) x 100].
Results: CT perfusion characteristics of the healthy pancreatic parenchyma were BF - 72±32.2 ml/min/100 ml, BV - 26.2±10.7 ml/100 ml, AF- 58.9±17.5 ml/min/100 ml, and PF- 30.3±28.8 ml/min/100 ml. There was a significant difference between pancreatic tumours and normal pancreatic tissue for BF and PF ($p < 0.05$). TTP for the healthy pancreatic parenchyma was 16±6.4 sec. In case of pancreatic cancer and cystic tumours, TTP significantly increases. There was a difference between well- and moderately differentiated neuroendocrine tumours and normal pancreatic tissue for TTP but not other parameters of perfusion. The radiation dose was 7.4±0.4mZv.
Conclusion: Low-dose whole pancreas CT perfusion values can be used as an additional parameter to differentiate pancreatic mass. Perfusion CT had higher diagnostic rate for neuroendocrine tumour than the conventional contrast-enhanced CT examination.

B-1268 14:49

Differentiation of heterogeneously enhancing pancreatic lesions: key features on multiphasic multidetector CT
L. Zhu, H.-d. Xue, W. Liu, X. Wang, H. Sun, Z.-y. Jin; *Beijing/CN*
(zhuliang_pumc@163.com)

Purpose: To determine the diagnostic accuracy of heterogeneously enhancing pancreatic lesions on multiphasic multidetector CT (MDCT), and to assess key CT features that lead to a correct diagnosis.
Methods and Materials: Thirty-six patients with heterogeneously enhancing pancreatic lesions were included in this study. Two radiologists independently

evaluated the preoperative multiphasic MDCT with a checklist of CT features. Both readers provided the diagnosis and selected the key CT features leading to the diagnosis from the checklist. Diagnostic accuracy and inter-observer agreement were investigated.
Results: The surgical pathology were pancreatic endocrine tumours (PETs, n=14), solid pseudopapillary tumours of the pancreas (SPT, n=15) and serous cystic neoplasm of the pancreas (SCN, n=7). The mean diagnostic accuracy was 91.7% for PETs, 93.1% for SPT and 95.8% for SCN. Inter-observer agreement was excellent (κ=0.87, $p < 0.01$). The most common findings for PETs were mosaic morphological pattern (78.5%) and peak of enhancement in pancreatic arterial phase (PAP, 78.5%), for SPT were rotten-melon morphological pattern (80%) and peak of enhancement in equilibrium phase (80%), and for SCN were peak of enhancement in PAP (100%) and peripherally located non-enhancing components (85.7%). Key features leading to a correct diagnosis for PETs were peak of enhancement in PAP (83.6%) and mosaic pattern (76.9%), for SPT were rotten-melon pattern (85.7%) and delayed filling-in (78.6%), and for SCN honeycomb pattern (100%) and peak of enhancement in PAP (60%).
Conclusion: Morphological features and enhancement pattern on multiphasic MDCT are key features for differentiating heterogeneously enhancing pancreatic lesions. Radiologists demonstrated good agreement in lesion characterisation.

B-1269 14:57

Contrast-enhanced ultrasound with quantitative perfusion analysis for early pancreatic ductal adenocarcinoma in C57BL/6 mouse model: comparison with PET-CT

Y. Dong, W.-P. Wang, Y.-J. Jiang, J.-Y. Cao; *Shanghai/CN (dr_mimi@163.com)*

Purpose: To determine the feasibility of using contrast-enhanced ultrasound (CEUS) quantitative perfusion analysis to characterise orthotopic pancreatic adenocarcinomas (OPAs) in the C57BL/6 mouse model, with comparison to 18 F-fluorodeoxyglucose (FDG) of positron emission tomography (PET)-computed tomography (CT).
Methods and Materials: In this animal care and use committee-approved study, the models of OPAs were established in immune complete C57BL/6 mice (18-21 g, 6-8 weeks, female, n=30). Pan02 cells (1×106 viable cells) were injected into the parenchyma of mice pancreatic tails. CEUS quantitative analysis were performed every week after injecting of Pan02 cells. Time-intensity curves were created from regions of interest. Five perfusion parameters were obtained for statistical analyses: peak intensity (PI), time to peak (TTP), time from peak to one half, mean transit time (MTT), and area under the curve (AUC). Furthermore, mice underwent positron emission tomography (PET)-computed tomography (CT) with 18 F-fluorodeoxyglucose (FDG) to evaluate early detection of OPAs.
Results: With the progression of tumours' formation, OPAs showed delayed and decreased enhancement in TICs of quantitative CEUS. PI and TTP of OPAs were changed from 10.1 ± 3.4 to 7.4 ± 4.4 dB and 7.5 ± 2.4 to 12.3 ± 3.7 sec, respectively ($P < 0.05$). All C57BL/6 mouse showed a strong FDG uptake in the pancreatic area. Significant correlation was found between the FDG score and PI, TTP ($P < 0.05$).
Conclusion: CEUS parameters PI and TTP can provide useful information in early detection of OPAs from normal pancreas. CEUS quantitative indexes had good correlation with FDG.

B-1270 15:05

Diffusion weighted imaging of pancreatic adenocarcinoma: which model is the most appropriate?

G.C. Manikis[1], K. Nikiforaki[1], N. Papanikolaou[2], N. Albiin[2], N. Kartalis[2], K. Marias[1]; [1]*Iraklion/GR*, [2]*Stockholm/SE*

Purpose: To compare four diffusion models including monoexponential and biexponential both Gaussian and non-Gaussian, in pancreatic adenocarcinoma and non-cancerous pancreatic tissue.
Methods and Materials: 15 patients with pancreatic adenocarcinoma underwent free breathing diffusion weighted imaging using 8 b values (0, 50, 100, 150, 200, 300, 600, 1000). Four different models including monoexponential and bi-exponential, both Gaussian and non-Gaussian versions, were applied. Three different statistical parameters including adjusted R square, root mean square error (RMSE) and sum of squares due to error (SSE) were calculated for each model. Wilcoxon signed rank and Dunn's nonparametric statistical tests were used to disclose any significant differences between all four models.
Results: Biexponential models fitted the experimental data obtained from cancerous areas, better than any mono-exponential models according to all 3 statistical measures (adj R square, RMSE and SSE). Differences between bi-exponential Gaussian and non-Gaussian models were not significant (p=0.13) while all other pairwise comparisons produced significant differences ($p < 0.01$). Adjusted R square of bi-exponential models of cancerous and non-cancerous tissues were 94.97% and 91.33% for the Gaussian model and 94.47% and 93.48% for the non-Gaussian model. Gaussian bi-exponential model fitted the experimental data obtained from non-cancerous areas, better than any other model according to all 3 statistical measures (adj R square, RMSE and SSE, all pairwise comparisons, $p < 0.01$).
Conclusion: Non-Gaussian bi-exponential diffusion models proved to be more accurate in fitting cancerous tissue taking into account tumour vascularity and heterogeneity while in non-cancerous tissue the dominating models were Gaussian bi-exponential taking account the microperfusion contamination effects.
Author Disclosures:
N. Papanikolaou: CEO; N. Papanikolaou & Associates LP. Owner; N. Papanikolaou & Associates LP.

B-1271 15:13

Magnetic resonance pancreatic fat-fraction and volume: association with obesity

V. Cuba, A. Gimeno, G. Blasco, J. Puig, S. Pedraza, J. Fernández-Real; *Girona/ES (victorcuba70@hotmail.com)*

Purpose: Interest in determining the potential role of the pancreas in insulin resistance associated with obesity is growing. We aimed to evaluate the relationship of MR pancreatic fat-fraction and volume with obesity.
Methods and Materials: We studied 24 obese subjects (BMI ≥30 kg/m^2) and 19 controls of similar age and sex. We acquired in-phase (TE=2.3 ms) and opposed-phase (4.6 ms) T1-weighted gradient-echo sequences. To segment the pancreas and determine the fat-fraction, we used an Olea Sphere 3.0 workstation (Olea Medical, La Ciotat, France). Clinical variables included BMI, lipid profile, and oral glucose tolerance test.
Results: The fat-fraction was higher in obese subjects than in controls ($p < 0.001$). The pancreatic fat-fraction correlated with age (r=0.327; p=0.037), BMI (r=0.436; p=0.004), insulin resistance (r=0.447; p=0.003), glycosylated haemoglobin (r=0.493; p= 0.001), and C-reactive protein (r=0.523; $p < 0.001$). In the multivariate linear regression analysis, BMI (p=0.005) and age (p=0.047) were independent predictors of pancreatic fat-fraction.
Conclusion: These preliminary results suggest that an increase in pancreatic fat-fraction might be associated with greater insulin resistance in obese subjects.

B-1272 15:21

Solid pseudopapillary tumour of the pancreas: gadoxetic-acid-enhanced MRI and DWI with emphasis on differentiation from neuroendocrine neoplasm

Y. Choi, C. Park, G. Han, S. Kim, N. Lee; *Busan/KR*

Purpose: Generally, a pancreatic mass with solid and cystic nature in a young female should raise suspicion for solid pseudopapillary tumour (SPT). These imaging features sometimes overlap with neuroendocrine tumour (NET). The purpose of our study was to determine imaging features that distinguish SPT from NET on gadoxetic acid-enhanced MRI with DWI.
Methods and Materials: From January 2009 to December 2014, eight patients with SPT and 19 patients with NET were retrospectively enrolled, who had undergone gadoxetic acid-enhanced MRI with DWI. Sex, location, morphologic features of the tumour (shape, margin, presence of hemorrhage, capsule, cystic portion, or calcification), signal intensities on T1- and T2-weighted image, enhancement pattern, presence of pancreatic duct dilatation and metastases were qualitatively analysed by Fisher's exact test. Age, size and mean ADC values of tumour were quantitatively analysed by Mann-Whitney U test.
Results: The distinct MRI features of SPT compared with NET were as follows: larger size (5.5 cm vs. 2.5 cm, p = 0.005), well-defined margin (87.5% vs. 42.1%, p = 0.043), capsule (75% vs. 26.3%, p = 0.033), calcification (75% vs. 0%, $p < 0.001$) and hemorrhage (50% vs. 0%, p = 0.004). All SPTs showed no arterial enhancement with progressively delayed enhancement ($p < 0.001$). ADC values of SPT (0.89 ± 0.28 ×10−3 mm2/sec) were statistically lower than those of NET (1.25 ± 0.25 ×10−3 mm2/sec) (p = 0.022).
Conclusion: A well-defined pancreatic mass with capsule, calcification, hemorrhage, hypovascularity on the arterial phase, and lower ADC values favor diagnosis of SPT on MRI.

14:00 - 15:30 **Room C**

Breast

SS 1902b

Preoperative imaging, neoadjuvant chemotherapy, imaging of the axilla

Moderators:
C. Dromain; Villejuif/FR
P. Panizza; Milan/IT

B-1273 14:00

Baseline breast evaluation with multiparametric MRI: prediction of pathological complete response to neoadjuvant chemotherapy in locally advanced breast cancer

M. Panzeri, C. Losio, A. Palmisano, R. Cavallin, R. Maria Grazia, P. Panizza, F. De Cobelli, A. Del Maschio; *Milan/IT (panzeri.marta@gmail.com)*

Purpose: NAC is the treatment of choice for locally advanced breast cancer (LABC), but less than a half of patients achieve a pathologically complete response (pCR). We investigated the predictive role of parameters at baseline breast MRI in differentiating responders from non-responders to NAC.
Methods and Materials: 72 patients with LABC underwent NAC between 2010 and 2015: MRI (1.5 T) was performed at baseline and after 6-8 months of Taxane-Anthracicline-based chemotherapy (T2-TSE,3D-FFE Gadobutrol-enhanced dynamic study and DW-EPI with b-values=0 and 900 s/mm2). The presence of intratumoural necrosis, pseudocapsule, oedema, rim enhancement and asymmetry of vascular maps were recorded. T2 signal intensity and the mean Apparent Diffusion Coefficient (ADC) were also assessed for each lesion. All parameters obtained from the kinetic curve were analysed (semiquantitative analysis). Final response to NAC was assessed on the surgical specimen. Logistic regression modelling was used to identify associations between the independent parameters and the final diagnosis (Responders vs non-responders).
Results: All women completed NAC and 40% achieved a pCR. At univariate analysis, presence of peritumoural oedema was significantly associated with pCR [OR 3.33 (IC95%: 1.13-9.82), p=0.029]. A higher mean ADC value[OR 1.03 (IC95%: 1.01-1.07), p=0.032] was predictive of chemosensitivity as Brevity of Enhancement [OR 1.08 (IC95%: 1.01-1.14), p=0.015]. At multivariate analysis, Brevity of Enhancement[OR 1.08 (IC95%: 1.01-1.16), p=0.025] and mean ADC values [OR 1.03 (IC95%: 1.01-1.07), p=0.049] were significantly associated with pCR.
Conclusion: Some characteristics at baseline MRI indirectly reflect tumour aggressiveness. The shortest duration of peak enhancement and peritumoural oedema are predictors of responsiveness. Otherwise, lower ADC values predict for chemoresistance to NAC.

B-1274 14:08

Can MRI features before and after neoadjuvant chemotherapy predict surgical margins?

Q. Zhao[1], O. Abeyakoon[2], A. Muellner[3], L. Carbonaro[4], E. Sutton[3], S. Wang[1], E. Morris[3]; [1]*Shanghai/CN*, [2]*Cambridge/UK*, [3]*New York, NY/US*, [4]*San Donato Milanese/IT (qiufengzhao2012@hotmail.com)*

Purpose: To identify MRI biomarkers that may predict surgical outcomes before or after neoadjuvant chemotherapy (NAC).
Methods and Materials: This IRB-approved, HIPAA-compliant retrospective study included 58 patients (mean age, 47 years; age range, 32-66 years) who underwent NAC followed by breast conservation therapy (BCT) and had pre- and post-NAC MRI. Surgery-related factors and demographic, clinicopathologic and MRI features were evaluated. Univariate and multivariate analyses were performed to identify variables associated with margin status after initial BCT.
Results: Positive margins (defined as tumour touched or ≤ 1 mm from inked margin) were found in 16/58 patients (27.6%) after initial BCT. In univariate analysis, the following predicted negative margins: no DCIS or lymphovascular invasion (LVI) on core biopsy, HER-2+ and triple-negative receptor type, pre-NAC MRI phenotype of unifocal mass or unifocal mass with satellite lesions, and concentric or resolved shrinkage on MRI ($P < 0.05$). In multivariate analysis, pre-NAC MRI phenotype and shrinkage pattern were the only features associated with negative margins ($P < 0.05$). Pathologic complete response (pCR) and radiologic complete response (rCR) rates were 34.5% (20/58) and 29.3% (17/58), respectively. In 7/17 patients with rCR, pCR was not present, and 2/17 (11.8%) had positive margins.
Conclusion: Pre-NAC MRI phenotypes and MRI shrinkage patterns were predictive of surgical margin status after initial BCT. A unifocal mass and a unifocal mass with satellite lesions on pre-NAC MRI, with concentric or resolved shrinkage on post-NAC-MRI, predicted negative margins.

B-1275 14:16

Tumour volume analysis TVA vs RECIST

A. Gordon, J. Morden, A. Lim, S. Cleator; *London/UK (angus.gordon@imperial.nhs.uk)*

Purpose: To show data from a trial of primary breast cancer, NEOCENT. Postmenopausal ER+ve women were randomised to receiveeither Neoadjuvant Chemotherapy (C) or Endocrine therapy (E).
Methods and Materials: Twenty eight patients were evaluated who had three dimensional ultrasound measurements, width, length and height at baseline and after randomised treatment, approximately 150 days later. Tumour measurements by diameter RECIST and Tumour Volume Analysis (TVA), a three dimensional calculation of the size of the mass=4/3 π a x b x c ,where a, b and c are the radii of the mass (GB patent 2441789).
Results: Twenty four patients responded to treatment and regressed by diameter and/or volume (C n=10 versus E n=14). No statistically significant difference was seen in the magnitude of response between treatment groups, when using either RECIST or TVA. Median percentage regression was -34% (IQR -44- --25.5) by diameter RECIST and -73% (IQR -85.5- -42.5) by volume TVA. $p < 0.0001$. Of the two tumours that enlarged by TVA alone the Tumour Doubling Times were +135 and +337 days. The 24 tumours that regressed had a Complete Response Time range -23- -1005 days. Two cases progressed > 20% volume and were Stable Disease (SD) by RCIST. Five were SD by RECIST but responded > 30% volume by TVA.
Conclusion: These results expose the mathematical shortcomings of expressing the size of a solid mass by the single diameter RECIST.

B-1276 14:24

Hybrid PET-MR imaging for accurate nodal staging prior to neoadjuvant chemotherapy in breast cancer patients - preliminary results

B. Goorts, M.L. Smidt, S. Vöö, T.J.A. van Nijnatten, F.M. Mottaghy, J.E. Wildberger, M.B.I. Lobbes; *Maastricht/NL (marc.lobbes@mumc.nl)*

Purpose: To assess the clinical value of hybrid FDG PET-MR imaging for nodal staging prior to neoadjuvant chemo- and immunotherapy (NAC) in breast cancer patients.
Methods and Materials: In this prospective study, patients with primary invasive breast cancer with at least cT2 and/or a histopathologically confirmed lymph node metastasis undergoing NAC were included. A hybrid PET-MR breast protocol was performed before NAC. MR images were evaluated independently by one dedicated breast radiologist, PET images independently by one dedicated nuclear physician. Afterwards a combined PET-MR report was made. The number and localization of lymph nodes suspicious for metastases on PET-MR was compared to conventional nodal staging methods, i.e. ultrasound with core needle biopsy and MRI-only. The percentage of patients with a modified treatment plan based on PET-MR was studied.
Results: In this ongoing study, 25 patients were included. In 16% (4/25) of the included cases, treatment plan altered based on PET-MR findings. In two patients, PET-MR showed an enlarged internal mammary lymph node with high FDG-uptake. One patient had five axillary lymph nodes suspicious for metastases on PET-MR, whereas initially only two where seen on ultrasound and none on MRI-only. For these three patients radiotherapy plan was extended. One patient had three axillary lymph nodes suspicious for metastases on PET-MR compared to more than three on ultrasound and MRI-only, resulting in a reduced radiotherapy plan.
Conclusion: Pre-NAC hybrid PET-MR changed treatment plan in 16% of patients. Consequently, PET-MR might be more accurate for nodal staging, compared to conventional imaging.

B-1277 14:32

Preoperative planning using an MRI-US fusion imaging system for breast-conserving surgery in patients with non-mass-like enhancement on breast MRI

T. Ando, S. Nakano, K. Fujii, J. Kousaka, Y. Mouri, R. Tetsuka, M. Goto, T. Imai, T. Ishiguchi; *Aichi/JP (snakano1@aichi-med-u.ac.jp)*

Purpose: In patients undergoing breast-conserving surgery (BCS), it is important to achieve tumour-free margins to avoid local recurrences. However, both the lack of a distinct tumour body and positional conversion make it difficult to precisely predict the extent of non-mass like enhancement (NMLE) on prone MRI in the surgical supine position. The aim of this study was to evaluate the influence of real-time virtual sonography (RVS), an MRI-US fusion imaging system, on surgical outcomes following BCS in patients with NMLE.
Methods and Materials: Between 2010 and 2015, a total of 38 consecutive patients with NMLE were enrolled in this study. Twelve patients underwent additional supine MRI followed by preoperative planning using RVS, which can localize MRI-determined enhancement onto the breast surface while checking real-time sonography. During the same time period, 26 patients underwent preoperative planning with conventional B-mode (cB-mode) alone. The extent of disease was determined by each device and marked on the skin. BCS was

performed using these markings as guides. The rates of tumour-positive margins and reoperations were compared between the two groups.
Results: The rate of positive margins was significantly lower in the RVS group than in the cB-mode group (17%, 2/12 vs 62%, 16/26, $p < 0.05$). Patients in the RVS group underwent significantly fewer reoperations than those in the cB-mode group (0%, 0/12 vs 42%, 11/26, $p < 0.05$).
Conclusion: Our results suggest that preoperative planning using RVS decreases the rate of tumour-positive margins and reoperations for BCS in patents with NMLE.

B-1278 14:40

Contrast enhanced ultrasound in axillary sentinel node assessment: does risk stratification improve yield

N. Larkman, N. Sharma, I. Haigh; *Leeds/UK (neal.larkman@nhs.net)*

Purpose: Contrast enhanced ultrasound (CEUS) of the axilla is a developing technique which can reduce the need for two stage axillary surgical operations. The purpose of our study was to assess if using a prediction tool to stratify patients by increasing likelihood of sentinel node metastases in those patients with a normal US or negative axillary biopsy, could offer targeted patient selection for CEUS.
Methods and Materials: Retrospectively, 103 patients with invasive breast cancer were identified. The US core biopsy, surgical sentinel Lymph node (SLN) and axillary histology were documented. The Memorial Sloan Kettering Sentinel Lymph Node Metastasis Nomogram was used to stratify patients into quartiles by likelihood of SLN being positive. Actual positive SLN rate compared to predicted mean rate, Technical CEUS biopsy failure rate (TFR) and negative predictive value (NPV) compared to surgical SLN assessment, were calculated for each quartile.
Results: Lowest risk quartile (0 to 25%, had a TFR of 5/23 (22%). A positive SLN rate (SLN) of 4/23 (17%) and a NPV of 87%. 26-50% quartile: TFR 10/40 (25%), SLN - 7/40 (18%) and NPV of 86%. 51-75% quartile: TFR 8/28 (29%), SLN - 9/28 (32%) and NPV of 81%. Highest quartile: TFR 1/12 (8%), SLN - 7/12 (58%) and NPV of 50%.
Conclusion: Risk stratifying patients using the Nomogram did not improve patient selection for CEUS. Our current NPV is 90% for macrometastases without a Nomogran. Patients in the highest quartile were the most likely to have a technically successful biopsy.

B-1279 14:48

Can MRI diffusion accurately detect complete pathological response in breast cancer patients receiving neoadjuvant chemotherapy?

S.W.Y. Gareer, H.H.N. El Kassas, M. Helal, A. Abu Rabia, N. Abd El Razik, M.H. Zedan, A. Farahat; *Cairo/EG (sherihangareer@gmail.com)*

Purpose: To assess the role of MRI diffusion in the evaluation of residual disease in patients with locally advanced breast cancer patients receiving neoadjuvant chemotherapy and hence affecting the surgical approach.
Methods and Materials: 35 patients with advanced breast cancer scheduled to receive neoadjuvant chemotherapy (NAC) between January 2014 and January 2015 were enrolled in this prospective study. Pretreatment tattooing of the lesions was performed. MRI with DW images was performed and parameters including number, size, signal in DWI and ADC values of lesions, were recorded at 2 stages: before the start of NAC and after completion of therapy. The percentage change in ADC values and size of bright tumour before and after the treatment of NAC were then calculated. The diagnostic performance of MRI imaging (morphological and functional imaging) in assessing residual disease and detecting complete radiological response was then compared to the histopathological results.
Results: The sensitivity and specificity for depicting residual tumour were 94% and 92% respectively for DW MR imaging, with 86 % correlation between complete radiological response and complete pathological response.
Conclusion: Diffusion-weighted MRI is a valuable tool in detecting the extent of residual disease after completion of neoadjuvant chemotherapy acting as a substitute in patients that cannot be given contrast. It also proved to be sensitive in determining complete pathological response hence enhancing the surgical outcomes aiming for better cosmoses.

B-1280 14:56

Radiologic imaging features of breast cancer according to the molecular subtypes

M.A. Nazli, I.N. Mutlu, Ö.N. Kilickesmez, C. Kelten, D. Can Tirabulus, A.H. Yardimci, T.F. Cermik; *Istanbul/TR (mnazli46@yahoo.com)*

Purpose: We aimed to investigate the relationship of molecular subtypes of breast cancer with radiomorphological findings and quantitative findings like Ultrasound (US) Elastography (EG), diffusion-weighted magnetic resonance imaging (DW-MRI) and positron emission tomography (PET)/ computed tomography (CT).
Methods and Materials: Between 2012-2015, 365 patients (mean age; 54.55 ±13.82) with 405 breast malignant tumour were evaluated and classified into three molecular subtypes according to immunohistochemical status. Luminal type breast cancer, HER2-Positive and hormon negative breast cancer, Triple-Negative Breast Cancer. Radiomorphologic appearence of tumour is evaluated strain ratio (SR) of tumour at US/EG, dynamic contrast curve at dynamic contrast-enhanced MRI (DCE-MRI), apperent diffusion coefficient (ADC) at DWI-MRI and F-FDG enhancement at PET/CT are all measured quantitatively.
Results: Luminal type cancers (n= 320, %79.4), HER2 type cancers (n=26, %6.9) and triple negative breast cancers (n= 45, %11.2), are all evaluated in terms of differentiating features of radiological findings. There was statistically meaningful difference in radiomorphologic appearance of luminal type cancers ($p=0.013< 0.05$). There was difference in morphologic appearence of triple negative tumours. ($p=0.029< 0.05$). At DCE-MRI, earlier maximum peak phase points was detected for HER2 type tumours ($p=0.014< 0.05$). There was no significant difference of SR value at US/EG, contrast enhancement morphology and dynamic contrast curve at DCE-MRI, ADC value at DW-MRI, FDG value at PET/CT between three molecular subtypes.
Conclusion: Determining the relationship of molecular subtypes and radiological findings may allow to evaluate the biological behavior of the tumours. This may contribute to determine the choices for personalised and targeted treatment of the patients.

B-1281 15:04

Diagnostic performance of standard breast MRI for axillary nodal staging

T.J.A. van Nijnatten, E.H. Ploumen, B. Goorts, S. Vanwetswinkel, P.J. Nelemans, M. Schavemaker, R.G.H. Beets-Tan, M.L. Smidt, M.B.I. Lobbes; *Maastricht/NL (t.vannijnatten@maastrichtuniversity.nl)*

Purpose: To evaluate the diagnostic performance of standard breast MRI in breast cancer patients to exclude extensive axillary nodal disease (pN2-3), in case node negative (pN0) or limited axillary nodal disease (pN1) is predicted.
Methods and Materials: All patients diagnosed with primary invasive breast cancer who underwent standard breast MRI prior to surgery in our hospital between 2009 and 2014 were included. Exclusion criteria were neoadjuvant systemic therapy and previous axillary surgery or radiotherapy. Two dedicated breast radiologists independently reassessed all breast MRIs and scored each axillary lymph node on a confidence level scale of 0 to 4. Results were compared to the gold standard of histopathology. Diagnostic performance was analysed by calculating false negative percentages and negative predictive values (NPV) for respectively pN0 and pN1. Quadratic weighted kappa measured interobserver agreement.
Results: A total of 200 patients were included. In case pN0 was predicted by the radiologists, pathology showed pN2-3 in 1.2% and 1.4%, with a NPV of 98.8% (95.3-99.8%) and 98.6% (94.7-99.8%) respectively. When pN1 was predicted by the radiologists, pathology showed pN2-3 in 13.0% and 10.2%, with a NPV of 87.0% (65.3-96.6%) and 89.8% (77.0-96.2%) respectively. Interobserver agreement between both radiologists was considered good (weighted kappa = 0.601).
Conclusion: A negative preoperative breast MRI can exclude extensive nodal disease in breast cancer patients. Furthermore, breast MRI differentiates more accurately between limited and extensive axillary nodal disease, compared to current conventional imaging.

B-1282 15:12

Axillary lymph node fine-needle aspiration biopsy in invasive breast cancer: usefulness of adding core-needle biopsy when cytological diagnosis is discordant or insufficient

J. Oliver Goldaracena, C. Martinez Gamarra, V. Córdoba Chicote, A. Verón Sánchez, M. Roca Navarro, A. Andres Mateo; *Madrid/ES (jmolivergoldaracena@gmail.com)*

Purpose: To show the utility of adding core-needle biopsy (CNB)when cytological diagnosis of US-guided fine-needle aspiration biopsy (FNAB)of the axillary lymph nodes (LN)is discordant or insufficient in newly diagnosed invasive breast cancer (NDIBC) patients.
Methods and Materials: Between January 2014 and February 2015 ,199 consecutive patients (203 axillae) with CK19 positive NDIBC,were evaluated by using axillary US.LNs with cortical thickness greater than 2.5 mm or abnormal morphologic characteristics underwent US-guided axillary FNBA.When cytological diagnosis was discordant or insufficient,additional CNB was performed from the same suspicious LN after FNAB.Patients with negative biopsy underwent sentinel LN biopsy. Intraoperative molecular analysis (OSNA)of total tumour load (TTL)in sentinel LN was performed.Patients with biopsy-proved metastasis or TTL in sentinel LN with more than 10000 mRNA-CK19 copies,underwent axillary dissection.
Results: A total of 93 axillae underwent FNAB (45.8%).In 62 axillae FNAB proved metastasis.In 7 axillae (5 discordant benign cytological diagnosis,2 insufficient samples),additional CNB was performed.CNB were metastatic in 5 and benign in 2.Sentinel LN biopsy was performed in 136 axillae,and

20 (15%)underwent axillary clearance.In 116 axillae (85%)lymphadenectomy was not performed (90 negative,5 Isolated tumoural cells- TTL between 100-249 copies,19 micrometastasis- TTL between 250-4999 copies, 2 macrometastasis TTL between 5000-10000 copies).From the total study population, 55.6%(113 of 203 axillae)had metastases.The sensitivity for US was 67.2% (76 of 113 axillae). The sensitivities for FNAB and FNAB/CNB were 81%(62 of 76 axillae) and 88%(67 of 76 axillae)respectively.
Conclusion: When cytological diagnosis of axillary LN US-guide FNAB is discordant or insufficient in NDIBC patients,adding CNB would increase the sensitivity in detecting metastatic axillae in 7%(88% vs81%).

B-1283 15:20

Evaluation of residual tumour after neoadjuvant chemotherapy (NAC) in patients with breast cancers: can we settle on DWI-MR sequence?
I. Leconte, B. Lacoste, L. Fellah, M. Berliere, C. Galant, N. Michoux; *Brussels/BE (isabelle.leconte@uclouvain.be)*

Purpose: To compare the performance of Diffusion-weighted imaging (DWI) sequence and Dynamic Contrast-enhanced (DCE) sequence in the evaluation of response to NAC.
Methods and Materials: Sixty-six patients (mean age:54 yrs) with invasive breast carcinoma (76 lesions) and treated with NAC were included in the study. Pre and post-NAC MRI were performed on 3 different magnets (two 1.5 T and one 3 T) with 3 sequences (axial T2-weighted imaging, axial DWI [b0-b600, b0-b1000, b0-b1500], axial 3D T1-weighted DCE) before surgery (< 6 weeks). Two radiologists (1 senior and 1 junior), blinded to anatomopathologic results, read independently post-NAC sequences with pre-NAC MRI available to locate the tumoural bed, and measured the largest diameter of the lesions. Performances of DWI/DCE (ROC), agreement with anatomopathology (Bland-Altman), and intra-/inter-observer agreement (Intra-Class Correlation) were assessed.
Results: Performance of DWI is significantly higher than that of DCE in the detection of the residual tumour (DWI:Se=84%/Sp=81%, DCE:Se=91%/Sp=38%, p=0.002). Agreement of DWI/DCE sequences with anatomopathology on the largest diameter of detected lesions is similar: mean_bias_senior_obsDWI vs anat=12% [-72%;+96%](95% CI), mean_bias_senior_obsDCE vs anat=10% [-101%;+121%](95% CI). Intra-/inter-observer agreements range from good to very good: ICCintra-obs:DWI=[0.94;0.97], ICCinter-obs:DWI=[0.91;0.95], ICCinter-obs:DCE=0.89.
Conclusion: DWI outperforms DCE in the detection of residual tumour after NAC and may be sufficient if pre-NAC MRI is available to locate the initial tumoural bed. DWI has both high repeatability and reproducibility and may be easily used by juniors. Optimising DWI-MR sequence towards a higher spatial resolution could improve the correlation with anatomopathology.

14:00 - 15:30 **Room Z**

Computer Applications

SS 1905

Quality control and safety issues in radiology

Moderators:
R. Salvador; Barcelona/ES
P.M.A. van Ooijen; Groningen/NL

K-35 14:00

Keynote lecture
B. Kelly; *Belfast/UK*

B-1284 14:09

The adaptive statistical iterative reconstruction V technique for radiation dose reduction in abdominal CT
B. Kim, H. Kwon, J. Lee, J. Cho, J. Oh, S. Lee; *Busan/KR (risual@hanmail.net)*

Purpose: To investigate whether reduced radiation dose abdominal computed tomography images reconstructed with adaptive statistical iterative reconstruction V (ASIR-V) compromise the depiction of clinically competent features when compared with the currently used routine radiation dose CT images reconstructed with adaptive statistical iterative reconstruction (ASIR).
Methods and Materials: 27 consecutive patients underwent CT of the abdomen at two time points. At the first time point, abdominal CT was scanned at 21.45 noise index levels of automatic current modulation at 120 kilo voltage. Images were reconstructed with 40% ASIR, the routine protocol of our institution. At the second time point, follow-up scans were performed at 30 noise index. Images were reconstructed with FBP, 40% ASIR, 30% ASIR-V, 50% ASIR-V and 70% ASIR-V for the reduced radiation dose. Both quantitative and qualitative analyses of image quality were conducted.
Results: At the follow-up study, the mean dose reduction relative to the currently used common radiation dose was 35.37%. The overall subjective image quality and diagnostic acceptability of the 50% ASIR-V scores at the reduced radiation dose were nearly identical to those recorded when using the initial routine dose CT with 40% ASIR. Objective image noise for 50% ASIR-V was 34.24% and 46.34% lower than, which was 40% ASIR and FBP.
Conclusion: Abdominal CT images reconstructed with ASIR-V may allow up for radiation dose reductions of to > 35% when compared with the ASIR.

B-1285 14:17

The feasibility of ultra-low dose 80 kVp and 20 ml contrast medium pulmonary CT angiography with iterative reconstruction
J. Liu, J. Gao; *Zhengzhou/CN (liujieict@163.com)*

Purpose: To investigate the feasibility of an ultra-low radiation dose 80 kVp pulmonary CT angiography (CTPA) with 20 ml low-volume contrast medium for the diagnosis of pulmonary embolism.
Methods and Materials: Twenty-eight patients underwent CTPA to rule out PE were randomly assigned to two protocols: Group A ,n=14, 80 kVp, 20 ml contrast medium, iterative model reconstruction technique (IMR) reconstruction. Group B ,n=14,120 kVp, 50 ml contrast medium., filtered back-projection technique reconstruction. The CT attenuation, image noise, effective radiation dose, signal-to-noise (SNR) and contrast-to-noise ratio (CNR) were compared between Group A and B. The subjective image quality was scored by a 5-point scale.
Results: The effective radiation dose of Group A (0.5 ± 0.1 mSv) was significantly lower than that of Group B (3.0 ± 1.3 mSv) ($P < 0.05$). The CT attenuation and image noise were 527.5 ± 135.2 and 44.2 ± 6.8 HU for Group A which were significantly higher than those of Group B (361.1 ± 74.5, 20.4 ± 4.2 HU) (both $P < 0.05$).
Conclusion: The image quality of low radiation 80 kVp CTPA with 20 ml contrast medium and iterative reconstruction was comparable to the standard protocol.

B-1286 14:25

Benchmarking of CT radiation dose parameters: comparison of two academic institutions in Switzerland
S.T. Schindera[1], R. LeCoultre[2], J. Bize[2], E.M. Merkle[1], R. Meuli[2], F.R. Verdun[2]; [1]*Basle/CH*, [2]*Lausanne/CH (sebastian.schindera@usb.ch)*

Purpose: To compare institutional diagnostic reference levels (DRLs) of different CT protocols in two academic centers.
Methods and Materials: Institutions A and B from Switzerland provided their dose data recorded from September 1st 2014 to August 3 1st 2015 with two different radiation dose management softwares (Radimetrics, Bayer; DoseWatch, GE). The 75th percentile of the DLP was chosen for comparison. Six CT protocols were selected for comparison: CT of the head to assess acute stroke, CT of the head for acute trauma, CT of the chest for assessment of pulmonary metastasis, CT of the chest to rule out pulmonary embolism, CT of the abdomen to rule out urolithiais and CT of the abdomen to rule out appendicitis.
Results: A total of 41,662 CT scans were assessed for institution A and 12,116 scans for institution B. The reported radiation doses of all CT protocols of institution B was substantially lower compared to institution A. The 75th percentile of the DLP for the CT for acute stroke, for acute head trauma, for assessment of pulmonary metastasis, to rule out pulmonary embolism, to rule out urolithiasis and to rule out appendicitis was 32% (1,863 vs 2,744 mGycm), 14% (749 vs 871 mGycm), 58% (237 vs 100 mGycm), 88% (115 vs 961 mGycm), 35% (474 vs 726 mGycm) and 10% (640 vs 710 mGycm) lower in institution B compared to A, respectively.
Conclusion: Substantial difference exists in regards to institutional DRLs between academic centers in Switzerland demonstrating the need for a comprehensive optimisation effort.

B-1287 14:33

Quality control in a radiology department by protocol standardisation and high dose justification
T. De Bondt[1], F. Zanca[2], J. De Roeck[1], L. Brouhon[1], M. Geldof[1], F. Deferme[1], P.M. Parizel[1]; [1]*Antwerp/BE*, [2]*Diegem/BE (timo.debondt@gmail.com)*

Purpose: To establish consistent and safe everyday practice standards throughout the radiology department; to understand the nature and cause of inconsistencies.
Methods and Materials: Using dose-monitoring software (DoseWatch, GE Healthcare), we gathered data from 13 imaging modalities within our radiology department (3 computed tomography (CT), 2 mammography (MX), 6 computed radiology (CR), 2 interventional radiology (IR)). Procedures were implemented to 1/ map RIS codes with modality protocols, 2/ standardize procedures in

terms of number of views, and 3/ justify high-dose studies by an a priori defined list of comments.
Results: After 3 months, a standard number of takes was achieved in 90% for CT, 80% for MX and 92% of CR procedures. Defining a standardized number of takes for interventional procedures is not relevant and is not discussed. Justification of high-dose studies was performed for 48% of CT and 98% of interventional procedures; conversely for CR and mammography this was 0%. Of all justified high-dose alerts on CT, the main reported causes were "patient overweight" (39%), "extra series requested by radiologist" (22%) and "performed by request of cardiology staff" (13%). Almost all alerts (96%) for IR were caused by "difficulty of procedure".
Conclusion: Dose-monitoring software is a useful tool for everyday quality control. It helps us to identify shortcomings in a radiology department. We identified opportunities for optimisation by using a standard list of comments for high-dose studies. To understand remaining standardization issues in MX and CR, we need to focus on implementing a practice of standard justification.
Author Disclosures:
F. Zanca: Employee; GE Healthcare.

B-1288 14:41

Big-data analytics and visualisation of a three-year CT radiation dose optimisation program at an academic center using radiation dose monitoring software
A. Parakh, A. Euler, S. Schindera; *Basle/CH (anushri.parakh@gmail.com)*

Purpose: To track and analyse the radiation dose of different CT protocols with a dose monitoring software.
Methods and Materials: A CT dose optimisation program was carried out at an academic center for three years (2012-2014). The program included systematic protocol optimisation, educating and training technicians and investment in new dose-efficient CT scanners. During this time period, data from all diagnostic CT scans were automatically tracked and analysed with a software (Radimetrics, Bayer Healthcare). Different dose parameters (DLP and effective dose) were evaluated for routine CT of the head, thorax and abdomen-pelvis as well as for two dedicated low-dose protocols (urolithiasis and pulmonary embolism).
Results: The total number of CT scans increased by 20% from 18,794 in 2012 to 22,558 in 2014. The mean effective dose per CT scan decreased by 32.8% from 2012 to 2014 (7.6 vs 5.1 mSv). On comparing the median DLP between 2012 and 2014, there was a decrease from 1,095 to 706 mGycm for head, from 245 to 81 mGycm for thorax and from 668 to 498 mGycm for abdomen-pelvis. The median DLP decreased from 289 to 170 mGycm for the low-dose renal colic protocol and from 134 to 88 mGycm for pulmonary embolism protocol.
Conclusion: A comprehensive organized dose-optimisation effort for CT can result in substantial dose reduction to ensure best practice. Dose-tracking software is a useful tool for visualizing and analysing a large amount of dose-data to monitor optimisation efforts and processes.
Author Disclosures:
S. Schindera: Advisory Board; Bayer Healthcare. Research/Grant Support; Siemens, Bayer Healthcare, ulrich medical.

B-1289 14:49

Metal artifact reduction of hip prostheses: comparison of an iterative algorithm with virtual monoenergetic extrapolations from dual-energy CT
K. Higashigaito[1], F. Angst[1], V.M. Runge[2], H. Alkadhi[1], O. Donati[1]; [1]*Zurich/CH*, [2]*Berne/CH (Kai.Higashigaito@usz.ch)*

Purpose: To directly compare virtual monoenergetic extrapolations (VME) from dual-energy CT with iterative metal artifact reduction (iMAR) in human pelvis with hip prostheses.
Methods and Materials: A human pelvis phantom with uni-/bilateral metal inserts of different material (steel/titanium) was scanned with third-generation dual-source CT using single (120 kVp) and dual-energy (100/150 kVp) at similar radiation dose (CTDIvol:7.15 mGy). Three image series for each phantom configuration were reconstructed: uncorrected, iMAR from single-energy, and VME from dual-energy. Two independent, blinded radiologists assessed quantitative (noise and attenuation) and qualitative image quality. Intraclass correlation coefficients (ICC) and Cohen's kappa was calculated to evaluate inter-reader agreements. Repeated measures ANOVA was used to compare reconstruction algorithms regarding quantitative, Friedman-test regarding qualitative image quality. Post-hoc testing was performed for pairwise comparisons using a corrected (Bonferroni) p-value< 0.017.
Results: Agreements between readers were high for noise (all,ICC≥0.975) and attenuation (all,ICC≥0.986); agreements for qualitative assessment were good to perfect (all,κ≥0.678). Compared to uncorrected images, iMAR resulted in significantly lower noise in all regions and phantom configurations (all,$p < 0.017$), whereas VME showed noise reduction ($p < 0.017$) in the phantom with titanium only. In all phantom configurations, deviations of attenuation were small in images reconstructed with iMAR. Compared to uncorrected images, iMAR had significantly higher image quality in all phantom configurations (all,$p < 0.017$). VME showed higher quality in phantoms with titanium compared to uncorrected images, however, without reaching statistical significance ($p > 0.017$).
Conclusion: In all phantom configurations, iMAR showed better metal artifact reduction capabilities than VME, whereas VME showed good results only in phantom configurations with titanium prostheses.

B-1290 14:57

DICOM and HL7 security worldwide: adoption maps and country ratings
O. Pianykh; *Newton Highlands, MA/US (opiany@gmail.com)*

Purpose: The fundamental standards of digital medical data exchange, such as DICOM and HL7, date back to the late 1980s. And although these standards went through countless enhancements, one particular aspect - security -remained virtually untouched. The main purpose of our work was to perform the first comprehensive study of DICOM and HL7 security worldwide.
Methods and Materials: We used DICOM handshake and HL7 acknowledgement messages to develop a fast, parallel-processing security-probing application. Testing each IP address for its openness to transmit medical data (with no actual data transferred), the application scanned the entire worldwide space of IP addresses in 4 weeks. Geolocation services were used to map each unsecure IP identified. As a result, we compiled a comprehensive map of open DICOM/HL7 servers worldwide, with different levels of security threats.
Results: Our scan discovered 2774 DICOM (PACS) and 324 HL7 (HIS) servers worldwide, which were left open for external data access. DICOM/HL7 protocols were used to categorise our findings by different levels of security threats, and geolocation data - by countries and regions. As a result, we compiled DICOM/HL7 security ratings per country, per capita, and per IT infrastructure. We also built the first map of DICOM/HL7 adoption worldwide.
Conclusion: Medical imaging archives, left wide-open to DICOM and HL7 threats, are by far the most common security problem, which needs to be addressed with a robust, standardised, and fully implemented solution. Our results demonstrate the full scope of this problem, and the areas where it needs to be addressed.

B-1291 15:05

Is ISO 9001:2015 standard better for teleradiology services for reduction of risks for patients, doctors and healthcare providers than the old version 2008?
P. Sögner[1], T. Möller[2]; [1]*Feldkirch/AT*, [2]*Dillingen/DE (peter.soegner@aon.at)*

Purpose: After 15-year teleradiology experience with ISO 9001:2000 and 2008 in Austria and Germany in over 600,000 emergency cases, we evaluated the value of the new version 2015 in part of risk management for prevention or reduction of undesired effects of teleradiology services for patients, doctors, teleradiologists and healthcare providers.
Methods and Materials: We analysed the percentage of conformance of already 9001:2008-certified teleradiology-QM systems to the new versions of mandatory requirements in risk-based thinking. We evaluated our two different kinds of teleradiology services [public centre-based (Austria) and private home-based (Germany)].
Results: In version 9001:2008, risk management was officially excluded (chapter 0.4); in version 2015, it is a central part. 2008 mandatory requirements for "preventive" actions are only in chapter 8.5.3; in version 2015, risk-based thinking is demanded in following chapters: 0.4; 4.4.1.f; 5.1.1.d; 5.1.2.b; 6ff; 9.1.3.e and 9.3.2e. Analysing our existing teleradiology-QMS to these risk-related requirements, we found in our Austrian-QMS only 1 conformancy to avoid technical risks but already 5 conformancies with overall 15 CPIs (critical process indicators) in the QMS of the private-German company in medical competence, technical requirements and legal conformance (e.g. DIN 6868-59). The conformancy to new requirements of ISO-9001:2015 of Austrian-public centre-based teleradiology was only 15%, of German-private home-based teleradiology-QMS was already 65%.
Conclusion: To address and manage patients, doctors and healthcare providers, risks/opportunities as determined in accordance with the legal and medical requirements for teleradiology services new ISO 9001:2015 has a greater potential to avoid failures and risk in daily-routine for all customers.

B-1292 15:13

Preliminary assessment of a radiological safety management platform shared in six hospitals
P. Fraga, C. Benito, E. Fraile, J. Azpeitia, J. Albillos; *Madrid/ES (patricia.fraga@salud.madrid.org)*

Purpose: To present the results obtained in a tool of record of adverse effects shared in six hospitals in the first seven months of implantation.
Methods and Materials: In June 2014, a new adverse effects registration tool integrated with the RIS was implanted in our institution, formed by six hospitals. It is accessible from any of the 130 workrooms by any of the 200

workers between radiologists and technicians at any time of day. Access may be direct from each patient radiation request and can reflect the incident occurred during the whole radiological process, the severity, the patient safe impact and describe it. The events are evaluated on real time or regularly by a quality committee that reviews and analyses the results to adopt appropriate corrective or prevent actuations.
Results: During the first seven months, 900 events were registered; 80% were notified by technical staff and 20% by radiologists. According to their severity, 65% were mild, 30% moderate and 5% severe. 60% had already been solved at the time of notification. Every two weeks, the Committee meets for its assessment and strategies for action planning.
Conclusion: It is necessary to have a system of notification of adverse effects that guarantees the safety of the patient in each radiology department. We have a stable platform of easy access for workers who already have integrated amongst their tools. It allows reporting incidents, analyses and responds in real time. Regular meetings are necessary to assess all events and responsive to them.

B-1293 15:21

Knowledge of radiology informatics among radiologists and residents in training in a developing country
A. Kharat, A. Shah; *Pune/IN (kharatamit75@gmail.com)*

Purpose: Assess knowledge of radiology informatics (RI) among radiology consultants, residents in training through multiple choice questionnaires (MCQ's).
Methods and Materials: 246 radiologists assessed for RI using MCQ's, standard statistical analysis, MS Excel 2013. MCQ: Single Best Response. Questions: (total 48, 48 keys, 146 distractors) mandatory. Item analysis done. Focus: Basic concepts in RI. Post survey 3-point Likert analysis. August 2014 - January 2015.Concepts: DICOM, PACS, cloud, data mining, natural language processing, vendor neutral archive, radiology/ hospital information systems, Information Technology Act 2008.
Results: Of 48 MCQ's, 32 (66%) "Must know", 11 (22.91%) "Desirable to know", 5 (10.41%) "Nice to know". Average correct answers: 44.9 %, highest 70.8 %, lowest 20.8 %. Question answered correctly: "DICOM as the universal format for PACS" (85.3 %), least correct answer: "PACS is a medical device (2.4%). Correct acronym of DICOM lacking (51%). Average score experience by years: 1-3 (43.5%), 4-6 (51.4%), 7-9 (42.7%), > 10 (55.5%). Likert analysis: Need for knowledge on RI: 221 (89.83 %) agreed, 20 (8.1%) disagreed and 5 (2.03%) neutral. Recommendation for RI in curriculum: 201 (81.6 %) agreed, 24 (9.7%) disagreed, 21 (8.5%) neutral. Inclusion of RI in CME: 230 (93.49%) agreed, 2 (0.81%) disagreed, 14 (5.69%) neutral
Conclusion: Irrespective of years of experience, knowledge of RI low: Average score 44.9%, significantly < than 66%. RI training, inclusion in curriculum, CME needed to assist radiology departments in resource crunched developing countries to keep pace with innovations in developed world. This can streamline workflow, plan resource allocation, improve patient care.

14:00 - 15:30 **Room O**

Abdominal Viscera

SS 1901b

Abdominal surgery: the added value of radiology

Moderators:
I. Dudás; Budapest/HU
D. Vorwerk; Ingolstadt/DE

B-1295 14:00

Prediction of late postoperative hemorrhage after the Whipple procedure by CT performed at early postoperative periods
G. Han, S. Kim, N. Lee; *Busan/KR*

Purpose: Delayed postpancreatectomy hemorrhage (PPH) is serious complication of Whipple surgery. There are many reports about CT findings at the time of bleeding and clinical risk factors associated with late PPH. The purpose of our study is to evaluate the radiologic features associated with late PPH at first follow-up CT to assist intensive patient management.
Methods and Materials: This study included 151 retrospectively identified patients undergone Whipple surgery. Two radiologists reviewed CT images performed within 7 days after surgery, including presence of suggestive feature of pancreatic fistula and abscess, fluid along hepaticojejunostomy and pancreaticojejunostomy (PJ), the density of ascites and the size of visible GDA stump. Postoperative peritoneal fluid analysis was also evaluated. Simple and multivariate logistic regression analyses were performed to identify independent clinical and imaging variables associated with late PPH.
Results: 20 patients (13.2%) showed late hemorrhage due to abnormality of GDA stump or other vessels and active ulcer at anastomosis site. Although univariate analysis showed that infected fluid revealed on peritoneal fluid analysis, fluid with air along PJ, abscess, and larger size of GDA stump on CT were associated with bleeding, multivariate analysis revealed that only the last three variables were correlated with bleeding (p=0.013, 0.038, and 0.003, respectively). In bleeding group, each CT findings of pancreatic fistula and abscess was noted in 15 patients and size of GDA stump was 6.04 ± 3.88 mm.
Conclusion: Postoperative CT findings including GDA stump size, abscess, and pancreatic fistula could play important role in predicting late PPH.

B-1296 14:08

Pancreatic volume and texture as radiological predictors of pancreatic fistula after Whipple procedure
I. Shrainer, V. Voropaev, E. Mershina, V. Lyadov, V.E. Sinitsyn; *Moscow/RU (shrainer@gmail.com)*

Purpose: Patients after pancreatoduodenectomy (Whipple procedure) experience postoperative complications in up to 50-60% of cases. Many surgical and radiological reports describe pancreatic fistula as the most frequent complication (10-24%). The aim is to find out the radiological predictors of pancreatic fistula in patients after Whipple procedure.
Methods and Materials: We retrospectively analysed 32 patients who underwent Whipple procedure and had a preoperative CT scan as staging in our centre. CT images were processed to obtain measures of pancreatic texture (density in nonenhanced scan), whole pancreatic volume, volume of pancreatic remnant and diameter of main pancreatic duct.
Results: Pancreatic fistula occurred in 15 patients who were included in the first group, the others 17 patients did not have pancreatic fistula and were included to the second group. There were significant differences between the two groups in texture of the pancreas (38.58±3.6 HU vs 21.7±3.0 HU; t = 3.57; p = 0.05), whole pancreatic volume (32.1±3.4 cm3 vs 21.4 ±3.0 cm3; t = 2.32; p = 0.05), and volume of pancreatic remnant (18.4± 2.1 cm3 vs 12.1±1.4 cm3; t = 2.51; p = 0.05). The significant difference of main pancreatic duct diameter (3.9±0.7 mm vs 3.8±0.5 mm, t = 0.2; p = 0.05) was not determined.
Conclusion: Pancreatic texture, preoperative whole pancreatic volume and volume of pancreatic remnant are independent predictors of pancreatic fistula.

B-1297 14:16

MR elastography for the preoperative estimation of liver regeneration capacity in patients with hepatocellular carcinoma after major hepatectomy
S. Jang, J. Lee, D. Lee, I. Joo, J. Yoon, W. Chang, J. Han; *Seoul/KR (junemiru@gmail.com)*

Purpose: To evaluate the relationship between liver stiffness value measured at preoperative magnetic resonance (MR) elastography and regeneration capacity of the remnant liver after major hepatectomy which was measured using computed tomographic (CT) volumetry in patients with hepatocellular carcinoma (HCC).
Methods and Materials: 41 patients (mean age of 59, range 34-84 years) who had undergone right hepatectomy due to HCC were included in this study. All patients had preoperative CT, MR elastography, and follow-up CT scans obtained at a mean of 79.8 days (minimum 12 days) after the surgery. The METAVIR scoring system was used to assess the diagnostic performance of liver stiffness (LS) value measured from MR elastography. Volumetric measurements were semiautomatically performed using image processing software. Volumes of total functional liver, future liver remnant (FLR), and postoperative liver remnant (LR) were measured. The regeneration index was expressed as [(VLR-VFLR)/VFLR]×100, where VLR is volume of the liver remnant and VFLR is volume of the FLR. The relationship between MR elastography and regeneration index was compared using Pearson's correlation test.
Results: The mean VFLR and VLR was 491.4 mL ± 154.8 and 932.7 mL ± 197.2, respectively. The regeneration index of the liver remnant was 100.8% ± 57.0. Average LS value at MR elastography increased along with hepatic fibrosis stage. The LS values at MR elastography and calculated regeneration index showed moderate negative correlation (r=-.369, P=.018).
Conclusion: Liver stiffness value measured at MR elastography showed moderate correlation with liver regeneration capacity after major hepatectomy in patients with HCC.

B-1298 14:24

Different strategies to induce hypertrophy of the future liver remnant (FLR) in case of major hepatic resection: a prospective comparative study in 118 patients

P. Marra, M. Venturini, C. Sallemi, F. Ratti, F. De Cobelli, L. Aldrighetti, A. Del Maschio; *Milan/IT (marra.paolo@hsr.it)*

Purpose: Liver failure represents a severe complication of major hepatic resection. Our aim was to compare percutaneous portal vein embolisation (PVE), portal vein ligation (PVL), and associating liver partition and portal vein ligation for staged hepatectomy (ALPPS) in terms of FLR hypertrophy, complications and clinical outcome.
Methods and Materials: From 2004 to 2015, 118 patients with inadequate FLR underwent procedures to induce FLR hypertrophy before liver resection (73=PVE, 27=PVL and 18=ALPPS). PVE was performed percutaneously under US/fluoroscopy guidance using PVA particles, coils and glue, through a 4-Fr catheter. Total liver volume, tumour volume and FLR were calculated before both the procedure and surgery. The following outcome measures were considered: operating time, intraoperative blood losses, hospital stay, morbidity and mortality rates. Plasma samples were collected preoperatively and in 1st, 2nd and 5th postoperative day to assess liver function. Serum levels of WBCs, CRP, IL-6 and ET-1 were determined as markers of inflammatory surgical stress response.
Results: The groups had homogeneous pre-procedural volumes and comorbidities. In ALPPS group, FLR growth was faster than in PVE/PVL groups (PVE=5.45±3.17 cc/day, PVL=5.59±2.19 cc/day, ALPPS =21.03±11.09 cc/day, $p < 0.05$). More severe complications occurred in ALPPS group compared to PVE/PVL. Postoperative plasma levels of AST, ALT, WBC, CRP, IL-6 and ET-1 showed a higher increase after the first surgical stage in the ALPPS series compared with the same stage of PVE/PVL.
Conclusion: PVE and PVL induce FLR hypertrophy comparably. ALPPS allows a faster growth of FLR but with more complications. PVE is preferable to PVL if two-stage hepatectomy is not required. ALPPS should not substitute PVE or PVL but rather expand the pool of resectable patients.

B-1299 14:32

Accuracy of simple approaches to assessing liver volume in radiological imaging

J.-P. Kühn, A.-M. Roloff, M.-L. Kromrey, N. Hosten, P. Heiss; *Greiswald/DE (kuehn@uni-greifswald.de)*

Purpose: To evaluate the accuracy of diameters and volume indices for measuring liver size and to derive a simple approach for estimating liver volume.
Methods and Materials: Three hundred twenty-nine volunteers (cohort A) from a net sample of a population-based study were selected to form three subsets with different liver volumes: small (n=109), medium (n=110), large (n=110). True liver volume was determined by magnetic resonance imaging (MRI) using manual segmentation and defined as standard of reference in this study. Maximum diameters (maxdiam) of the liver and distances in mid-clavicular line (MCL) were measured in three and two planes, respectively. In addition, volume indices were calculated as a simple product of those diameters. Thereafter, the calculated volume indices were calibrated to predict true liver volume. Performance was evaluated in a control group (cohort B) of randomly selected volunteers (n=110). Statistical analysis was performed using linear regression and Bland-Altman analysis.
Results: There were strong correlations between diameters and true liver volume (rs = 0.631-0.823). Calculation of volume indices slightly improved correlation (maxdiam rs=0.903,MCL rs=0.920). In cohort A, calibration of volume indices was performed. In cohort B, high correlation between calibrated volume indices was confirmed (maxdiam rs=0.912,MCL rs=0.909). In addition, the low mean difference between predicted liver volume (maxdiam= -102 cm3;MCL= -116 cm3) and true liver volume confirms that the calibrated method allows accurate assessment of liver volume.
Conclusion: Both simple diameters and volume indices allow estimating liver size with high precision. A simple calibration formula enables prediction of true liver volume without significant expense.

B-1300 14:40

Intraoperative constrast enhanced ultrasound and color coded elastography for characterisation of liver lesions before surgical resection

N. Platz Batista da Silva, M. Loss, M. Hornung, C. Stroszczynski, E.M. Jung; *Regensburg/DE (natascha.platz-batista-da-silva@ukr.de)*

Purpose: To evaluate if IO-CEUS and CCE allow a differentiation between malignant and benign liver lesions in comparison to histopathology.
Methods and Materials: Retrospective evaluation of digitally stored intraoperative CEUS examinations. IO-CEUS and CCE of 98 liver lesions were compared to histopathology following surgical resection. Examinations performed by one experienced examiner using a multifrequency linear probe (6-15 MHz, LOGIQ E9/GE). Loops of CEUS evaluated during arterial (15-45s), portal venous (60-90s) and late-venous phase (2-5 min). Characterisation of the CCE performed using digital cine-loops > 10 s, based upon a color coded quality rating. Semi-quantitative analysis of the lesions' stiffness based upon a default scaling of 0-6 (0 low up to 6 high) performed using 7 ROIs (2 in the center, 5 in the marginal zone).
Results: Lesion diameter 4 - 80 mm, mean 27 mm. 89/90 malignant lesions displayed signs of malignancy in CEUS. 3 lesions could not be characterised definitely using IO-CEUS and CCE and were found to be a partially thrombosed hemangioma, a granuloma and a dystrophic fibrosis. 3 lesions were correctly diagnosed as complicated cysts using IO-CEUS. 2 cholangiomas were mistaken for malignant tumours. Overall accuracy of IO-CEUS 97%, sensitivity 98.8%, specificity 75%. Using CCE, malignant lesions were found to be inhomogenous, partially indurated in 58/90 lesions (max. 0.5-5.8, mean 3.2). Only 8 lesions showed central indurations (4-6). Overall accuracy of CCE 65.3%, sensitivity 64.4%, specificity 75%.
Conclusion: IO-CEUS offers clear benefits for localization and characterisation of liver lesions. CCE only partly allows a correct characterisation of lesions.

B-1301 14:48

Biliary cast syndrome: which T1 weighted sequence is able to show it best in patients after liver transplantation?

S. Kinner[1], P. Hunold[2], A. Dechene[1], T.C. Lauenstein[1], A. Laader[1]; [1]*Essen/DE*, [2]*Lübeck/DE*

Purpose: It has already been shown that T1-weighted (T1w) images in addition to MRCP facilitates detection of cast in patients after liver transplantation. Aim of this retrospective study was to compare unenhanced T1w sequences with regard to cast visibility.
Methods and Materials: 61 patients with liver MRI including MRCP on a 1.5 T MR and a subsequently performed endoscopic retrograde cholangiopancreatography (ERCP) with diagnosis and extraction of biliary cast were included. The following axial non-enhanced sequences were evaluated by 2 readers: (1)T1w 3D VIBE (volume interpolated breathhold examination), (2)T1w in-phase (IP) and (3)T1w opposed-phase (OP). Image quality (IQ) was evaluated using a 3-point scale (3:homogeneous signal, no artefacts, 1:inhomogeneous signal, strong artefacts). The conspicuity of cast was assessed using a 4-point scale (4:very good, 1:not visible). Wilcoxon Rank Test was applied with $p < 0.05$ indicating statistical significance. κ-values for interobserver agreement were assessed.
Results: IP and OP images showed similar scores for IQ (mean IP 2.75±0.44, OP 2.75±0.43), being significantly higher than VIBE (mean 2.60±0.53, $p < 0.05$ respectively), emphasized by a good inter-rater agreement (IP 0.78, OP 0.74). OP demonstrated significantly higher values for cast visualisation (mean 2.73±1.06, $p < 0.02$ respectively; VIBE 2.42±1.09, IP 2.60±0.95). In one patient, cast was only depicted in OP images. Inter-observer agreement was good (κ:VIBE:0.84, IP:0.84, OP:0.8).
Conclusion: OP was superior regarding IQ and cast conspicuity. Using OP as single non-enhanced T1w sequence in addition to MRCP for detection of cast in patients after liver transplantation might shorten MR protocols and optimise workflow in clinical routine.

B-1302 14:56

Pre-operative prediction of operating time for laparoscopic cholecystectomy using ultrasonographic and MRCP parameters

S. Vujnovic[1], D. Stojanov[2]; [1]*Banjaluka/BA*, [2]*Niš/RS (svujnovic@yahoo.com)*

Purpose: To determine if preoperative radiology data can predict duration of operating time for laparoscopic cholecystectomy (LC).
Methods and Materials: Following approval from the institutional ethical committee, a prospective study was carried out at University Clinical Center of Republic of Srpska, Banjaluka in 89 eligible patients. The sample comprised 62 female and 27 male (range 18-85 years) who underwent LC during November 2010 to January 2013. Patient characteristics, clinical history, ultrasonography and MRCP results as well as intra-operative details were prospectively analysed to determine predictors of operating time for LC.
Results: The final multivariate mode identified two significant predictors of operating time for laparoscopic cholecystectomy : male gender (p-value =0.001, Chi-square =11,745, df =1), and ultrasound messured common bile duct (CBD) diameter > 6.1 mm (p-value =0.006, Chi-square =11,221, df =1). MRCP had a positive prediction value for anatomical variations of the cystic duct of 0.974 and negative of 0.941. However, anatomical variations of the cystic duct is not significantly associated with operating time.

Conclusion: Clinical and ultrasonographic findings may help predict a operation time of LC. This information may be useful to both the patient and the treating surgeon. These predictors may be useful in anesthesia management, planning theater lists and in selecting patients for day surgery. MRCP is useful in evaluating cysitic duct but its routine use may not be justified.

B-1303 15:04

Nutritional status as a negative prognostic factor for postoperative complications after pancreaticoduodenectomy

R. Cervelli, C. Cappelli, L. Barbarello, U. Boggi, C. Bartolozzi; *Pisa/IT (rosa.cervelli@virgilio.it)*

Purpose: Since the 1970s postoperative mortality after pancreaticoduodenectomy (PD) has decreased, but morbidity still remains a problem. Classical prognostic factors are tumour type, tumour stage, surgeon expertise and hospital volume. Among newer factors, obesity, fat distribution and sarcopenia (muscle mass wasting) seem to play a role. The aim of our study was to evaluate if body fat, its distribution, and muscle mass, measured at preoperative CT, can predict postoperative morbility and mortality.
Methods and Materials: 77 (43 females; 34 males) patients undergoing open (40) or robotic (37) PD were examined. All patients underwent pre-operative CT exams. Preoperative parameters included sex, age, American Society of Anesthesiologists Score and body mass index (BMI). Total, visceral and subcutaneous abdominal fat tissue volume were measured with a semi-automatic algorithm (Synapse 3D Fat analysis) applied to unenhanced CT scan. Muscle mass was measured on a selected CT slice (iliac crest plain). Postoperative complications were graded according to Clavien's score.
Results: 60 patients had malignant tumours, 17 benign pancreatic diseases. Mean visceral fat volume was 2479±1588 cm3 and 1734±1174 cm3 in patients with malignant and benign lesions, respectively; the corresponding mean subcutaneous fat volume was 2422±1106 cm3 and 2411±1073 cm3. Patients with high visceral fat or low subcutaneous fat volume, and patients with low muscle mass had higher Clavien's score ($p < 0.0001$). Clavien's score was not statistically related to BMI, robotic/open surgery, or tumour type.
Conclusion: Our study confirms that obesity, cachexia and sarcopenia are associated with an increased risk of postoperative complications after PD. Nutritional support could improve these figures.

B-1304 15:12

Correlation between MRI imaging of intestinal endometriosis and laparoscopy in 80 lesions

A. Brandão, B. Barbosa, L. Cardeman, C. Crispi; *Rio de Janeiro/BR (brandaosalomao@gmail.com)*

Purpose: This paper aims to describe the most relevant MR imaging findings in intestinal endometriosis, relevant for surgical planning and to achieve appropriate control of the disease.
Methods and Materials: 80 lesions of bowel endometriosis were evaluated, before laparoscopy. Location, depth, circumference, multiplicity, size, and signal intensity characteristics were assessed by MRI. The exams were retrospectively evaluated (2012.2013), and were compared to the surgical report and histopatologic results. The MR protocol included axial, sagittal and coronal T2-weighted FSE images, axial T1-weighted gradient-echo images with and without FS, and sagittal T1-weighted gradient-echo with FS. Images are acquired before and after the intravenous injection of gadolinium. MR imaging was performed in a 1.5 T magnet (Signa, GE). To prevent intestinal and uterine contractions, butylescopolamine was injected intravenously. The preparation consisted of 10 mL of intravaginal gel and glycerin suppository before the examination, along with 80 ml of saline solution rectally.
Results: There was strong correlation between the MRI and laparoscopic findings procedure concerning most of the analysed aspects of the bowel endometriosis, including identification, location, the distance to the anus and depth of the lesions. A slight difference was seen concerning the extent of the injury, which sometimes was underestimated by the MRI. This may be due to physiological corrugation of the intestinal wall.
Conclusion: MRI has high sensitivity/specificity in assessing the extent of disease, determining precise longitudinal involvement of the intestinal wall, its location and the distance to the anal margin. MRI also allows the detection of associated diseases.

14:00 - 15:30 **Room N**

Cardiac

SS 1903

MR (2)

Moderators:
C. Herzog; Munich/DE
N.N.

B-1305 14:00

Evaluation of miocardial viability in patients with coronary hearth disease: MR-diagnostics

A. Ikramov, N. Djuraeva, M. Pirnazarov, A. Amirkhamzaev, A. Chekeridi, T. Zulina; *Tashkent/UZ (nika.kt@rambler.ru)*

Purpose: Contrast heart MRT feasibility study in myocardial viability evaluation in CHD.
Methods and Materials: Ten patients with postinfarction cardiosclerosis aged 60-65 were examined by GESignaHdxt1.5 T using 20-segment assay. Local contractility and global heart function were evaluated through systolic thickening pole maps, wall thickness and motion, LV functions. Myocardial perfusion was monitored after gadolinium-containing paramagnetic contrast agent (CA) intravenous injection (0.5 millimole/ml, 0.125 ml/kg, 5 ml/s) by Mississippi "Ulrih" injector. Perfusion defects - myocardial zones with hypointensive signal - CA intake delay. Deferred scanning was performed in 10-15-20 min after CA introduction using FGRE sequences (TI 80-150-200), evaluating cicatricial changes thickness and length - myocardium zones with hyperintensive signal.
Results: 115 segments of 200 with filling defects were revealed in myocardial perfusion evaluation. One patient (10%) presented with subendocardial defects in 2 segments. 2 patients (20%) presented with transmural defects in 7 segments. SPECT revealed 110 segments with perfusion defects in these patients. In addition to perfusion defects, local contractility malfunction was found in 15 segments in 4 patients (40%). In total 7 segments with akinesia and 8 segments with hypokinesia were found. Perfusion defect and malfunction of segment kinetics are definitive for viable myocardium. Apart from perfusion defect and kinetics malfunction unviable myocardium demonstrates deferred contrast associated with cardiosclerosis.
Conclusion: MRT with intravenous CA enables revealing of localization, perfusion intensity, myocardial contractility defects to higher precision. The technique allows estimation of disease extensity and ratio of scar size and viable myocardium. These data can be extrapolated to determine approaches and patient life prognosis.

B-1306 14:08

Comparison of cardiac imaging planes for quantification of T1 maps and myocardial extra-cellular volume (ECV)

M. Caballeros, J.M. Madrid, P. Bartolome, P. Garcia Barquin, J. Pueyo, G. Bastarrika; *Pamplona/ES (fcaballeros@unav.es)*

Purpose: Myocardial fibrosis can be measured non-invasively by CMR by calculating extra-cellular volume (ECV) using pre and post contrast T1 relaxation times of blood and myocardium. To date, the ideal slice orientation to estimate the amount of myocardial fibrosis remains undefined. This study was performed to compare differences in native and post-contrast T1 maps and ECV values obtained in short axis (SA) and four chamber views (4C).
Methods and Materials: 64 consecutive patients (48 male, mean age 59.7±15.3 years) underwent CMR examination on a 1.5 T magnet. Native and 15 minutes post-contrast T1 mapping (total Gadovist dose of 0.2 mmol/kg) was performed using single breath-hold Modified Look-Locker Inversion recovery (MOLLI) acquisition in mid SA and 4C views. Same size regions of interest were placed in the inferior septum (SA), mid septum (4C) and left ventricular cavity to obtain T1 values of myocardium and blood. Student t-test for paired samples, Pearson coefficient (r), Bland and Altman plots and Lin´s concordance-correlation coefficients (CCC) were calculated.
Results: No statistically significant differences were observed between SA and 4C derived native T1 (mean difference= 2.9±35.7 ms), post-contrast T1 (mean difference= 2.5±20.1 ms) and ECV (mean difference= 0.2±2.2%) values ($p > 0.05$). Correlation between SA and 4C quantification of native T1 (r=0.81), post-contrast T1 (r=0.96) and ECV (r=0.95) maps and agreement between these parameters (CCC=0.80; CCC=0.96, and CCC=0.95, respectively) was excellent.
Conclusion: Short axis and four chamber views equally allow quantification of native T1, post-contrast T1 and ECV maps. Correlation and agreement between these two imaging planes is excellent.
Author Disclosures:
G. Bastarrika: Speaker; Bayer and Siemens.

Sunday

B-1307 14:16

Diagnostic image contribution of gadolinium-enhanced VIBE sequences in cardiac MRI

N. Guberina, T. Schlosser, F. Nensa, M. Forsting, K. Naßenstein; *Essen/DE*

Purpose: The purpose of this prospective study was to evaluate whether the addition of axial Volumetric Interpolated Breath-hold Examination (VIBE) sequences in cardiac magnetic resonance imaging (MRI) contributes to the diagnostic confidence in diagnosis of extra-cardiac findings.
Methods and Materials: HASTE, cine, and inversion recovery are implemented standard sequences in the routine protocols for cardiac MRI. We evaluated additional axial VIBE-sequences in 111 patients with assumed or known coronary heart disease, myocardial infarction, cardiomyopathies, acute or chronic myocarditis, or metabolic disease. Cardiac MRI was performed at 1.5 T. Diagnostic confidence for the diagnosis of incidental pulmonic, mediastinal, abdominal, skin and bone lesions was evaluated using a five-point Likert scale (0 = indiscernible; 1 = certainly no lesion, 2 = probably no lesion, 3 = probably lesion, 4 = certainly lesion) for cardiac MRI with and without additional axial VIBE images.
Results: In 30 of the 111 patients, image quality, anatomical detailed depiction and consequently diagnostics were enhanced by post-contrast VIBE sequences. In 5/111 cases pulmonary lesions, in 7/111 cases bone lesions, in 1/111 case skin lesion and in 1/111 case breast lesion were diagnosed based on the VIBE-images. These findings were not discernable or rated as "certainly" or "probably no lesion" on HASTE-sequences. Furthermore, diagnostic confidence for vascular pathologies (e.g. vessel anomalies, thrombus) proved to be higher based on VIBE-sequences (5/111).
Conclusion: Additional axial VIBE-images of the thorax improve the diagnostic confidence for incidental extra-cardiac findings. Hence, additional post-contrast VIBE-sequences should be integrated into a standard cardiac MRI protocol.

B-1308 14:24

Simple and rapid evaluation of left ventricular function in cardiac MRI

A. Zidi, N. Mnif; *Tunis/TN (drzidiasma@yahoo.fr)*

Purpose: To test the MRI measurement of Mitral Annular Plane Systolic Excursion (MAPSE) and fractional shortening of the left ventricle (LVFS) as quick and simple means for estimating left ventricular function.
Methods and Materials: This a retrospective study of 77 patients investigated by MRI 1.5 Tesla including 37 patients with hypertrophic cardiomyopathy and 40 with acute myocarditis suspicion. Mitral excursion and fractional shortening of the left ventricle measurements were performed by cine MRI 4-chamber view sections. The left ventricular ejection fraction was performed by short axis stack according to the method of Simpson.
Results: The average value of MAPSE was 12.6 ± 4.7 mm.The average value of the LVFS was 38.66 ± 12.21%.The MAPSE and LVFS were significantly correlated with LVEF in all patients (respectively R = 0.252; p = 0.027 and R = 0.278; p = 0.014). The optimal value of MAPSE derived from the Receiver Operating Characteristic (ROC) curves of identifying patients with a LVEF < 50% was 11 mm (sensitivity = 80% and specificity =69, 4%). The optimal value of the LVFS identifying LVEF < 50% was 38, 5% (sensitivity =86.7% and specificity =58.1%).
Conclusion: Our study showed accurately that MAPSE and LVFS values are significantly correlated with LVEF and can be quick and simple indicators to surrogate measurement for left ventricular function.

B-1309 14:32

Diagnostic performance of 3.0-T whole-heart coronary MR angiography performed as a part of routine contrast-enhanced CMR study

A. Yamada, M. Ishida, Y. Goto, M. Uno, S. Nakamori, Y. Ichikawa, M. Nagata, K. Kitagawa, H. Sakuma; *Tsu, Mie/JP (akimasa09074033163@gmail.com)*

Purpose: To evaluate the diagnostic accuracy of 3.0-T whole-heart coronary MR angiography (MRA) performed as a part of routine comprehensive cardiovascular magnetic resonance (CMR) protocol for the detection of obstructive coronary artery disease (CAD).
Methods and Materials: Fifty-one patients (69.1±9.6 years) who underwent both whole-heart coronary MRA at 3.0-T and X-ray coronary angiography within 90 days were retrospectively evaluated. Free-breathing, navigator gated TFE coronary MRA was acquired as a part of routine contrast-enhanced CMR after late gadolinium enhanced MRI (0.15 mmol/kg of Gd-DOTA). Significant CAD was defined as luminal narrowing of ≥50% on quantitative coronary angiography in coronary arteries with a reference diameter of ≥2 mm.
Results: Acquisition of coronary MRA was completed in all 51 patients, with a mean imaging time of 16.4±3.5 minutes. The prevalence of significant CAD was 59% (30/51). The area under the receiver-operator characteristic curve (AUC), sensitivity, specificity and accuracy were 0.94, 89%, 92%, and 91% on vessel-based analysis, and 0.92, 97%, 76%, and 88% on patient-based analyses, respectively. The AUC, sensitivity, specificity and accuracy were comparable among three major coronary vessel territories (0.92, 83%, 89%, and 86% for left anterior descending artery; 0.94, 93%, 94%, and 94% for left circumferential artery; 0.94, 94%, 90%, and 92% for right coronary artery, respectively).
Conclusion: 3.0-T whole-heart coronary MRA performed as a part of routine contrast enhanced CMR study allows for accurate detection of significant CAD.

B-1310 14:40

Assessment of left-ventricle non-compacted myocardium magnetic resonance parameters modified by novel semi-automatic pixel intensity-based approach of trabeculae measurement

E. Pershina, V.E. Sinitsyn, E. Mershina; *Moscow/RU (pershina86@mail.ru)*

Purpose: To reassess left-ventricular (LV) MR parameters (non-compacted mass index and non-compacted mass percentage) for left ventricle non-compacted myocardium (LVNC) patients with novel semi-automatic pixel intensity-based trabeculae measurement method.
Methods and Materials: Cardiac MR examination was performed on 22 (9 males, 13 females, mean age 35.6±18.2 years) patients diagnosed with LVNC using standard echocardiographic criteria as well as additional clinical and imaging criteria and on 45 patients (32 males, 13 females, mean age 56.2±10.1 years) diagnosed with dilative cardiomyopathy (DCM) and hypertrophic cardiomyopathy (HCM), LV parameters such as total myocardial and non-compacted masses were determined in diastolic phase using a novel pixel intensity-based segmentation algorithm QMass MR 7.6 ("MassK" mode) (Medis). It was validated as an effective method to semi-automatic exclusion of trabeculae from the LV blood volume. Non-compacted mass index (NCMi) and non-compacted mass percentage (NCMp) were calculated.
Results: In NCM patients, NCMi and NCMp were higher (39.8±11.0 g/m2, 41.0±6% vs. 19.2±8.2 g, 18.0±6% and 25.0±12.1 g, 26.0±7%, p15 g/m2 and NCMp> 20%). For diagnosing LVNC with "MassK" mode ROC curves revealed following optimal cutoff values: 36 % for NCMp and 31 g/m2 for NCMi with sensitivity and specificity 71%; 98% and 77%; 91%, p < 0.0001, resp.
Conclusion: Novel semi-automatic pixel intensity-based approach in LVNC is an effective tool for quantification of non-compacted myocardial volumes. But its application in some cases may give results contradicting with previously proposed LVNC diagnostic criteria so further research in this field is needed.

B-1311 14:48

Late gadolinium enhancement (LGE) at 1.5 and 3 Tesla GE: can stronger fields detect more areas of fibrosis/necrosis? Preliminary evaluation

A. Mancini, V. Vellucci, L. Patriarca, F. Bruno, L. Panebianco, M. Paoli, R. Masi, E. Di Cesare, C. Masciocchi; *L'Aquila/IT (mancioo@hotmail.it)*

Purpose: Assessment of LGE is the goal of cardiac magnetic resonance (CMR) studies. To evaluate the clinical significant added value detecting areas of LGE with 3.0 Tesla.
Methods and Materials: Period: May 2015 - September 2015; population: 20 patients (12 M, 8 F), age 31-77 years (avg 52 years); cardiomyopathies: ischaemic (8); dilatative (4); myocarditis (3); chronic heart failure (3); hypertrophic (2). All patients had positive areas of LGE in the first CMR at 1.5 T, identified with 2DMDE Inversion Recovery (2DMDEIR) sequence in short axis (IR = 180-240 ms). All patients undergone to CMR at 3.0 T and LGE areas were evaluated with Phase-Sensitive IR (PSIR) sequence in short axis (TI = 280 - 420 ms). In post-processing (software: Cardiac VX) 2 expert cardiac radiologists drew an ROI and evaluated the areas in grams (g) of LGE, their values of signal intensity (SI) and rumour (R) in 1.5 T and 3.0 T. At the same time, another ROI in normal myocardium was used to compare SI and R.
Results: LGE areas (average grams): 1.5 T = 11.21 g; 3.0 T = 12 g (p > 0.05). Average of SI normal myocardium/LGE area ratio: 1.5 T = 2.59; 3.0 T = 5.28 (p &it 0.05). Average of R normal myocardium/LGE area ratio: 1.5 T = 1.39; 3.0 T = 1.58 (p &gt 0.05).
Conclusion: Our results indicate that assessment of LGE using 3.0 T is high-performing, especially in discriminating healthy/fibrotic myocardium. This should be considered when the detection of small areas of LGE is clinically significant.

B-1312 14:56

Accuracy and time-efficiency of an automated software tool to assess left ventricular volumes in cardiac MRI

P. Bartolome, P. Garcia Barquin, A. Quilez, M. Caballeros, J.C. Pueyo, G. Bastarrika; *Pamplona/ES (bastarrika@unav.es)*

Purpose: To assess the accuracy, reliability and time-efficiency of a recently commercialized fully automated left ventricular (LV) segmentation software tool to calculate LV volumes and function compared with conventional manual contouring.
Methods and Materials: Sixty-seven consecutive patients (53 male, mean age 62.5±10.9 years) underwent adenosine stress/rest perfusion CMR exam to rule out myocardial ischemia. Double-oblique short-axis 6-mm slice thickness steady-state free precession (SSFP) cine images were acquired to assess LV

ejection fraction (EF), end-diastolic volume (EDV), end-systolic volume (ESV), and stroke volume (SV) using manual contour tracing and a recently developed and commercially available fully automated software tool (syngo.MR Cardiac 4D Ventricular Function, Siemens Healthcare). Length of time needed to obtain LV volumes with each segmentation method was also compared.
Results: Compared with conventional manual contouring, the fully automated software tool minimally underestimated LV-EF (mean difference of 2.95±3.94%) and SV (mean difference of 4.43±8.53 mL) and slightly overestimated ESV (mean difference of 6.41±10.77 mL), whereas there was no statistically significant difference for EDV quantification (mean difference 1.99±11.2 mL). Agreement for EF (CCC=0.92), EDV (CCC=0.98), ESV (CCC=0.96), and SV (CCC=0.93) was excellent. The evaluated software allowed to quantify LV parameters with a 79% reduction in the time required for manual contouring.
Conclusion: Objective quantification of LV volumes using the evaluated fully automated segmentation software is reliable, accurate, and time-efficient.
Author Disclosures:
G. Bastarrika: Speaker; Bayer and Siemens.

B-1313 15:04

Quantification of myocardial extra-cellular volume (ECV) in adenosine stress/rest perfusion CMR examinations: effect of contrast dose
M. Caballeros, J. Madrid, P. Garcia Barquin, P. Bartolome, J. Pueyo, G. Bastarrika; *Pamplona/ES (fcaballeros@unav.es)*

Purpose: To establish the feasibility of estimating myocardial ECV in stress/rest perfusion CMR examinations and to analyse differences in ECV calculation after injection of single and double dose of contrast.
Methods and Materials: Thirty-seven consecutive patients (30 male, mean age 62±13 years) underwent an adenosine stress/rest perfusion CMR examination to rule out myocardial ischemia following a conventional contrast injection protocol (split dose of 0.1 mmol/kg, total gadobutrol dose of 0.2 mmol/kg). Native and post-contrast T1 mapping was performed using breath-held Modified Look-Locker Inversion recovery (MOLLI) acquisition. Student's t-test for paired samples, Pearson correlation coefficients, Bland-and-Altman plots and concordance-correlation coefficients (CCC) for T1 and ECV measurements were calculated.
Results: There was strong positive correlation between ECV estimations following single or double dose of contrast administration ($r=0.92$, $p < 0.001$). Slight systematic overestimation of single-bolus-derived ECV calculation (mean difference of 2.3±1.1%, 95%CI 1.9 to 2.7%) was observed. Concordance correlation coefficient for both ECV values was 0.66 (95%CI 0.51 to 0.76).
Conclusion: Estimation of myocardial ECV on conventional stress/rest CMR perfusion protocols is feasible. Post-contrast T1 maps obtained 15 minutes after a single bolus injection of 0.1 mmol/kg of contrast provide slightly higher myocardial ECV values

B-1314 15:12

Is it possible to distinguish infarcted area and area-at-risk using native T1 map in patients with acute ST-elevation myocardial infarction?
N. Galea, M. Francone, A. Fiorelli, L. De Luca, L. Agati, C. Catalano, I. Carbone; *Rome/IT (nicogale2000@yahoo.it)*

Purpose: Combined assessment of edema and necrosis using T2-weighted sequences and late gadolinium enhanced (LGE) imaging has been established as the reference standard for in-vivo assessment of myocardial damage in acute myocardial infarction (AMI).However the standard CMR protocol is time-consuming, not tolerated by patients in poor clinical conditions and needs of gadolinium administration. Our purpose was to investigate the capability of native T1-mapping to differentiate infarcted area, healthy myocardium and area-at-risk.
Methods and Materials: Twenty-seven consecutive patients performed CMR within the first 7 days following STEMI. CMR protocol included MOLLI, STIR T2w and cineMR sequences.LGE images were acquired after gadoterate meglumine (Gd-DOTA) administration. MOLLI images were analysed with a dedicated software (Cvi42, Circle) by placing four ROIs within necrotic areas (LGE area, excluding MVO), area-at-risk (hyperintense area on STIR images without LGE) and remote myocardium. Acquisition time of each sequence was measured. Results are expressed on mean±SD and compared with Student's t test.
Results: Mean T1 native value of patients (age 59±11 yrs) was 1299±57 ms in necrotic area (LGE+/MVO-),1088±60 ms in area-at-risk (LGE-/STIR+) and 988±89 ms in remote myocardium (LGE-/STIR-). Significant differences were found in the comparison of T1 values between all regions ($p < 0.01$ for all). Infarct size was 24±18% of left ventricular mass. Acquisition time of cineMR+mapping protocol was 24.9±8.9 min, whereas standard CMR protocol was 49.8±9.9 min ($p < 0.01$).
Conclusion: Native T1 mapping may reliably distinguish between necrotic area and salvageable area-at-risk in reperfused AMI and in future probably will provide a complete assessment of myocardial viability in shorter time and without contrast injection.

B-1315 15:20

Evaluation of left atrial function with MRI in patients with atrial fibrillation before and after pulmonary vein isolation and linear catheter ablation of the left atrial anterior line
A. Curta, S. Fichtner, R. Wakili, H. Estner, H. Kramer; *Munich/DE (adrian.curta@med.uni-muenchen.de)*

Purpose: An improvement in left atrial (LA) functional parameters post pulmonary vein isolation (PVI) with linear catheter ablation (CA) in patients with persistent atrial fibrillation (AF) has already been demonstrated through echocardiography. A confirmation by cardiac magnetic resonance imaging (cMRI) needs to be performed.
Methods and Materials: We acquired axial steady-state-free-precession (SSFP) cine-sequences for functional imaging of the LA on a 3 Tesla MRI system (MAGNETOM Verio, Siemens Medical) before and after CA with PVI and left atrial anterior line (LAAL). For statistical analysis, functional parameters pre- and post-CA were recorded. Patients were grouped in a) subjects with successful CA, i.e. sinus rhythm, and b) subjects without sinus rhythm at the time of follow-up-cMRI. Results were evaluated with a paired t-test; a p value of 0.05 was set as the significance level.
Results: 72 patients were included in the study. Pre- and post-ablation-cMRI was performed in 44 patients. The mean time before CA and follow-up-cMRI was 111 days (76-313). 8 individuals were excluded due to poor image quality. 30 patients were allotted to group a, 6 to group b. Group a showed a significant difference in ejection fraction (23.5±6.9% vs. 28.7±4.6%; p=0.000; CI=95%), end-systolic volume (107±47 ml vs. 96±37 ml; p=0.012; CI=95%) and stroke volume (32±13 ml vs. 38±12 ml; p=0.002; CI=95%) in follow-up-cMRI. Group b showed no significant changes in LA functional parameters in the follow-up-cMRI.
Conclusion: Successful PVI plus LAAL leads to a significant improvement in LA function by decreasing the LA endsystolic volume, hereby improving the ejection fraction in this cohort.

14:00 - 15:30 **Studio 2016**

Oncologic Imaging

SS 1916

Assessment and prediction of treatment response

Moderators:
L.S. Fournier; Paris/FR
A. Gogbashian; Middlesex/UK

K-37 14:00

Keynote lecture
N.N.

B-1316 14:09

Tumour response evaluation in daily practice: comparison between free-text evaluation and RECIST 1.1 criteria
J. Goebel[1], J. Hoischen[2], H.P. Schemuth[1], S. Kinner[1], F. Nensa[1], K. Nassenstein[1]; [1]*Essen/DE*, [2]*Düsseldorf/DE (Haemi.Schemuth@uk-essen.de)*

Purpose: Different criteria have been established to improve and standardize tumour response evaluation. Currently, these criteria are used in clinical trials, but rarely in daily work. This retrospective study compared free-text evaluation and application of RECIST 1.1 in everyday work.
Methods and Materials: One-hundred consecutive tumour patients with regular contrast enhanced computed tomographies (CT) of the trunk were identified in the radiology information system. Inclusion criteria were (1) known tumour disease and (2) at least 5 CT follow-ups. All CTs were re-evaluated using dedicated software (mint lesion™) applying RECIST 1.1 criteria. All free-text radiology reports were assigned to RECIST response categories (complete response, partial response (PR), stable disease (SD), progressive disease (PD)). Accordance in tumour response categories was analysed using Kendalls Tau.
Results: Main included tumour entities were lung (17%) and colorectal cancer (16%). Median time intervals between CTs were 9-12 weeks. At first follow-up, 47% of cases were rated differently comparing free-text and RECIST with an underrepresentation of SD and an overrepresentation of PR and PD using free-text. In the subsequent follow-ups, categorical differences were seen in

38%, 44%, 37%, and 44% of cases. Accordance between free-text and RECIST was strong to medium (Kendalls Tau: 0.611, 0.689, 0.541, 0.557, 0.487 (always: $p < 0.001$)) and tended to decrease with increasing observation period, which was mainly due to different reference points used for image analysis.
Conclusion: Severe differences in tumour response evaluation were detected comparing free-text and RECIST 1.1 evaluation. Given this, tumour response criteria should be implemented in the daily routine.

B-1317 14:17

Prognosis of pN0 esophageal cancer: determined by characteristic of lymph nodes on pre- and post neoadjuvant chemotherapy multi-detector row CT

Y.-K. Chi, Y. Chen, X.-T. Li, Y.-S. Sun; *Beijing/CN (nancy.cy@163.com)*

Purpose: Neoadjuvant chemotherapy improves the prognosis of patients with esophageal cancer. More patients obtain pN0 staging after surgery. The heterogeneity of prognosis of these patients poses a great challenge of customizing individualised therapeutic strategies. The signs of lymph nodes on CT scan can provide more information for evaluation. We investigated a new approach to LN-OS survival analysis by using peri-NCRT CT.
Methods and Materials: 135 patients who undergone curative resection after neoadjuvant chemotherapy were studied. 79 patients obtained pN0 staging. The sign of lymph node on both pre-NCRT and post-NCRT CT was acquired and analysed. The patients were divided into two groups (N0a and N0b) according to the LN size and number. The statistical significance was assessed by univariate and multivariate survival analysis.
Results: The LN number on pre-NCRT CT and size on post-NCRT CT remained the independent predictor of survival. Using these two factors as classification criterion, N0b group included patients with LN number> 4 on pre-NCRT CT and short-axis diameter of MaxLN > 7 mm on post-NCRT CT and the rest of pN0 patients were included in N0a group. N0a group (5-year survival rate: 75.2%) had a significantly better overall survival than N0b group (5-year survival rate: 32.6%). The overall survival of N0b group was similar to that of patients with pN1 staging (p=0.801).
Conclusion: The LN size and number on peri-NCRT were proved important prognostic factors in patients with pN0 esophageal cancer. This criteria can distinguish the pN0 patients into N0a and N0b, according to the different prognosis.

B-1318 14:25

Enhancement on subtraction MRI can predict lesion progression of hepatic metastasis in malignant melanoma patients

M. Lee, S.-E. Baek, H. Kim; *Seoul/KR (liverpoolnic@yuhs.ac)*

Purpose: To determine whether contrast-enhanced MRI adopting subtraction sequences can be applied to predict the treatment response of melanoma liver metastasis.
Methods and Materials: The MRI of 41 liver metastases in 15 patients (male, 11, female, 4; median age, 56 years) were retrospectively analysed. Two radiologists independently assessed the following parameters and consensus was reached for disagreements: The presence or absence of enhancement on 1) arterial/portal phase and 2) subtraction sequences (arterial/portal phase - precontrast phase). 3) T2 signal intensity (SI). Cohen's kappa value was calculated for each parameter. Follow-up CT or MRI obtained 1~3 months afterwards were used to determine treatment response according to RECIST 1.1 (progression vs. non-progression). Analysis with generalized estimating equations was performed (enhancement on subtraction sequence).
Results: The markedly high T1 SI of the lesions on precontrast images obscured enhancement. Consequently, positive enhancement could be identified in 15% (n=6/41) lesions on routine arterial/portal phase, but 68% (n=28/41) in subtraction images. The interobserver agreement of subtraction sequence interpretation was fine ($\kappa = 0.68$). Follow-up studies determined lesion progression in 34% (n=14/41). The progressed lesions all showed iso-to-intermediate high T2 SI (100%, n=14/14) whereas non-progressive lesions showed low T2 SI in 29.6% (n=8/27) and iso-to-intermediate high SI in 70.3% (n=19/27). Lesion progression was associated with positive enhancement on subtraction images (odds ratio=12.1, $P < 0.05$).
Conclusion: MRI adopting subtraction sequences can improve the detection of contrast enhancement of melanoma liver metastasis. Positive contrast enhancement in a melanoma liver metastasis is associated with higher risk for progression.

B-1319 14:33

18 F-FDG PET/CT prognostic value in the treatment of metastatic melanoma with anti-PD1 monoclonal antibodies

L. Facchetti, L. Nardo, K. Loo, A. Algazi, K. Tsai, A. Daud, M.H. Pampaloni; *San Francisco, CA/US (facchettil@gmail.com)*

Purpose: To investigate the value of early changes in hypermetabolism on 18 F-FDG PET/CT studies in the treatment of metastatic melanoma using anti-PD1 monoclonal therapy.
Methods and Materials: Twenty-six highly selected patients (age 62.2±15.5 y) with metastatic melanoma were prospectively enrolled from March, 2012. Inclusion criteria: (i) measurable metastatic disease determined by RECIST criteria on cross-sectional studies obtained the month prior to enrolment, (ii) 18 F-FDG PET/CT scan with diagnostic CT component (not for attenuation correction only) obtained at both baseline and 16 weeks after first treatment injection, (iii) bimonthly follow-up visits. Each study was assessed according RECIST scoring system. Size, site and maximum standardised uptake value (SUVmax) of the lesions were recorded as patient medical condition. The most intensely FDG-avid lesion was selected for each baseline study and the difference of SUVmax between baseline and follow-up was calculated. Cox proportional hazards and Kaplan-Meier models were used to examine association between imaging findings and overall survival (OS).
Results: Mean survival time was 20±10 months; 19 patients were alive at the end of the study (09/2015). According to RECIST criteria, complete response, partial response, stability and progression of disease were achieved by 6, 10, 5 and 5 patients, respectively. Nine patients had stable or increased hypermetabolic lesions. Decreased SUVmax correlated with OS ($P < 0.05$, ExpB=0.89). Neither RECIST response nor FDG avidity at the baseline correlates with OS ($P > 0.05$). Liver metastases at baseline predicted shorter OS ($P < 0.01$).
Conclusion: Early decrease in FDG avidity of target lesions correlates with better overall survival, whilst the presence of liver metastases is associated with poor overall survival.

B-1320 14:41

Prognostic value of baseline 18 F-FDG PET/CT and laboratory parameters in treatment of metastatic melanoma with anti-PD1 monoclonal antibodies

L. Nardo, L. Facchetti, K. Loo, A. Algazi, K. Tsai, A. Daud, M.H. Pampaloni; *San Francisco, CA/US (lorenzo.nardo@ucsf.edu)*

Purpose: To assess molecular imaging, clinical and laboratory findings as prognostic parameters in the metastatic melanoma treatment with anti-PD1 monoclonal therapy.
Methods and Materials: Thirty-nine patients (age 63.3±14.6 y; 18 females; 27 cutaneous primary site) were prospectively enrolled from March, 2012. Inclusion criteria were (i) measurable metastatic disease determined by RECIST criteria on cross-sectional studies obtained in the month prior to enrolment, (ii) 18 F-FDG PET/CT obtained within a month before first treatment injection, (iii) white blood cells (WBC) count and lactate-dehydrogenase (LDH) obtained in the week before first treatment injection and (iv) compliance with regular clinical follow-up visits every 3-6 months. PET/CT studies were assessed for standardised uptake (SUVmax), number and site of target lesions. WBC count and LDH levels as well as site of primary melanoma were recorded at baseline. Cox proportional hazards and Kaplan-Meier models were used to examine associations between imaging, clinical and laboratory findings with the overall survival (OS).
Results: The mean survival time was 18±11 months; 22 patients were alive at the end of the study (September, 2015). Correlation between number of hyper-metabolic lesions ($P < 0.01$), presence of liver metastases ($P < 0.01$), cutaneous primary site ($P < 0.05$), LDH values ($P < 0.01$; ExpB=1.008), WBC counts ($P < 0.05$; ExpB=1.199) and overall survival was demonstrated. However, no definite correlation between SUVmax values and OS was noted ($P > 0.05$).
Conclusion: The number and site of hyper-metabolic lesions along with LDH and WBC count might represent a prognostic parameter in the treatment of metastatic melanoma using anti-PD1 antibody.

B-1321 14:49

Early shear-wave elastography measurements in liver metastasis after neoadjuvant chemotherapy: preliminary results

J.F. Carlsen, C. Ewertsen, C. Lauritzen, M.B. Nielsen; *Copenhagen/DK (jonathan.carlsen@gmail.com)*

Purpose: To assess if any changes of liver metastasis stiffness are observed in early ultrasound shear-wave elastography measurements following chemotherapy treatment.
Methods and Materials: Eighteen patients (5 women, 13 men, median age 69, range 59-80 years) scheduled for chemotherapeutic downstaging of colorectal cancer with CT-verified liver metastases were prospectively

included. Ten shear-wave speed measurements of one liver metastasis were performed in each patient prior to and two weeks after initiation of chemotherapy treatment. Measurements were performed on a Philips Epiq 7G scanner using a 5-MHz curved array transducer. In a subgroup of 14 patients, 10 shear-wave speed measurements in adjacent non-metastatic liver tissue were also performed.
Results: The average increase in shear-wave speed in liver metastases before and two weeks after administration of chemotherapy was 0.38 m/s, SEM 0.14, which was significant using a paired t test (P=.015). No significant changes of shear-wave speed in adjacent healthy liver tissue were seen during the same period (P=.268).
Conclusion: Changes in the stiffness of liver metastasis during chemotherapy can be measured as early as two weeks after initiation of treatment. No significant change in liver parenchymal stiffness was seen in the same period. The underlying mechanisms of increased liver metastasis stiffness are not yet clear, but if the changes in metastasis stiffness are correlated to response to chemotherapy, shear-wave elastography may in future be used for early evaluation of treatment response.

B-1322 14:57

Estimated relative hepatic tumour burden at baseline CT in a colorectal cancer cohort treated first-line with targeted therapy: predictive relevance with respect to overall survival

N. Hesse, V. Heinemann, J. Holch, F. Hofmann, A. Baumann, M. D'Anastasi, W. Sommer; *Munich/DE (nina.hesse@med.uni-muenchen.de)*

Purpose: Estimation of total hepatic tumour volume is important for tumour response assessment. The aim of our study was to analyse the predictive relevance of estimated relative hepatic tumour burden for overall survival.
Methods and Materials: 243 patients with metastatic colorectal cancer were treated with identical targeted chemotherapy as part of a phase-III clinical trial. After an initial training phase on 36 patients from a different cohort, two radiologists estimated relative hepatic tumour burden (eTB) at baseline CT independently and in random order. Estimations were done in 1% increments up to 10% eTB, over 10% eTB in 5% increments and averaged between both readers. The cohort was dichotomised: eTB≤5% and eTB> 5%. Overall survival (OS) was compared by performing Kaplan-Meier analysis.
Results: OS was significantly longer for patients with eTB≤5% (n=140) than for patients with eTB> 5% (n=103); ($p < 0.012$). Median OS was 73 days longer for patients with eTB≤5% (794d vs. 721 d). These differences were comparable at 75% survival quartile (Δ94 d, 516 d vs. 422 d), but larger at 25% survival quartile: patients with eTB≤5% lived 388 days longer (1359 d vs. 971 d). This is also reflected by survival rates over time for patients with eTB≤5% vs. eTB> 5%: year one 0.85 [95%-CI: 0.80-0.92] vs. 0.79 [0.72-0.88], year three 0.37 [0.29-0.47] vs. 0.20 [0.12-0.32], year four 0.20 [0.12-0.32] vs. 0.11 [0.05-0.22].
Conclusion: Estimated relative hepatic tumour burden in the liver could be a valuable imaging biomarker for overall survival in patients with metastatic colorectal cancer. In the examined population, a high volume of liver metastases affects especially the survival in the long term.

B-1323 15:05

Neuroendocrine tumours treated with ^{90}Y-DOTATOC radionuclide therapy: early response assessment with whole body diffusion-weighted MRI predicts survival

V. Vandecaveye, S. Van Binnebeek, R. Dresen, K. Haustermans, C. Verslype, E. Van Cutsem, F. De Keyzer, D. Christophe; *Leuven/BE (vincent.vandecaveye@uz.kuleuven.ac.be)*

Purpose: Response assessment of peptide receptor radionuclide therapy (PRRT) with yttrium-90 (^{90}Y) DOTATOC in disseminated neuroendocrine tumours (NET) is challenging as initial anatomical or molecular imaging response rarely correlates to long-term outcome. Diffusion-weighted (DWI) magnetic resonance imaging (MRI) allows response assessment by measuring changes in tissue microstructure. Our aim was to evaluate whole body (WB)-DWI for early response assessment of PRRT.
Methods and Materials: Forty patients with disseminated NET, progressive under conventional treatment, prospectively and consecutively underwent 3 Tesla WB-DWI prior to and 7 weeks after the first cycle of ^{90}Y-DOTATOC. Treatment responses at 7 weeks were assessed with apparent diffusion coefficient changes at 7 weeks to baseline ($ADC_{ratio7w}$) at WB-DWI and RECIST 1.1 measurements at contrast-enhanced MRI. Kaplan-Meier and log-rank tests were used to correlate the response variables with progression-free (PFS) and overall survival (OS).
Results: Median PFS was 9 months and median OS was 17 months. Survival analyses showed significant effects on PFS by the number of therapy cycles (p=0.026), tumour grade (p=0.024) and $ADC_{ratio7w}$ ($p < 0.0001$) as well as significant effects on OS by the number of therapy cycles (p=0.006), tumour grade (p=0.0047), nuclear antigen KI67 index (p=0.013) and $ADC_{ratio7w}$ ($p < 0.0001$). After multivariable analysis, the $ADC_{ratio7w}$ remained the only significant predictor of 9 months PFS (p=0.011) and 17 months OS (p=0.001). Contrary, RECIST 1.1 did not show any correlation with outcome.
Conclusion: The $ADC_{ratio7w}$ at WB-DWI was an independent predictor of PFS and OS for disseminated NET treated by ^{90}Y-DOTATOC.

B-1324 15:13

Added value of pre-treatment apparent diffusion coefficient in rectal cancer for predicting local recurrence

M. Lee, S. Cho, G. Kim, H. Kim, K. Shin, S. Lee, W. Kim, J. Park, G. Choi; *Daegu/KR (minga0423@naver.com)*

Purpose: To assess the complementary prognostic value of pre-treatment tumour apparent diffusion coefficient (ADC) for the prediction of tumour recurrence in patients with rectal cancer.
Methods and Materials: From March 2012 to March 2013, a total of 128 patients with mid/lower rectal cancer who underwent pre-treatment rectal MRI were enrolled in this retrospective study. Two radiologists in consensus evaluated conventional imaging features (C_{img}) in pre-treatment rectal MRI: tumour height from anal verge (≤5 cm vs. > 5 cm), T stage (high vs. low), presence or absence of lymph node metastasis, mesorectal fascia invasion, and extramural venous invasion. The mean tumour ADC values ($Tumor_{ADC}$) based on high b-value (0, 1000 $x10^{-3}$ mm^2/s) diffusion weight images were extracted. A multivariate Cox proportional-hazard (CPH) regression was performed to evaluate the association of C_{img} and $tumour_{ADC}$ with the 3-year local recurrence (LR) rate. Predictive performance of two multivariate CPH models (C_{img} only vs. C_{img} + $tumour_{ADC}$) was compared using Harrell's c index (HCI).
Results: A $tumour_{ADC}$ (Adjusted HR, 6.461; 95% CI 2.915-14.320) and high T stage (Adjusted HR, 6.677; 95% CI 2.117-21.058) were independently associated with the 3-year LR rate. The CPH model generated with T stage + $Turmor_{ADC}$ (HCI, 0.813; 95% CI 0.697-0.928) showed significantly higher HCI than that with T stage only (HCI, 0.734; 95% CI 0.578-0.890) ($P = 0.014$).
Conclusion: In patients with mid/lower rectal cancer, integrating $Turmor_{ADC}$ to C_{img} increases predictive performance of the CPH model than that with C_{img} alone for the prediction of LR within 3 years after surgery.

B-1325 15:21

Pretreatment tumour CT density is associated with overall and progression-free survival and tumour growth in patients with metastatic renal cell carcinoma under antiangiogenic therapy

S. Matoori, A. Sohaib, D.-M. Koh, Y. Thian, A. Gutzeit; *Sutton/UK (simon.matoori@pharma.ethz.ch)*

Purpose: To evaluate the relationship between pretreatment computed tomography tumour density and overall survival (OS), progression-free survival (PFS), and tumour growth in patients with metastatic renal cell carcinoma (mRCC) treated with sunitinib.
Methods and Materials: Pretreatment and first follow-up contrast-enhanced CT scans of 63 mRCC patients subsequently treated with sunitinib between October 2008 and March 2013 were retrospectively reviewed. Using Cox regression analysis, pretreatment mean CT density of metastatic renal cell cancer was related to OS and PFS. Pretreatment mean CT density was further correlated with tumour size at first follow-up divided by tumour size at baseline.
Results: High mean CT density before treatment was associated with prolonged PFS and increased OS [hazard risk (HR) 0.968, 95% confidence interval (CI) 0.948-0.989, p=0.002, and HR 0.956, 95% CI 0.931-0.982, p=0.001, respectively]. High pretreatment mean CT density was further associated with reduced tumour growth at first follow-up (Spearman's rho=-0.323, p=0.010).
Conclusion: High pretreatment CT density of renal cell metastases was associated with improved PFS and OS, and reduced tumour growth following sunitinib treatment, indicating that highly vascularised metastases are more susceptible to antiangiogenic therapy. The pretreatment CT tumour enhancement value is a promising predictive and prognostic factor, which may improve the selection of patients who would benefit from multi-kinase inhibitor treatment.

14:00 - 15:30 **Room L8**

Genitourinary

SS 1907

Imaging of the reproductive system

Moderators:
G. Masselli; Rome/IT
K.B. Puzakov; Moscow/RU

B-1326 14:00

The added value of diffusion-weighted MRI in diagnosis of polycystic ovary syndrome: a preliminary study

M. Deveer[1], R. Deveer[1], N. Cullu[1], O. Yeniceri[1], A. Sivrioglu[2]; [1]*Mugla/TR*, [2]*Istanbul/TR (deveer3@hotmail.com)*

Purpose: Our aim was to determine whether patients with Polycystic Ovary Syndrome (PCOS) have different apparent diffusion coefficient (ADC) values, compared with healthy controls.
Methods and Materials: A cross-sectional study was carried out in 40 women of at fertile age. Patients were divided as PCOS group (20 patients) and healhty control group (20 patients). The mean ADC values of patients were measured and compared between two groups. A Pearson correlation coefficient analysis was used to determine the association of ovarian volume with mean ADC values. Receiver-operating characteristic (ROC) method was used to predict a threshold value for the diagnosis of PCOS by using ADC values.
Results: ADC values of patients with PCOS were found to be lower than those of healthy controls. The sensitivity and specificity of ADC values were 75% and 75%, respectively for patients with PCOS. Area under the curve was 0.810 and cut-off point of 1.63x 10-3 /mm2 for ADC value. We found no correlation between mean ADC values and mean ovarian volume.
Conclusion: The measurement of mean ADC value of ovaries may be a useful adjunt in the diagnosis of PCOS.

B-1327 14:08

Cyclic changes of the junction zone on 3 T MR images in young and middle-aged females during the menstrual cycle: anatomical and functional values

Y. He, N. Ding, H. Xue; *Beijing/CN (ylhe_526@163.com)*

Purpose: To evaluate cyclic changes of junction zone on 3 T MR images in different age groups during menstrual cycle, and the correlation with basic hormone levels.
Methods and Materials: 38 normal volunteers (20-30 yrs, n=22; 31-40 yrs, n=16) with regular menstrual cycle accepted pelvic MR examination on menstrual phase (MP), follicular phase (FP), peri-ovulatory phase (OP), luteal phase (LP) respectively. T2 3D-Space, T2 mapping and diffusion tensor imaging (DTI) were performed on a 3 T MRI scanner (Magnetom Skyra, Siemens). Thickness, T2 values, FA and ADC values of junction zone on midsagittal images were blinded measured by two radiologists. Linear mixed model was used to evaluate the differences between age groups during menstrual cycle. Serum levels of oestradiol (E), progesterone (P), luteinizing hormone (LH) and follicle stimulating hormone (FSH) were measured on MP, compared with MR anatomic and functional values using Pearson correlation analysis.
Results: When age increased, thickness of anterior and posterior junctional zone showed significant increase ($p < 0.05$). In 20-30 yrs group, thickness of MP was significant thicker than that of other three phases ($p < 0.05$). Serum E levels correlated moderately with variation of thickness during menstrual cycle. When age increased, ADC values showed significant decrease (p=0.02). In both groups, ADC and T2 values of junctional zone showed significant difference between MP and LP ($p < 0.05$). Serum E, P, LH levels correlated moderately with variation of ADC and T2 values during menstrual cycle.
Conclusion: Thickness and ADC values of junctional zone showed significant difference between two age groups. Cyclic changes of thickness, ADC and T2 values were found during menstrual cycle, which moderately correlated with basic hormone levels.

B-1328 14:16

Placental elasticity and histopathological findings in normal and intrauterine growth restriction pregnancies assessed with strain elastography in ex vivo placenta

G. Durhan, H. Ünverdi, C. Deveci, M. Büyükşireci, T. Değirmenci, A. Bayrak, P. Koşar, S. Hücümenoğlu, Y. Ergün; *Ankara/TR (gamzedurhan@gmail.com)*

Purpose: The aim of this study was to investigate the clinical utility of placental elasticity in the prediction of intrauterine growth restriction (IUGR) and also to show whether or not there is any association between histopathological changes and placental elasticity.
Methods and Materials: 55 human placentas were collected at delivery, including 25 with IUGR and 30 controls with no maternal or fetal complications except pre-term birth. Strain elastography (SE) was performed ex-vivo and all placentas were examined histopathologically from the three regions of centre, intermediate and edge of the placenta. Elasticity index (EI) and histopathological findings such as infarct, villitis, villous immaturity, decidual vasculopathy, chorioamnionitis, increased syncytial knots, perivillous fibrin deposition, intervillous thrombus and fibrosis were compared between IUGR and control groups. Any association between histopathological findings and EI was investigated.
Results: The placentas of the IUGR group were significantly stiffer than those of the control group ($p < 0.05$). Compared with controls, IUGR group showed more histopathological changes. Histopathological findings were associated with decreased EI values, although difference between groups did not reach statistical significance in some histopathological findings and in different regions of placenta.
Conclusion: The placental stiffness and presence of histopathological changes were higher in IUGR group than in controls. SE may be used as an imaging method supplementary to those in current use for the diagnosis of IUGR. The presence of histopathological findings was associated with decreased EI values and reduced placental elasticity could be the result of the cumulative effects of all the histopathological findings in IUGR.

B-1329 14:24

Apparent diffusion coefficient is significantly decreased in monochorionic diamniotic twin pregnancies with selective intrauterine growth restriction

L. Fu; *Shanghai/CN (fule0125@qq.com)*

Purpose: Apparent diffusion coefficient (ADC) was demonstrated as a reliable marker to detect intrauterine growth restriction in singleton pregnancy. Here, we employed diffusion-weighted MR imaging (DWI) to explore the correlation of ADC and selective intrauterine growth restriction (sIUGR) in monochorionic diamniotic (MCDA) twin pregnancies.
Methods and Materials: A total of 60 MCDA twin pregnancies without twin-twin transfusion syndrome was retrospectively analysed by DWI. MCDA twins were divided into two groups: with/without sIUGR. Two regions of interest, which located nearby the insertion of the umbilical cord of each twin, were defined in each placenta. And ADCs in these regions were quantitative. Furthermore, rADC (ADCHigh/ADCLow) in each placenta was also evaluated. In addition, ADCs and rADCs were compared between cases with/without sIUGR.
Results: Altogether, 28 cases with sIUGR and 32 cases without sIUGR were included. Compared with sIUGR cases, the value of ADC in cases without sIUGR was significantly increased (1.85 ± 0.22 vs 2.41 ± 0.18, $p < 0.001$). Meanwhile, the rADC in cases with sIUGR was significantly increased (1.54 ± 0.31 vs 1.12 ± 0.16, $P < 0.05$), suggesting the heterogeneity of placenta in sIUGR cases.
Conclusion: ADCs correlated well with sIUGR in MCDA twin pregnancies, and placentas in sIUGR cases trended to be heterogeneous.

B-1330 14:32

The value of preoperative static and dynamic MRI for predicting occult stress urinary incontinence

N. Li, C. Yu; *Tianjin/CN (nalilina1989@163.com)*

Purpose: Part of patients with pelvic organ prolapse (POP) but without symptoms of stress urinary incontinence (SUI) may demonstrate SUI after pelvic reconstruction (occult SUI), currently no optimal preoperative method is available for it. This study aim to estimate the value of MRI for predicting occult SUI preoperation.
Methods and Materials: 47 POP patients were enrolled for advanced prolapse without complaining of SUI. Preoperatively static and dynamic MRI of pelvic floor were performed with prolapse reduction. Levator ani muscle (LAM, including puborectalis and iliococcygeus) injury, urethral mobility, vesical neck movement, and urethral sphincter dysfunction (defined as funneling at the urethrovesical junction) were recorded. Primary outcome was de novo SUI at 1 year postoperative follow-up.
Results: Of the 47 patients, 5 cases (10.6 %) exhibited de novo SUI postoperatively. Occult SUI patients were having more minor but not major LAM defects than continent patients, both in puborectalis (minor 40.0% vs. 21.4%, major 60.0% vs. 50%; P=0.06) and iliococcygeus (minor 80.0% vs. 33.3%, major 20.0% vs. 19.0%; P=0.33). Vesical neck downward movement measured in Occult SUI patients was more obvious than continent patients (23.4 ± 16.4 vs. 19.9 ± 11.4, P=0.06). Urethral mobility was equally active in Occult SUI patients and continent patients (50.8 ± 32.4 vs. 50.4 ± 26.1, P=0.46). Urethral sphincter dysfunction and funneling were present in all of Occult SUI patients whilst only 7.14% in continent patients.

Conclusion: The MRI examination preoperation is feasible for screening occult SUI, and funneling at the urethrovesical junction can be treated as a practical indicator.

B-1331 14:40

Adnexal torsion: added diagnostic value of coronal reformations at CT

Y. Yim, S. Jung, M. Yu, H. Park, Y. Kim, H. Jeon; *Seoul/KR*
(youngheeyim@gmail.com)

Purpose: To evaluate the incremental value of using coronal reformations in addition to a transverse CT scan for the detection of adnexal torsion.
Methods and Materials: This study included total 106 women suspected of having adnexal torsion who underwent CT with coronal reformations and subsequent surgical exploration. Two readers independently recorded the presence of CT findings such as the thickening of a fallopian tube, twisting of the adnexal pedicle, uterine deviation to the twisted side, ascites, fatty infiltration of the pelvic cavity, eccentric smooth wall or septal thickening of the torsed adnexal masses, or poor enhancement of the torsed adnexal mass, and the overall impression of adnexal torsion with a transverse scan alone or combined coronal reformations and a transverse scan. The areas under the receiver operating characteristic curves (AUCs), sensitivity, specificity, positive predictive value, and negative predictive value were used to compare diagnostic performance.
Results: Fifty-two patients were confirmed to have adnexal torsion. For the overall detection of adnexal torsion, the addition of coronal reformations to the transverse scan improved AUCs for readers 1 and 2 from 0.74 and 0.75 to 0.92 and 0.87, respectively ($P < 0.05$). The sensitivity regarding a CT finding of twisting of the adnexal pedicle increased significantly for readers 1 and 2 from 0.27 and 0.29 with a transverse scan alone to 0.79 and 0.77 with combined coronal reformations and a transverse scan, respectively ($P < 0.05$).
Conclusion: Coronal reformations in addition to a transverse CT scan can improve detection of the adnexal torsion.

B-1332 14:48

Role of diffusion-weighted magnetic resonance imaging of testes in patients with testicular varicocele

J. Asogan Vaishnavi, S. C.R., A. Ali, H. Bhat, S. Sharma; *Chennai/IN*
(drjananimd@gmail.com)

Purpose: A study to evaluate the role of apparent diffusion coefficient (ADC) values in patients with testicular varicocele in comparison with normal population.
Methods and Materials: Thirty consecutive patients with varicocele and 30 controls were included in this study. Clinical diagnosis of varicocele was based on physical examination and finally confirmed by colour Doppler ultrasound. Diffusion-Weighted Magnetic Resonance Imaging (DWI) was done for all participants and the data were used to generate ADC maps which were expressed as arithmetic means and SDs. A one-way analysis of variance with a post-hoc Bonferroni test was used to analyse normally distributed continuous data. Independent sample Student t tests were used to compare continuous variables between the groups. The association between venous diameters and mean ADC values in patients with varicocele was analysed using Pearson correlation coefficient. A two-sided p value < 0.05 was considered statistically significant.
Results: The ADC values of both ipsilateral and contralateral testicular parenchyma in patients with varicocele were lower than those of healthy age-matched controls. In patients with varicocele, the mean ADC values were significantly negatively correlated with larger venous diameters during rest and during Valsalva maneuver.
Conclusion: Based on the results of our study, early detection of testicular damage and the degree of testicular fibrosis due to varicocele can be identified using DWI. The measurement of testicular ADC values may be used as a indirect diagnostic indicator in the detection of testicular damage.

B-1333 14:56

Injection free Imaging: evaluation of diffusion weighted MRI over contrast enhanced MRI in testicular torsion

B. Jeevanandham; *Coimbatore/IN (bjradiologist@gmail.com)*

Purpose: To compare the usefulness of DWI MRI over contrast enhanced MRI in testicular torsion.
Methods and Materials: 62 patients with suspicious of testicular torsion underwent MR imaging with Diffusion Weighted Imaging (DWI) and post gadolinium contrast imaging. ADC (Apparent Diffusion Coefficient) maps and contrast enhanced maps were generated. The results were compared with Wilcoxon signed rank test.
Results: Among 62 patients 21 patients were diagnosed to have testicular torsion. Among the 21 patients, diffusion weighted imaging shows ADC values of 420 - 580 x 10 micrometre/ s. In rest 41 patients, ADC values were 940 - 1450 x 10 micrometre/ s.
Conclusion: DWI can be used as an alternate for contrast enhanced MRI as evidence of by the equal sensitivity and positive predictive of ADC value and contrast enhacement in testicular torsion. Hence DWI can save time and expenditure by limiting contrast administration.

B-1334 15:04

Quantitative evaluation of dynamic contrast enhanced MRI in the differentiation between benign and malignant testicular lesions

M. Saldari, V. Vinci, S. Bernardo, L. Manganaro, C. Catalano; *Rome/IT*
(matteo.saldari@gmail.com)

Purpose: To determine if quantitative dynamic contrast enhanced MRI parameters are able distinguish benign from malign non-palpable testicular lesions.
Methods and Materials: 44 patients with US diagnosis of non-palpable testicular lesion underwent an MRI contrast enhanced examination. For the quantitative analysis, one radiologist placed a region of interest (ROI) on subtracted dynamic images. Time-signal intensity curves of measured MRI signal were created, and five parameters were extracted from the curves: ktrans, Kep, Ve and IAUC and signal intensity after 120 seconds from the injection of the contrast medium.
Results: ktrans and Kep were both significantly shorter in benign neoplasms compared to malignant tumours (respectively mean ktrans values 0.327 ± 0.208 min-1 vs. 0.353 ± 0.726 min-1, p=0.024 and mean Kep values 0.798 ± 0.255 vs.1.245 ± 0.244, p=0.041). Ve (%) was not statistically different between the hystotypes. IAUC was significantly higher in benign lesions (16.502 ± 10.873 vs. 5.759 ± 3.430, p=0.032). The intensity of signal (expressed in Hounsfield Unit) at 120 seconds after administration of medium contrast appeared higher in benign lesions compared to the malignant (1.14 ± 029 vs. 0.57 ± 0.20 HU, $p < 0.001$). Logistic regression analysis revealed that IAUC is the best independent predictor of malignancy (regression coefficient = -0.234; -2 loglikelihood ratio = 6.768, p=0.076).
Conclusion: MRI is able not only to characterise benign and malignant testicular lesions. Ktrans and Kep were both significantly shorter in benign neoplasms compared to malignant tumours and IAUC is the best independent predictor of malignancy.

B-1335 15:12

The role of imaging in paratesticular sarcomas

D. Ap Dafydd, C. Messiou, K. Thway, E. Moskovic; *London/UK*
(derfelapdafydd@hotmail.com)

Purpose: Paratesticular sarcomas are uncommon but potentially life-threatening. Due to lack of awareness, optimal treatment can be unintentionally denied. Commonly mistaken for inguinal hernias, inadequate resection often requires re-resection, with a higher risk of recurrence. The purpose of this analysisis is to illustrate the typical features of paratesticular sarcomas and examine the clinical data in a review of a large sample referred to the Royal Marsden sarcoma unit.
Methods and Materials: The database was filtered for paratesticular sarcoma since 2006. The available clinical notes were reviewed. Clinical parameters were recorded (e.g. demographics, referral source) and the histology. Imaging characteristics were recorded (e.g. abnormal fat, calcification).
Results: 77 cases were included. 55/77 (71%) of referrals came from urology. 33/76 (43%) were imaged with CT/MRI pre-operatively. 64/77 (83%) were either liposarcomas or leiomyosarcomas. 67/77 (87%) were referred post-op, 24%(16) of which required re-excision. Abnormal fat and Calcifications were present exclusively in liposarcomas (16/22 and 3/22). Leiomyosacromas were purely solid masses. Loco-regional adenopathy was not a feature of liposarcomas or leiomyosarcomas. Few had metastases at presentation.
Conclusion: This analysis illustrates the typical imaging characteristics of paratesticular sarcoma. Imaging is instrumental in their diagnosis and pre-operative planning, although currently rarely undertaken. Most in this sample were discovered accidentally and referred post-operatively, placing them at higher risk of relapse. If their management is to be optimised, greater awareness is needed (coordinated with urology) together with a lower threshold for CT/MRI. Triggers for performing CT/MR should include an "irreducible inguinal hernia" or other suspicious findings.

14:00 - 15:30 **Room E2**

Neuro

SS 1911

Movement disorders and neurodegenerative diseases

Moderators:
L. Haider; Vienna/AT
S. Lehéricy; Paris/FR

B-1337 14:00

Can 3D FLAIR reflect intact presynaptic dopaminergic function in patients with parkinsonism?

S. Oh[1], W. Lee[2], N.-Y. Shin[2], S.-K. Lee[2], S. Lim[2]; [1]*Cheonan/KR*, [2]*Seoul/KR (oasis1979@gmail.com)*

Purpose: To evaluate direct in vivo visualisation of nigrosome 1 in substantia nigra (SN) with 3D FLAIR and its diagnostic value in predicting intactness of presynaptic dopaminergic function of nigro-striatal pathway.
Methods and Materials: Forty-five patients showing suspicious parkinsonism who underwent both 3D FLAIR and dopamine transporter (DAT) imaging were recruited. Total 90 SNs were reviewed on axial 3D FLAIR. We regarded oval or linear hyperintensities in postero-lateral side of SN as intact nigrosome 1. Two neuroradiologists independently evaluated the appearance of nigrosome 1 and disagreements were settled by consensus. Kappa values for inter-rater agreement were calculated. Diagnostic performances of the appearance of nigrosome 1 for predicting presynaptic dopaminergic function on DAT imaging (side-by-side analysis) and Parkinson's disease (PD; patient-by-patient analysis) were calculated.
Results: Diagnostic performances of loss of nigrosome 1 on 3D FLAIR for predicting impaired presynaptic dopaminergic function on DAT imaging were as follows: sensitivity, 85.7%; specificity, 85.4%; positive predictive value (PPV), 83.7%; and negative predictive value (NPV), 87.2%; and for predicting PD: sensitivity, 94.7%; specificity, 76.9%; PPV, 85.7%; and NPV, 90.9%. When only oval hyperintensity was considered as intact nigrosome 1, its sensitivity and NPV were increased up to 95.2% and 91.7% for predicting DAT imaging and both 100 % for predicting PD. Inter-rater agreement for appearance of nigrosome 1 on 3D FLAIR was substantial (κ=0.625).
Conclusion: Nigrosome 1 could be visualised on 3D FLAIR, and its loss can be used to predict presynaptic dopaminergic function and diagnose PD with high diagnostic accuracy.

B-1338 14:08

Peculiarities of tremor-related brain activation in Parkinson's disease during motion: fMRI study

O. Omelchenko, Z. Rozhkova, I. Karaban; *Kyiv/UA (ol.omelchenko@gmail.com)*

Purpose: Tremor is one of the main Parkinson's disease (PD) symptoms. Nevertheless altered pattern of brain activation in PD patients was shown, no tremor severity patients' subdivision was previously done. We propose brain activation analysis in PD patients with different tremor severity for evaluation of PD-subtype specific fMRI response.
Methods and Materials: Thirty right-handed PD patients (12 F, 46-74 y.o). were studied by fMRI with 1.5 T SIGNA (GE, USA). According to UPDRS tremor severity scale, sidedness was divided into four groups. Left-side tremor: GLlignt (7 patients, 2 F, tremor 0-1), GLsevere (11 patients, 5 F, tremor 2-4). Right-side tremor: GRlignt (6 patients, 3 F, tremor 0-1), GRsevere (6 patients, 1 F, tremor 2-4). Right-hand finger-tapping task was used for activation. EPI was used for BOLD imaging (TR/TE=3000/71 ms, voxel 4x4x5 mm). FMRI data processing was done using FSL (Oxford, GB).
Results: fMRI data showed common pattern of activation: bilateral primary (M1S1), premotor, supplementary motor cortex, thalamus and cerebellum. Increase of activation volume (voxels)/ΔBOLD (%) amplitude was shown (GRlight>GRsevere>GLsevere>GLlight): (3736/2.22, 3281/1.96, 1664/1.36, 1274/1.33) respectively (Fig.1). Activation of subthalamic region was shown in GRlight, GRsevere (Fig. 2). Decrease of M1S1 activation was shown in GRsevere. Bilateral cortex activation in PD patients under unilateral motor task execution is explained by plasticity changes in brain motor network. Activation of subthalamic region in severe tremor patients might have compensative physiological background. Decreased activation of M1S1 in GRsevere reveals a decrease of excitatory input to M1S1.
Conclusion: Tremor severity and sidedness influence brain activation pattern and BOLD response in PD patients.

B-1339 14:16

Increased connectivity between sensorimotor and attentional areas in Parkinson's Disease

M. Onu; *Bucharest/RO (onu.mihaela@gmail.com)*

Purpose: Our study is using independent component analysis (ICA) to evaluate functional connectivity changes in Parkinson's disease (PD) in an unbiased manner.
Methods and Materials: Resting-state fMRI data was collected for 27 PD patients and 16 healthy subjects. Differences for intra- and inter-network connectivity between healthy subjects and patients were investigated using FMRIB Software Library (FSL) tools (Melodic ICA, dual regression, FSLNets).
Results: Twenty-three ICA maps were identified as components of neuronal origin. Intra-network connectivity changes: eight components showed a significant connectivity increase in patients ($p < 0.05$); these were correlated with clinical scores and were largest for (sensori)motor networks. Inter-network connectivity changes: we found higher connectivity between the sensorimotor network and the spatial attention network (p=0.0098) and lower connectivity between anterior and posterior default mode networks (DMN) (p=0.024), anterior DMN and visual recognition networks (p=0.026) as well as between visual attention and main dorsal attention networks (p=0.03), for patients as compared to healthy subjects. The area under the Receiver Operating Characteristics (ROC) curve for the best predictor (partial correlation between sensorimotor and spatial attention networks) was 0.772. These functional alterations were not associated with any gray or white matter structural changes.
Conclusion: Our results show higher connectivity between sensorimotor and spatial attention areas in patients that may be related to the reduced movement automaticity in PD.
Author Disclosures:
M. Onu: Author; Mihaela Onu. Research/Grant Support; This work was supported by UEFISCDI – Unit for Higher Education Research Development and Innovation Funding (grant number 84/2012). Speaker; Mihaela Onu.

B-1340 14:24

Magnetic resonance spectroscopy of supraventricular areas and immunological markers in Parkinson disease

J. Khomenko, E. Gromova, G. Kataeva, M. Karpenko, I. Milukhina, A. Bogdan; *St. Petersburg/RU (julkhom@rambler.ru)*

Purpose: Application of proton magnetic resonance spectroscopy (H-MRS) in Parkinson disease (PB) was usually performed in basal ganglia and motor cortex, but metabolic status of other cerebral regions remains unrevealed. The aim of the research was to study metabolism in supraventricular areas with H-MRS, and match findings with immunological markers in patients with PD.
Methods and Materials: 22 PD patients (age 60.9±9.8; 12 males; 1.0-3.0 stages by Hoehn-Yahr scale) were examined. Multivoxel H-MRS of supraventricular white matter (WM) and medial cortex was performed on Achieva 3 T scanner, Philips (2D-PRESS, TE/TR=144/1500 ms). The area of MRS study [8*9 voxels (10*10*15 mm), whole 80*90*15 mm] included six ROIs in WM (3 for each hemisphere) and 3 ROIs in medial cortex. NAA/Cr, NAA/Cho, Glx/Cr ratios (NAA - N-acetylaspartate, Cr - creatine, Cho - choline, Glx - glutamine+glutamate) were analysed. Concentrations of interleukins (IL) 2.17, tumour necrosis factor alpha (TNF-alpha) were measured in cerebrospinal fluid (CSF) by the standard method.
Results: Negative correlation of PD stage and NAA/Cr in left WM were estimated ($r=-0.5$; $p < 0.05$). Several correlations with cytokines in CSF were revealed ($p < 0.05$): NAA/Cr and TNF-alpha (r=-0.5), NAA/Cho and TNF-alpha (r=-0.5) in right hemisphere WM; NAA/Cho and IL2 (r=-0.6) in grey matter. Glx/Cr correlated ($p < 0.05$) with TNF-alpha (r=0.6), IL-2 (r=0.5), IL-17 ($r=0.6$; $p < 0.01$) concentrations in right WM and Il-17 in medial cortex (r=0.5).
Conclusion: Revealed correlations allow suggesting that decreasing of NAA (as a neuronal integrity marker) with progression of the disease reflects changes in the brain tissue out of the main pathogenetic regions (basal ganglia, motor centres).

B-1341 14:32

Functional connectivity and gray matter volume changes in the Multiple-Demand Network of Parkinson patients

C. Mathys[1], F. Hoffstaedter[2], J. Caspers[1], M. Südmeyer[1], C. Eickhoff[2], K. Reetz[3], B. Turowski[1], A. Schnitzler[1], S. Eickhoff[1]; [1]*Düsseldorf/DE*, [2]*Jülich/DE*, [3]*Aachen/DE (mathys@uni-duesseldorf.de)*

Purpose: Parkinson's disease (PD) is known to impaire executive functioning (EF). Three key components of EF are attention, working memory and inhibitory control, which have shown to converge on the "Multiple-Demand" Network (MDN). In order to detect a substrate of PD-related executive dysfunction, we here investigated gray matter volume (GMV) of MDN nodes and alterations of functional connectivity (FC) between them.

Methods and Materials: Anatomical and resting-state fMRI data was collected from closely matched 71 PD patients and 68 healty controls (HC). Preprocessing of data was conducted with SPM8/VBM8. Correlations were computed between time-series of all MDN nodes. FC and GMV were assessed for group differences. Relationships with UPDRS-III, MoCA score and disease duration (DD) were tested.
Results: PD patients showed decreased resting-state FC within the MDN: R aIns-L IFJ; R aIns-R IPS; R pMFC-R IPS; R IFJ-R IPS. Moreover, VBM analysis detected PD-related atrophy in R IFJ. In addition, following functional connections within MDN showed negative correlation with DD in PD: L aIns-L IFJ; R IFS-R pMFC; L aIns-R IFJ; L aIns-R pMFC.
Conclusion: Previous studies found PD-related changes - related to components of EF - in nodes of the MDN (aIns, pMFC, IFJ), which also showed FC-changes or gray matter atrophy in our analysis. In sum, all components of EF can be affected by PD and, at the same time, involve nodes of the MDN. Therefore, our findings indicate loss of FC and loss of GMV within the MDN as substrate for PD-related impairment of EF.

B-1342 14:40

Differential functional connectivity changes of right DLPFC subdivisions in Parkinson's disease

J. Caspers, F. Hoffstaedter, C. Mathys, M. Südmeyer, E.C. Cieslik, C. Rubbert, B. Turowski, A. Schnitzler, S.B. Eickhoff; *Düsseldorf/DE (Julian.Caspers@med.uni-duesseldorf.de)*

Purpose: Parkinson's disease (PD) is associated with deficits in executive function (EF). The right dorsolateral prefrontal cortex (rDLPFC) is a key region for EF. Recently, a bipartition of rDLPFC into a posterior and anterior aspect was revealed by co-activation based parcellation. We investigated, if functional connectivity (FC) of these rDLPFC subdivisions is differentially affected in PD.
Methods and Materials: Resting-state FC was investigated in 39 PD patients and 44 age-, gender- and movement-matched healthy controls on a 3 T-MRI. Patients were examined after at least 12h withdrawal of dopaminergic drugs (medical OFF) and under their regular medication (medical ON).
Results: Only posterior rDLPFC showed FC alterations in PD, while anterior rDLPFC was unaffected. There was a PD-related decreased FC with posterior rDLPFC in the bilateral precuneus, left dorsal visual and left premotor regions in medical OFF. In the medical ON, FC with left dorsal visual and premotor regions normalised, while decoupling with the precuneus remained. Furthermore, increased FC between posterior rDLPFC and bilateral dorsomedial prefrontal cortex (DMPFC) was found.
Conclusion: The hierarchically organised rDLPFC shows differential impairment in PD. The posterior parts facilitating rather basal EF functions are more affected than the anterior parts involved in abstract EF tasks. Particularly, visuospatial stimulus integration and working memory updating is disturbed by posterior rDLPFC decoupling in PD and only partly alleviated by dopaminergic treatment, but possibly compensated by improved performance monitoring and adjustment trough increased DMPFC coupling. Lastly, the observed changes can be regarded as a PD-related shift within the 'executive control network'.

B-1343 14:48

Utility of susceptibility weighted imaging in differentiating patterns of iron deposition in Parkinson disease and the Parkinson-plus syndromes

C.S. Oustwani, A.W. Korutz, M. Lester, Y. Kianirad, T. Simuni, T. Hijaz; *Chicago, IL/US (coustwani@gmail.com)*

Purpose: Patterns of iron deposition can be readily depicted on susceptibility-weighted imaging (SWI) in patients with Parkinson Disease (PD), Multisystem Atrophy - Parkinsonian Type (MSA-P) and the tau protein-related conditions, Progressive Supranuclear Palsy (PSP) and Corticobasal Degeneration (CBD). The aim of this study is to investigate whether differences in brain iron deposition can differentiate between these conditions.
Methods and Materials: This was a retrospective, cross-sectional study. Twenty-five, 11, and 10 patients with a clinical diagnosis of PD, MSA-P, and PSP/CBD, respectively, who underwent SWI of the brain were included. Two neuroradiologists produced SWI hypointensity scores based on the background signal intensity of the caudate nucleus, putamen, globus pallidus, dentate nucleus, red nucleus, and substantia nigra using a five-point scale, with cortical vein intensity=1, cerebrospinal fluid intensity=3, and grey matter intensity=5, and intermediate intensities=2 or 4. Statistical analysis was performed with the intraclass correlation (ICC) and Kruskal-Wallis tests with a Bonferroni correction setting the significance threshold at 0.0045.
Results: Inter-rater agreement was excellent for all regions (ICC=0.906). There was a statistically significant difference in scores in the substantia nigra (p=0.002), where PSP/CBD demonstrated the greatest hypointensity (hypointensity score of 2.25) compared with PD and MSA-P (hypointensity scores of 2.82, 2.5, respectively). No significant score differences were seen between any other region (p = 0.034-0.983).
Conclusion: SWI demonstrates significantly greater hypointensity within the substantia nigra in PSP/CBD, compared with PD and MSA-P. Our data suggests that SWI grading of the substantia nigra may help in differentiating between these conditions.

B-1344 14:56

1H MRS and fMRI investigation of metabolism and dysfunction of the resting state default mode network in patients with Parkinson's disease and different level of cognitive impairment

Z.Z. Rozhkova, O. Omelchenko; *Kiev/UA (invivo@ukr.net)*

Purpose: We investigate metabolism and integrity of RSDMN connectivity in patients with PD and different level of CI.
Methods and Materials: Three groups of PD-patients (57-73y) with various cognitive statuses are studied by 1HMRS and fMRI with 1.5 T SignaExcite (GE). 1st group (DPDG) consists of 13 subjects with dementia. 2nd-(CIPDG)-5 subjects with mild CI, and 3rd-(NPDG)-12 patients with normal cognitive function. Spectra are recorded in the white matter of the anterior (APCG), and in the posterior portion of cingulate gyrus (PPCG). EPIBOLD scans were acquired:TR/TE=3000/71 ms.
Results: In APCG the mean values of NAA/Cr in DPDG, CIPDG, and NPDG:(1.68+-0.02),(2.04+-0.03),(2.32+-0.05),Cho/Cr:(0.84+-0.02),(0.81+-0.05),(0.53+-0.03). In PPCG the mean values NAA/Cr in DPDG, CIPDG, and NPDG:(1.14+-0.12),(1.81+-0.02),(1.98+-0.04),Cho/Cr:(0.96+-0.02),(0.77+-0.03),(0.68+-0.03). We found progressive decreasing NAA/Cr in the PPCG and increasing of Cho/Cr for the patient of NPDG, CIPDG, DPDG. The analysis of DMN revealed a gradual reduction in functional connectivity in DPDG in the cuneus, precuneus and PPCG, which correlate with severity of CI. RSNs involving areas of the cerebellum and frontal lobe, that could be interpreted as a potential compensatory mechanism to functional disorders caused by the CI:increasing the functional activity of specific areas in response to a gradual cognitive decline. In the NPDG connections between the APCG and PPCG, and inferior parietal gyrus bilaterally were found. In the NPDG activation of APCG decreased, but connectivity patterns persisted. In CIPDG activated clusters were found precuneally, in PPCG, however, no connection to parietal lobe or APCG.
Conclusion: fMRI and MRS give new approach for understanding pathophysiological changes in PD-patients associated with CI.

B-1345 15:04

Quantitative susceptibility mapping at 7T to evaluate the primary motor cortex of ALS patients

G. Donatelli, M. Costagli, L. Biagi, D. Frosini, G. Siciliano, M. Tosetti, M. Cosottini; *Pisa/IT*

Purpose: Amyotrophic lateral sclerosis (ALS) is a neurodegenerative disease involving upper and lower motor neurons but a radiological marker of upper motor neuron (UMN) impairment has not been found yet. Recent MRI studies documented that ALS patients have greater T2*-hypointensity than healthy controls (HC) in primary motor cortex (M1) where pathological examination showed iron-containing microglia. Ultra-high field MRI has higher T2*-sensitivity which allows obtaining precise maps of magnetic susceptibility (χ) to estimate iron concentration. We aimed to evaluate M1 χ in ALS patients and HC and the relationship between χ and UMN-burden, using 7T-MRI.
Methods and Materials: Seventeen ALS patients and 13 HC underwent a 7-T MR brain examination including T2*-weighted sequences targeting M1. Patients' UMN involvement was quantified by a clinical UMN score. Images were visually classified as belonging to patients or HC based on M1 morphology. Maps of χ were obtained from raw MRI-data. ROIs were drawn in deep cortical layers of M1 in Penfield's areas of hand and foot. χ differences between patients and HC and the relationship between χ and UMN-score in patients were evaluated.
Results: χ in M1 deep layers was significantly higher in ALS patients than in HC ($p < 0.05$). χ and UMN score were higher in correctly diagnosed patients than in misdiagnosed ones ($p < 0.05$ and $p < 0.01$ respectively). χ in each subregion of patients' M1 correlated with UMN score of the corresponding limb ($r=0.40$; $p < 0.001$).
Conclusion: Ultra-high field MRI allows obtaining χ measures confirming in vivo the iron accumulation in M1 deep layers of ALS patients with significant UMN impairment.

B-1346 15:12

Involvement of corpus callosum differs in bulbar vs. limb onset amyotrophic lateral sclerosis

M.P. Vora; *Himachal Pradesh/IN (dr_maulikvora@yahoo.com)*

Purpose: Amyotrophic lateral sclerosis (ALS) is a fatal and most common motor neuron disease, caused by progressive loss of motor neurons. We tried to detect patterns of corpus callosum (CC) involvement in bulbar vs. limb onset ALS.
Methods and Materials: In this observational study, twenty-one patients with ALS and well-matched 21 controls received diffusion tensor imaging (DTI) and 3d multi-voxel spectroscopy (MRS). ALS patients were classified in definite, possible and probable category and patients were also studied in limb versus bulbar onset.
Results: Corpus callosum of ALS patients showed consistent reduction in Fractional Anisotropy in definite and probable group ($p < 0.05$). In possible disease corpus callosum involvement was not significant. Bulbar onset ALS patient showed more consistent decrease in FA than limb onset ($p < 0.05$). Anterograde degeneration of callosal fibers was supported by increase in regional mean diffusivity. Corpus callosum showed metabolite changes in form of reduce NAA/Cr and NAA/Ch in bulbar onset and definite group ($p < 0.05$).
Conclusion: Corpus callosum in bulbar onset and limb onset ALS patients showed different patterns of involvement. Extra motor involvement suggested by corpus callosum involvement is a feature seen in bulbar onset patient and can suggest poorer outcome in such patients. Patient with relative early disease do not show CC involvement. DTI and MRS are useful tool for disease categorisation and prognostic stratification.

B-1347 15:20

Special aspects of hippocampal morphology in patients with depressive disorders compared to healthy volunteers: neurocognitive and MRI comparison

R. Ezhova, N. Ananyeva, I. Galsman, M. Davletkhanova, T. Rostovtseva; *St. Petersburg/RU (rostovtsevat@mail.ru)*

Purpose: To compare MRI findings and psychological tests in patients with depression.
Methods and Materials: 101 healthy volunteers and 47 patients with depression were examined using Hamilton scale (HDRS), Montgomery-Asberg depression scale (MADRS) and Beck depression inventory (BDI) for the assessment of mental state and depression intensity. Cognitive functions were examined using Wexler adult intelligence scale (WAIS) and Rey-Osterrieth complex figure. All of the patients underwent brain MRI using standard protocol with addition of detailed study of mediobasal parts of temporal lobes with FLAIR IR, REAL IR, and 3D MPRAGE followed by automatic morphometry (FreeSurfer) and manual morphometry (DISPLAY, Montreal Neurological Institute, Quebec, Canada) for the evaluation of hippocampal subregions.
Results: We have found significant decrease of both thalami, caudate nuclei volumes and significant increase of right amygdala volume in patients with depression compared to healthy volunteers. Higher depression intensity correlated with poor attention focusing and voluntary attention shift, worse short- and long-term visual memory and visual-motor coordination, worse dynamic characteristics of cognitive activity and practice. Hippocampal volume changing was mostly seen in patients with early disease onset ($p < 0.05$) and high depression criteria according to MADRS and BDI ($p < 0.01$).
Conclusion: Hippocampus has strong connection with associative cortex (lower parietal region and upper part of upper frontal gyrus, orbitofrontal cortex, arcuate fissure and lobar poles). This two-way connection of these limbic structures is important for the normal functioning of the system of the fixation and consolidation of new experience and reproduction of possessed experience.

14:00 - 15:30 **Room F2**

Physics in Radiology

SS 1913

Physics of dual-energy CT and breast imaging

Moderators:
H. de las Heras Gala; Zorneding/DE
I.A. Tsalafoutas; Athens/GR

B-1348 14:00

Evaluation of optimal dual-energy (DE) blending ratios for linearly generated DE-blended images in dependency of radiation exposure level and acquisition mode

J. Hansen[1], C.M. Sommer[2], S. Würstlin[2], G. Pahn[1], S. Skornitzke[1], H.-U. Kauczor[1], G.M. Richter[2], W. Stiller[1]; [1]*Heidelberg/DE*, [2]*Stuttgart/DE (Jens.Hansen@med.uni-heidelberg.de)*

Purpose: Systematic assessment of optimal DE blending ratios α in order to achieve equal or better image quality of DE-blended images in comparison to single-energy (SE) images acquired at the same radiation exposure.
Methods and Materials: Nine patients with liver lesions received at least one CT examination each consisting of three series (SE120 kVp; DE80/Sn140 kVp; DE100/Sn140 kVp; total: 17 examinations). The examinations were classified into three groups according to three radiation exposure levels (CTDI_{vol}=10 mGy; 7 mGy; 5 mGy). For each acquired image slice 100 linearly blended dual-energy images were generated with varying α between 0.0 and 1.0. Image quality parameters (CT numbers, noise level, contrast-to-noise ratio (CNR), signal-to-noise ratio (SNR)) were compared between DE-blended and corresponding SE image for each α and each combination of acquisition mode and radiation exposure level.
Results: Optimal α is independent of patient radiation exposure level. Optimal α significantly differ depending on evaluated image quality parameter and acquisition mode: Optimal α_{CNR/SNR} (α_{CNR}≈0.7/α_{SNR}≈0.6) provide significantly higher CNR/SNR (up to 40%; $p < 0.05$) than corresponding SE image slices for both DE acquisition modes and differs significantly from standard DE blending ratios (α_{80/Sn140 kVp}=0.3; α_{100/Sn140 kVp}=0.5). DE80/Sn140 kVp mode provides higher CNR/SNR than DE100/Sn140 kVp mode. Lowest noise level for DE blended images is reached at α≈0.3 for both DE modes. Equal CT numbers and CNR are obtained for standard α for DE80/Sn140 kVp mode.
Conclusion: DE-blended images generated with optimal DE blending ratios can achieve better image quality than corresponding SE image slices acquired with the same radiation exposure allowing for potential dose reduction for patients.
Author Disclosures:
C.M. Sommer: Research/Grant Support; Siemens Healthcare technically supported the study (Siemens European Reference Site for Interventional Radiology and Oncology, Klinikum Stuttgart, Stuttgart, Germany). **S. Würstlin:** Research/Grant Support; Siemens Healthcare technically supported the study (Siemens European Reference Site for Interventional Radiology and Oncology, Klinikum Stuttgart, Stuttgart, Germany). **H.-U. Kauczor:** Research/Grant Support; Siemens, Bayer. Speaker; Böhringer Ingelheim, Novartis, Siemens, Almirall, Glaxo Smith Kline. **G.M. Richter:** Research/Grant Support; Siemens Healthcare technically supported the study (Siemens European Reference Site for Interventional Radiology and Oncology, Klinikum Stuttgart, Stuttgart, Germany).

B-1349 14:08

Dual Energy CT (DE-CT) bone densitometry: assessing a potential alternative to DXA and quantitative CT (qCT) in imaging-based bone mineral density analysis

P.C. Hofmann[1], M. Sedlmair[1], B. Krauss[1], B. Schmidt[1], J.L. Wichmann[2], R.W. Bauer[2], T.G. Flohr[1], A.H. Mahnken[1]; [1]*Forchheim/DE*, [2]*Frankfurt a. Main/DE (hofmann.philipp.ext@siemens.com)*

Purpose: Osteoporosis reduces lifespan and life quality. We introduce a new Dual-Energy (DE) based method to evaluate volumetric bone mineral density which is enhanced by isolating the bone fraction from any given tissue using DE three-material decomposition.
Methods and Materials: An evaluation method was developed using phantom measurements (ESP bone mineral density phantom, QRM, Möhrendorf, Germany) from modern dual energy CT scanners (SOMATOM Force, Definition Flash, Siemens Healthcare GmbH, Forchheim, Germany). Three-material decomposition for DE-CT was applied. The method was tested on DE-CT data of 10 patients recorded in the University Hospital of Frankfurt which were taken in addition to DXA examinations performed on the same day.

Results: Phantom measurements show DXA equivalent accuracy and a precision with a coefficient of variation < 0.03. For higher beam energy combinations, CVs are lower, as far as < 0.01 for 80/Sn150 kV. The DE-CT/DXA patient datasets showed 100% accuracy in BMD classification using the ACR guidelines for result assessment. No additional phantom was necessary as calibration proved robust over time. One case showed agreement between DE-CT and DXA where normal qCT failed.
Conclusion: DE-CT does not seem to require any phantom and can be applied to a wide range of existing CT images. Agreement in indications between DXA gold standard is 100% as far as both vBMD and aBMD can be compared. Accuracy and precision are on DXA level, showing potential for therapeutic use. The isolation of the bone fraction of scanned tissue allows for exclusion of other tissue to avert typical DXA error sources.
Author Disclosures:
P.C. Hofmann: Grant Recipient; Siemens Healthcare GmbH. **M. Sedlmair:** Employee; Siemens Healthcare GmbH. **B. Krauss:** Employee; Siemens Healthcare GmbH. **B. Schmidt:** Employee; Siemens Healthcare GmbH. **T.G. Flohr:** Employee; Siemens Healthcare GmbH.

B-1350 14:16

Clinical investigation of single source dual energy computed tomography (SSDECT) accuracy in quantification of iodine concentration in calf liver simulated lesions

C. Riedl, U. Mahmood, A. Agostini, L. Mannelli; *New York, NY/US (mannellilorenzo@yahoo.it)*

Purpose: Determine dual energy iodine maps accuracy in iodine quantification.
Methods and Materials: 10 sausages were with injected with different iodine quantities. The amount of iodine injected in each lesion was recorded. The sausages were inserted into two calf's livers by the radiologist. The sausages locations in the two livers were recorded. A physicist blinded to sausages location and amount of injected iodine performed a dual energy image acquisition with a CT scanner (GE Discovery 750): 80/140 kVp, 600 mA, 0.8 seconds rotation time, 0.984 Pitch, 2.5 mm reconstruction slice thickness. Iodine maps were calculated and lesion volume and iodine concentration per lesion were measured. The average percent difference between the nominal injected vs. measured iodine per sausage were generated. A student t-test was used to compare injected and measured values (hypothesis rejected for $p < 0.05$).
Results: Radiologist reported leakage of injected iodinated contrast of from two sausages; these were excluded from this study. A total amount of 1590 mg of Iohexol 300 were injected in 8 sausages; with iodine injected per sausage ranging between 120 mg and 300 mg. The total amount of iodine measured by the physicists was 1567.39 mg. The average percent difference between the nominal injected vs. measured iodine per sausage was -0.71%, with a rage between -12.17% and 11.64%. No statistical difference was present between the injected and measured amount of iodine ($p > 0.90$).
Conclusion: Iodine concentration can be calculated by DECT with an expected error within 12%.

B-1351 14:24

Spectral filtration in paediatric and adult chest CT examinations: a phantom study on dose reduction and image quality

S. Suntharalingam[1], S. Labus[1], T. Allmendinger[2], K. Nassenstein[1], A. Wetter[1]; [1]*Essen/DE*, [2]*Forchheim/DE (Saravanabavaan.Suntharalingam@uk-essen.de)*

Purpose: To determine the radiation dose and image quality of non-enhanced chest CT using spectral filtration.
Methods and Materials: Three physical anthropomorphic phantoms (neonate, child and adult) were scanned on a third-generation dual-source CT (Siemens Somatom Definition Force) using Care KV in semi-mode and Care Dose (ref. KV: 120; ref. mAs 50; Care KV mode "dose saving optimised for non-contrast-enhanced imaging" which is number 3 on the 12-point scale). Scans were performed with all available tube potentials (70 - 150 kV and Sn150). The exam with the lowest CTDIvol was selected to perform a Sn100-scan with a comparable (Sn100-full) and half (Sn100-half) CTDIvol value. Image quality was evaluated on the basis of signal to noise ratio (SNR).
Results: For neonates, 90 kV revealed the lowest CTDIvol (0.36 mGy). Sn100-full (1.6) and Sn100-half (0.8) showed lower SNR as compared to the 90 kV scan (2.6). The lowest CTDIvol for the child phantom was achieved at 120 KV (0.78 mGy). Sn100-full showed higher SNR (5.0); at Sn100-half (2.7) SNR was comparable to the 120 kV scan (2.6). For adults, 150 kV revealed the lowest CTDIvol (2.67). The Sn150 kV scan delivered comparable SNR (0.9 vs 0.9), but a lower CTDIvol (2.08). Sn100-full (1.2) showed higher SNR; at Sn100-half (0.9) SNR was comparable to the 150 kV scan.
Conclusion: For neonates, 90 kV scans should be preferred for non-enhanced chest CTs. For children, (Sn100) and adults (Sn100 & Sn150) spectral shaping allows substantial radiation dose reduction while maintaining a comparable image quality.
Author Disclosures:
T. Allmendinger: Employee; Siemens AG Healthcare.

B-1352 14:32

Quantitative comparison of single-acquisition dual-energy iodine maps as an alternative to abdominal CT-perfusion measured with the Patlak model

S. Skornitzke[1], F. Fritz[1], M. Klauß[1], J. Hansen[1], G. Pahn[1], L. Grenacher[2], H.-U. Kauczor[1], W. Stiller[1]; [1]*Heidelberg/DE*, [2]*Munich/DE (Stephan.Skornitzke@med.uni-heidelberg.de)*

Purpose: Evaluation of quantitative single-acquisition dual-energy (DE) iodine maps can replace perfusion measurements obtained using the Patlak-model in analogy to earlier findings using the Maximum-slope model.
Methods and Materials: Dynamic DECT-perfusion sequences were acquired over 51s (34 acquisitions every 1.5s) in 24 patients with histologically verified pancreatic carcinoma at tube voltages of 80 kVp and 140 kVp. Permeability and blood volume maps were calculated from 80 kVp images applying the Patlak model after deformable motion correction, using software developed in-house. Furthermore, iodine maps were calculated for each of the 34 DECT acquisitions. Within manual segmentation of the pancreas, voxel-by-voxel correlation was calculated between the permeability (volume) map and each of the iodine maps for each patient, determining the time of maximum correlation tmax for each parameter. Regions of interest (ROIs) were placed inside tumour and healthy pancreatic tissue. Correlation between mean permeability (volume) and mean iodine concentrations within these ROIs at tmax was calculated for the patient sample.
Results: For permeability (volume) measurements, average tmax was 44.4±5.4s (33.6±5.4s) after contrast agent injection. Average permeability (volume) for healthy tissue and tumour was 37.5±18.0 ml/100 ml/min (64.5±41.3 ml/100 ml) and 23.7±18.3 ml/100 ml/min (39.8±51.4 ml/100 ml); $p < 0.05$ (p=0.06). Average iodine concentrations at respective tmax for permeability (volume) were 2.4±1.0 mg/ml (2.2±0.8 mg/ml) and 1.7±0.9 mg/ml (1.6±1.1 mg/ml); $p < 0.05$ ($p < 0.05$). Correlation between permeability (volume) and iodine concentrations was moderate-to-high: r=0.72 (r=0.69).
Conclusion: Earlier research on replacing perfusion measurements using the Maximum-slope model with quantitative single-acquisition iodine maps could be reproduced using the Patlak-model to measure permeability and blood volume, confirming previous results and extending them to two-compartment models.
Author Disclosures:
H.-U. Kauczor: Research/Grant Support; Bayer, Siemens. Speaker; Almirall, Böhringer Ingelheim, GlaxoSmithKline, Novartis, Siemens.

B-1353 14:40

Computed tomography blood flow measurements: a phantom experiment

S. Prevrhal, C. Spink, M. Grass, M. Bless, A. Schlaefer, H. Ittrich, M. Regier, G. Adam; *Hamburg/DE (sven.prevrhal@philips.com)*

Purpose: Physiological parameters like blood flow are used to quantify vascular functional impairment induced by stenosis. Non-invasive determination of blood flow using CT is an attractive alternative to invasive wire-sensor measurements, but CT temporal resolution is insufficient for physiological flow rates. Here, we established principles and evaluated basic feasibility of dynamic determination of volumetric blood flow rate in a phantom experiment from CT projection data, which have suitably high temporal resolution.
Methods and Materials: Dynamic flow was generated through an abdominal aorta phantom with a cardiopulmonary pump. Multiple circular CT scans were acquired with a dynamic perfusion CT protocol on an iCT scanner (Philips Healthcare, Cleveland, USA) at fixed table position. Iodine contrast agent was injected with a contrast agent pump proximal to the aorta during the circular acquisition phase at 6 ml/sec injection rate for 6 sec. The 256-slice CT system covers 8 cm at isocenter and delivers projections at 3636 frames/s. Projection data were analysed using masked difference projection, and flow data were determined per system rotation using row-wise uptake curve correlation.
Results: While flow could not be determined from image data, flow velocities of 7.65 cm/sec for the whole phantom and 6.87 / 8.63 cm/sec for the left / right branches of the phantom were calculated, corresponding to flow measured for the pump without phantom at 6.10 cm/sec.
Conclusion: Determination of volumetric flow rates from CT projection data is feasible with good correspondence to input flow data for static vessels.
Author Disclosures:
S. Prevrhal: Employee; Philips. Patent Holder; 9082211. **M. Grass:** Employee; Philips.

B-1354 14:48

Beam width and beam edge measurements in CT, mammography and radiotherapy with a sustainable electronic ruler

H. de las Heras[1], K. Mair[2], O. Blanck[3], Q. AlZoubi[4], B. Renger[5], R. Klausz[6], Y. Popova[6], D. Coll-Segarra[7], F. Schöfer[1]; [1]*Zorneding/DE*, [2]*Kempten/DE*, [3]*Lübeck/DE*, [4]*Amman/JO*, [5]*Munich/DE*, [6]*Buc/DE*, [7]*Nashville, TN/US (hugo@quart.de)*

Purpose: Investigate the applicability of an electronic radiation ruler for alignment and beam profile measurements as an alternative to the use of conventional, radiochromic or CR films.
Methods and Materials: The device consists of a 4 cm-ruler located above an array of 16 diodes. The ruler is centred on the edge of the light field, or on the laser alignment lights, and then irradiated. A profile along the ruler is displayed and the evaluation results are automatically displayed and saved in a report. We have tested the device in all diagnostic x-ray and radiation therapy modalities to find its sensitivity thresholds, maximum profile length and repeatability.
Results: A minimum of 100 µGy was required for diagnostic energies (up to 160 keV) and 20 mGy for radiation therapy beams (up to 15 MeV). Beam profiles in CT could be completely displayed for widths up to 2.5 cm. Using robotic radiosurgery, repeatability of the measurements was found to be below 0.1 mm. Serial measurements enabled the quality control of dynamic collimation in breast tomosynthesis and overlap of slices in CT.
Conclusion: The investigated device requires one exposure for the evaluation of each profile. However, the advantages of using it instead of film are its ability to automatically and objectively evaluate the coincidence of light and radiation fields, the reduced time it takes to make and display measurement results, and the elimination of repetitive costs, environmental burden and other complications incurred when using any kind of film.
Author Disclosures:
H. de las Heras: Consultant; Hugo de las Heras is a research consultant at QUART GmbH. **O. Blanck:** Employee; Saphir Radiosurgery. **Q. AlZoubi:** Employee; AlKA Est. **R. Klausz:** Employee; GE Healthcare. **Y. Popova:** Employee; GE Healthcare. **D. Coll-Segarra:** Employee; CNMC Co. **F. Schöfer:** CEO; QUART GmbH.

B-1355 14:56

Towards a framework to objectively assess clinical image quality in digital mammography

C. Balta[1], R.W. Bouwman[1], R.E. van Engen[1], S. Schopphoven[2], I. Sechopoulos[1], N. Karssemeijer[1], M.J.M. Broeders[1], W.J.H. Veldkamp[3]; [1]*Nijmegen/NL*, [2]*Marburg/DE*, [3]*Leiden/NL (christiana.balta@gmail.com)*

Purpose: To investigate the appropriateness of using a model observer (MO) to determine image quality in raw and processed mammographic images of a 3-D printed anthropomorphic breast phantom (ABP) constructed from patient data.
Methods and Materials: MOs have been shown to predict human detection performance with images created from noise or simulated structures/lesions. For this study, a 4.5 cm thick ABP, based on dedicated breast CT patient data, was constructed and cut in two transverse slabs. To simulate microcalcifications, aluminum foils with 0.1 mm and 0.25 mm diameter gold discs were inserted between the slabs. Multiple mammographic images of the ABP were acquired at different dose levels. Samples containing signal or background from raw and processed images were extracted from various locations, and analysed with a MO to calculate detectability indices (d').
Results: For the 0.1 mm discs, mean and std. dev. of d' were 1.60±0.26 for 10 mAs and increased 25% for 20 mAs and 56% for 30 mAs. For the 0.25 mm discs, d' was 1.65±0.19 for 10 mAs and increased 44% for 20 mAs and 75% for 30 mAs. No significant difference in d' was found between raw and processed images (p=0.19).
Conclusion: The image processing algorithm used by this mammography system does not affect the detectability of microcalcification-related signals. It was also shown, as expected, that probability of detection increases with dose. Therefore, with the proposed framework using MOs and physical ABPs the entire imaging chain can be assessed. After further validation, the framework might be valuable to assess clinical image quality objectively.
Author Disclosures:
S. Schopphoven: Shareholder; Primago GmbH. **I. Sechopoulos:** Consultant; Fujifilm Medical Systems U.S.A. Research/Grant Support; Barco Inc., Hologic Inc. **N. Karssemeijer:** CEO; ScreenPoint Medical. Shareholder; Matakina Technology, Qview Medical Inc.

B-1356 15:04

Comparison of phantom target detectability for synthetic and conventional digital mammograms

L. Cockmartin, N.W. Marshall, E. Martens, G. Yegin, H. Bosmans; *Leuven/BE (lesley.cockmartin@uzleuven.be)*

Purpose: To compare target detectability in synthetic mammograms (SM) derived from breast tomosynthesis volumes to digital mammography (DM).
Methods and Materials: Detectability was measured with two phantoms: CDMAM contrast-detail phantom and a structured phantom made from an acrylic container filled with water, acrylic spheres and a range of 3D-printed spiculated, non-spiculated masses and microcalcifications. DM and tomosynthesis series of the CDMAM (positioned between two 20 mm Plexiglas plates) and the structured phantom were acquired on a Hologic Selenia Dimensions system. Synthetic mammograms were exported from the imaging system. Eight DM and SM CDMAM images were manually read using a four-alternative-forced-choice (4 AFC) method by 4 readers using the Sara2 software yielding average threshold gold thickness versus disc diameter. The structured phantom was also read using the 4 AFC method and percent-correct response (PC) together with detection threshold diameters (dtr) at 62.5% PC was assessed from 10 trials per target.
Results: Detection of masses in the structured phantom was higher in SM compared to DM with dtr of 4.8 and 6.4 mm for DM and 3.3 and 3.3 mm for SM for spiculated and non-spiculated masses ($p < 0.0001$, $p < 0.0001$) respectively. For microcalcifications, an increase in dtr was found for SM (127µm) compared to DM (108µm) ($p < 0.0001$). Threshold gold thicknesses were between 4% and 40% lower for DM compared to SM (p=0.004), suggesting a reduction in detection of small details.
Conclusion: Phantom evaluations showed higher detectability of mass-like targets in SM compared to DM whereas DM outperforms SM for detection of microcalcification-like details.
Author Disclosures:
H. Bosmans: Founder; Co-founder Qaelum NV.

B-1357 15:12

Phantom and visual grading analysis of three breast tomosynthesis reconstruction methods

K. Michielsen, C. Van Ongeval, A. Van Steen, M. Keupers, J. Soens, H. Ghunaim, D. Petrov, L. Cockmartin, J. Nuyts; *Leuven/BE*

Purpose: We compare three reconstruction techniques for breast tomosynthesis: super-resolution filtered backprojection with post-reconstruction denoising (SRSAR), model based iterative reconstruction (MLTR-pr), and regular filtered backprojection (FBP), in terms of phantom lesion detectability and visual grading analysis.
Methods and Materials: Detection threshold diameters of calcification and mass models placed in a phantom with structured background were determined from a four-alternative forced-choice experiment. Clinical image quality was scored based on eight criteria for clinical mammography quality assessment and evaluated by four radiologists on 56 patients with similar distribution in four density groups (N1, P1, P2, DY) and four thickness groups ($<$ 40 mm, 40-54 mm, 55-69 mm, $>$ 70 mm). Reader scores were evaluated by visual grading characteristics (VGC) analysis.
Results: Detection thresholds for calcifications and masses are significantly better ($p=0.003$, $p < 0.001$) for MLTR-pr (137µm, 2.33 mm) and SRSAR (144µm, 2.51 mm) than FBP (159µm, 3.15 mm), but not different between MLTR-pr and SRSAR (p=0.154, p=0.125). VGC analysis finds an overall trend that prefers SRSAR over FBP, and FBP over MLTR-pr. Significant differences were found for the following criteria: increased noise in SRSAR compared to FBP, more artefacts in MLTR-pr than in SRSAR, better skin line visualisation in SRSAR compared to FBP and MLTR-pr, and better overall image quality in SRSAR than in MLTR-pr.
Conclusion: Both SRSAR and MLTR-pr improved performance on the detection tasks, but resulted in significantly different overall appreciation of image quality. Considering both detection and visual grading evaluations, SRSAR improves most upon current FBP, although adjustment of the denoising might be needed.
Author Disclosures:
K. Michielsen: Patent Holder; US Patent 8,594,407. **J. Nuyts:** Patent Holder; US Patent 8,594,407. Research/Grant Support; Siemens Healthcare.

14:00 - 15:30 **Room D1**

Chest

SS 1904

Computer-based quantification and texture analysis

Moderators:
R. Cesar; Golnik/SI
M. Regier; Hamburg/DE

B-1358 14:00

CT-texture analysis of pulmonary ground glass nodules: tumour heterogeneity correlates with in-situ/minimally and invasive adenocarcinoma pathology

J.G. Cohen[1], E. Reymond[1], M. Medici[1], M. Lederlin[2], F. Laurent[3], A.-C. Toffart[1], A. Jankowski[1], S. Lantuejoul[1], G.R. Ferretti[1]; [1]*Grenoble/FR*, [2]*Rennes/FR*, [3]*Bordeaux/FR (jcohen@chu-grenoble.fr)*

Purpose: To evaluate the usefulness of CT-texture analysis (CTTA) in differentiating in-situ/minimally and invasive adenocarcinomas in ground-glass nodules (GGNs).
Methods and Materials: Retrospective review of 49 GGNs by 2 radiologists. We analysed the association between histopathology and CTTA parameters. CTTA comprised a filtration-histogram technique. Filtration extracted features of different sizes corresponding to the spatial scale filter (SSF) i.e. without-filtration (SSF=0), fine (SSF=2 mm), medium (SSF=3-5 mm) and coarse texture scales (SSF=6 mm) followed by histogram quantification using mean intensity, standard deviation (SD), entropy, mean positive pixels (MPP), skewness and kurtosis. Statistical analysis comprised univariate and multivariate analysis.
Results: There were 13 pure and 36 part-solid GGNs corresponding to 16 adenocarcinomas in situ (AIS), 5 minimally invasive adenocarcinomas (MIA) and 28 invasive adenocarcinomas (IVA). CTTA significantly differentiated AIS/MIA and IVA on uni- and multivariate analysis ($p < 0.05$) using for pure GGNs: MPP at SSF 0, skewness at SSF 2 and kurtosis at SSF 6; for part-solid GGNs: SD at SSF 0, MPP at SSF 3 and skewness at SSF 2. A MPP at SSF 0 had a sensitivity and specificity of 100% and 88% for the diagnosis of IVA in pure GGNs.
Conclusion: CTTA demonstrated the potential to significantly differentiate AIS and MIA from IVA.

B-1363 14:08

Performance of semi-automated software in segmenting ground-glass and solid components and comparison of software and pathology measurements in resected pulmonary adenocarcinomas

J.G. Cohen[1], R.-E. Yoo[2], C. Park[2], C. Lee[2], D. Chung[2], Y. Kim[2], G. Ferretti[1], B. Van Ginneken[3], J. Goo[2]; [1]*Grenoble/FR*, [2]*Seoul/KR*, [3]*Nijmegen/NL (jcohen@chu-grenoble.fr)*

Purpose: To evaluate the performance of software in segmenting ground-glass and solid components in subsolid nodules and to compare measurements on CT with those on pathology.
Methods and Materials: Seventy-three pulmonary adenocarcinomas manifesting as subsolid nodules were included. Two radiologists measured the maximal axial diameter of the ground-glass components on lung windows and that of the solid components on lung and mediastinal windows. Nodules were segmented using software by applying five (-850 HU to -650 HU) and nine (-130 HU to -500 HU) attenuation thresholds. We compared the manual and software measurements of ground-glass and solid components with pathology measurements of tumour and invasive components.
Results: Software segmentation was adequate in 92 % of cases. Segmentation of ground-glass components with a threshold of -750 HU yielded the best results with mean differences of +0.06 mm (p=0.83) and +2.31 mm ($p < 0.001$) when compared with pathology and manual measurements, respectively. For solid components, mean differences between the software (at -350 HU) and pathology measurements and between the manual (lung and mediastinal windows) and pathology measurements were -0.12 mm (p=0.74), -0.15 mm (p=0.73), and -1.14 mm ($p < 0.001$), respectively.
Conclusion: Software segmentation of ground-glass and solid components in subsolid nodules showed good correlations with pathology.

B-1360 14:16

CT texture analysis for independent prediction of tumour recurrence in patients with surgically resected adenocarcinoma of the lung

J. Jang[1], H. Koo[1], Y. Sung[1], H. Xu[2], C.-M. Choi[1], J. Lee[1], M. Kim[1]; [1]*Seoul/KR*, [2]*Nanjing/CN (jongkeon.jang@gmail.com)*

Purpose: To determine if preoperative CT findings including texture and histogram analysis measurements are independently associated with tumour recurrence in patients with surgically resected adenocarcinoma of the lung.
Methods and Materials: The study included 195 patients with surgically resected adenocarcinoma of the lung who performed preoperative CT between January 2013 and October 2013. During the follow-up period, 26 patients had recurrence. CT texture and histogram analysis of lung adenocarcinoma on the preoperative CT images were performed using modified ImageJ software. Inter-values correlation between 1-mm and 5-mm data were obtained using the intraclass correlation coefficient. Univariate and multivariate logistic regression methods were used to investigate the association between tumour recurrence and the preoperative CT findings and clinical variables. To test a discriminatory power, receiver operating characteristic curve analysis was used.
Results: The inter-values correlation coefficient between 1-mm and 5-mm data showed high correlation in terms of area, perimeter, diameter and entropy. Circularity, aspect ratio and roundness showed moderate correlation. However, skewness and kurtosis showed low correlation. In univariate analysis, central location, lobulated margin, peritumoral interstitial thickening, tumour size, and roundness were associated with tumour recurrence ($P < 0.05$). Multivariate logistic regression analysis revealed that tumour size ($P < 0.001$) and the roundness (P=0.006) were independently associated with tumour recurrence.
Conclusion: Tumour size and roundness are independently associated with tumour recurrence in patients with surgically resected adenocarcinoma of the lung. The receiver operating curve using the two independent predictive factors showed high diagnostic performance (C-index=0.81).

B-1361 14:24

Lung cancer textural analysis: to contrast or not to contrast

A. Farchione, A. Larici, N. Dinapoli, R. Gatta, C. Masciocchi, A. Damiani, P. Franchi, V. Valentini, L. Bonomo; *Rome/IT (alessandra.farchione@gmail.com)*

Purpose: To evaluate contrast medium influence on morphological and textural features derived from CT images in Patients (Pts) with NSCLC.
Methods and Materials: Pre-operative CT of 39 NSCLC Pts, acquired pre- and post-contrast medium administration using the same technical parameters (CT scanner Light Speed GE Medical Systems, Milwaukee WI USA; thickness and increase layer; kernel reconstruction), were retrospectively included. For each pre- and post-contrast series, a thoracic radiologist semi-automatically segmented tumour volumes using a commercial software (Eclypse Varian Aria v.11). Finally morphological and textural tumour features (area/volume, mean, kurtosis, skewness, deviation standard DS, entropy) were extracted using a software developed in our Department (Moddicom). Pre- and post-contrast analysis results were compared (Wilcoxon Signed Rank test for paired data).
Results: Skewness and entropy showed statistically significant higher value in the post-contrast acquisitions (both p value 0.007); mean values were greater in the post-contrast acquisitions, even though the difference was not statistically significant. Area/volume and kurtosis showed statistically significant higher values in the pre-contrast acquisitions (p value respectively 0.046 and 0.036); DS values were greater in the pre-contrast acquisitions, even though the difference was not statistically significant.
Conclusion: Contrast medium significantly influences morphological and textural features derived from CT of NSCLC. The difference can be related both to technical factors and to different tissue components of which it is expression. As these features are known predictors of different NSCLC outcomes and may be included in predictive models useful for the creation of therapeutic decision-making systems, the standardization of technical protocols seems appropriate.

B-1362 14:32

Temporal subtraction of chest CT in lung cancer screening

E.T. Scholten[1], C. Jacobs[1], C.M. Schaefer-Prokop[1], J. Rühaak[2], H.J. de Koning[3], M. Oudkerk[4], P.A. de Jong[5], M. Prokop[1], B. van Ginneken[1]; [1]*Nijmegen/NL*, [2]*Lübeck/DE*, [3]*Rotterdam/NL*, [4]*Groningen/NL*, [5]*Utrecht/NL (ethscholten@quicknet.nl)*

Purpose: Detection of change between CT images is crucial in lung cancer screening. We analysed whether subtraction images can detect change in nodular size between successive low-dose CT images.
Methods and Materials: Given two successive CT scans lung segmentation and non-rigid registration between the two scans is performed and a subtraction image is obtained by subtracting the deformed prior scan from the current scan. Subtraction images of a total of 111 participants of a lung cancer screening trial that were referred to a pulmonologist on the basis of the last CT

were studied. An experienced radiologist annotated all relevant nodular changes by inspecting the subtraction images. The two original images were available side-by-side for confirmation. In addition, the quality of the subtraction images, was scored on a 1-5 scale.
Results: The quality of the subtraction images was rated high: only six subtraction images (4%) had a rating lower than 4, meaning that the images were significantly degraded by artefacts. In the referred cases 58 new nodules > 5 mm were found. Furthermore 45 nodules with significant growth were noted. A significant nodule was missed in 8 cases, of which 2 were stable and hence not visible on the subtraction image, 1 was missed because of its pleural location and 5 showed a mean increase in the diameter of 21%.
Conclusion: Temporal subtraction of CT images is a promising tool for the visual detection of change, especially significant growth of nodules, between successive CT scans.

B-1364 14:40

FIRST vs AIDR 3D vs. FBP methods: accuracy of computer-aided volumetry (CADv) for low-dose lung cancer CT screening protocols in QIBA recommended lung nodule phantom study

Y. Ohno[1], A. Yaguchi[2], T. Okazaki[2], K. Aoyagi[3], N. Sugihara[3], S. Kaminaga[3], T. Yoshikawa[1], K. Sugimura[1]; [1]*Kobe/JP*, [2]*Kawasaki/JP*, [3]*Otawara/JP*
(yosirad@kobe-u.ac.jp)

Purpose: To directly compare the capability of three reconstruction methods using forward projected model-based iterative reconstruction (FIRST), adaptive iterative dose reduction using three dimensional processing (AIDR 3D) and filter back projection (FBP) for radiation dose reduction and measurement accuracy of computer-aided volumetry (CADv) for nodule management on chest CT examination in phantom study.
Methods and Materials: An anthropomorphic thoracic phantom with 30 simulated nodules with 3 density types (100, -630, and -800 HU) and 5 different diameters was scanned with an area-detector CT at the following tube currents: 270, 200, 120, 80, 40, 20, and 10 mA. Each scanned data were reconstructed as thin-section CT with three methods. Then, all simulated nodules were measured by CADv software. On comparison of the capability for CADv at each tube current, absolute percentage measurement errors were compared among all reconstruction methods by means of Tukey's HSD test. Then, absolute percentage measurement errors on all reconstruction methods were compared between each tube current with 270 mA by Dunett test.
Results: Mean absolute percentage measurement errors of AIDR 3D and FIRST methods in each nodule type group were significantly lower than that of FBP method at 20 mA and 10 mA ($p < 0.05$). In addition, absolute percentage measurement errors of FBP method at 20 mA and 10 mA were significantly higher than that at 270 mA in all nodule type group ($p < 0.05$).
Conclusion: FIRST as well as the AIDR 3D method is more effective than FBP method for radiation dose reduction with higher measurement accuracy of CADv on chest CT examination.
Author Disclosures:
Y. Ohno: Research/Grant Support; Toshiba Medical Systems Corporation. **A. Yaguchi:** Employee; Toshiba Corporation. **T. Okazaki:** Employee; Toshiba Corporation. **K. Aoyagi:** Employee; Toshiba Medical Systems Corporation. **N. Sugihara:** Employee; Toshiba Medical Systems Corporation.s. **Kaminaga:** Employee; Toshiba Medical Systems Corporation. **T. Yoshikawa:** Research/Grant Support; Toshiba Medical systems Corporation. **K. Sugimura:** Research/Grant Support; Toshiba Medical Systems Corporation.

B-1365 14:48

Influence of computed tomography dose reduction and iterative reconstruction on pulmonary nodule volumetry

A.M. den Harder[1], M.J. Willemink[1], R.W. van Hamersvelt[1], E.-j.P. Vonken[1], A.M. Schilham[1], J.-W.J. Lammers[1], R.P. Budde[2], T. Leiner[1], P.A. de Jong[1]; [1]*Utrecht/NL*, [2]*Rotterdam/NL (R.w.vanhamersvelt-3@umcutrecht.nl)*

Purpose: To determine the effects of computed tomography (CT) radiation dose reduction and iterative reconstruction (IR) on pulmonary nodule volumetry.
Methods and Materials: Our local institutional review-board approved this prospective study, in which 25 patients (13 men, median age 66 (60-72) years) scheduled for follow-up of pulmonary nodules were included. After obtaining informed consent, computed tomography (CT) scans were acquired at four dose levels by reducing tube current (median of 2.1, 1.2, 0.8 and 0.6mSv). Data were reconstructed with filtered back projection (FBP), three hybrid (iDose4) levels and three iterative model-based reconstruction (IMR) levels. Two radiologists defined pulmonary nodules ≥3 mm after which volumetry was performed on each reconstruction using semi-automatic software. All volumetric measurements were statistically compared to volumetric measurements at the reference scan (routine dose reconstructed with FBP) using Wilcoxon signed ranks-test.
Results: In total 37 pulmonary nodules were present. At routine dose > 92% (34/37) and at the lowest dose level > 84% of the nodules could be segmented. Twenty-two nodules were correctly segmented on all dose levels and reconstructions. No significant differences in volumetry between FBP, hybrid and model-based IR were identified at any reduced dose level. In addition, reduced dose levels did not yield significant differences compared to FBP at routine. Relative differences were low, ranging from 1.5% to -8.9%.
Conclusion: At submilliSievert dose using FBP or IR, pulmonary nodule volumetry can be accurately performed.

B-1366 14:56

Prediction of decline in forced vital capacity by texture-based automated quantification of regional disease patterns on initial CT in idiopathic pulmonary fibrosis

H. Park, S. Lee, J. Seo, S. Lee, N. Kim, S. Oh, J. Song; *Seoul/KR*
(happyeahj@gmail.com)

Purpose: To retrospectively determine predictive factors for decline in forced vital capacity (FVC) on initial CT using texture-based automated quantification in patients with idiopathic pulmonary fibrosis (IPF).
Methods and Materials: Institutional review board approval with waiver of the patient informed consent was obtained. 193 IPF patients (M:F = 152:41; mean age, 63.4 years ± 7.6) with one-year follow-up pulmonary function test, were enrolled in our study. A texture-based automated system using the in-house software, quantified six regional CT patterns: normal, NL; ground-glass opacity, GGO; reticular opacity, RO; honeycombing, HC; emphysema, EMPH; and consolidation, CONS. The fibrotic score was obtained as the sum of each extent of RO and HC. Decline of FVC was defined as more than a 10% decrease of the initial FVC.
Results: Decline of FVC occurred in 32 patients and the mean volume of decline in FVC was 0.43L ± 0.18. The mean extents of GGO, RO, HC, EMPH, CONS, and fibrotic score were 12.3% ± 11.9, 16.8% ± 9.8, 7.1% ± 6.7, 3.9% ± 5.5, 2.8% ± 0.8, and 23.9% ± 12.3, respectively. Multivariate analysis revealed that RO was the sole significant independent predictor for a decline in FVC (P= 0.012; adjusted odds ratio, 1.047). ROC analysis showed that the AUC of RO was 0.641 and the optimal cut-off value of RO was 22.05% (sensitivity: 50.0%, specificity: 81.4%, and negative predictive value: 89.1%).
Conclusion: Reticular opacity of less than 22.05% in extent can accurately predict stable IPF at the one-year follow-up examination in terms of FVC.

B-1367 15:04

Longitudinal analysis in idiopathic pulmonary fibrosis: changes in lung mass as a new biomarker for quantitative computed tomography

T. Kracke, B. Hensen, T.A. Alten, O. Solyanik, T. Werncke, A. Prasse, A. Großhennig, F. Wacker, H.-O. Shin; *Hannover/DE (tom.kracke@gmx.de)*

Purpose: To evaluate whether changes in lung mass correspond to parenchymal changes of the lungs in idiopathic pulmonary fibrosis (IPF).
Methods and Materials: After semiautomatic segmentation of the lung and the lung lobes using a region-growing algorithm, the lung mass was calculated using segmented volume and averaged density in longitudinal paired CT scans of 24 patients with IPF. As the gold standard, disease progression was rated by three experienced readers (double blinded) using a three point scale (increase, stable, decrease) evaluating three pathologic patterns (cystlike lesions, ground-glass opacities, reticular pattern). Inter- and intra-rater reliability analysis for each pattern and lung lobe was performed with Krippendorff's alpha coefficient.
Results: Reliability in visual assessment was moderate (Intra-rater alpha 0.49-1; Inter-rater alpha 0.13-0.87). Lobe based analysis in visually stable disease showed no change in mass. Mean difference of lung mass in individual lobes varied between -6.19% to 0.98% in follow-up examinations. With increasing reticular pattern and ground-glass opacities the lung mass increased accordingly (+0.94% to +7.52% and -0.13% to 17.31%). A remission of these patterns is accompanied by a decrease in lung mass (ground-glass -13.43% to -12.33%, reticular pattern -11.9% to 3.99%). The enlargement of cystlike lesions, e.g. honeycombing, caused a broad distribution of mass changes (-13.6% to 8.42%) due to accompanying parenchymal changes like reticular pattern and GGOs.
Conclusion: In longitudinal studies, early morphological changes in CT (reticular pattern and ground-glass) can be assessed by changes in lung mass. It could be used as an imaging biomarker for monitoring disease in IPF.

B-1368 15:12

Baseline prognostication in diffuse fibrosing lung diseases (FLD): evaluation of computer-based quantitative CT analysis against visual CT analysis and pulmonary function tests (PFT)

J. Jacob[1], B. Bartholmai[2], A. Brun[1], R. Egashira[3], R. Karwoski[2], M. Kokosi[1], S. Raghunath[2], A. Wells[1], D. Hansell[1]; [1]*London/UK*, [2]*Rochester, MN/US*, [3]*Saga/JP (akelajacob@gmail.com)*

Purpose: Even in the absence of a specific diagnosis, prognostication remains an important part of patient management. The ability of computer-based quantitation to predict mortality, regardless of a specific FLD diagnosis, was compared to visual CT analysis and PFTs.
Methods and Materials: Baseline CT imaging from 872 consecutive patients with a variety of FLDs were analysed by a computer algorithm (CALIPER) developed at the Biomedical Imaging Resource, Mayo Clinic, Rochester, USA. Each CT was analysed visually by two experienced sub-specialty thoracic radiologists. PFTs including FVC, DLco and composite physiologic index (CPI) were obtained within three months of the CT. CT parenchymal patterns analysed included emphysema, honeycombing, reticulation, ground glass opacities, visual traction bronchiectasis and CALIPER-derived pulmonary vessel volume (PVV). Individual cox proportional hazards models were created for CALIPER and visual variables and PFTs. A final multivariate model evaluated variables predictive of mortality in the individual models.
Results: Model variables independently predictive of mortality included: CALIPER: emphysema, reticulation, honeycombing and PVV ($p < 0.0001$ for all variables). Visual: reticular pattern, honeycombing and traction bronchiectasis ($p < 0.0001$ for all variables). PFTs: CPI ($p < 0.0001$). Five variables were independently predictive of mortality in the combined multivariate model: CALIPER PVV (HR 1.19, $p < 0.0001$, CI 1.10-1.28), CALIPER emphysema (HR 1.05, $p < 0.0001$, CI 1.03-1.07), visual honeycombing (HR 1.03, $p < 0.0001$, CI 1.02-1.04), visual traction bronchiectasis (HR 1.05, $p < 0.0001$, CI 1.02-1.08) and CPI (HR 1.04, $p < 0.0001$, CI 1.02-1.05).
Conclusion: CALIPER variables, including the novel feature of PVV, are amongst the strongest predictors of mortality for the evaluation of FLDs, irrespective of diagnosis.

14:00 - 15:30 **Room D2**

Interventional Radiology

SS 1909

Endovascular

Moderators:
V. Bérczi; Budapest/HU
M. Krokidis; Cambridge/UK

K-36 14:00

Keynote lecture

C. Binkert; Winterthur/CH

B-1376 14:09

Fabrication and assessment of 3D printed anatomical models of the lower limb for femoral vessel access training in interventional radiology

M.K. O'Reilly, G. Sugrue, T. Geoghegan, J.F.X. Jones; *Dublin/IE (michael.oreilly3@gmail.com)*

Purpose: 3D printing is an emerging technology in the field of medicine. At present simulators used in interventional radiology training are expensive and have low fidelity. Using 3D printing technologies, we aimed to manufacture a high-fidelity low-cost patient-specific vascular access simulator.
Methods and Materials: A 3D model of the right femoral artery, vein and hip was created from an existing CT Aorta data set using medical image-processing software (Mimics® Version-16.0). The model was produced with a ZCorp Z250 3D printer and the lost wax method of casting. It was tested against a commercially available simulator on the entire cohort of first year radiology residents in Ireland (n=19). Results were analysed using SPSS software. A five-item six-point Likert questionnaire for radiologists' opinion of the vascular model was tested for internal consistency with Cronbach's-alpha.
Results: Participants in this study preferred our model compared to the commercially available simulator with an agreement rating of 5.1/6. The model performed favourably as an ultrasound phantom in terms of life like mimicry (5.2/6) and haptic characteristics such as a palpable pulse (4.3/6). Overall our model was found to closely resemble a real patient encounter (4.6/6).
Conclusion: The final model was a high-fidelity low-cost ultrasound phantom. It had a palpable pulse, similar Doppler signals to in vivo arterial and venous waveforms and vessels that can be cannulated many times before repair is needed. Our study suggests that 3D printing will be a useful adjunct in teaching the basic principles of Interventional Radiology.

B-1369 14:17

Prostatic artery embolisation for benign prostatic hyperplasia: anatomical factors affecting the procedure performance

A. Cannavale[1], B. Maher[2], T. Bryant[2], N. Hacking[2]; [1]*Canterbury/UK*, [2]*Southampton/UK (alessandro.cannavale@hotmail.com)*

Purpose: To investigate any procedural/anatomical factors that might affect the technical outcome of Prostatic Artery Embolisation (PAE).
Methods and Materials: We performed a retrospective review of 55 patients (110 pelvic sides) who underwent PAE from June 2012 to December 2014. All selected patients underwent complete urological assessment. The following characteristics, detected on CTA, were recorded on a diagrammatic template: prostate volume, grade of vascular ectasia, calcification (mild, moderate, severe), presence of common gluteal trunk (CGT), gluteal-pudendal trunk (GPT), replaced obturator artery (rOb), number of prostatic arteries (PrA) including origin, degree of origin/ proximal tract PrA tortuosity, presence of connections with nearby visceral arteries. Uni/multivariate analysis was used to relate the anatomical factors to the technical success, procedure time, fluoroscopy time and radiation dose.
Results: According to the univariate/multivariate analysis severe arterial ectasia and calcified atheroma did not affect technical success (p=0.5). Calcified atheroma hindered the cannulation of the left PrA in 12.5%. The presence of CGT, GPT or rOb did not prove to be a significant adverse anatomical factor. Presence of the tortuous pattern of PrA demonstrated reduced technical success of 84.7% (7/46 sides failed) versus the straight pattern (7/46 sides failed, technical success 84.7% - vs 3/64 sides failed, 95.3%; p= 0.058). Procedure and fluoroscopy time was signficantly higher in tortuous PrA. Anastomotic vessels did not affect the technical success (p= 0.921), but increased the use of Dyna-CT.
Conclusion: Anatomical factors which can affect the perfomance of the procedure include: severe aorto-iliac atherosclerotic disease,tortuous PrA and presence of anastomotic vessels.

B-1370 14:25

Uterine artery embolisation for adenomyosis: portending factors affecting the clinical outcome

A. Cannavale[1], D. Miligkos[2], B. Maher[2], B. Karunyam[2], I. Wilson[2], N. Hacking[2]; [1]*Canterbury/UK*, [2]*Southampton/UK (alessandro.cannavale@hotmail.com)*

Purpose: To investigate any potential factor that can affect the clinical success of Uterine Artery Embolisation (UAE) for Adenomyosis (AM).
Methods and Materials: We retrospectively collected data from patients who underwent UAE for AM between 2010 and 2012. Inclusion criteria were: menorrhagia, dysmenorrhea with or without bulk symptoms, MRI diagnosis of isolated uterine AM or AM coexisting with uterine leiomyomata. MRI was performed before embolisation and at 3, 6 and 12 months of follow-up. The following imaging/procedural features were analysed and put in relation to the clinical success of the procedure by using uni/multivariate analysis: pattern of AM (Focal or Diffuse); percentage of infarcted AM tissue (technical success if> 90%); AM baseline volume; AM volume reduction and Uterine volume reduction.
Results: Forty patients underwent treatment with UAE: 15 patients (37.5%) had pure adenomyosis and 25 (62.5%) had adenomyosis associated with fibroids. Post-procedural volume of AM was not significantly different in patients who completely healed from symptoms vs patients who had only improvement of symptoms (mean volume 73.0 vs 43.0 ml, p=0.47), but it was significantly different vs patients who had no change or worsening of symptoms (mean volume 259.0vs 73.0 ml, p=0.03). Pre and post-operative uterine volume correlated only with improvement of bulk symptoms, but not with menorrhagia or dysmenorrhea. Otherwise devascularisation > 90% was significantly correlated with improvement of menorrhagia (p=0.05): patients with less than 90% of AM infarction showed a significant higher mean symptom score for menorrhagia (mean score=0.72,range 0-3).
Conclusion: Adenomyosis volume and degree of devascularisation after UAE are the main factors related to the clinical success.

B-1371 14:33

Fourteen-year experience of PAVMs embolisation in patients with hereditary haemorrhagic telangiectasia: what has changed?

S. Bongiovanni, A. Antonietti, A. Balderi, F. Pedrazzini, D. Sortino, M. Grosso; *Cuneo/IT (simone.bongio@gmail.com)*

Purpose: To determine the efficacy and safety of high-flow pulmonary arteriovenous malformations (PAVMs) embolisation in patients with Hereditary Haemorrhagic Telangiectasia (HHT), comparing Amplatzer plug type IV to other embolisation devices.
Methods and Materials: From December 2001 to June 2015, we embolised 317 PAVMs, during 139 procedures, performed on 102 patients, referred by the "Italian Center of HHT" and enrolled in a screening programme of HHT families. All patients underwent clinical evaluation, abdomen ultrasound,

echocardiography with bubble study and chest CT. 117 of 317 PAVMs (37%) were treated using Amplatzer plug IV (from April 2010 to June 2015).
Results: All 117 embolisations using Amplatzer plug IV were successful, with complete PAVMs exclusion. There were no plug migrations or major complications, except one hemiparesis resolved after 12 hours. CT angiography follow-up (mean 36 months) showed 24 PAVM recanalisations after coil embolisation and only one after plug occlusion.
Conclusion: Percutaneous embolisation has become the first-line treatment for PAVMs, showing high efficacy and minimal invasiveness compared with thoracotomy. From 2009 is available Amplatzer plug type IV, that can be deployed using 4 or 5 French catheters. This device has some interesting features, such as low profile, versatility, reduced risk of migration and easy delivery, proving low recanalisation rates. Despite the high device cost, it allows a time- and money-saving treatment, comparing to usual multiple coil deployment, preserving the same invasiveness. The Amplatzer Plug IV might become the device of choice for the embolisation of PAVMs with feeding arteries smaller than 6 mm in diameter.

B-1372 14:41

Endosaccular embolisation of visceral artery aneurysms with adjunctive techniques

M. Maruno, H. Kiyosue, S. Tanoue, N. Hongo, S. Matsumoto, H. Mori;
Yufu-shi/JP (marum@oita-u.ac.jp)

Purpose: To evaluate the safety and efficacy of endosaccular embolisation with adjunctive techniques for the treatment of visceral artery aneurysms.
Methods and Materials: We reviewed consecutive twenty-two patients with unruptured visceral artery true aneurysms, including splenic, renal, and gastroduodenal artery aneurysms, underwent endosaccular embolisation with detachable coils. In all patients, adjunctive techniques, including balloon-assist, stent-assist, multiple catheter technique, were applied to preserve parent arteries and major branches. The mean maximum diameter of aneurysms was 16.2 mm. All cases were followed by digital subtraction angiography and/or MR angiography. Immediate occlusion rates, complications and follow-up results were evaluated. The relationships between the morphology of aneurysms, packing density and immediate and follow-up results were also analysed.
Results: All cases were successfully embolised without any complications. Angiography immediately after embolisation revealed complete occlusion (CO) in 14, neck remnant (NR) in 7, dome filling (DF) in one. During the follow-up period (mean 28.7 months), CO cases showed no recurrence in 10, and neck recanalisation in 4, NR cases showed stable in 5, and dome filling due to coil compaction in 2. In DF case, the dome filling was decreased. Patients showing coil compaction were treated by repeated endosaccular embolisation. Higher packing density was associated with stable occlusion with statistical significance; meanwhile, there was no relationship of stable occlusion with other factors including the aneurysmal volume, dome/neck ratio and branch involvement.
Conclusion: Endosaccular embolisation with adjunctive techniques is safe and effective for visceral artery aneurysms. Dense packing is required for stable occlusion, and careful observation is essential.

B-1373 14:49

Investigation of international conformance of health economic analyses by comparing open and endovascular repair of abdominal aortic aneurysm regarding costs and outcomes

A. Nagy, E. Nagy, A. Palkó, Z. Palásthy, T. Takács, L. Baráth; *Szeged/HU (nagya23@gmail.com)*

Purpose: We aim to investigate the conformance and international interchangeability of health economic analyses (HEA) by comparing two medical procedures with similar outcomes regarding costs and outcomes.
Methods and Materials: Abdominal aortic aneurysm patients - 8 females (mean age: 73.5 years) and 36 males (73 years) - treated in our institute in 2014 were investigated, 23 of them with open repair, and 21 of them with endovascular repair. As HEA, cost--benefit analyses (CBA) were performed. For the CBA, costs and specific outcomes (hospital stay length, procedure time, reoperation ratio, intensive care unit stay, use of blood products and perioperative death) of both procedures were determined. The quotients of the costs and outcomes were compared between the two procedures. The results were compared to available international data.
Results: Direct health-related costs of the perioperative period were assumed. Mean costs of the endovascular repair were 8.5 times higher compared to open repair, which significantly differ from the international data. Regarding the above-mentioned outcomes, endovascular repair was proven to be superior, which is consistent with the international results. Due to the marked cost difference, CBA demonstrates distorted results.
Conclusion: As the results of our HEA significantly differ from the international data, that was due to stentgraft and prosthesis cost differences, low labour and hospital stay costs, we concluded that standardisation of HEAs should be undertaken to make the results internationally valid. By standardisation, there would be no need to repeat these important but expensive and time-consuming analyses country by country.

B-1374 14:57

Inducing false lumen thrombosis in type B aortic dissection by selectively excluding true lumen re-entry points

M. Wojtaszek, E. Wnuk, R. Maciag, K. Lamparski, K. Korzeniowski, O. Rowinski; *Warsaw/PL (nwojtaszek@gmail.com)*

Purpose: Aortic dissection is one of the most frequently diagnosed life-threatening aortic diseases. TEVAR is beneficial in thoracic aortic remodelling but concern remains regarding further dilatation of the abdominal aorta in select patients. We present a number of secondary endovascular methods which may promote false lumen thrombosis (FLT) and prevent abdominal aortic dilatation.
Methods and Materials: Out of 78 patients after TEVAR, 15 patients (12 men and 3 women; mean age: 59.6) required ancillary endovascular procedures to halt abdominal false lumen dilatation and induce FLT. The following different techniques were used alone or in conjunction: 1) stentgraft occlusion of a re-entry point at the level of the detached renal artery ostium, 2) occlusion of a major entry tear using a vascular plug, 3) occlusion of distal reentry points in the abdominal aorta using an endograft and 4) embolisation of a false lumen proximal or distal endoleak with the embolisation polymer Onyx.
Results: A mean clinical follow-up of 43.8 months was achieved (range 2 days to 86.8 months) during which three deaths occurred. Eight of 12 surviving patients (66.6%) had complete FLT. Three patients had partial FLT but with demonstrated stable aortic diameters at follow-up. In one patient, the false lumen increased in size and will still require ancillary interventions.
Conclusion: Selective exclusion of the remaining post-TEVAR re-entry tears appears to represent a safe and feasible approach to promote FLT which effectively stabilises abdominal aortic expansion. Unfortunately, most patients will not benefit from a single-stage procedure.
Author Disclosures:
M. Wojtaszek: Speaker; Medtronic. **R. Maciag:** Speaker; Medtronic. **O. Rowinski:** Speaker; Medtronic.

B-1375 15:05

Endovenous radiofrequency ablation for the treatment of varicose veins: a single center experience

S. Riva, G. Guzzardi, R. Fossaceca, P. Cerini, A. Galbiati, A. Carriero; *Novara/IT (silviariva.riva@gmail.com)*

Purpose: Catheter-based endovenous thermal ablation with Radiofrequency (RFA) has become a widely accepted, minimally invasive alternative to the traditional treatment of lower extremity chronic venous Insufficiency. The aim of our study was to evaluate the efficacy of RFA in small and great saphenous vein insufficiency with clinical (CEAP score) and duplex scan evaluation at one week, one month and six months.
Methods and Materials: Sixty-five consecutive patients (71 extremities) underwent office procedures RFA in the period from October 2014 to October 2015. Graduated compression stockings 20 - 30 mm Hg thigh-high were applied before the patient was allowed to ambulate. Patients were instructed to wear the stockings continuously for 3 weeks.
Results: Technical success was 100% (71/71). Complete vein occlusion was observed in 100% of patients (71/71) at 1 month and in 94% (69/71) at 6 months. The incidence of deep vein thrombosis was 1.5 % (1/71). Four patients (5.6%) with residual varicose veins after the follow-up period underwent sclerotherapy (3/4) and perforating vein ligation (1/4). Improvement of CEAP score was demonstrated in 58% cases at 6 months.None of minor complications such as hematoma, paresthesia, hemorrhage, infection or pain have been observed after one week.
Conclusion: Our experience suggests that RFA is a safe and effective treatment for the management of varicose veins that is associated with a high success rate and patient satisfaction.

B-1377 15:13

In vitro quantitative analysis of blood flow blockage effect of Amplatzer vascular plugs (AVP): comparison of AVP-I and AVP-II

K. Hidaka, T. Tajikawa, K. Osuga; *Suita/JP (hidaka@hp-rad.med.osaka-u.ac.jp)*

Purpose: To analyse quantitatively the blood flow blockage effect of Amplatzer Vascular Plugs (AVP) using an in vitro blood vessel model, and to compare the effects between AVP-I and AVP-II.
Methods and Materials: AVP-I and II (sizes 8 mm and 16 mm) were placed in simulated straight blood vessels with inner diameters 4, 6, 8, and 16 mm, respectively. The expanding ratio (ER) of AVP varied from 25% to 100%

depending on the blood vessel size. Distilled water was circulated in the simulated blood vessel as a steady flow with 0 to 1.0 m/s speeds. Pressure loss between the proximal and distal position of the AVP, which indicated the flow resistance as the flow blockage effect, was measured at various ERs in each AVP type.
Results: Pressure loss (Δp) increased proportional to the flow ratio (Q) at all ERs in both AVP types (Δp ∝ Q^1.54±0.10). Pressure loss of AVP-II was three times higher than that of AVP-I when ER was 75% (P=0.004). In the vessels with the same inner diameter, there was no significant difference in Δp regardless of ER of both types of AVP within the commercially recommended size range (P> 0.112). In contrast, at 25% ER, Δp was slightly increased compared with Δp when AVP was placed at higher ER in the blood vessel with the same inner diameter.
Conclusion: AVP-II has significantly higher blood flow blockage effect than that of AVP-I. The blood flow blockage effect of AVP does not depend on their ER in the blood vessel with the same inner diameter.

B-1378 15:21

Carotid stents: seven-year experience
T. Kokovic, V. Till, A. Petres, D. Ilic, S. Stojanovic; *Novi Sad/RS*
(tijana_kokovic@yahoo.com)

Purpose: According to the criteria of the European Society for Vascular Surgery there are strict indications for endovascular treatment of the carotid arteries, in a selected patients. The purpose was to analyse the endovascular treatment results of carotid disease.
Methods and Materials: This retrospective study included 112 patients with carotid disease, average age 64.3 years, who were endovascular treated from May 2007 to December 2014 (7-year period). The presence of cerebrovascular disease (CVD), the presence/absence of prior open surgical treatment of the lesion, the course of endovascular procedures and postoperative complications were followed.
Results: In our study, 99/112 (69%) patients suffered from CVD (78/112-69% patients had transitor ischaemic attack and 21/112-19% had stroke) and 13/112 (12%) patients had asymptomatic CVD, before endovascular procedure. Previous ipsilateral open surgical treatment of the carotid lesions had 23/112 (11%) patients, whilst primary endovascular treatment had 89/112 (89%) patients. The procedure passed as planned in 101/112 (91%) patients, 4/112 (2.8%) patients had complications, stent was not placed at 7/112 (6.2%) patients, because of inadequate vessel morphology. Proper postoperative course was at 96/112 (85%) patients, early complications occurred in 12/112 (12%), and late in 4/112 (3%) patients.
Conclusion: In selected patients, endovascular treatment of carotid disease has long-term effect and small number of peri- and postoperative complications.

14:00 - 15:30 **Room G**

Radiographers

SS 1914

How to improve image quality in MRI and mammography

Moderators:
B. Bougias; Ioannina/GR
E. Szabó; Szeged/HU

B-1379 14:00

Breast compression: an exploration of decision making in mammography
J.M. Nightingale, F.J. Murphy, L. Robinson; *Greater Manchester/UK*
(J.Nightingale@salford.ac.uk)

Purpose: Mammography breast compression decreases radiation dose and reduces unsharpness, and yet there is variability in applied compression force within and between centres. This research explored the application of breast compression force from the mammography practitioners' perspective.
Methods and Materials: A phenomenological study of mammography practitioner values, behaviours and beliefs included focus groups at six breast screening centres in England (participant n=41), and semi-structured interviews with mammography educators (n=6). A secondary analysis of the full data set was undertaken using a thematic content analysis process to extract data related to mammography compression problem solving. Emerging themes were peer-validated and developed into a model of practice.
Results: Seven consecutive stages contributed towards compression force problem-solving: assessing the request; first impressions; explanations and consent; handling the breast and positioning; applying compression force; final adjustments; feedback. Behavioural problem solving, heuristics and intuitive decision making are reflected within this seven-stage model, informing the practitioners' 'ideal' compression scenario.
Conclusion: In searching for the 'ideal' compression scenario, practitioners choose between imperfect options to gain a balance between compassion and technical perfection. This decision is influenced by a range of factors and prior experiences. The application of compression within mammography should no longer be considered as a single event, but is now recognised as a seven stage problem solving continuum. This continuum model is the first to be applied to mammography, and is arguably adaptable and transferable to other radiography practice settings.
Author Disclosures:
J.M. Nightingale: Research/Grant Support; CORIPs College of Radiographers Industry Partnership Scheme. **F.J. Murphy:** Research/Grant Support; CORIPS. **L. Robinson:** Research/Grant Support; CORIPS.

B-1380 14:08

A system for automatic mammography images quality control - images acquisition and examination
A. Golja, S. Androjna, U. Štrekelj, I. Koceva, J. Izlakar, N. Mekiš, J. Žibert; *Ljubljana/SI*

Purpose: Annotated collection of raw mammography images for development of a system for automatic detection of artifacts in mammography images quality control.
Methods and Materials: The image acquisition protocol for daily image quality control was determined for seven different mammography units, which are used in screening program. The images were acquired with the use of exposure parameters for daily tests by using the phantoms that are provided by the manufacturers. All of the images were produced with DR mammography units. Images collection was examined with our own developed tool, which was made for labeling the following artifacts: non-homogeneity, dead pixels, lines, ghost artifacts, and others. The examination was performed by 4 evaluators, each examined one half of the images. The agreement between the evaluators was also measured.
Results: In total we have acquired 548 raw mammography images, where 102 cases of non-homogeneity, 66 cases of ghosting artifacts, 8 cases of dead pixels, and 56 cases of lines were found. The agreement between the evaluators was 87% in the first half of the images (239of274 images were consistently annotated), while in the second half it was 72% (198of274 images were consistently annotated).
Conclusion: The evaluation of mammography images reveals quite high proportion of images with artifacts. That can be explained by the way of our careful two-pass image examination process and by the fact that we intentionally selected certain amount of artifacts, which further served as a training material in a development of a prototype system for automatic artifacts detection.

B-1381 14:16

A system for automatic mammography images quality control: a development of a system for automatic image artifacts detection
A. Iskra, G. Bensa, J. Šomen, K. Lokar, M. Podvratnik, U. Zdešar, N. Mekiš, J. Žibert; *Ljubljana/SI*

Purpose: Development of a prototype system for automatic detection of artifacts in quality control of mammography units.
Methods and Materials: A system for automatic detection of artifacts was developed by following standard machine learning and image processing methodology. Firstly, the images were pre-processed by performing contrast adjustment with histogram normalization and standardization to the reference images associated with each mammography unit. Then, the texture based GLCM (gray-level co-occurrence matrix) features energy, contrast and homogeneity were computed by adding additional feature, which was based on image segmentation. All together 7 features were derived. Images, represented by these features, were further modeled by support vector machines (SVMs) for detection of the following artifacts: non-homogeneity, dead pixels, lines, ghost artifacts, and other artifacts. The system evaluation was performed by applying leave-one-out cross-validation experiments for detection of each artifacts separately. The evaluation results were produced by computing area-under-curve (AUC) in ROC analyses.
Results: The AUC in the ROC analysis of ghosting artifact was evaluated to 91%, the AUC of non-homogeneity was 86%, the AUC of other artifacts was estimated to 98%, while line and dead-pixel artifacts were detected under 70% by AUC.
Conclusion: A prototype system for automatic detection of artifacts in mammography images was built by using well-established texture-based GLCM features and SVM models. In such a way we were able to obtain quite high evaluation results for detection of the homogeneity-based artifacts (ghosting, non-homogeneity, other artifacts), while the locally-based artifacts (lines, dead pixels) were not so successfully recognized.

B-1382 14:24

Optimisation of image quality and dose in direct digital chest radiography for a neonatal chest phantom, using Cu filtration

V. Harsaker, A. Raszkowski, C. Cin, S. Bamboi, T. Granhus; *Oslo/NO (vanja.harsaker@hioa.no)*

Purpose: To investigate the impact of additional filtration and different combinations of kVp and mAs on diagnostic image quality and effective dose in thorax examination in a premature phantom.
Methods and Materials: 57 images of a Gammex Anthropomorphic Neonatal Chest Phantom in an analog incubator with different kVp (50, 57, 63 and 75) and mAs (0.5, 0.63, 0.71 and 0.8), different levels of added copper (Cu) filtration (0 mm, 0.1 mm, 0.2 mm, 0.3 mm) were performed. Ten observers evaluated the images for overall image quality, and visibility of carina, bronchial tree and pneumothorax, using a 5-point Likert-scale. Mathematical measures of image quality included SNR and CNR. PCXMC Monte Carlo simulation software was used to calculate effective dose.
Results: The images performed with 63 kV and 75 kV, with no filter and 0.2 mm filter got the highest, and similar score, on the subjective evaluation. Of these images, the ones performed with 0.2 mm cupper filtration had a measured effective dose of approximately 50% compared with the respectively images without filtration. SNR values were similar for the images performed with no filter and 0.2 mm filter, but images without filter had the highest value of CNR.
Conclusion: Additional filtration is a method that can be used to lower the dose and still obtain acceptable image quality in thorax examinations in a premature phantom.

B-1383 14:32

Computed ultra high b value diffusion-weighted MR imaging of the prostate: what is the clinical added value of extrapolated b3000 images for prostate cancer detection?

M. Hakkert, M. Hakkert; *Haarlem/NL (marcel.hakkert@inholland.nl)*

Purpose: To investigate if calculated ultra high b value (b3000) diffusion weighted imaging provides higher positive predictive value for prostate cancer, compared to high b value images (b1400).
Methods and Materials: 21 patients, suspected of prostate cancer, underwent multiparametric MRI. The MR exam consisted of both calculated b1400 and calculated b3000 sequences. In two cases also an acquired b3000 DWI series was made. Patient studies were independently reviewed by two readers. Different forms were scored: first, if abnormalities suspected of cancer, were seen on calculated b1400 and on b3000 images. Second, image quality and diagnostic value were assessed for calculated b1400, calculated b3000 and acquired b3000 images. Third, if abnormalities suspected of cancer, were seen on calculated b3000 and on acquired b3000 images. Pathological findings from either biopsy or prostatectomy served as reference standard.
Results: For reader 1 there was no difference in PPV for calculated b1400 and b3000 (89.5% both series). Reader 2 achieved better result on the b3000 series (87.5%) compared to b1400 (84.6%). (McNemar for number of scored lesions not significant: p 1,000 and 0.500). Regarding image quality: calculated b3000 series had highest tumour-Periferal Zone contrast and highest suppression of normal tissue (Friedman rank: statistically significant: p 0.000 and 0.002). Due to very small number of patients for acquired b3000 series, PPV could not be assessed for acquired b3000 images.
Conclusion: An individual reader can benefit from calculated b3000 images and achieve higher PPV.

B-1384 14:40

Magnetic resonance cholangiopancreatography applying a natural negative oral contrast - black tea

A.R.R. Videira, S.R.R. Martins, M.C.P. Ribeiro, P.J. Sousa, J.G.C. Mascarenhas; *Lisbon/PT (arafaelarv@gmail.com)*

Purpose: The signal intensity of the gastro-intestinal fluids may overlap the anatomic structures and mask the pathologies. Some trials approaches the administration of natural oral contrast, applied in Magnetic Resonance Cholangiopancreatography (MRCP) with the purpose to mitigate the tissues of the background. Through the administration of an oral negative contrast-black tea, our aims were to optimise the MRCP acquisition protocol maximising the evidence of anatomical structures, regarding the suppression of the gastrointestinal tract, and to develop methods to minimise the artifacts caused by respiratory motion.
Methods and Materials: Ten healthy subjects were underwent to an Avanto® MRI system [Siemens;Healthcare; Erlangen;Germany]. Without moving the participant's position was applied a 3D T2W heavy weighting sequence after the ingestion of 300 ml of sugared black tea infusion. A whole-body synergy coil-16 channels was used.
Results: The sample has (60% F;40% M). Using two Likert scales both graded [1-4], the images obtained before and after tea ingestion were analysed by four experts, focusing the evidence of hepato-biliary-pancreatic tract. After ingestion the representation of image's structures was optimised except in the Vater ampulla ($\mu1=2\pm1;\mu2=2\pm1$). The Wirsung´s values were ($\mu1=2\pm1;\mu2=1\pm1$).
Conclusion: The sequences heavily T2-weighted well represents the hepato-biliary-pancreatic tract due to its liquid content used as intrinsic contrast (hypersignal). The black tea, as a negative oral contrast media, is accessible, cost-effective and provides a reduction of the gastrointestinal fluids. The respiratory triggering most effective was through the synchronisation of the diaphragm's amplitude. The limitations were a small sample subjects and the method of image's assessment.

B-1385 14:48

Optimisation of MR imaging for the evaluation of human placental anatomy

E. Routledge, C. Malamateniou, M. Lohezic, J.M. Allsop, M.J. Fox, B. Kainz, A. Price, J.V. Hajnal, M.A. Rutherford; *London/UK (christina.malamateniou@kcl.ac.uk)*

Purpose: MRI is an important structural imaging tool, complementary to ultrasound. We wanted to optimise currently available MRI techniques for improved placental structural visualisation in normal pregnancies.
Methods and Materials: Twenty-two healthy pregnant volunteers (Median GA: 29.6, range 21.4-38.4 weeks) were scanned at 1.5 T or 3.0 T. We used T2-weighted single-shot acquisitions at low and high resolution with one or multiple imaging planes to explore the optimal imaging strategy. The signal-to-noise ratio (SNR), signal intensity homogeneity and presence of artefacts were evaluated using a 3-point rating scale on the acquired images under these different imaging strategies. Images were also qualitatively evaluated for visualisation of the cotyledons, cord insertion site depiction and placental thickness. The added value of diffusion-weighted imaging (DWI) in coronal and transverse plane, where available, in depicting placental tissue and cotyledon structure was also assessed.
Results: Placental MRI scans at 3.0 T have significantly higher SNR (p=0.03) but also more inhomogeneity (p=0.06) and artefacts (p=0.1). Coronal planes allow better cotyledon visualisation, whereas sagittal/transverse planes allow assessment of cord insertion and placental thickness. High-resolution scans provide better anatomical detail of the placenta. DWI (b-value 500) provided better anatomical depiction of placental tissue margins and cotyledons in a subset of scans compared to T2-weighted.
Conclusion: The suggested optimised placental scanning strategy comprises high-resolution 3-plane scans at 1.5 T to improve image quality of placental structural scans and yield useful anatomical information in normal pregnancies. Moreover, DWI holds promise for structural characterisation of the placenta; further research is underway to investigate this capability.
Author Disclosures:
J.V. Hajnal: Research/Grant Support; Philips Medical Systems, Best, the Netherlands.

B-1386 14:56

Assessment of image quality criteria from brain MRI examinations

L.P. Ribeiro, C. Alves, A.M. Ribeiro, A.F.C.L. Abrantes, K.B. Azevedo, O. Lesyuk, N.M. Pinto, R.P.P. Almeida; *Faro/PT (npinto@ualg.pt)*

Purpose: To assess the image quality criteria from brain MRI examinations based on quality control charts and to demonstrate the importance of implementing an image quality control system.
Methods and Materials: A retrospective study was conducted in a public MRI unit using a random sample of 500 brain MRI examinations grouped in 20 smaller samples, each one with 25 exams. Using a checklist based on MRI quality criteria, the conformities and non-conformities found were recorded and used to establish three types of quality control: (1) the proportion of conformities and non-conformities (p chart); (2) the total number of non-conformity exams (np chart) and (3) the total number of non-conformities in each sample (c chart), in order to suggest corrective actions for improvement.
Results: Considering all exams, 53.60% are non-conformity exams. 326 non-conformities were identified and the "artefacts" presented the highest number of non-conformities (90.18%), followed by the group "absence of data relating to examination" (8.28%), and the "incorrect positioning" (1.53%).
Conclusion: This research allowed the identification of different types of non-conformities found in brain MRI images, which have impact on image quality. Therefore, the existence of suitable quality control of the image is essential to achieve high quality standards in MRI departments. It is recommendable to do training courses regularly improving radiographers performance and strategies to reduce MRI artifacts must be implemented.

B-1387 15:04

Reducing metal artefacts in MRI: a retrospective analysis of improved diagnostic quality and reporting confidence without the use of specialised commercial pulses/techniques

C. Pereira, K. Partington; *Oxford/UK (claudio.pereira@ouh.nhs.uk)*

Purpose: Metal-related susceptibility artefacts (MA) are, nowadays, a regular finding in MRI. Their severity can vary wildly depending on implant, field strength used and MRI sequences employed. Modern medical implants are design to reduce MA, but significant problems persist regarding diagnostic quality (DQ). The purpose of this work was to assess if MA could be reduced without the aid of specialised MRI pulses/techniques.
Methods and Materials: Retrospective analysis was performed on MRI examinations of patients with metallic implants using standard sequences and MARS. Image assessment was undertaken by five consultant musculoskeletal radiologists on a stand-alone and direct comparison visual analysis. Comparison criteria focused on the overall severity of MA and DQ of the acquired images to assess the degree of artefact reduction, image contrast change and overall radiologist reporting confidence. MARS were produced through parameter manipulation of standard sequences on both 1.5 and 3 Tesla MR scanners. Additionally, time of acquisition (TA), noise level and specific absorption rate (SAR) were also compared.
Results: All consultant radiologists reported significant overall reduction of MA on images produced with MARS only with increased DQ and reporting confidence. TA, noise level and SAR were slightly increased over standard sequences. Limitations identified on MARS were restricted to cases where J-decoupling produced significant signal enhancement for fat tissue.
Conclusion: MARS produces reduced MA and improved DQ, over standard sequences in the presence of metallic implants. TA, noise level and SAR of MARS can be kept at acceptable values for the clinical environment.

B-1388 15:12

Reduction in respiratory motion artefacts on gadoxetate-enhanced (Primovist) MRI after training technicians

A. Gutzeit, J. Fröhlich, S. Matoori; *Zurich/CH (agutzeit2000@gmail.com)*

Purpose: In recent years, several studies have described arterial phase image degradation at gadoxetate-enhanced (Primovist) liver MRI. Aim of the study was to investigate whether a trained group of technicians using a modified breathing command during gadoxetate-enhanced liver MRI reduces respiratory motion artifacts compared to non-trained technicians.
Methods and Materials: The gadoxetate-enhanced liver MR images of 30 patients acquired using the traditional breathing command and the subsequent 30 patients after training the technicians to use a modified breathing command were analysed. A subgroup of patients (n=8) underwent scans both by trained and untrained technicians. Images were compared for the presence of breathing artifacts [respiratory artifact-based image quality scores from 1 (best) to 5 (non-diagnostic)].
Results: There was a highly significant improvement in the arterial phase image quality scores in patients using the modified breathing command compared to the traditional one ($P < 0.001$). The percentage of patients with severe and extensive breathing artifacts in the arterial phase decreased from 33.3% to 6.7% after introducing the modified breathing command (P=0.021). In the subgroup that underwent MRI using both breathing commands, arterial phase image quality improved significantly (P=0.008) using the modified breathing command.
Conclusion: Training of technicians significantly improved arterial phase image quality of gadoxetate-enhanced liver MRI.Our findings support the role and importance of well-trained technicians in applying more patient-oriented breathing commands to guide their patients more closely during liver MRI. We believe that respiratory motion artifacts may be overcome to a large extent by training technicians to apply an optimized patient-oriented breathing command.

B-1389 15:20

Evaluation of the corpus callosum by MRI related to the frontal atrophy in the elderly people

M.C.P. Ribeiro, J.E. O'Neill, J.F. Cruz-Maurício; *Lisbon/PT (margarida.ribeiro@estesl.ipl.pt)*

Purpose: The thinning of the corpus callosum (CC) is a sign of brain changes related with age. The use of quantitative methods can help to discriminate the pathological cerebral atrophy from the normal brain aging. This study aimed to quantify the atrophy of frontal lobe in subjects with the age recoded in [< 65 and ≥66] years old and to investigate its relationship with the dimensions (length and volume) of the CC.
Methods and Materials: From T1w2D whole-brain sequence the length was assessed through the corpus callosum index (CCI). To assess the volume of CC the FreeSurfer package segmentation was used. The atrophy of frontal lobe was assessed by visual rating scale in the frontal cortex. To apply the atrophy rating scale, the relationship between sulcus and gyrus was assessed in coronal T1w images by two experts using a 5 points Likert scale. All subjects were undergoing a 1.5T MRI INTERA scanner (Philips Medical, Systems Best, Netherlands) performing 96 valid cases.
Results: The Pearson correlation between CCI and Cerebral Atrophy (CA) is negative,R=(-303);Pp=0.002.Through Mann-Whitney test there are differences, P=0.008, between CCI and age. The differences between CC (rostrum, genu and body) values and age were significant with (P=0.009; 0.003; 0.0025 respectively). The CA and CCI presented significant differences (P=0.027).
Conclusion: Methods of bi-dimensional and volumetric stereology allow concluding that the age is higher in patients with high levels of CA and when there are trends in the reduction of CC volume.The CA may predicts the status of pré-senescence in the elderly.

Wednesday, March 2

12:30 - 13:30 **Room D2**

Clinical Trials in Radiology 1

Moderators:
R.L. Arenson; San Francisco, CA/US
M. Dewey; Berlin/DE

12:30
The Swedish CArdioPulmonary BioImage Study (SCAPIS): objectives and design
G. Bergström[1], A. Blomberg[2], J. Brandberg[1], K. Cederlund[3], G. Engström[4], J. Engvall[5], M.G. Hansson[6], T. Jernberg[3], L. Lind[6], E. Lindberg[6], M. Persson[4], A. Rosengren[1], J. Sundström[6], S. Söderberg[2], K. Torén[1], C. Östgren[5]; [1]*Gothenburg/SE*, [2]*Umeå/SE*, [3]*Stockholm/SE*, [4]*Lund/SE*, [5]*Linköping/SE*, [6]*Uppsala/SE (goran.bergstrom@hjl.gu.se)*

Purpose: Cardiopulmonary diseases are major causes of death worldwide, but currently recommended strategies for diagnosis and prevention may be outdated because of recent changes in risk factor patterns.
Methods and Materials: The Swedish CArdioPulmonarybioImage Study (SCAPIS) combines the use of new imaging technologies, advances in large-scale omics, and epidemiological analyses to extensively characterise a Swedish cohort of 30,000 men and women aged between 50 and 64 years. SCAPIS is a joint effort by six universities in Sweden (Gothenburg, Linköping, Uppsala, Umeå, Lund and Karolinska Institutet). SCAPIS uses computer tomography (CT) angiography of coronary arteries, high resolution pulmonary CT, ultrasound and imaging of fat depots in combination with more traditional epidemiology for phenotyping. The information obtained will be used to improve risk prediction of cardiopulmonary diseases, study epidemiology and optimise the possibilities to study disease mechanisms.
Results: A comprehensive pilot study in 1111 individuals, which was completed in 2012, demonstrated the feasibility and financial and ethical consequences of SCAPIS. Recruitment to the national, multi-centre study is on-going with 5 sites being operational and more than 7.000 subjects included.
Conclusion: The aim of SCAPIS is to obtain novel information to identify and treat individuals with cardiopulmonary and metabolic diseases and to optimise the possibilities to study disease mechanisms.

12:40
Discussant:
G. Krombach; *Giessen/DE*

12:45
NSsaFe study: observational study on the incidence of nephrogenic systemic fibrosis in renal impaired patients following gadoteric acid administration
A. Gottschalk, B. Kress; *Frankfurt a. Main/DE (andreas.gottschalk@gmx.net)*

Purpose: To prospectively determine the incidence of Nephrogenic Systemic Fibrosis (NSF) in renal impaired patients following gadoteric acid (DOTAREM®) administration.
Methods and Materials: The NSsaFe study is a worldwide observational study including hundreds of patients with moderate to severe and end stage renal impairment, scheduled to undergo a contrast-enhanced Magnetic Resonance Imaging (MRI) with gadoteric acid. Medical history, indication for MRI and renal function are recorded at inclusion. Adverse Events (AE) occurring during the MRI examination or the time of usual follow-up post gadoteric acid administration are recorded. Patients are then followed up over 2 years with 3 visits in order to detect any occurrence of NSF.
Results: As of 6 October 2015, data of 540 patients (mean age: 69.6 years [range: 21-95]; male: 58.5%) were analysed. The population included 69.3% of moderate, 16.1% of severe, 12.0% of end stage renal insufficiency and 2.6% of kidney transplanted patients and the mean (±SD) eGFR was 37.6 (±15.7) ml/min/1.73m^2 (range: 4.0-74.2). A total of 369 patients attended the first follow-up visit (between 3 and 12 months after MRI), 231 patients attended the second (between 13 and 21 months) and 165 patients attended the third (between 22 and 27 months). No AEs related to the administration of gadoteric acid were reported. No cases of NSF have been observed.
Limitations: None
Conclusion: Interim analysis of the NSsaFe study showed no cases of NSF in patients with moderate to severe renal impairment after the administration of gadoteric acid.

12:55
Discussant:
G. Heinz-Peer; *St. Pölten/AT*

13:00
Computed tomography angiography vs Agatston score for diagnosis of coronary artery disease: results from the international Collaborative Meta-Analysis of Cardiac CT (COME-CCT)
V. Wieske[1], H. Alkadhi[2], S. Leschka[3], B.L. Nørgaard[4], J. Knuuti[5], A.C.P. Diederichsen[6], B.A. Halvorsen[7], H. Mickley[6], K. Sun[8], R.R. Büchel[2], S. Muraglia[9], R. Marcus[10], M. Walther[11], P. Schlattmann[11], M. Dewey[1]; [1]*Berlin/DE*, [2]*Zurich/CH*, [3]*St. Gallen/CH*, [4]*Aarhus/DK*, [5]*Turku/FI*, [6]*Odense C/DK*, [7]*Fredrikstad/NO*, [8]*Inner Mongolia Province/CN*, [9]*Trento/IT*, [10]*Tübingen/DE*, [11]*Jena/DE (viktoria.wieske@charite.de)*

Purpose: An Agatston score of zero is recommended in stable chest pain guidelines for exclusion of obstructive coronary artery disease (CAD); for increased scores referral to computed tomography angiography (CTA) and invasive coronary angiography (ICA), is recommended. We sought to determine whether CTA is superior to the Agatston score in the detection of CAD.
Methods and Materials: 1900 patients with suspected CAD (stable chest pain) and an indication for ICA from the collaborative meta-analysis of cardiac CT (COME-CCT) consortium were included. Diagnostic accuracy of Agatston score and CTA were compared with ICA as reference standard (obstructive CAD ≥ 50% coronary diameter stenosis).
Results: Median Agatston score was 63; 835 patients showed obstructive CAD on ICA (44%). Diagnostic accuracy of CTA for the detection of CAD (89.4%, 95% confidence interval [CI]: 88.0% to 90.8%) was significantly higher than that of the Agatston score (67.8%, 95% CI: 65.6% to 69.9%, $p < 0.001$). 20% (93/475) of the patients with Agatston score of zero showed CAD on ICA. Diagnostic accuracy of CTA was not significantly different in patients with an Agatston score of 1-400 (87.6%, 95% CI: 85.4% to 89.6%) versus above 400 (90.4%, 95% CI: 87.3% to 93.0%, $p < 0.131$).
Limitations: Although a predefined subanalysis, not all of the COME-CCT sites performed Agatston score analysis.
Conclusion: CTA has significantly higher diagnostic accuracy than the Agatston score in symptomatic patients with an indication for ICA. Diagnostic performance of CTA is equally good in patients with moderately and highly increased Agatston score.
Author Disclosures:
J. Knuuti: Other; Juhani Knuuti reports personal fees from Lantheus Inc, grants from Orion Pharma, outside the submitted work. **R.R. Büchel:** Other; Ronny Büchel reports that The University Hospital Zurich holds a research contract with GE Healthcare. **P. Schlattmann:** Grant Recipient; Prof. Schlattmann reports grants from Ministry of Education and Research (BMBF) for meta-analyses as part of the joint programme, during the conduct of the study; grants from German Science Foundation (DFG), grants from European Union, outside the submitted work. **M. Dewey:** Board Member; Prof. Dewey is an associate editor of Radiology and European Radiology. Consultant; Prof. Dewey is a consultant to Guerbet and one of the principal investigators of multi-center studies (CORE-64 and 320) on coronary CT angiography sponsored by Toshiba Medical Systems. Research/Grant Support; Prof. Dewey has received grant support from the Heisenberg Program of the DFG for a professorship (DE 1361/14-1), the FP7 Program of the European Commission for the randomized multicenter DISCHARGE trial (603266-2, HEALTH-2012.2.4.-2), the European Regional Development Fund (20072013 2/05, 20072013 2/48), the German Heart Foundation/German Foundation of Heart Research (F/23/08, F/27/10), the Joint Program from the German Research Foundation (DFG) and the German Federal Ministry of Education and Research (BMBF) for meta-analyses (01KG1013, 01KG1110, 01KG1110), GE Healthcare, Bracco, Guerbet, and Toshiba Medical Systems. Other; Prof. Dewey has received lecture fees from Toshiba Medical Systems, Guerbet, Cardiac MR Academy Berlin, and Bayer (Schering-Berlex), he is also the editor of Coronary CT Angiography and Cardiac CT, both published by Springer, and offers hands-on workshops on cardiovascular imaging (www.ct-kurs.de), Institutional master research agreements exist with Siemens Medical Solutions, Philips Medical Systems, and Toshiba Medical Systems. The terms of these arrangements are managed by the legal department.

13:10
Discussant:
L. Saba; *Cagliari/IT*

13:15
Efficient use of medical imaging in Belgium: where does it go wrong in prescribing imaging studies for the lumbar spine and abdomen? A national multicentric study
N. Stichelbaut, P. Hoste, B. De Roo, L. Annemans, K. Verstraete; *Ghent/BE (Nele.Stichelbaut@ugent.be)*

Purpose: Evaluation of physicians prescribing for lumbar imaging in Belgium showed an overutilisation in the study in 2010. A follow-up study five years after active campaign educating patients and physicians should show an improvement with positive impact on the dose and healthcare budget.

Methods and Materials: In nine Belgian radiology departments 771 patients with a request for lumbar or (thoraco-)abdominal imaging in 2010 and 331 in 2015 were included in this prospective, multicentric follow-up study. A new anamnesis and clinical examination were performed on every patient. The request was confronted with the Belgian recommendations for efficient use of medical imaging and impact on dose and costs was calculated. An evaluation of a senior and second observer showed good coherence (Kappa: 0.724 and 0.792).
Results: The number of unnecessary lumbar CT requests significantly improved in 2015 (82.2% in 2010, 71.0% in 2015) when adjusted for confounders (prescriber, hospital setting) (p=0.048; 95% CI=0.041-0.989).The effective dose can be halved. The shift from lumbar spine CT to MRI could still grow if MRI was more available (+27.8% in 2010, +75.0% in 2015). The capacity problem is increasing with average waiting time of 3.6 weeks in 2015 despite the more effective use of the available devices.
Limitations: Interpretation of the requesting physician is not known.
Conclusion: Implementation of guidelines for lumbar CT was improved with a positive impact on the dose and costs in Belgium, with still significant room for improvement, especially in the availability of MRI. More education and organisational changes are necessary.

13:25
Discussant:
F.J. Gilbert; *Cambridge/UK*

Thursday, March 3

12:30 - 13:30 **Room D2**

Clinical Trials in Radiology 2

Moderators:
R.L. Arenson; San Francisco, CA/US
M. Dewey; Berlin/DE

12:30
MR-targeted vs TRUS-guided prostate biopsy in patients with high PSA values: a randomized controlled trial
F. Russo[1], S. Mazzetti[1], V. Giannini[1], A. Giacobbe[2], D. Collura[2], E. Castelli[2], G. Muto[3], D. Regge[1]; [1]*Candiolo/IT*, [2]*Turin/IT*, [3]*Rome/IT (daniele.regge@ircc.it)*

Purpose: To compare detection rate of MR-targeted and TRUS-guided prostate biopsy in patients with high PSA values and suspicious prostate cancer (PCa) at multiparametric (mp) magnetic resonance (MR) Imaging.
Methods and Materials: 185 subjects referred for clinical suspicion of PCa underwent mp-MR imaging. Of these, 43 patients (23%) showed at least one suspicious lesion at mp-MR; these were divided randomly into two groups balanced with respect to age, PSA value, lesion size and location. Group A included 22 patients who underwent MR-targeted biopsy towards the MR findings. Group B included 21 patients who underwent a TRUS-guided saturation biopsy. Pathologic specimens were reviewed by a pathologist who defined PCa presence and Gleason score.
Results: In group A, PCa was detected in 17/22 (77.3%) cases, 5 of which were located in the transition zone (TZ). All negative findings in group A were in the peripheral zone (PZ). In group B we found 16/21 (76.2%) PCa, 6 of which were in the TZ. Four negative findings in group B were in the PZ, and one in the TZ. Detection rates between the two groups were not significantly different (p>0.78).
Limitations: First, results may not be generalisable as this is a single-centre trial. Second, we included men without considering previous number of prostate biopsies performed. Finally, in the TRUS-guided arm cognitive targeting could not be avoided.
Conclusion: This randomised controlled trial demonstrated that PCa detection rate of MR-targeted and saturation biopsy are not different provided that an additional mp-MR examination is performed before biopsy.

12:40
Discussant:
P. Asbach; *Berlin/DE*

12:45
The multicentre DISCHARGE trial pilot study: Image quality and protocol adherence results
G. De Rubeis[1], M. Dewey[2], on behalf of the DISCHARGE Consortium (www.dischargetrial.eu); [1]*Rome/IT*, [2]*Berlin/DE (derubeis.gianluca@gmail.com)*

Purpose: To review image quality and protocol adherence within the pilot study of the multicentre DISCHARGE trial (Funding: EU-FP7 Framework Programme 2007-2013, EC-GA 603266).
Methods and Materials: To conclude the pilot study, each of the sites had to recruit 60 patients with suspected coronary artery disease: 30 from computed tomography (CT) and 30 invasive coronary angiographies (ICA). The core lab assessed protocol adherence and image quality initially based on 3 CT and 3 ICA cases from each site and invited further case submissions if quality criteria were not met.
Results: Overall, 178 cases (113 CT and 65 ICA) from 23 sites were reviewed. Three of 113 CT (3%) and 2 of 65 ICA cases (3%) had exclusion criteria. Only 11% (7/65) ICA images did not meet all of the predefined criteria. In contrast, 88% of the initially submitted CT images (56/64) did not meet all predefined criteria. This decreased to 68% (26/38, p<0.05) for the second and 55% (5/11, p<0.05) for the third wave of subsequent case submissions. The overall rate of nondiagnostic CT image quality was 20% (23/113) which was reduced in the subsequent submissions. We were also able to increase the left-ventricular cavity-to-myocardium signal difference from the first to second wave (336.6±125.2 vs 386.4±108.9 HU; p<0.05).
Limitations: Only a subset of the pilot study patients was transferred to the core lab for review.
Conclusion: Image quality and protocol adherence of cardiac CT was relevantly improved by a pilot study phase before starting a multicentre randomised controlled trial.

Author Disclosures:
M. Dewey: Author; Toshiba Medical Systems, Guerbet, Cardiac MR Academy Berlin, and Bayer-Schering. Consultant; Guerbet. Grant Recipient; Heisenberg Program of the German Research Foundation (DFG) for a Professorship (DE 1361/14-1), FP7 Program of the European Commission for the randomized multicenter DISCHARGE trial (603266-2, HEALTH-2012.2.4.-2), European Regional Development Fund (20072013 2/05, 20072013 2/48), German Heart Foundation/German Foundation of Heart Research (F/23/08, F/27/10), Joint program of the DFG and the German Federal Ministry of Education and Research (BMBF) for meta-analyses (01KG1013, 01KG1110, 01KG1110), GE Healthcare, Bracco, Guerbet, and Toshiba Medical Systems. Other; Cardiac CT Courses in Berlin: www.ct-kurs.de, Book Author: "Coronary CT Angiography, Springer, 2009, Cardiac CT, Springer 2011 and 2014., Institutional master research agreements exist with Siemens Medical Solutions, Philips Medical Systems, and Toshiba Medical Systems, The terms of these arrangements are managed by the legal department of Charité Universitätsmedizin Berlin.

12:55
Discussant:
R. Vliegenthart; *Groningen/NL*

13:00
Dynamic stress perfusion CT for detection of inducible myocardial ischemia: rationale and design of the SPECIFIC-trial
F. Bamberg[1], B. Ghoshhajra[2], U. Hoffmann[2], K. Kitakawa[3], A. Kono[4], R. Vliegenthart[5], P. van der Harst[5], H. Alkadhi[6], R. Manka[6], U. Schoepf[7], D. Steinberg[7], S. Achenbach[8], M. Lell[8], T. Geisler[1], K. Nikolaou[1], F. Pugliese[9], A. Coenen[10], K. Nieman[10]; [1]*Tübingen/DE*, [2]*Boston, MA/US*, [3]*Mie/JP*, [4]*Kobe/JP*, [5]*Groningen/NL*, [6]*Zurich/CH*, [7]*Charlston, SC/US*, [8]*Erlangen/DE*, [9]*London/UK*, [10]*Rotterdam/NL (fabian.bamberg@uni-tuebingen.de)*

Purpose: The aim of SPECIFIC is to determine the diagnostic accuracy of dynamic CT-based myocardial perfusion imaging (MPICT) for the detection of hemodynamically relevant coronary stenosis as defined by invasive measurement of the fractional flow reserve (FFR) in patients with suspected coronary artery disease (CAD). In a sub-study the diagnostic accuracy of cardiac magnetic resonance imaging (CMR) for the detection of myocardial perfusion defects will be investigated.
Methods and Materials: The study is designed as a prospective, multicentre observational cohort study enrolling 150 subjects at eight clinical sites in Japan, Germany, The Netherlands, Switzerland, and the USA. Eligible, consenting patients with suspected CAD and clinical indication for invasive angiography will undergo an investigational CT study consisting of a non-enhanced acquisition, CT angiography (80-100 kV) and dynamic myocardial perfusion imaging (70-80 kV, 140 µol/kg/min adenosine for 3-5min, 10cm myocardial coverage), using 3rd generation Dual-Source CT. During subsequent catheterisation, FFR will be performed in all obstructed vessels. Optionally, study participants can undergo a standardised stress perfusion CMR examination at 3T. Analysis will be performed by independent core laboratories in a blinded fashion.
Results: Patient recruitment for SPECIFIC is planned to start early 2016, and main results will be available by 2017.
Limitations: The results are limited to the efficacy of dynamic MPICT.
Conclusion: The study will establish the diagnostic performance of dynamic MPICT to identify hemodynamically significant CAD, and its incremental value over CT angiography to guide management decisions.

13:10
Discussant:
S. Kajander; *Turku/FI*

13:15
The impact of breast MRI on surgical planning and reoperation rate: first results from the MIPA study
R.M. Trimboli[1], G. Di Leo[1], D. Sacchetto[2], R. Mann[3], M. Álvarez Benito[4], C. Zuiani[5], E. Wenkel[6], K. Siegmann-Luz[7], M. Lobbes[8], C. Balleyguier[9], K. Pinker-Domenig[10], M. Calabrese[11], J. Veltman[12], U. Aksoy Ozcan[13], F. Pediconi[14], J. Camps Herrero[15], G. Forrai[16], S. Harms[17], I.-M. Obdeijn[18], M. Van Goethem[19], M. Docema[20], J. Anderson[21], C. Losio[22], F. Gilbert[23], T.H. Helbich[10], N. Houssami[24], F. Sardanelli[1]; [1]*San Donato Milanese/IT*, [2]*Turin/IT*, [3]*Nijmegen/NL*, [4]*Cordoba/IT*, [5]*Udine/IT*, [6]*Erlangen/DE*, [7]*Tübingen/DE*, [8]*Maastricht/NL*, [9]*Villejuif/FR*, [10]*Vienna/AT*, [11]*Genoa/IT*, [12]*Almelo/NL*, [13]*Istanbul/TR*, [14]*Rome/IT*, [15]*Alzira/ES*, [16]*Budapest/HU*, [17]*Fayetteville, AR/US*, [18]*Rotterdam/NL*, [19]*Edegem/BE*, [20]*São Paulo/BR*, [21]*Perth/AU*, [22]*Milan/IT*, [23]*Cambridge/UK*, [24]*Sydney/AU (gianni.dileo77@gmail.com)*

Purpose: MIPA is an ongoing multicentre study enrolling two concurrent groups of women with newly-diagnosed breast cancer, not candidate to neoadjuvant therapy, receiving or not receiving MRI before surgical treatment (ST).

Methods and Materials: For each breast, ST planned at mammography/ultrasound and the actual ST were recorded. For the MRI-group, ST planned considering additional MRI information was also recorded. McNemar and $\chi 2$ were used.
Results: By June 2015, 1240 patients had data for analysis: 574 (46%) without and 666 (54%) with MRI. Mastectomy rate planned based on mammography/ultrasound was 73/583 (13%) for non-MRI-group and 133/685 (19%) for MRI-group(p=0.002). In MRI-group, planned mastectomies were 133/685 (19.4%) before MRI and 140/685 (20.4%) after MRI(p=1.000); the rate of MRI-detected new contralateral cancers was 13/647 (2%); of 558 breasts conservatively treated, MRI did not change the ST in 415 (74%), but did prompt a wider or >1 excision in 72 (13%), a less extensive ST in 71 (13%). Actual mastectomy rate was 79/586 breasts (14%) in non-MRI-group and 141/697 (20%) in MRI-group(p=0.002), the OR adjusted for age/density being 1.5 (MRI versus non-MRI, 95%CI 1.2-1.7). Per-patient reoperation rate for close/positive margins were 85/573 (14.8%) in non-MRI-group and 51/666 (8%) in MRI-group(p<0.001).
Limitations: Observational study.
Conclusion: These preliminary results showed that after MRI the rate of more extensive ST was balanced by the rate of less extensive ST, with a low increase of mastectomy rate. The MRI-associated lower reoperation rate should be considered in the light of the higher mastectomy rate, mostly already planned before MRI.

13:25
Discussant:
E.M. Fallenberg; *Berlin/DE*