Zürich
2012

Schweizerischer Radiologiekongress
Congrès Suisse de Radiologie
Swiss Congress of Radiology

Kongresshaus, May 31 – June 2, 2012

Online Abstract Book

des Schweizerischen Radiologiekongresses
du Congrès Suisse de Radiologie
of the Swiss Congress of Radiology

www.radiologiekongress.ch

Table of Contents

ISSN: 2234-9936

Dear Delegates and Visitors of the Swiss Congress of Radiology 2012, Dear Colleagues!

The Swiss Society of Radiology (SGR-SSR) and the Swiss Society of Nuclear Medicine (SGNM-SSMN) are delighted about the high quality of abstracts which were submitted for presentation at the 99th Swiss Congress of Radiology. The continuous excellent work of all authors is highly appreciated by both societies as it makes the congress to a prestigious scientific meeting.

After introducing the new "Online Abstract Book of the Swiss Congress of Radiology" in 2011, our society members encouraged us to continue with this innovation. Thus, we are proud to present the 2012 abstract book which includes all the abstracts of the scientific talks and posters presented at the annual Swiss Congress of Radiology in Zurich.

The "Online Abstract Book of the Swiss Congress of Radiology" will permanently be accessible on both the Society's and Congress' web page at www.sgr-ssr.ch and www.radiologiekongress.ch. The online-only web publication of the abstract book offers several advantages over a printed version such as cost efficiency, durable and platform independent documentation of scientific abstracts, integration of the abstract data into both the Society's and Congress' web page as well as permanent accessibility for all over the world.

Proper citation of scientific abstracts is however important, especially in case of online-only web publications. The Swiss Society of Radiology thereof recommends the use of the following structure to cite abstracts from the new "Online Abstract Book of the Swiss Congress of Radiology":

Author1 A, Author2 B, …, Author last X. Title of the abstract (abstr.). Swiss Congress of Radiology 2012, Zurich. Online Abstract Book (www.sgr-ssr.ch)

We look forward to welcome you to the Swiss Congress of Radiology 2012 in Zurich.

PD Dr. G. Andreisek

Member Scientific Committee SGR-SSR

Prof. Dr. D. Weishaupt

Congress president SGR-SSR
and President Scientific Committee SGR-SSR

Swiss Congress of Radiology 2012, Zürich

Congress President

D. Weishaupt, Zürich

SGR-SSR Executive Board

President
R. Kubik-Huch, Baden

Past President
B. Allgayer, Luzern

President-elect
S. Duewell, Frauenfeld

Secretary
U. Wolfensberger, Horgen

Treasurer
T. Roeren, Aarau

Assessors
D. Weishaupt, Zürich
C. Becker, Genève
T. Jung, Zürich
H.-P. Ledermann, Basel
M. Lütolf, Chur
F. Del Grande, Lugano

SGR-SSR Scientific Committee

President
D. Weishaupt, Zürich

Members
G. Andreisek, Zürich
M. Becker, Genève
G. Bongartz, Basel
J. Bremerich, Basel
K.-O. Loevblad, Genève
S. Schmidt, Lausanne
H. Thoeny, Bern

Representative SGPR
M. Anooshiravani-Dumont, Genève

Representative SSVCIR
A. Jacob, Basel

SGR-SSR Office

SGR-SSR Secretariat
Christoph Lüssi
Moosstrasse 2
CH-3073 Gümligen
Phone +41 31 301 22 55
Fax +41 31 952 76 83
E-Mail info@sgr-ssr.ch
Website www.sgr-ssr.ch

Congress Organisation Company and Exhibition Management

MCI Schweiz AG
Flughofstrasse 54
CH-8152 Glattbrugg
Phone +41 44 809 42 87
Fax +41 44 809 42 01
E-Mail info@radiologiekongress.ch
Website www.radiologiekongress.ch

Abstract Reviewing Panel

D. Weishaupt, Zürich
G. Andreisek, Zürich
M. Anooshiravani-Dumont, Genève
M. Becker, Genève
G. Bongartz, Basel
J. Bremerich, Basel
K.-O. Loevblad, Genève
S. Schmidt, Lausanne
H. Thoeny, Bern

Poster Jury

B. Allgayer, Luzern
M. Becker, Genève
G. Bongartz, Basel
P. Hagmann, Lausanne
H.-M. Hoogewoud, Fribourg
P. Knuesel, Chur
M. Patak, Zürich
A. Platon, Genève
H. Thoeny, Bern
R. Wyttenbach, Bellinzona

SS101

SPECT/CT and PET/CT imaging in clinical operations: Variations among users worldwide

T. Beyer[1], J. Czernin[2], O. Israel[3], H. Wieder[4], L. Freudenberg[4];
[1]Zürich, [2]Los Angeles, LA (US), [3]Haifa (IL), [4]Grevenbroich (DE)

Purpose: Clinical adoption of SPECT/CT and PET/CT varies widely. We report on results of surveys conducted among SPECT/CT- and PET/CT-users worldwide.
Methods and Materials: SPECT/CT- and PET/CT-surveys were initiated through e-mail advertising using Academy of Molecular Imaging databases. Questions were asked on demographics (location, number systems, staff), operations and utilization and variations in imaging protocols.
Results: Most SPECT/CT are installed in NucMed dept's (84%) w/ extensive prior SPECT-only experience (82%). Only 14% of SPECT/CTs are installed in Radiology. SPECT/CT is performed either as routine (51%) or "add-on" procedure (49%) w/ a high inter-site and inter-examination variability. Only 6% use SPECT/CT devices for stand-alone CT. PET/CT: More than half of the systems are installed in NM. PET/CT imaging is most frequently used for torso/whole-body oncology (87%), and for RTP (4%), cardiac (4%) and neurologic imaging (5%). Avg. fasting prior to a FDG-PET/CT scan is 7±3 h. Blood glucose levels are measured w/ large variations in max. levels. Mean FDG activity injected is 390 MBq (110-585) for 3D-acquisition of a 75 kg patient. Mean uptake time is 64±14 min. 52% of sites report the use of iv and/or oral CT contrast in up to 25% of the patients. 62% sites provide a fully integrated report.
Conclusion: SPECT/CT is a not a routine component of nuclear medicine procedures. The majority of the centers do not fully utilize the diagnostic potential of the CT. Clinical FDG-PET/CT protocols vary widely among clinical centres. These findings illustrate the need for continuous training and standardization.

SS102

Performance of SPECT/CT, planar scintigraphy alone, CT alone and orthopantomography in patients with suspected osteomyelitis or osteonecrosis of the jaw

C. Bolouri, M. Merwald, M. Hüllner, O. Lieger, P. Veit-Haibach, J. Kuttenberger, M. Perez, K. Strobel; Luzern

Purpose: To evaluate the performance of a novel flat-panel SPECT/CT in patients with suspicion of osteomyelitis (OM) or osteonecrosis (ON) of the jaw in comparison with planar bone scintigraphy (PS), CT alone and conventional orthopantomography (OPT).
Methods and Materials: 46 patients (23 female, 23 male) mean age 55 (range 10–84 years) with suspected ON (17), OM (24) or exacerbation of a known OM (4) were investigated with OPT, PS, CT alone and combined SPECT/CT. Images were separately reviewed by a nuclear physician/radiologist and jaw surgeon regarding presence of OM/ON. Additionally, the different methods were rated regarding their usefulness for diagnosis (5 point scale: from 1=diagnostic to 5=useless). Biopsy served as reference standard in 33 patients and clinical/imaging follow-up of at least 6 months in 13 patients.
Results: In 39 of 46 patients final diagnosis of OM or ON was established according to the reference standard. Sensitivity, specificity and accuracy for OPT was 59%, 100% and 66%, for CT alone 79%, 86%, 80%, for PS 100%, 71% and 96% and for SPECT/CT 100%, 86% and 98%. SPECT/CT was rated as the most useful imaging modality (mean value 1,2) compared with PS (2,2), CT (2,5) and OPT (3,3).
Conclusion: High resolution SPECT/CT is a very accurate method to assess the presence, activity and extension of osteomyelitis/osteonecrosis of the jaw and superior to planar scintigraphy, CT alone and orthopantomography. Since its implementation SPECT/CT serves as the first line imaging modality in patients with suspected osteomyelitis of the jaw in our institution.

SS103

Coincidental findings in thoracic CT-scan aquired for attenuation correction in myocardial perfusion scintigraphy

O. C. Maas, R. M. Benz, M. Zellweger, F. Forrer; Basel

Purpose: The aim of this study is to evaluate the frequency of coincidental lung findings in low-dose CT, acquired for attenuation correction in myocardial perfusion scintigraphy.
Methods and Materials: All patients who underwent MPS with SPECT/CT at our institution were consecutively included during a period of 7 months. CT scans (average mAs 13, kV 130) were assessed in lung kernel of 80 from raw data and evaluated by 2 independent readers.
Results: During our observation period 276 patients (171 Men, 105 Women, Median age: 66,1+/-10,2) were examined by MPS. 97 (35%) of them had coincidental findings in the lung. 34 (12%) were considered relevant and further diagnostic was recommended. So far 2 out of 34 were diagnosed with to date unknown malignant disease by follow-up examinations. Another 17 patients have suspicious findings and are therefore in the process for further diagnostic evaluation. 3 were diagnosed with benign disease. Of the 34 patients 4 were identified as malignant from previous examinations and 8 were identified as benign from previous examination.
Conclusion: It is absolutely mandatory to asses and evaluate thoracic window of the low dose CT data set acquired for attenuation correction in MPS. Although the scans do not face the requirements of a diagnostic thoracic CT and are not part of the initial intention for MPS, the coincidence of relevant lung findings demonstrate the need for assessment and systematic evaluation of the yielded raw CT data set.

SS104

Diffusion-weighted MRI and FDG PET/CT in head and neck squamous cell carcinoma: Is there any correlation between SUV and ADC values?

O. Rager, S. Patsoura, A. Ailianou, R. Kohler, K. Masterson, O. Ratib, M. Becker; Genève

Purpose: The purpose of this study was to assess the correlation between apparent diffusion coefficient (ADC) values and maximum standardized uptake values (SUVmax) in patients with primary squamous cell carcinoma of the head and neck (HNSCC).
Methods and Materials: Retrospective analysis of a consecutive series of 32 patients with biopsy-proven primary HNSCC (10 females and 22 males, mean age=55 years) who have undergone MRI at 1.5 T and contrast enhanced FDG PET CT prior to biopsy and / or surgery. Axial diffusion weighted EPI sequences (DWI) were obtained using b-values of 0 mm²/s and 1000 mm²/s. Calculation of ADC maps was done automatically. The ADC and the SUVmax values were measured both with regions of interest (ROIs) covering the entire tumor and with predefined ROIs. Measurements were performed by two experienced readers, who were blinded to the histological and clinical data. Statistical analysis was done using kappa statistic and Pearson's correlation analysis.
Results: Interobserver agreement for both ADC and SUVmax measurements was very good [kappa=0.85 – 0.97]. Mean ADC values in primary HNSCC were 1.19 [range: 0.948 – 1.841] and SUV max values were 13.1 [range: 5.6 – 18.8]. We observed no significant correlation between mean ADC values and SUVmax measurements in primary HNSCC (Pearson's correlation=0.092, p-value=0.745).
Conclusion: Our data suggest that in primary HNSCC there is no correlation between FDG uptake and ADC values. Further studies are necessary to investigate the possible complementary role of DWI and PET/CT in HNSCC.

SS105

Sequential integrated PET/CT-MR system: Comparison of image registration accuracy of PET/CT versus PET/MR

F. Kuhn[1], A. Samarin[2], G. K. von Schulthess[1], D. T. Schmid[1];
[1]Zürich, [2]Tallinn (EE)

Purpose: In order to assess the clinical benefit of PET/MR versus the gold standard PET/CT the hardware registration performance of a tri-modality PET/CT+MR system is evaluated (Discovery PET/CT 690 and 3T-MR 750, both GE Healthcare).
Methods and Materials: 10 patients underwent a CT followed by a PET, a shuttle-transfer to the MR-system in the adjacent room (max. 2 minutes), and a MR-scan. The accuracy of the PET/CT and PET/MR registration was assessed separately for head/neck and torso by using a commercial software-based registration tool (Integrated Registration, GE Healthcare).
Results: The mean lateral registration inaccuracy between PET and CT images was 1.8 mm±1.1 for the torso and 0.3 mm±2.2 for head/neck in the lateral direction, between PET and MR 0.7 mm±3.4 for the torso and 1.4 mm±4.3 for head/neck. No significant differences were found for the misalignment of PET with CT compared to PET with MR in the head/neck (p=0.833; Wilcoxon Signed Ranks Test) and in the abdomen (p=0.917). Due to a fixed table height and consistent laser light land marking there were no offsets in the longitudinal or the anterior-posterior direction.
Conclusion: The 'hardware-based' registration accuracy of the system was excellent with less than 4 mm lateral misalignment between CT, PET and MR data sets and similar to the intrinsic error assessed with phantom measurements. Therefore comparison of PET/CT and PET/MR data using this tri-modality system is feasible even without using a dedicated software-based registration tool.

SS106

PET-MRI hybrid brain imaging: Clinical applications

V. Garibotto[1], S. Heinzer[2], S. Vulliemoz[1], S. Haller[1], F. Grouiller[1], M. Seeck[1], H. Zaidi[1], K. Loevblad[1], M. Wissmeyer[1], O. Ratib[1], M.-I. Vargas[1]; [1]Genève, [2]Zürich

Purpose: We tested a new whole-body hybrid PET/MR scanner to evaluate the performance and clinical applicability of combined imaging protocols for brain studies in clinical routine.
Methods and Materials: 15 patients (6 males; 9 females, mean age and range: 51±30, 6-89) were scanned on a Philips Ingenuity TF PET/MR. Standard imaging protocols of both modalities were combined. We also tested a specific MR-compatible EEG recording system in order to obtain simultaneous EEG monitoring of epileptic patients during fMRI and PET acquisition.
Results: The clinical indications evaluated are: a. FDG imaging for functional assessment of cognitive disturbances of suspected neurodegenerative origin (4 patients), b. FDG imaging for epileptic focus localization (6 patients), c. tumor brain imaging with specific aminoacidic tracer (fluoro-ethyl-tyrosine) (5 patients). In all cases, we obtained full diagnostic quality of both modalities, by optimized imaging protocols, keeping the total duration of the exam within a tolerable range (<2 h), which has an important impact on MR image quality.
12 subjects had positive findings, 9/12 confirmed by clinical follow-up: for the three remaining subjects the follow-up is ongoing. 3 subjects had negative findings: for all three, the clinical follow-up so far confirmed the imaging findings.
Conclusion: Acquiring both PET and MRI in a single session on a hybrid tomograph minimized patient discomfort while maximizing clinical information and optimizing registration of both modalities. In addition, in comparison to PET/CT, we could decrease the effective dose (CT related), which is particularly beneficial in children.

SS107

A combined 3 Tesla PET-MRI scanner improves prostate cancer detection

T. de Perrot, M. Lord, O. Rager, M. Pusztaszeri, S. Heinzer, L. Koehl, A. Figueiral, C. Iselin, M.-F. Pelt, O. Ratib, J.-P. Vallee; Genève

Purpose: To define the benefit of 18F-fluorocholine PET-MRI combined in a single session with pelvic MRI on a 3 Tesla PET-MRI scanner in prostate cancer patients before radical prostatectomy.
Methods and Materials: Fifteen patients (Gleason 7.6±0.91) scheduled for a prostate PET-MRI before radical prostatectomy were retrospectively analyzed. The examinations were performed on a Philips 3 Tesla PET-MRI scanner with prostate MR protocol included T2, diffusion (ADC) and perfusion (Ktrans) imaging followed by a PET acquisition after 18-Fluorocholine injection. Using pathology as gold standard, probit regression was performed and ROC curves with and without PET were compared.
Results: A complete protocol was obtained in 14 patients, one exclusion due to non-diagnostic diffusion MRI. Prostate cancer was found in 40 sectors over 112. Following the registration of PET and T2, SUV was significantly increased in the peripheral zone sectors with prostate cancer on histology by comparison with normal sectors (4.6±0.9 vs. 2.3±0.6, $p<0.0001$). The regression analysis shows significant coefficient for the PET only ($p=0.04$). An improved area under the ROC curve (AUC) was observed when PET analysis was combined with MRI by comparison to MRI only (AUC=0.9 for PET+T2+ADC+Ktrans vs. AUC=0.84 for T2+ADC+Ktrans, $p=0.04$).
Conclusion: Hybrid whole-body PET-MRI results in accurate measurements of SUV in the peripheral zone of prostate that differentiate normal prostate from cancer. By comparison to MRI only, combining pelvic MRI and 18F-fluorocholine PET-MRI improves the detection of prostate cancer in patients before radical prostatectomy.

SS108

Hybrid PET/MRI in the assessment of cardiac viability: Added value compared to PET/CT

R. Nkoulou[1], S. Heinzer[1], D. Carballo[1], G. M. Vincenti[1], A. Quercioli[1], M. Stuber[2], D. Didier[1], T. H. Schindler[1], O. Ratib[1], J.-P. Vallee[1]; [1]Genève, [2]Lausanne

Purpose: We evaluated the potential for hybrid PET/MRI devices to provide integrated metabolic, functional and anatomic characterization of patients with suspected coronary artery disease
Methods and Materials: Ten patients (5 with suspected hibernating myocardium and 5 healthy volunteers) performed an imaging study using a hybrid PET/MRI (Philips). Viability assessed by 18F-FDG was performed in diseased patients along with MRI anatomic and functional study and reassessed within 30 minutes by conventional PET/CT. Non-contrast right coronary artery (RCA) targeted and whole heart 3D coronary angio-MRI using ECG-gating and respiratory navigator was performed in healthy volunteers with reconstruction performed using MPR and volume rendering. The extent of metabolic defect (MD) using PET/MRI and PET/CT were compared in patients and coronary territories (LAD, CX, RCA). Assessibility of coronary lumen was judged as good, sub-optimal or non-assessable using a 16-segments coronary model.
Results: Metabolic assessment was successful in all patients with MD being 19.2% vs 18.3% using PET/MRI and PET/CT, respectively (P=ns). The MD was 10.2%, 6%, and 3% vs 9.3%, 6% and 3% for LAD, CX and RCA territories, respectively (P=ns). Coronary angio-MRI was successful in all volunteers with 66 coronary segments visualized overall. The RCA was fully visualized in 4/5 volunteers and the left coronary arteries in 4/5 volunteers. Assessibility in visualized segments was good, sub-optimal and non-assessable in 88%, 2% and 10%, respectively.
Conclusion: Hybrid PET/MRI devices may enable metabolic evaluation comparable to PET/CT with additional value owing to accurate functional and anatomical information including coronary assessment.

SS109

Feasibility of simultaneous PET-MR imaging in breast cancers

C. Tabouret-Viaud, P. Loubeyre, R. Guignard, V. Garibotto, M. Viallon, S. Heinzer, O. Ratib, M. Lord; Genève

Purpose: Our aim is to illustrate the contribution of a hybrid device combining a whole body PET and a whole body MRI in breast cancer staging and follow-up. Hybrid PET-MR acquired in prone position with dedicated breast coils was compared to conventional thoracic PET-CT and MRI studies acquired separately.
Methods and Materials: The Philips Ingenuity PET/MR scanner was tested combining a 3 Tesla MR and a time-of-flight PET scanner sharing a single bed moving from one device to another allowing sequential acquisition of co-registered MR and PET images. 25 patients were studied for breast cancer staging and follow-up. Standard imaging protocols of both modalities were combined to optimize acquisition sequences for loco-regional assessment of tumor extension and whole body staging. Hybrid images were interpreted by multidisciplinary teams of radiologists and nuclear physicians. PET-MR results were compared to thoracic PET-CT acquired in conventional supine position associated with diagnostic MRI acquired separately.
Results: Optimized PET-MR protocols allowing full diagnostic quality of both modalities while reducing the total time of the study were developed successfully. Staging was more precise with PET-MR acquired with dedicated breast coils than with conventional thoracic PET-CT and MRI acquired separately. Some clinical examples highlight this added value of hybrid PET-MR imaging.
Conclusion: This work presents optimized imaging protocols developed for co-registration of PET and MR in breast cancer staging and follow-up. Compared to PET-CT, PET-MR allowed a reduction of the effective dose, and minimized patient discomfort by reducing the total time of the study, while maximizing clinical information.

SS110

Low kVp contrast-enhanced CT: Can imaging closer to the k-edge of iodine allow for a reduction in contrast media?

D. B. Husarik[1], D. Marin[2], R. C. Nelson[2]; [1]Zürich, [2]Durham (US)

Purpose: To verify the anticipated decrease in iodinated contrast material when decreasing tube voltage from 120 kVp to 100 kVp during abdominal CT angiography to achieve equal aortic enhancement.
Methods and Materials: 47 patients (20 f, 27 m, mean 65 y, mean BMI 25) were prospectively included and randomly assigned to one of the following dose-equivalent protocols: A (120 kVp, auto-mA, 40% ASIR, 150 mL i.v.-contrast injected @4 mL/sec) or B (100 kVp, auto-mA, 40% ASIR, 123 mL i.v.-contrast, injected @3.3 mL/sec). A 20% decrease in iodinated-contrast material was selected based on iodine-attenuation-curves and physiologic-flow-phantom-data. A 64-section-MDCT-scanner was used. Enhancement of the abdominal aorta was measured at the level of the celiac axis. Noise estimates were derived from fat. Aortic signal-to-noise-ratios (SNRs) were calculated. Visualization of small vascular detail was assessed qualitatively. All parameters were compared between the two protocols using a Student's t-test.
Results: There were no differences in patient characteristics between the two protocols. Aortic enhancement (340+/-72 HU) and SNR (26+/-11) in protocol A did not differ from aortic enhancement (343+/-73 HU) and SNR (24+/-8) in protocol B (P=0.6). There was no difference in qualitative assessment of small vascular detail between the protocols.
Conclusion: When decreasing tube voltage from 120 kVp to 100 kVp, intravenous iodinated contrast can be reduced by 20% to achieve equal aortic enhancement during abdominal CT-angiography.

SS111

Emergency CT in patients with renal insufficiency: Is high-dose i.v. N-Acetylcysteine effective to prevent nephrotoxicity?

P.-A. Poletti, A. Platon, S. de Seigneux, P. Saudan, P. Y. Martin, C. Becker; Genève

Purpose: To assess the effect of intravenous administration of high dose of N-acetylcysteine (NAC) on serum levels of creatinine and cystatin C, two markers of renal function, in patients with renal insufficiency who underwent emergency contrast-enhanced CT.
Methods and Materials: 110 adult patients with renal insufficiency who underwent emergency contrast-enhanced CT were randomized to two groups. In the first group, in addition to hydration, patients received a 6000-mg injection of NAC 1 hour before injection of iodine contrast medium. Patients in the second group received hydration only. Serum levels of creatinine and cystatin C were measured at admission and on days 2, 4 and 10 after CT. Nephrotoxicity was defined as a 25% or greater increase in serum creatinine or cystatin C levels compared to baseline values.
Results: Nephrotoxocity was observed after injection of iodine contrast medium in 13 (23%) of 56 patients in the group placebo and in 14 (26%) of 54 patients in the group NAC. The difference between both groups was not statistically significant (p=0.66).
Conclusion: Our data suggest that high dose of intravenous NAC is ineffective in preventing nephrotoxicity in patients with renal insufficiency who require an emergency contrast-enhanced CT.

SS112

Serum creatinine measurements: Evaluation of a questionnaire according to the ESUR guidelines. Final results

C. Newerla, S. Potthast, G. Bongartz, J. Hohmann; Basel

Purpose: The Contrast Media Safety Committee of the European Society of Urogenital Radiology propose measurements of serum creatinine to identify patients with reduced renal function and therefore with a higher risk of CMIN and/or NSF. The aim of the study was to find out patients with an elevated serum creatinine level according to a proposed questionnaire.
Methods and Materials: Between 04/09 and 02/10 a questionnaire in 1385 patients before contrast administration for a CT or MRI examination was done. Creatinine measurements were performed when one or more questions concerning previous renal disease (including surgery), known diseases in relatives, history of diabetes, proteinuria, hypertension, gout or analgetic medication were positive.
Results: Of the 1385 patients 499 gave one or more positive answers to the questionnaire. Of these, 68 had an elevated creatinine level. 18 patients had a creatinine level above 150 µmol/l. Only the question concerning previous renal disease showed a significant relation to an elevated creatinine level (p=0.0007). Comparing the groups with a complete negative response, with at least one positive response and with elevated serum creatinine level we found a significant difference in the mean age (51±16 y, 59±13 y, 70±12 y, p<0.0001).
Conclusion: We demonstrated a relatively low specificity of the proposed questionnaire. Taking the time/effort of the questionnaire-process into account, we propose to just question about previous renal diseases (including surgery). Patients above 70 years should get a creatinine measurement in any case.

SS113

Deep spatial analysis of renal ASL perfusion data in mild chronic kidney disease

C. Rossi[1], F. Artunc[2], P. Martirosian[2], H.-P. Schlemmer[3], F. Schick[2], A. Boss[1]; [1]Zürich, [2]Tübingen (DE), [3]Heidelberg (DE)

Purpose: To analyze the spatial heterogeneity of renal perfusion assessed with arterial spin labeling (ASL) MRI in a cohort of subjects with moderately impaired kidney function versus a cohort of healthy volunteers.
Methods and Materials: Eight healthy volunteers and 9 patients with mild renal dysfunction (i.e., with GFR>30 ml/min per 1.73 m²) were included in the study. ASL perfusion measurements were performed at 1.5T using a FAIR (flow-sensitive alternating inversion recovery) True-FISP (true fast imaging in steady-state precession) sequence. Histogram analysis of perfusion maps was performed to quantify the metric of the perfusion of renal cortex and entire parenchyma, respectively. Mean perfusion value (µ), standard deviation of the mean value (σ), skewness (s), and kurtosis (k) were computed to describe the distribution of the perfusion values.
Results: Histogram analysis revealed significant changes in the distribution of the cortical perfusion values and a reduction of blood perfusion over both, cortex and parenchyma, in patients as compared to the healthy volunteers (Table 1).

	Cortex		Parenchyma	
	Patients	Healthy volunteers	Patients	Healthy volunteers
µ (ml/100 g/min)	263±81*	329±53	244±77*	301±51
σ (ml/100 g/min)	86±22	74±24	96±20	104±26
s	-.125±.581*	-.543±.298	.173±.912	-.267±.387
k	-.151±.561*	.371±.590	0.757±1.615	-.145±.544

Conclusion: The preliminary results reported in this study suggest the importance of the regional assessment of the renal perfusion. Cortical perfusion seems to be a marker of the onset of the renal disorders. Histogram analysis of ASL perfusion data may have potential diagnostic value for detection and monitoring of mild renal disorders.

SS114

Diffusion – Weighted MRI in Renal Allografts: Is it helpful in daily clinical routine?

P. Steiger[1], M. Ith[1], A. Kruse[1], M. Gugger[1], J. M. Froehlich[2], D. Chong[1], H. Thoeny[1]; [1]Bern, [2]Zürich

Purpose: To determine whether diffusion-weighted MRI (DW-MRI) can be used to stratify patients for biopsy (BI) or follow-up (FU) based on various diffusion parameters.
Methods and Materials: Thirty-five consecutive kidney transplant patients (8 w/27 m) with deteriorating renal function underwent DW-MRI (EPI-sequence; ten b-values: 0-900 s/mm²) on a 1.5 Tesla MR-scanner (Siemens Sonata) within ten days before or after biopsy. DW-MRI data were processed applying either mono-exponential (yielding ADC-values [x10-5 mm²/s]) or bi-exponential fitting (yielding values for pure diffusion ADCD [x10-5 mm²/s] and perfusion fraction FP [%]). If renal biopsy yielded at least one result with a direct implication for clinical management, e.g. rejection, patients were assigned to the BI-group. Statistical evaluation was performed using STATA and values are given as mean±SEM. Unpaired t-tests were used to compare the DW-MRI parameters between BI- and FU-group.
Results: Of the 35 patients who underwent renal allograft biopsy 22 were classified into the BI-group and 13 into the FU-group. Histopathologic findings in the BI-group included cellular rejection (n=8), humoral rejection (n=2), glomerulonephritis (n=1), IGA nephropathy (n=1), BK virus nephropathy (n=2), acute tubular necrosis (n=2), cyclosporine toxicity (n=8) and chronic allograft-nephropathy (n=3), whereas findings in the FU-group included chronic changes such as vascular or glomerular sclerosis, fibrosis, atrophy or minor interstitial inflammation. DW-MRI parameters of the BI-group were significantly lower compared to the FU-group:

ADC (183±1 vs. 195±1; p<<0.01), ADCD (177±12 vs. 188±12; p<<0.01) and perfusion fraction FP (16±3% vs. 18±5%; p<<0.01), respectively.
Conclusion: DW-MRI in kidney transplant patients with deteriorated renal function might improve the diagnostic workup by stratifying patients for renal biopsy.

SS115

Differentiation of low and high gleason scores in prostate tumors using diffusion weighted MRI: Monoexponential and biexponential model estimates of the apparent diffusion coefficient (ADC)

L. Bains, D. Chong, M. Ith, M. Triantafyllou, J. Froehlich, A. Fleischmann, H. Thoeny; Bern

Purpose: To investigate whether different methods of calculating the apparent diffusion coefficient (ADC) in prostate tumours imaged using 3.0T MRI can separate tumors with low Gleason scores from those with intermediate or high Gleason scores.
Methods and Materials: 96 patients underwent MR imaging prior to prostatectomy. Diffusion-weighted imaging (DW-MRI) was performed with 8 b-values. Diffusion coefficients were estimated using monoexponential fitting of DW-MRI data from all b-values (ADCtotal), and of b-values from 0-130 (ADClow) and 270-900 (ADChigh) separately. Biexponential fitting was also performed to estimate the perfusion fraction f, and the fast and slow apparent diffusion coefficients ADCD* and ADCD. Two tailed t-tests were used to assess differences between tumors with low (5, 6) and intermediate or high (7, 8, 9, 10) Gleason scores. Mean ADC estimates were correlated with postsurgical Gleason score using Spearman rank correlations.
Results: Tumors with intermediate or high Gleason scores had significantly lower values for both monoexponential (ADCtotal, ADChigh) and biexponential (ADCD) diffusion coefficients (p<0.05).
Both monoexponential (ADCtotal, ADChigh) and biexponential (ADCD) diffusion coefficients correlated well with Gleason score, with correlation coefficients between -0.39 and -0.47.
Conclusion: Parameters related to interstitial water diffusion (ADCtotal, ADChigh, ADCD) were significantly higher in tumours with low Gleason scores. Parameters which may be related to perfusion or other types of diffusion (ADClow, ADCD*, f) were not significantly different in tumors with low Gleason scores.
The parameter ADCtotal which is calculated by most MRI vendor software is sufficient to separate tumors with low Gleason scores from those with intermediate or high Gleason scores.

SS116

Diagnostic accuracy of DW-MRI in comparison to histopathology for detection of lymph nodes metastases in normal sized lymph-nodes in patients with bladder or prostate cancer

J. Froehlich[1], M. Triantafyllou[2], G. Petralia[2], D. Chong[2], P. Vermathen[2], F. Birkhäuser[2], A. Fleischmann[2], U. E. Studer[2], H. Thoeny[2]; [1]Zollikon, [2]Bern

Purpose: To assess the diagnostic accuracy of Diffusion-weighted MRI (DW-MRI) for the detection of metastases in normal sized lymph nodes in patients with bladder or prostate cancer and negative staging in correlation to histopathology.
Methods and Materials: A total of 87 patients (7 w, 80 m; mean= 63 yrs, 43-82) with bladder or prostate cancer planned for surgical lymphadenectomy were examined on a 3T MRI. Patients underwent morphological 3D T1- and T2-w SPACE sequences and an axial EPI DW-MRI sequence with 3b-factors (0, 500, 1000 sec/mm²) with the following parameters (TR=4700 ms, TE=59 ms, matrix 128x128, FOV=330, slice thickness=4 mm, NSA=6, TA=4.23 min). Image analysis was performed twice, first in consensus by two readers before surgery and then several months later independently, blinded by three readers.
Results: A total number of 3533 lymph nodes were resected and screened for metastases. In 25 patients lymph node metastases were found. Prospective DW-MRI correctly detected 14/25 patients as positive. In the remaining 11/25 patients micrometastases all underneath a short-axis diameter of 3 mm were missed. DW-MRI classified 22 patients as false-positive while 40/62 negative patients were correctly detected as negative. The three independent readers achieved diagnostic accuracies of 75.9%, 88.5% and 88.5%, respectively. Their negative predictive values were excellent with 84.7%, 91.9% and 93.3%. Fleiss's kappa inter-rater agreement for the four ratings yielded a 77.8% overall agreement.
Conclusion: DW-MRI improves the diagnostic confidence to detect lymph node metastases in normal sized lymph nodes. In case of smaller lymph node metastases these might be missed due to poor spatial resolution or in case of unspecific impeded diffusion false positive cases might occur.

SS117

Software-supported evaluation of small-bowel motility in MRI: Precision and speed

S. Bickelhaupt[1], J. M. Froehlich[1], R. Cattin[2], S. Raible[2], H. Bouquet[3], U. Bill[3], F. Merz[3], M. A. Patak[1]; [1]Zürich, [2]Biel, [3]Bern

Purpose: Functional analyses of small bowel motility by MRI have been performed by hand, which is potentially subjective and time-consuming. A new developed software (Motasso) permits semi-automatic measurement of small bowel diameter over time thus displaying motility. The aim was to validate the software prototype by comparing it to manual measurements.
Methods and Materials: 45 patients were included in this study. MRI (1.5-T, Siemens Sonata) was performed after standardized preparation. 2D (dynamic T2-2D-FIESTA) motility acquisitions covering the entire small bowel were performed in apnea (27 s). Image analysis for assessment of small bowel motility was performed both manually and with the software. The main curve characteristics describing motility were compared using Student's t-Test. The level of scattering of individual measurements was compared between the two methods.
Results: 91 single regions of interest were analyzed 3 times by hand and 3 times with Motasso. Overall 92% of the motility-curves qualitatively matched each other. No significant intraindividual difference (p>0.05) was found for peristaltic frequencies (mean: 4.15/min manual; 4.09/min Motasso), amplitudes (5.14 mm; 5.03 mm) and mean lumen diameters, respectively. Mean duration for single measurement was significantly (p<0.05) lower with Motasso (6.30 min for manual and 1.20 min for Motasso). The scattering differed significantly (p<0.05) between the two measurements.
Conclusion: The use of Motasso proves highly reliable, fast and accurate measurement of small bowel motility. Curve characteristics and peristaltic motility frequencies of manual and software-supported analyses did not differ significantly, while the measurement precision and the time needed for measurement differed significantly in favor of Motasso.

SS118

MR motility measurement for the evaluation of crohn's disease activity compared to biopsy

M. A. Patak[1], J. Cullmann[2], Z. Szucs-Farkas[3], N. Patuto[2], R. Tutuian[2], S. Raible[2], J. M. Froehlich[1]; [1]Zürich, [2]Bern, [3]Biel

Purpose: The purpose of this study is to correlate MR-motility alterations with the activity of the disease and the presence of chronic changes based on histopathologic samples of the terminal ileum in patients with Crohn's disease (CD).
Methods and Materials: 43 patients with known CD underwent MRI (1.5T) using 2D TrueFisp cine sequences in addition to a standard imaging protocol. An oral non-invasive preparation method (1 l mannitol 3%) was used for optimal distension. MR motility was measured at the level of the terminal ileum as diameter changes over time on each slice orthogonally to the small bowel axis. Motility was graded as normal, hypomotility or absence. This was correlated with biopsy of the terminal ileum, not more than 14 days from the MR. The biopsies were graded for the presence of disease, disease activity (high activity, mild activity, no activity) and for chronic changes (severe, mild or no chronic changes). The motility alterations were correlated with the presence of disease, the activity and the chronic changes using the Spearman rank order correlation.
Results: Biopsy proved CD in 28 patients, 15 active CD (7 highly active, 8 mild) while 17 showed chronic changes (4 severe, 13 mild). MRI revealed motility changes in 21 patients(13 hypomotility, 8 absent). The degree of motility alterations correlated with the grade of activity (R=0.522) and chronic changes (R=0.521; p<0.001). The sensitivity and specificity for motility changes were 0.79/0.67 for detection of activity and 0.81/0.72 for detection of chronic changes.
Conclusion: MR-motility alterations of the terminal ileum in patients with CD correlate with biopsy proven active and chronic changes.

SS120

The influence of body temperature on image contrast in post-mortem MR

T. D. Ruder[1], G. M. Hatch[2], L. Siegenthaler[2], G. Ampanozi[1], S. Mathier[2], M. Thali[1], O. Weber[3]; [1]Zürich, [2]Bern, [3]Basel

Purpose: To assess the temperature dependency of tissue contrast on post-mortem magnetic resonance (PMMR) images both objectively and subjectively; and to visually demonstrate the changes of image contrast at various temperatures.
Methods and Materials: The contrast of water, fat, and muscle was measured using regions of interest (ROI) in the orbit of 41 human corpses to assess how body temperature (range 2.1°C to 39.8°C) relates to image contrast of T1-weighted (T1W) and T2-weighted (T2W) sequences on PMMR images. Images were acquired on a 1.5 T MR-unit. Regressions were calculated using the method of least squares. Three readers judged visible changes of image contrast subjectively by consensus.
Results: There was a positive relationship between temperature and contrast on T1-weighted (T1W) images and between temperature and the contrast of fat/muscle on T2-weighted (T2W) images. There was a negative relationship between temperature and the contrast of water/fat and water/muscle on T2W images. Subjectively, the influence of temperature became visible below 20°C on T2W images, and below 10°C on T1W images.
Conclusion: Image contrast on PMMR depends on the temperature of a corpse. Radiologists involved in post-mortem imaging must be aware of temperature-related changes in MR image contrast. To preserve technical quality, it is our suggestion that scanning corpses below 10°C should be avoided on 1.5 T MR-units.

SS121

Identifying a myocardial infarct in forensic imaging by means of MTR-mapping

H. J. A. Crooijmans[1], T. D. Ruder[2], S. Mathier[3], C. A. Schön[3], W.-D. Zech[3], S. Bolliger[3], M. Thali[2], O. Bieri[1]; [1]Basel, [2]Zürich, [3]Bern

Purpose: One of the paramount goals of current research in forensic imaging is to establish reliable tools for non-invasive assessment of myocardial infarction. Post-mortem cardiac MR has usually focused on detecting myocardial edema using T2-weighted sequences. However, other sequences may provide more detailed information regarding the extent of an infarction. We have explored the use of magnetization transfer ratio (MTR) mapping, which is known to give detailed information on myocardial infarctions in-vivo.
Methods and Materials: Two non-balanced steady state free precession (FISP) acquisitions with different pulse durations (TRF=310 µs, 2100 µs) for strong and weak MT-weighting were acquired. MTR-maps were generated according to MTR=(SweakMT – SstrongMT)/ SweakMT, which is customary to quantify MT-effects. Measurements were performed on human post-mortem cases: with and without (control) myocardial infarction. MR-imaging was followed by autopsy to validate MR-findings.
Results: Control group data show homogeneous MTR maps throughout the myocardium (MTRhealthy=23.9%±0.9%), while the MTR-maps of cases with myocardial infarction show a reduced MTR value in the region of infarction (MTRhealthy=25.4%±0.8% vs. MTRinfarction=21.3%±0.8% are found to be statistically different according to a t-test with 95% confidence interval and $p<<0.001$). The region of infarction indicated by the MTR-map was confirmed by autopsy findings.
Conclusion: We have shown that MTR-maps give detailed information on cases of myocardial infarction. MTR values between cases have shown to differ, however, homogeneous results are obtained for “healthy” cases, where infarction shows signifficant local MTR reduction for the affected region.

SS122

Visualization of myocardial infarction in post-mortem CT-angiography – A feasibility study

S. de Froidmont, K. Michaud, F. Doenz, P. Mangin, S. Grabherr; Lausanne

Purpose: Multiphase post-mortem CT-angiography (MPMCTA) permits to visualize the vascular system of the head, thorax and abdomen in detail which allows performing vascular diagnosis with very high sensitivity. This advantage can be used to examine coronary arteries in cases of sudden cardiac death. In some of those cases, a pathological enhancement of the myocardium can be observed that may correspond to the morphological finding of myocardial infarction. The aim of this study is to investigate the possibility to identify a myocardial infarction by MPMCTA.
Methods and Materials: We investigated retrospectively 10 cases of myocardial infarction on which a pre-autopsy MPMCTA has been performed. In all cases the autopsy diagnosis was performed by macroscopic and histological analyses. MPMCTA was executed using the oily contrast agent Angiofil and following a standardized protocol. The presence or absence of myocardial enhancement and its distribution was investigated by a forensic pathologist together with a board certified radiologist.
Results: In all cases a pathological enhancement (mean Hounsfield Units ≥ than 100) of the myocardium was observed in regions which correlated with the localization of the infarction. While a slight diffuse enhancement of the myocardium correlated to an acute ischemia, a concentrated enhancement in the subendocardic layer was observed in case of old infarct.
Conclusion: This study suggests that it is possible to diagnose myocardial infarction after MPMCTA by evaluation of the pathological enhancement of the myocardium. This presentation describes the aspect of the radiological image and compares it to macroscopic and histological findings.

SS123

Investigation of sharp trauma by post-mortem multi-phase CT-angiography

J.-B. Zerlauth, F. Doenz, S. de Froidmont, S. Binaghi, R. Meuli, S. Grabherr; Lausanne

Purpose: The multi-phase post-mortem CT-angiography (MPMCTA) consists in the performance of a native MDCT scan and three angiographic phases. The aim of the presented study was to investigate the performance of MPMCTA on cases of sharp trauma in addition to conventional autopsy.
Methods and Materials: 10 cases, 6 suicides and 4 homicides, were selected: 7 male and 3 female subjects, of whom age varied from 17 to 64 years. 6 of them died from exsanguination, 3 due to a cardiac tamponade and 1 from asphyxia. More than 75 lesions due to sharp trauma were described in the final autopsy reports: 49 stab wounds, 26 cuts and multiple scratches, thanks to conventional autopsy and radiological MPMCTA.
Results: Native MDCT could identify only some of the injuries by the presence of air in the soft tissue or due to bone lesions visible on the trajectory. However, the sensitivity of PMPCTA to detect major lesions was extremely high (100%). Trajectories of stab wounds and superficial cuts could be rendered visible. The 3D-software permitted different reconstructions used to plan the conventional autopsy and to measure the depth of the injuries. Moreover, extravasations of the contrast agent allowed detecting the exact source of bleeding.
Conclusion: The protocol of MPMCTA is a powerful tool to investigate lesions due to sharp trauma localized in the head, thorax and abdomen. The detection of the exact source of bleeding represents an advantage over conventional autopsy. However, smallest lesions can be overseen and the depth of stab wounds can be underestimated in comparison with conventional autopsy.

SS124

Is abdominal plain film still adapted for the screening of illegal intra-corporeal containers (“body-packing”)? A comparative study with low-dose CT

A. Platon, P.-A. Poletti, E. Lock, C. Becker; Genève

Purpose: To compare the abdominal plain film (APF) with a low-dose CT (LDCT) in the detection of illegal intra-corporeal containers (“packets”); to evaluate whether the number of packets and their density at LDCT affects the APF interpretation.
Methods and Materials: 330 consecutive persons, suspected of having ingested drug packets, underwent a supine APF. The presence or absence of packets at APF were reported and compared to the result of the abdominal low-dose CT (LDCT), considered reference standard. The density and the number of packets (≤12 or above) at LDCT were recorded and analyzed to determine whether they may influence the APF interpretation. This study was approved by the institutional ethical review board (IRB=06-023).
Results: Packets were detected at LDCT in 53 (16%) suspects. The sensitivity of APF for depiction of packets was 77% (41/53), the specificity 97% (268/277). The packets appeared iso-dense to the bowel content at LDCT in sixteen (30%) of the 53 positive cases. Nineteen (36%) of the 53 positive LDCT displayed fewer than 12 packets. An iso-dense aspect of the packets at LDCT and a low number of packets (≤12) were both significantly associated with false negative APF.
Conclusion: APF is not effective at detecting drug packets that are iso-dense to the bowel content and/or in low quantity.

SS125

Intra-individual assessment of normal myocardial T1 time and the extracellular volume fraction (ECV) for Gd-DTPA and Gd-BOPTA by means of T1 mapping

N. Kawel, M. Nacif, A. Zavodni, J. Jones, S. Liu, C. Sibley, D. Bluemke; Bethesda (US)

Purpose: Myocardial T1 time and extracellular volume fraction (ECV) are altered in patients with diffuse myocardial fibrosis. The purpose of this study was to perform an intra-individual assessment of normal T1 time and ECV for two different contrast agents.
Methods and Materials: In 24 healthy subjects (8 men; 28±6 years) a modified Look-Locker Inversion Recovery (MOLLI) sequence was acquired at 3T pre-contrast and every 5 min between 5-45 min post-contrast in two separate exams: after administration of a bolus of 0.15 mmol/kg gadopentetate dimeglumine (Gd-DTPA; Magnevist®) (exam 1) and 0.1 mmol/kg gadobenate dimeglumine (Gd-BOPTA; Multihance®) (exam 2). T1 times were measured in myocardium and blood. ECVs were calculated: (ΔR1myocardium/ΔR1blood)*(1-hematocrit).
Results: Mean myocardial T1 time was 15±2 ms (2.5±0.7%) shorter for Gd-DTPA at 0.15 mmol/kg compared to Gd-BOPTA at 0.1 mmol/kg ($p<0.01$) while there was no significant difference for T1 time of blood ($p>0.05$). Between 5-45 min post-contrast, mean ECV values increased linearly with time for both contrast agents from 0.27±0.03 to 0.30±0.03 ($p<0.0001$). Mean ECVs were slightly higher (by 0.01, $p<0.05$) for Gd-DTPA compared to Gd-BOPTA. ECV showed wide variation between subjects (e.g. range 0.23-0.32 [Gd-DTPA] and 0.22-0.32 [Gd-BOPTA] at 15 min). However, ECV with Gd-DTPA was highly correlated to ECV by Gd-BOPTA ($r=0.803$; $p<0.0001$).
Conclusion: ECV values vary widely between normal subjects (by approximately 30-40% of the mean population value). However, absolute differences in ECV between Gd-DTPA and Gd-BOPTA were small and rank correlation was high. After bolus injection of either Gd-DTPA or Gd-BOPTA, ECV increases continuously indicating equilibrium is not reached by 45 min after injection.

SS126

Comparison of cardiac CT and echocardiography for transcatheter aorte-valve implantation and device selection

V. Dunet, D. Locca, F. Tobalem, E. Ferrari, P. Monney, R. A. Meuli, S. D. Qanadli; Lausanne

Purpose: To compare cardiac CT and ultrasound (US) for aortic valve annulus (AVA) measurement in patient selected for transcatheter aortic-valve implantation (TAVI).
Methods and Materials: Thirty patients (15 W/15 M, age 84±7 y) who underwent transfemoral (n=15) or transapical (n=15) TAVI were enrolled. All patients underwent dedicated cardiac CT to measure valve diameter (DCT). Peri-procedural transoesophagal echocardiography was performed to measure valve diameter (DUS). Pre and post-procedural transthoracic echocardiography was performed to assess trans-valvular gradients (Gmax) and pre/post-TAVI gradient difference (ΔGmax) using a Doppler technique. Student t-test was used for subgroups comparisons. Agreement between DCT and DUS was assessed by Lin test (ρc) with computation of Bland-Altman limits-of-agreement (LOA).
Results: EuroSCORE was significantly higher in patients who underwent transfemoral TAVI (48±14 vs. 17±5%, $p<0.0001$). DCT was not different between transfemoral and transapical TAVI (22.9±3.0 vs. 21.2±1.5 mm, $p=0.06$). Though DCT was significantly lower than DUS (22.2±2.6 vs. 23.3±2.1, $p=0.017$) and agreement between DCT and DUS was poor (ρc=0.62, mean difference=–1.1±1.9 mm, 95% LOA: –4.8-2.6), this was not clinically relevant. Pre-TAVI Gmax was similar in patients who underwent transfemoral or transapical TAVI (70.8±33.7 vs. 86.3±24.0 mmHg, $p=0.17$). Post-TAVI Gmax was significantly lower than pre-TAVI Gmax (78.5±29.7 vs. 16.8±5.1, $p<0.001$). ΔGmax was similar in transfemoral or transapical TAVI (46.3±28.6 vs. 70.4±25.1 mmHg, $p=0.05$).
Conclusion: In both transfemoral and transapical TAVI procedure cardiac CT can be used to size the AVA compared to US. Diminution of Gmax pre and post-implantation highlights the adequation of the right prosthetic valve choice prior to TAVI procedure.

SS127

Multi-phase cardiac computed tomography for detection of left atrial appendage thrombi

G. D. Puippe, M. Jaguszewski, C. Manes, S. Salzberg, T. Frauenfelder, U. Landmesser, H. Alkadhi; Zürich

Purpose: To evaluate three multi-phases cardiac computed tomography (CT) protocols for detection of left atrial appendage (LAA) thrombi in patients with atrial fibrillation.
Methods and Materials: Eleven patients (2 women, mean age 72±14 years) with atrial fibrillation underwent cardiac CT due to suspected LAA thrombi. All CT studies were performed on a 128-slice dual-source CT scanner. Protocols consisted of a 2-phase retrospectively ECG-gated helical CT (double-spiral), a 2-phase prospectively ECG-gated sequence (double-sequence), and a sequence followed by prospectively ECG-gated high-pitch spiral (sequence-flash). Phase-1 enclosed the entire heart; phase-2 was limited to the LAA. Scan delay between phases was 30 seconds. Two readers assessed image quality (diagnostic vs. non-diagnostic) and the LAA (no filling defect, early filling defect in phase-1, persisting or resolving filling defect in phase-2). CTDIvol and DLP were noted.
Results: Mean heart rate was 69±25 bpm (range 44-120 bpm, all absolute arrhythmia). Diagnostic image quality was obtained in all scans. Early filling defects in phase-1 were observed in 3 patients, of which only one persisted in phase-2, and two resolved in phase-2. Radiation dose differed significantly among the protocols (CTDIdouble-spiral vs CTDIdouble-sequence vs CTDIsequence-flash=129±16 vs. 54±7 vs. 31±23 and DLP double-spiral vs DLPdouble-sequence vs DLPsequence-flash=1687±206 vs. 618±254 vs. 312±142, all $p<.05$).
Conclusion: Multi-phase cardiac CT is mandatory for the differentiation between early filling defect due to slow blood flow and LAA thrombus. A combined sequence and high-pitch CT protocol is favored because of the low radiation dose.

SS128

ECG triggered Nonenhanced MRA of the upper extremity: Initial experience

M. Rasmus[1], D. Harder[1], S. Kos[2], G. Bongartz[1], S. Forte[1], M. Aschwanden[1], D. Bilecen[3]; [1]Basel, [2]Binningen, [3]Laufen

Purpose: Improvements in MR hardware and software, coupled with concerns about the safety of gadolinium-based contrast agents, have contributed to a renaissance of interest in nonenhanced MR Angiography (NE-MRA) (Miyazaki, Radiology 2008). Especially for patients with end stage kidney disease NE-MRA represents a chance of NSF-risk-free arterial imaging. Risk-free MRA of dialysis shunts is of clinical interest.
Methods and Materials: Healthy volunteers underwent NE-MRA (n=10, Verio 3T, Siemens, MRA: Flow sensitive 3D-Turbo-Spin-Echo with ECG triggering and subtraction of image data with- and without arterial peak flow, Native Space, Siemens; single step acquisition, 1.1 mm isovoxel). Evaluation consisted of a consensus reading of two radiologists with grades from 1 (good: homogeneous visualization of >75% of two main arteries and side branches) to 4 (insufficient: <75% of two main arteries visualized).
Results: Mean of given grades was 2.4 (distribution 1:3x, 2:3x, 3:1x, 4:3x). Insufficient data showed lack of homogeneity of arterial signal and artifacts at surfaces like bone/tissue. There was no trend towards better results with increasing experience.
Conclusion: The potential of good quality NE-MRA of the upper extremity with this technique was demonstrated. However, the technique revealed unstable quality results. Especially micro-motions due to tremor, maybe also breathing led to qualitative limitations in accordance to the underlying subtraction algorism. We found the relatively high number of insufficient data sets to be unacceptable in view of clinical imaging. Accordingly an initially planned second study-part in dialysis patients was abandoned. We hope that further developments of NE-MRA will overcome these problems (i.e. motion correction, not subtraction-dependent approaches).

SS129

Outcome of tunneled hemodialysis catheter placed in an angiographic suite

S. Abderhalden, T. Maeder, M. Glenck, S. Segerer, T. Pfammatter; Zürich

Purpose: Tunneled dialysis catheters (TDC) are used in patients with unplanned dialysis start as a bridging until a definitive dialysis access is available. TDC placement was moved at our institution from the operating room to the angiographic suite. The outcome of these TDCs was analyzed after two years' experience.

Methods and Materials: We reviewed the reports of 100 patients in whom 118 transjugular TDCs (Quinton and Hemosplit) had been placed by 2 interventional fellows and 1 board-certified interventional radiologist with ultrasound and fluoroscopic guidance between 09/2009 and 07/2011.

Results: The average age was 59 yrs., 18 to 90 yrs. (M:F=59:41) with a mean of 4 comorbidities (0 to 8). Technical success rate was 100%. Early complications were 12 (10%) minor bleedings, 10 (9%) hematomas and 2 (2%) cardiac arrhythmias. 27 TDCs were lost to follow up. Tunnel infections and TDC-related bacteremia occurred in 6 respectively 5 cases (0.63 and 0.52 per 1000 catheter days). The median duration of TDC use was 60 days (range 3 to 719). 44 catheters (47.4%) were explanted due to recovery of kidney function, maturated fistula or after start of peritoneal dialysis. 13 (14.3%) were removed due to suspected complication. 19 (20.9%) had to be exchanged as a result of poor blood flow, malposition or other indications. 10 patients (11%) died of their underlying disease with a functioning catheter.

Conclusion: TDC placements in angiographic suites have a high primary success and a low infection rate.

SS130

Assessment of intra-cranial bleeding and the extent of ischemic stroke with dual-energy unenhanced CT in post-thrombectomy patients

J. Caetano, V. Cuvinciuc, V. M. Pereira, I. Momjian-Mayor, A. M. Korchi, K. Loevblad, M.-I. Vargas; Genève

Purpose: To assess the use of dual-energy unenhanced CT following thrombectomy in order to identify intra-cranial bleeding and the extent of ischemic stroke in this patient group.
Methods and Materials: 20 patients were included in the study (average age 71 years, range 47-95 years, 11 male and 9 female, with 1 patient excluded due to impossible image processing). All patients underwent unenhanced CT imaging performed in a dual-energy acquisition with two x-ray tubes operated at 80 and 140 kV. Virtual unenhanced images were obtained with dual-energy evaluation software allowing the removal of iodine content from each voxel in order to discriminate between iodine contrast material extravasation and haemorrhage and to allow identification of the ischemic lesion. Follow-up MRI was performed in 7 patients and all patients underwent follow-up unenhanced CT.
Results: Dual-energy unenhanced CT allowed to discriminate between iodine contrast agent extravasation and haemorrhage in 100% of patients and a better visualization of the ischemic lesion in all patients. Results were confirmed by follow-up unenhanced CT scans and MR scans.
Conclusion: Dual-energy unenhanced CT allowed the discrimination between haemorrhage and iodine contrast extravasation in 100% of cases as confirmed by follow-up unenhanced CT or MRI. This rapid response allows clinicians to adapt treatment with the shortest possible delay and to decrease the cost in health care by limiting the number of follow-up exams needed in this patient group.

SS131

Individual detection of parkinson disease patients using support vector machine analysis of susceptibility weighted imaging (SWI)

I. Barnaure[1], S. Badoud[1], D. Nguyen[2], M.-L. Montandon[1], K. Loevblad[1], P. R. Burkhard[1], S. Haller[3]; [1]Genève, [2]Carouge, [3]Commugny

Purpose: Brain iron accumulation was assessed in patients with suspected Parkinson disease (PD) using susceptibility weighted imaging (SWI). In a two-stage analysis, we performed a group level analysis to detect regions of brain iron deposition in PD, followed by a pattern recognition analysis to detect PD patients among subjects with various forms of Parkinsonism at the individual level.
Methods and Materials: The study was approved by the local ethical committee. We included 36 consecutive patients with parkinsonism suggestive of PD who had (i) SWI at 3T, (ii) brain 123I-ioflupane SPECT (DaTScan) and (iii) extensive neurological testing including follow-up (16 PD, 67.4±6.2 years, 11 females; 20 OTHER 65.2±12.5 years, 6 females). Group-level analysis included region of interest (ROI) and voxel-wise statistics, individual-level analysis included support vector machine (SVM) classification.
Results: At the group level, the visual analysis yielded no differences between groups. In contrast, the voxel-wise analysis demonstrated decreased iron deposition in bilateral thalamus and left substantia nigra in PD patients versus other Parkinsonism. The inverse comparison yielded no supra-threshold clusters. At the individual level, SVM correctly classified PD patients with accuracies superior to 86%.
Conclusion: Support vector machine based pattern recognition of SWI data provides accurate discrimination of PD among patients with various forms of Parkinsonism at an individual level, despite the absence of visually detectable alterations.

SS132

Diagnostic performance of MRI with diffusion weighted images for the detection of recurrent squamous cell carcinoma after radio(chemo)therapy

A. Ailianou, S. Patsoura, P. Dulguerov, R. Kohler, M. Becker; Genève

Purpose: To evaluate the diagnostic value of MRI with diffusion-weighted EPI sequences (DWI) for the differentiation of recurrent head and neck squamous cell carcinoma (rHNSCC) from post-therapeutic changes.
Methods and Materials: MRI examinations at 1.5T were carried out in 62 consecutive patients (8 females, 54 males, mean age=58 years, range: 43 – 80 y) with suspicion of rHNSCC. The MRI protocol included routine turbo spin echo sequences±iv Gadolinium and DWI sequences with b-values of 0 mm²/s – 1000 mm²/s. Apparent diffusion coefficient (ADC) maps were calculated. Biopsy±surgery and follow-up of >9 months after the MRI served as standard of reference. Images and ADC measurements were analyzed separately by experienced readers, who were blinded to the histological (n=46) and clinical / radiological follow – up (n=16).
Results: Recurrent tumors were present in 40 patients (65%), while the remaining 22 (35%) patients showed post-therapeutic changes. The mean size of rHNSCC was 30 mm (range: 3 – 51 mm). The mean size of post-irradiation scar tissue was 17 mm (range: 10 – 25 mm). The mean ADC value of rHNSCC (1.03±0.31 x 10-3 mm²/s) was significantly lower than that of post-therapeutic changes (1.51±0.55 x 10-3 mm²/s), (P<.01). Sensitivity, specificity and accuracy for MRI with DWI and with a threshold ADC value of 1.1 x 10-3 mm²/s for differentiation, were 94%, 95% and 95%, respectively.
Conclusion: MRI with DWI and ADC measurements allows accurate differentiation of rHNSCC from post-therapeutic changes in most cases.

SS133

Detection of recurrent or residual tumor after (chemo)radiotherapy for laryngeal and hypopharyngeal cancers: Does diffusion weighted MRI help?

D. W. Tshering Vogel, P. Zbären, A. C. Geretschlaeger, H. Thoeny; Bern

Purpose: To assess the ability of diffusion-weighted MRI (DW-MRI) to detect residual or recurrent tumors after (chemo) radiotherapy of laryngeal and hypopharyngeal carcinomas.
Methods and Materials: The study was approved by the local ethics committee and informed consent was obtained from all patients. Forty six patients (41 men, 5 women, age range: 41-83 years) with newly developed or worsening symptoms after (chemo)radiotherapy for laryngeal (n=30) and hypopharyngeal (n=16) cancers were prospectively imaged on a 1.5T MR unit using conventional MRI and axial DW-MRI with 6 b-values (0-1000 sec/mm²). The DW-MR images were analysed qualitatively by visual assessment together with the conventional MR images and also quantitatively both monoexponentially to give the ADC total (ADCT) and biexponentially to yield the perfusion fraction (FP) and the true diffusion coefficient (ADCD). Distribution of these values in patients with tumor and post-therapeutic changes was compared. Final diagnosis was based on histopathology and follow-up. Mann Whitney U test was used for statistical analysis.
Results: Qualitative DW-MRI in combination with morphological images improved the detection and exclusion of tumor in this patient cohort with a sensitivity of 94% and specificity of 100%. There was a significant difference in the distribution of the quantitative parameter values in patients with and without tumor with however overlapping values.
Conclusion: This study shows that DW-MRI combined with conventional MRI can help to accurately detect tumor after (chemo)radiotherapy of laryngeal and hypopharyngeal cancers.

SS134

CT angiography of the external carotid artery branches in the neck: Sufficient resolution to plan microvascular flap reconstruction procedures?

R. Kohler, K. Masterson, J. Schaepkens van Riempst, A. Terzic, P. Dulguerov, M. Becker; Genève

Purpose: Head and neck tumor patients often require extensive reconstructive procedures with microvascular free flaps. The purpose of this study was to evaluate the performance of multislice computed tomography angiography (MSCTA) for vascular mapping of host vessels prior to microvascular flap reconstruction procedures in the head and neck.
Methods and Materials: MSCTA was carried out before surgery in 34 patients (28 males, 6 females, mean age 60.1 years) scheduled for microvascular reconstruction with free flaps (26 antebrachial, 7 fibular, 1 latissimus dorsi). A 64-slice spiral computed tomography (CT) was performed with MPR and 3-dimensional VR reconstructions. MSCTA images were analyzed retrospectively by two readers, who were blinded to intraoperative findings. The diagnostic MSCTA quality, vessel diameter, patency, arteriosclerotic changes, stenoses and occlusions of the relevant host vessels (superior thyroid (STA), facial (FA) and lingual arteries (LA)) were assessed. Results were compared with intraoperative findings.
Results: No adverse reactions or complications were seen. With the exception of 2 MSCTA, all remaining examinations were of good or excellent quality. Of the 204 assessed vessels, 162 (79.7%) were normal, 32 (15.4%) were occluded and 10 (4.9%) were stenotic. Six (2.9%) showed calcified atheromatous plaques. Based on MSCTA, all normal, stenotic and occluded vessels were correctly identified despite their small diameter (mean diameters for STA, FA and LA were 1.49, 1.66 and 1.94 mm, respectively).
Conclusion: Our data indicate that MSCTA provides sufficient anatomic detail for the correct assessment of the critical vasculature of the recipient. Microvascular reconstruction procedures may thus be planned by means of MSCTA.

SS135

Laryngeal fractures and related complications: MDCT findings in the acute emergency setting

P.-O. Duboe[1], A. Platon[2], R. Kohler[2], P. Dulguerov[2], P.-A. Poletti[2], M. Becker[2]; [1]Poitiers (FR), [2]Genève

Purpose: To analyze fracture patterns and related complications in patients with laryngeal trauma seen in the acute emergency setting.
Methods and Materials: A consecutive series of 30 patients with laryngeal trauma was investigated by MDCT in the emergency situation. Contrast enhanced axial images with 0.75 mm – 1 mm slices, 2D multiplanar reconstructions (2D MPR) and 3D volume renderings (3DVR) of cartilages and airways were analyzed retrospectively by blinded observers according to defined criteria. Laryngeal fractures, injuries of the hyoid bone, hypopharynx and soft tissues, including airway compromise were evaluated and correlated to clinical, endoscopic and surgical findings.
Results: 45 fractures were present in 30 patients: 27 thyroid, 8 cricoid, 6 arytenoid, and 4 hyoid bone fractures. Most fractures were bilateral (20 thyroid, 8 cricoid, 4 arytenoids, 2 hyoid bones). Emphysema was present in 14/30 (47%) patients, intralaryngeal hematoma in 17/30 (57%), hypopharyngeal hematoma in 6/30 (20%), and mucosal lacerations in 9/30 (30%) patients. 3 laryngeal cartilage fractures and 6 arytenoid luxations were missed on axial images alone but were all seen on 2DMPR. 3D VR added diagnostic accuracy for the length, width, shape and spatial orientation of fractures in 16 (53%) cases and for the precise evaluation of airway narrowing in 15 (50%) cases.
Conclusion: Our data show that laryngeal fractures are most often multiple and bilateral and emphysema may be absent on CT. As axial CT images may miss fractures, 2DMPR should be performed routinely. 3D VR add diagnostic accuracy for fracture orientation and location of laryngotracheal narrowing providing helpful data for optimal management.

SS136

Computed tomography for pulmonary embolism: Scan assessment of a one-year cohort and estimated cancer risk associated with diagnostic irradiation

T. Niemann[1], I. Zbinden[1], H.-W. Roser[1], J. Bremerich[1], M. Rémy-Jardin[2], G. Bongartz[1]; [1]Basel, [2]Lille Cedex (FR)

Purpose: The objective of this study is to evaluate the additional lifetime attributable risk of cancer incidence and cancer mortality due to a single diagnostic irradiation in a one-year cohort of consecutive chest CT scans for suspicion of pulmonary embolism.
Methods and Materials: A one-year cohort of consecutive chest CT admitted to our service for suspicion of pulmonary embolism (691 patients) was analysed retrospectively.
Patient specific estimations of the radiation doses received by individual organs were correlated with the mean predicted cancer incidence and the predicted cancer mortality based on the BEIR VII results and compared with natural occurring risks in Switzerland.
Results: The lifetime attributable risk of cancer incidence/ mortality after one chest CT scan was calculated for cancer of the stomach, colon, liver, lung, breast, uterus, ovaries, bladder, thyroid and for leukemia.
The lifetime attributable risk remains very low for all age categories and all age groups in our collective, but being higher than the natural occurring risk for some cancer sites in the young age groups (20–40 years), e.g. lung and breast cancer.
Conclusion: The attributable cancer risks of cancer incidence and cancer mortality for a chest CT for pulmonary embolism are very low for all age groups and sex, but being above natural risk estimates for young patients. Hence the risk for radiation induced organ cancers must be outweighed with the potential benefit or a treatment and the potential risks of a missed and therefore untreated pulmonary embolism.

SS137

Pulmonary CT with the radiation dose of a chest X-ray: Wish or reality?

A. Neroladaki[1], D. Botsikas[2], S. Boudabbous[1], C. Becker[1], X. Montet[3]; [1]Genève, [2]Versoix, [3]Puplinge

Purpose: The purpose of this study was to investigate image quality of pulmonary CT with a radiation dose similar to conventional chest radiography by using iterative reconstruction.
Methods and Materials: The CT data of 43 consecutive patients undergoing non-enhanced thoracic CT (GE 750 HD) were included in this study. The protocol consisted of a standard dose CT and ultra-low dose acquisition(100 kV, 10 mAs). The ultra-low dose (ULD) CT was reconstructed with filtered back projection (FBP), with adaptive statistical iterative reconstruction (ASIR) and with model based iterative reconstruction (MBIR). The image quality of the reconstruction was compared by means of a 5 point scale (1=High quality, 5=non diagnostic), taking into account normal anatomy and pathologic features, eg, pulmonary nodules.
Results: The dose length product (DLP) for ULD CT and full dose CT was 7.59+/-1.85 and 347+/-247 mGy.cm, respectively. The quality of the CT was graded 1.2+/-0.5 for full dose CT, 3.5+/-0.8 for ULD CT reconstructed with a FBP algorithm, 3.1+/-0.8 for ULD CT reconstructed with an ASIR algorithm and 1.6+/-0.7 for ULD CT reconstructed with a MBIR algorithm ($p < 0.001$).
163 micro-nodules were seen on full dose CT. 77, 114 and 159 micro-nodules were seen on FBP, ASIR and MBIR, respectively.
27 nodules were seen on standard dose CT. 16, 22 and 27 nodules were seen on FBP, ASIR and MBIR, respectively.
Conclusion: ULD CT reconstructed with an MBIR algorithm provides pulmonary images of diagnostic quality and allows detecting the same number of micro-nodules and nodules as standard dose CT.

SS138

MRI of the lung: Comparison of an ultra short echotime sequence (UTE) with a zero echo time sequence (ZTE)

N. Chuck, W. Jungraithmayr, G. D. Puippe, S. Pazahr, D. Nanz, A. Boss; Zürich

Purpose: The purpose of this study was to evaluate signal-to-noise-ratio (SNR) and contrast-to-noise-ratio (CNR) and image quality (IQ) of ultra-short-echo-time (UTE) magnetic resonance imaging (MRI) in comparison to newly available zero-echo-time (ZTE) MRI for assessment of the lung parenchyma in small animal high-field MRI scanner.
Methods and Materials: MRI of the mouse lung was conducted on a 4.7 T small animal scanner (Bruker BioSpec) using a RF coil with a 3D-UTE sequence (TE/TR 20 µs/8 and 4 ms) as well as a ZTE sequence (TR 8 and 4 ms) in 6 healthy mice and 6 mice after syngeneic transplantation of the left lung. SNR was calculated for parenchyma of the right lung, additionally in the left transplanted lung, hilum, vertebra of the thoracic spine, paravertebral muscles, in the left lobe of the liver and the heart. CNR was defined for lung vs. hilum. Image quality (IQ) was assessed by two independent readers on a four-point-scale reader score.
Results: Both sequences provided good image quality of lung parenchyma. IQ was rated higher for the UTE images than the ZTE images. SNR and CNR were higher in the UTE images than in the ZTE images (SNR: e.g. lung 25.49+/-6 in UTE, 16.03+/-4.5 in ZTE; CNR: 9.59+/-1.5 in UTE, 8.7+/-2.1 in ZTE).
Conclusion: Both sequences, UTE and ZTE, are suitable for highfield MRI and provide measurable SI in the lung. ZTE images showed comparable image quality to UTE with slightly smaller SNR and CNR and stronger artefacts.

SS139

Mammography image quality in Switzerland

N. Richli Meystre, J.-L. Bulliard; Lausanne

Purpose: Although image quality in mammography has been positively associated with screening performance, mammography quality has seldom been assessed. In Switzerland, regional screening programs undergo strict quality management procedures, which also include training programs for radiographers. This study aimed at evaluating quality of mammograms in Switzerland, its evolution over time, and at identifying its determinants.
Methods and Materials: 7352 mammograms, performed between 1999 and 2007, were randomly drawn from 6 hospitals in 2 cantons with and without a screening program, and evaluated according to the PGMI (P: Perfect, G: Good, M: Moderate, I: Inadequate) classification system. Determinants of quality were assessed by multivariate logistic regressions for 2 indicators of quality.
Results: Overall, the inadequate image rate decreased over time (-0,8%/year, CI 95%: –1,14; –0,45) while the proportion of good or perfect images increased (+0,51%/year, CI 95%: +0,18; +0,84). Higher image quality was associated with a mammogram being performed recently, in a hospital with an output of >250 mammographic images/radiographer/year and within a screening program. Positioning was the most frequent reason for inadequate image quality (14,8%).
Conclusion: Mammography image quality is steadily improving since 1999. Although quality-assurance procedures for screening programs have contributed to the higher quality, the difference across settings has decreased. The annual volume of images performed per radiographer appears to be a strong predictor of image quality. As positioning is the most frequent reason for poor image quality, the effort in training radiographers should be continued.

SS140

Phase contrast enhanced mammography: A new diagnostic tool for breast imaging

M. Stampanoni[1], Z. Wang[2], M. Trippel[3], R. Kubik-Huch[3], G. Singer[3], E. Roessl[4], U. Stevendaal[4], T. Köhler[4], N. Wieberneit[4], I. Schulze-Wenck[4], T. Thuering[2], C. David[2], M. Hohl[3], N. Hauser[3]; [1]Zürich, [2]Villigen, [3]Baden, [4]Hamburg (DE)

Purpose: Phase-contrast and scattering-based x-ray imaging are known to provide additional and complementary information to conventional, absorption-based methods. We report on the first mammographic investigation of 30 native, that is, freshly dissected, breasts carried out with a grating interferometer and a conventional x-ray tube source. Patients in this study had histopathologically proven invasive breast cancer. Two male patients, without the presence of any malignant lesions within the resected breast, were added as control specimens.
Methods and Materials: We used a Talbot-Lau interferometer installed on a conventional x-ray tube; the interferometer was operated at the fifth Talbot distance, tube voltage of 40 kVp with mean energy of 28 keV, and current of 25 mA. The device simultaneously recorded absorption, differential phase and small-angle scattering. These quantities were combined into novel color and high-frequency-enhanced radiographic images. Presurgical images (conventional mammography, ultrasonography, and MRI) supported the findings and clinical relevance was verified.
Results: Our approach yields complementary and otherwise inaccessible iinformation on electron density distribution and small-angle scattering power of the sample at microscopic scale. This information can be used to answer clinically relevant, yet unresolved questions such as unequivocally discerning between malignant, premalignant changes and postoperative scars and distinguishing cancer-invaded regions within healthy tissue.
Conclusion: We present the first ex vivo images of fresh, native breast tissue obtained from mastectomy specimens using grating interferometry. This technique yields improved diagnostic capabilities when compared with conventional mammography, especially when discerning the type of malignant conversions and their breadth within normal breast tissue.

SS201

Radiation dose reduction in abdominal CT using a model based iterative reconstruction algorith: How low can we go?

D. B. Husarik[1], D. Marin[2], S. Richard[2], E. Samei[2], R. C. Nelson[2];
[1]Zürich, [2]Durham (US)

Purpose: To compare image quality of abdominal CT scans in an anthropomorphic phantom acquired at different radiation dose levels where each raw data set is reconstructed with both a standard convolution filtered back projection (FBP) and a new model based iterative reconstruction (MBIR).
Methods and Materials: An anthropomorphic phantom in three sizes was used with a custom built liver insert simulating later hepatic arterial enhancement and containing hypervascular 15 mm spherical lesions. Imaging was performed on a 64-section MDCT-scanner (GE-Healthcare) at 3 different tube voltages for each patient size, and 5 incrementally decreasing tube current-time products for each tube voltage. Datasets were reconstructed with FBP and MBIR. Lesions-to-liver CNRs were calculated. Subjective lesion conspicuity and image quality were rated by 3 readers (5-point scale).
Results: CNR on MBIR images was significantly higher and mean image noise was significantly lower than on FBP images in all patient sizes, at all tube voltage settings, and radiation dose levels ($p<.05$). Overall image quality and lesion conspicuity were rated higher for MBIR images compared to FBP images at all radiation dose levels. Image quality and lesion conspicuity on 25-50% dose MBIR images were rated equal to full dose FBP images.
Conclusion: This phantom study suggests that MBIR allows for a 50-75% reduction in radiation dose without compromising image quality.

SS202

**Assessment of segment specific flip angle distribution in multi-transmit 3.0 Tesla liver imaging:
Effects on contrast weighting in standard imaging**

S. Pazahr[1], M. A. Fischer[1], N. Chuck[1], R. Luechinger[1], F. Schick[2],
D. Nanz[1], A. Boss[1]; [1]Zürich, [2]Tübingen (DE)

Purpose: To measure the segment specific B1-field distribution in 3.0T liver magnetic resonance imaging with and without parallel transmission and to analyze related contrast changes in standard imaging.
Methods and Materials: Six patients with liver lesions and nine healthy volunteers were included. In a 3.0 Tesla MR scanner capable of two-channel transmit spin excitation, the hepatic B1-field distribution was measured using Actual Flip angle Imaging. Also Contrast-to-noise ratios between liver parenchyma and segmental veins were evaluated for each liver segment. Additionally, a 2D T1-weighted gradient-echo (TR/TE 180.0 ms/2.3 ms, excitation angle 55°) and a T2-weighted single-shot fast spin-echo sequence (TR/TE 1501 ms/80 ms) were acquired.
Results: Using single-transmission we found the in the left liver lobe nominal excitation flip angles between 30-50% and in segments VI-VII between 50-70%; in no liver segments a mean flip angle higher than 80% was reached. A relatively homogenous pattern of the RF field was found in multi-transmission with mean actual flip angles between 80-100%.
In areas of low B1-field intensity in single-transmission, the contrast weighting in “T1-weighted” gradient-echo images was changed towards pure proton density weighting. Liver metastases could be overlooked in those regions due to lacking T1 contrast. This undesired effect can be overcome by multi-transmission. T2-weighted imaging provided nearly unchanged contrast in areas with low B1-field intensity, but significantly reduced signal yield.
Conclusion: Applying multi-transmit technology, a relatively homogeneous B1-field of the liver can be achieved at 3 Tesla thus reducing the risk of overlooking lesions, especially in T1-weighted gradient-echo imaging.

SS203

MRI of the liver: Parenchymal apparent diffusion coefficients (ADC) do not respond to caloric intake – despite increased portal-venous blood flow

S. Pazahr[1], D. Nanz[1], F. Schick[2], A. Boss[1], N. Chuck[1];
[1]Zürich, [2]Tübingen (DE)

Purpose: To measure potential changes of the apparent diffusion coefficient (ADC) in diffusion weighted imaging (DWI) of the liver before and after caloric challenge.
Methods and Materials: Each of ten healthy volunteers underwent four measurements in a 1.5 Tesla whole-body MR scanner on two different days: first scan after fasting time of at least eight hours and a second scan 30 minutes after a standardized caloric intake of either protein or carbohydrate rich food. DWI acquired images with b-factors of 0, 500, 750 and 1000 s/mm² with an echo-planar imaging sequence (TR/TE 6300 ms/76 ms). Additionally, portal vein flow was quantified with a phase contrast sequence. ADC values were obtained as mean values from regions of interest drawn on ADC maps.
Results: Carbohydrate and protein rich food intake both resulted in a substantial increase of portal vein flow (fasting state: 613.6±203.2 ml/min, post carbohydrates: 1417±165.6 ml/min, post proteins: 1759±343.7 ml/min). Mean ADC after fastening was 1.24±0.09 mm²/s, after carbohydrate intake 1.27±0.06 mm²/s and after protein intake 1.26±0.06 mm²/s. Mean paired intra-individual differences between fastening and food intake was 5.28±3.98% and 11.22±5.97%, respectively. There was not statistically significant difference between fastening and caloric challenge.
Conclusion: Differences in portal vein flow do not influence ADC values in DWI of the liver. In clinical diffusion imaging, patients may be scanned without a special preparation regarding food intake.

SS204

Quantification of fat in the liver by MRI

I. Zbinden[1], X. Deligianni[1], C. Bernsmeier[1], O. Bieri[1], G. Bongartz[1],
U. Zingg[2], S. Potthast[2]; [1]Basel, [2]Schlieren

Purpose: Hepatic steatosis is characterized by abnormal accumulation of lipids within hepatocytes and is the key finding of non-alcoholic fatty liver disease (NAFLD) and non-alcoholic steato-hepatitis (NASH). The current clinical gold standard to diagnose and monitor therapy these diseases is liver biopsy, an invasive method. Therefore non-invasive methods as MRI that accurately and objectively quantify liver fat are needed. The purpose was to assess liver fat quantification by MRI and compare the quantitative amount of fat with biopsy data.
Methods and Materials: In healthy volunteers and patients with suspected or known NAFLD/NASH, twelve sequentially shifted echoes were acquired within a single breathhold using a modified 3D multi-contrast gradient echo (GRE) sequence at 3T on a clinical scanner. Liver images were analyzed pixel wise based on a singular value decomposition (SVD) analysis which allowed the extraction of water and fat components, as well as of the corresponding T2* relaxation times.
Results: For normal appearing liver in volunteers a mean fat fraction of 2.4±0.9% was found with a corresponding T2* of 4.5±1.7 ms for fat and 17.2±0.3 ms for water components. Tests with a first patient with NAFLD showed a fat fraction of 10.8±1.3%, and a T2* 2.6±0.1 ms for fat and 18.3±1.0 ms for water. Pathology showed a mild liver steatosis.
Conclusion: Intrahepatic fat can be predicted by MRI with a high accuracy and might be a nonivasive alternative to invasive liver biopsy in future to diagnose and/or monitor patients with NAFLD and NASH.

SS205

Can contrast-enhanced MRI differentiate malignant from benign hepatocellular tumour in the non-cirrhotic liver

M. Fischer, D. Raptis, O. F. Donati, S. Breitenstein, P.-A. Clavien,
H. Alkadhi, M. A. Patak; Zürich

Purpose: To retrospectively evaluate whether MR imaging findings can be used to differentiate hepatocellular-carcinoma (HCC) from hepatocellular-adenoma (HA) and atypical focal-nodular-hyperplasia (FNH) in non-cirrhotic patients.
Methods and Materials: In total 107 consecutive patients (46 men; 45±14 years), who underwent liver resection for HCC (n=55), HA (n=24) and FNH (n=28) were included in this international-multi-center study. Preoperative liver-MRI was analysed by two independent radiologists for the following imaging findings: lesion-diameter, lesion-demarcation; presence of satellite-lesions, central-scar, lesion-capsule, fat, hemorrhage, signal-intensity (SI) on unenhanced T1- and T2-weighted images, arterial-enhancement and contrast-media wash-out. Differences between both readers were resolved in a consensus reading and independent diagnostic parameters for diagnosis of HCC were determined by multivariance analysis.
Results: HCC showed a significant higher frequency (all, $p<.01$) of a) T1-hypointensity (69.4% vs 30.6%) b) T2-hyperintensity (64.4% vs 35.5%) c) presence of fat (86.7% vs 13.3%) d) satellite-lesions (64.4% vs 35.5%) e) lack of arterial-enhancement (73.1% vs 26.9%) f) contrast-media wash-out in the equillibrium-phase (67.7% vs 32.3%) as compared to both HA and FNH. Significant predictors for diagnosis of HCC (R, Odds Ratio; $p<.05$) were T1-hypointensity (R=6.0), presence of satellite-lesions (R=4.9) and contrast-media wash-out (R=3.8).
Conclusion: MR-Imaging characteristics in primary non-cirrhotic liver tumors show significant differences. Independent parameters for diagnosis of HCC are T1-hypointensity, presence of satellite-lesions and contrast-media wash-out which might help to differ this entities in the future.

SS206

Hepatobiliary-specific MR contrast agents: Is there added value of T1-weighted MR cholangiography in the assessment of biliary ductal obstruction?

C. S. Reiner[1], R. T. Gupta[2], M. R. Bashir[2], N. L. Walle[2], H. K. Nazeer[2], E. Merkle[2]; [1]Zürich, [2]Durham (US)

Purpose: To determine the additional value of Gd-EOB-DTPA contrast-enhanced magnetic resonance cholangiography (ceMRC) to standard liver MR examination in assessment of biliary ductal obstruction.
Methods and Materials: 41 patients (age, 50.0±6.8 years) (45 exams) who underwent MR imaging (including unenhanced and dynamic T1-weighted images, T2-weighted MRC and ceMRC) for suspicion of biliary pathology were included in this study. Three blinded radiologists first evaluated MR-images without ceMRC for presence and significance of biliary obstruction, etiology for obstruction, and confidence in final diagnosis. After adding ceMRC images, readers again determined presence and significance of biliary obstruction and confidence in final diagnosis. Goldstandard was established by two different radiologists in consensus using MR imaging, ERCP, and percutaneous transhepatic/intraoperative cholangiography.
Results: Mean accuracy for all three readers in diagnosing significance of obstruction was 61.5% without ceMRC and increased to 83.7% with ceMRC ($p<0.001$). Across all readers, assessment of significance of obstruction was changed when adding ceMRC in 56/135 cases (41.5%); significance of obstruction was correctly changed in 44/56 cases (78.6%). When biliary obstruction was graded of unknown significance (28/135 cases, 20.7%) without ceMRC, significance of biliary obstruction was classified correctly after adding ceMRC in 26/28 cases (92.9%). Confidence in final diagnosis was significantly higher with addition of ceMRC for two readers ($p<0.002$).
Conclusion: The addition of ceMRC to liver MR improves diagnostic accuracy in assessing significance of biliary obstruction and can improve reader confidence in establishing final diagnosis. The ability to differentiate degree of biliary obstruction on ceMRC could have substantial impact in determination of the most appropriate therapeutic options.

SS207

Feasibility of hepatocyte damage quantification using gadoxetate enhanced MRI after intraoperative coagulation of the liver resection area

S. Bickelhaupt[1], C. Kim-Fuchs[2], P. Studer[2], J. M. Froehlich[1], M. A. Patak[1]; [1]Zürich, [2]Bern

Purpose: Extensive electrocoagulation during liver resection is used to reduce intra- and postoperative complications. But it may damage more liver tissue than the usual resection surface. This might be crucial in patients with preoperatively calculated borderline liver-volumes. The aim was to determine the feasibility of evaluating electrocoagulation induced hepatocyte damage by using hepatocyte-specific contrast as an MRI-marker for viable liver tissue.
Methods and Materials: 13 patients were prospectively included in this study prior to elective liver-resection. Gadoxetate-enhanced MRI (3T, Verio) was performed 3-7 days after surgery. T1-w-GRE (Vibe) series were acquired after contrast-administration. SNR of the resection border was compared to healthy liver rim and the area of the resection-surface was compared with intraoperative area-measurement. The paired-Student's t-test was used statistically.
Results: 12 of 13 patients showed sufficient image quality to perform the measurement. Mean MRI resection volumes of 52.05 mm^3 (SD: ±22.85) and a mean resection surface of 75.65 cm^2(±28.65, depending on resection modality) resulted. No significant correlation ($p>0.05$) between MRI- and intraoperative surface measurements (mean 83.00 cm^2±30.04) was found. Mean contrast enhancement was significantly reduced ($p<0.05$) in the tissue next to the resection-surface (mean SNR: 67.95±29.05) compared to healthy liver rim(81.79±35.96).
Conclusion: The contrast enhancement close to the resection border was significantly reduced after liver resection, suggesting intraoperative affection of adjacent tissue. The use of gadoxetate as a marker of tissue viability seems promising. No correlation was found for intraoperative measurement and postoperative MRI of the resection area, potentially related to the postoperative healing process and the methodic limitations of the intraoperative measurement.

SS208

Is liver volume after portal vein embolisation worth more? A case-control study

S. Terraz, R. Meier, R. Breguet, G. Mentha, P. E. Majno, C. Becker; Genève

Purpose: To assess the impact of portal vein embolisation (PVE) on immediate post-operative liver function following major hepatic resection, in comparison with living donors for liver transplantation (LDLT).
Methods and Materials: A total of 68 patients underwent PVE and extended right hepatectomy between 1999 and 2010. After exclusion of patients older than 70 years or with cirrhosis, the remaining 28 PVE patients (study group) were compared to 17 donors of liver grafts for adult-to-adult LDLT (control group). The baseline characteristics of the two groups were compared, using Student's t and chi-square tests, and their postoperative liver function (factor V and bilirubin levels) was analysed with linear regression models.
Results: Groups were similar for gender, size and weight ($p>0.05$). PVE patients were older than LDLT (58 vs 41 years, $p<0.0001$). Among PVE patients, 22 patients (79%) had preoperative chemotherapy. PVE and LD patients had similar resected liver to body weight ratio (1.15% vs. 1.05%, $p>0.05$) and similar volume of the remnant liver to body weight ratio (1.15% vs. 1.10%, $p>0.05$). Postoperative bilirubin levels showed significantly lower values post-surgery in PVE compared to the LD ($p=0.0005$). Factor V levels showed significant higher values in PVE compared to LD group ($p=0.0004$).
Conclusion: The immediate postoperative function was better in patients with hypertrophied liver than in unprepared patients, in spite of older age and chemotherapy. Furthermore, our results suggest that current threshold levels for safe liver volumes after PVE may be too restrictive.

SS209

Refinements of preoperative portal vein embolisation using ethylene-vinyl alcohol copolymer: A pilot study

S. Boudabbous, R. Breguet, C. Toso, G. Mentha, C. Becker, S. Terraz; Genève

Purpose: To evaluate the efficacy and safety profile of ethylene-vinyl alcohol copolymer (Onyx) injection in portal branches with particular anatomy or high-risk of embolic agent migration during preoperative portal vein embolisation (PVE).
Methods and Materials: From 2008 to 2011, 98 PVE procedures were performed in patients with small future liver remnants (FLR). Under general anaesthesia, PVE was achieved with injection of a mixture of n-butyl-cyanoacrylate (Histoacryl) and iodised oil (Lipiodol) using a 5-F catheter. At the operator's discretion, portal branches with particular anatomy or high-risk of embolic agent migration were embolised with Onyx through a 2.3-F microcatheter. CT volumetry of the FLR was performed before and 4-6 weeks after PVE. Clinical outcome was assessed on medical records.
Results: Twenty-one patients (median age, 62±27 years) underwent PVE with Histoacryl-Lipiodol and additional Onyx during 24 procedures. The indications for Onyx were embolisation of segment IV (n=17), early bifurcation of right posterior portal vein (n=2) or segmental portal branches (n=4) and PVE in a one-year-old girl with cystic hamartomas. All targeted portal branches were successfully embolised with Onyx and no major complication was observed. Related-procedure adverse events included a self-limited subcapsular haematoma (4%) and two Histoacryl-Lipiodol migrations without thrombosis (8%). CT volumetry showed a mean FLR hypertrophy of 64±28%. Hepatectomy was performed in 18 patients (86%) and cancelled in three patients, due to tumour progression (n=2) or insufficient FLR volume (n=1).
Conclusion: PVE with complementary Onyx before liver resection is safe and feasible, and helps to occlude portal branches that are not accessible with conventional embolic materials.

SS210

Transcatheter arterial embolisation of autologous bone marrow stem cells versus standard of care in patients with decompensated alcoholic liver disease: Results of a randomised clinical trial

R. Breguet, L. Spahr, Y. Chalandon, L. Rubbia-Brandt, C. Becker, S. Terraz; Genève

Purpose: To evaluate the impact of intrahepatic arterial embolization of autologous bone marrow stem cells (BMST) on liver function in patients with decompensated liver disease.
Methods and Materials: Fifty-eight patients (mean age, 54±17 years) with decompensated alcoholic steatohepatitis (mean MELD, 19±4) were randomized in two treatment arms; standard medical therapy (SMT) alone (n=30) versus SMT and arterial embolization of autologous BMSC (n=28). After bone marrow aspiration and isolation, the BMSC (volume range, 30-50 ml) were selectively injected into the hepatic arteries after trans femoral access. All patients underwent a liver biopsy and abdominal CT at baseline and at day 28. The clinical outcome was determined at 1, 2 and 3 months. The primary endpoint was a MELD score decrease (≥3 points) at 3 months.
Results: The characteristics of both groups were similar at baseline. Embolization of BMSC was achieved in all but two patients (93%). During follow-up, six patients died. Adverse events were equally distributed in both groups, but none was related to embolization. The primary endpoint was reached in 17/28 (61%) and 16/30 (53%) of BMSC and SMT patients, respectively. At 3 months, the mean MELD was 13.7±1.2 and 12.5±1.1 in the BMSC and SMT group, respectively ($p>0.05$). In both groups, a similar reduction of liver volumes and steatosis were observed on abdominal CT, whereas immunohistological studies showed a more pronounced cellular regeneration in the BMSC group.
Conclusion: Autologous BMSC transplantation is well tolerated in patients with decompensated alcoholic liver disease, but does not provide significant clinical benefit over a 3-months period.

SS211

Percutaneous contrast-enhanced ultrasound-guided biopsy of focal liver lesions inconspicuous on B-mode ultrasound: A case series of 33 patients

M. Cerny, F. Becce, M. E. Kamel, R. Meuli, J.-Y. Meuwly; Lausanne

Purpose: To evaluate the feasibility and accuracy of percutaneous contrast-enhanced ultrasound (CEUS)-guided biopsy of focal liver lesions (FLLs) inconspicuous on B-mode US.
Methods and Materials: In a retrospective review of 355 consecutive percutaneous US-guided liver biopsies performed between August 2005 and July 2011, 33 patients (21 men, 12 women, mean age 65.3 years) with 34 FLLs not confidently delineated on B-mode US were included in this IRB-approved study. Target lesions characteristics and procedure-related data were retrieved. Two radiologists independently assessed the visibility of each target lesion on B-mode and CEUS images in random order using a 5-point scale: 1=excellent lesion conspicuity, 5=invisible lesion. Percutaneous core needle (18-gauge) biopsy was performed under simultaneous CEUS and B-mode guidance. The final diagnosis was established based on histopathological results and clinical and imaging follow-up.
Results: The diameter and depth of target lesions were 4.1±3.4 (mean±SD) and 2.3±2.1 cm, respectively. CEUS-guided biopsy length and number of needle pass were 7.5±6.0 minutes (mean±SD) and 2.6±1.0, respectively. No biopsy-related complication occurred. The technical success rate of CEUS-guided biopsy was 100% (34/34), while its diagnostic accuracy was 97.1% (33/34). Visibility scores of FLLs were significantly better on CEUS (1.5±0.7, mean±SD) than on B-mode (4.0±0.9) ($p<0.001$), with weighted kappa of 0.74 and 0.67, respectively. Histopathological diagnoses were: metastasis (n=19), cholangiocarcinoma (n=5), hepatocellular carcinoma (n=2), focal nodular hyperplasia (n=1), alveolar echinococcosis (n=2), other (n=5).
Conclusion: Percutaneous CEUS-guided biopsy of FLLs is technically feasible, safe and accurate. By improving target lesions conspicuity, this technique should be considered when FLLs are not well-defined on B-mode US.

SS212

Is the alpha-angle able to discriminate between symptomatic patients with femoroacetabular impingement (FAI) and asymptomatic volunteers?

R. Sutter, T. Dietrich, P. O. Zingg, C. W. A. Pfirrmann; Zürich

Purpose: To assess diagnostic characteristics of different alpha-angle thresholds in volunteers and FAI patients.
Methods and Materials: 106 individuals (20-50 years) were included (53 patients with cam-deformities and 53 age and gender-matched asymptomatic volunteers). The patient group consisted of 33 cam-type FAI and 20 mixed-type FAI. Alpha-angles were measured on a radially reformatted T2-weighted true-FISP 3D-MRI-sequence of the proximal femur by two independent readers. Intraclass Correlation Coefficients (ICC) and Receiver Operator Characteristics (ROC) were calculated.
Results: Mean alpha-angles were highest in the anterosuperior segment with 65.4°±11.5/ 65.2°±7.3 (for reader 1/2) for patients and 53.3°±9.6/ 55.0°±8.8 for volunteers. Alpha-angles >55° were measured in 20 and 33 out of 53 volunteers (38%/ 63% for reader 1/2). Most elevated alpha-angles in volunteers were found anterosuperiorly (32%/ 51%) and superiorly (19%/ 32%). The maximal alpha-angle in any segment was significantly different (p<.001) in patients and volunteers (70.3°±11.2 vs. 57.9°±10.5 for reader 1; 69.4°±8.8 vs. 58.7°±8.9 for reader 2), albeit with a large overlap. Interobserver agreement was good (ICC=0.712). ROC showed the largest area under the curve at the anterosuperior segment (Area=0.791/0.824 for reader 1/2; p<.001): A 55° alpha-angle threshold gave a sensitivity/specificity of 82%/65% for reader 1 and 90%/47% for reader 2, while a 60° threshold gave 72%/76% for reader 1 and 80%/73% for reader 2.
Conclusion: The alpha-angle does not reliably discriminate between volunteers and FAI patients with cam-type deformities. Discrimination is best at the anterosuperior segment. Raising the alpha-angle threshold from 55° to 60° reduces false-positives, while maintaining a reasonable sensitivity.

SS213

Study of degenerative changes of the hip on CT in a population of young adults considered as having normal hips

D. Tchernin, A. Syrogiannopoulou, D. Arditi, P.-A. Poletti; Genève

Purpose: In the context of sports medicine in the young adult with hip pain, we must often interpret images of the hip with MR, MR-arthrography or CT-arthrography. We need then to differentiate between the normal aging process of the hip and early pathologic processes that can be at the origin of the pain. This study examines the prevalence of different degenerative changes of the hip in a population of young adults considered as having normal hips.
Methods and Materials: Retrospective analysis of 70 hips on CT in 70 patients (randomly chosen right or left hip) aged between 35 and 40 years referred to the hospital for a problem other than the hip and who had an abdominal CT. Patients with radiologic hip osteoarthritis, other hip pathology on imaging, and current or past medical hip history or surgery were excluded.
Assessed parameters were presence of femoral head osteophytes and labral ossifications in 9 different regions, after segmentation of the femoral head in 5 parts and the acetabulum in 4 parts. Presence or absence of a herniation pit and its localization was also noted.
Results: The prevalence labral ossifications of the posterosuperior labrum is 95% and can be considered as part of the „normal“ aging process. Anterosuperior ossifications are much smaller but are also seen very often, in 75% of cases. Femoral head osteophytes are seen in about 20%.
Conclusion: Some degenerative changes of the hip, like posterosuperior labral ossifications can be considered as part of the normal aging process of the hip.

SS214

Screw-home mechanism and its influence on tibial tuberosity-trochlear groove (TTTG) distance: Measurement on MR examinations of the knee in asymptomatic volunteers in full extension, 15° flexion and 30° flexion

T. Dietrich, M. Betz, C. W. A. Pfirrmann, P. Koch, S. F. Fucentese; Zürich

Purpose: Increased tibial tuberosity-trochlear groove (TTTG)-distance leads to patellar instability. The so-called screw-home mechanism refers to an outward rotation of the tibia when the knee reaches full extension. We hypothesized that the so-called screw-home mechanism of the knee in end stage extension increases the distance of the TTTG-distance of the knee on MRI.
Methods and Materials: Transversal spin-echo T1-weighted MR images of the knee were acquired in full extension, 15° and 30°flexion of the knee in 30 asymptomatic volunteers using a flexible coil. MRI parameters: slice thickness: 3 mm, matrix: 256x384, FOV: 150x150 mm. Two observers measured the TTTG-distance in all three positions. Student t-test and intraclass correlation coefficient (ICC) served for statistics.
Results: Mean TTTG-distance for observer 1 was 15.1±3.2 mm (range: 8.4-19.9 mm) in full extension, 10.0±3.5 mm (range: 4.0-15.6 mm) in 15° flexion and 8.1±3.4 mm (range: 2.5-14.6 mm) in 30° flexion (observer 2, full extension: 14.8±3.3 mm, 15° flexion: 9.4±3.0 mm, 30° flexion: 8.6±3.4 mm). Mean values were significantly different (p-value<0.001) between full extension and 15° as well as 30° flexion for both observer. Mean values were significantly different (p-value<0.001) between 15° and 30° for observer 1, however the p-value was 0.102 for observer 2. Inter-reader agreement of all measurement techniques was perfect at all three positions (ICC: 0.87–0.88; p<0.001).
Conclusion: The TTTG-distance increases significantly in the endstage extension of the knee. Therefore the comparability of published TTTG-values measured on radiographs, CT and MRI at various flexion/extension angles of the knee is limited.

SS215

Is it possible to identify a pathologic hindfoot alignment on non-weight-bearing coronal MR-images? An attempt using different measurement techniques

F. M. Buck[1], A. Hoffmann[1], N. Mamisch-Saupe[1], M. Farshad[1], N. N. Espinosa[1], D. Resnick[2], J. Hodler[1]; [1]Zürich, [2]San Diego (US)

Purpose: To investigate the ability to discriminate between normal and abnormal hindfoot alignment on coronal non-weight-bearing MR images.
Methods and Materials: IRB approval and informed consent of all patients was obtained.
Three different measurement techniques (calcaneal axis, medial and lateral calcaneal contour) based on standard radiographs were applied in 49 patients (mean age, 48 years; range 21–76 years). A group of patients with a normal hindfoot alignment (0°–10° valgus) and a group with abnormal hindfoot alignment (>10° valgus or varus) were identified. Hindfoot alignment was then measured on coronal MR images using six different measurement techniques (calcaneal axis [adapted Cobey technique], medial and lateral calcaneal contour, sustentaculum-tangent, fibulocalcaneal distance, talar offset). ROC analysis was performed to find the one MR measurement technique with the greatest sensitivity and specificity for discrimination between a normal and abnormal hindfoot alignment.
Results: If on the hindfoot alignment radiographs the measurements based on the medial calcaneal contour were used to define the assignment of the patients into the normal or the abnormal group, all measurements on MR images were able (p<0.05) to identify abnormal hindfoot alignment. MR measurements using the calcaneal axis, however, were the best with regard to sensitivity (86%) and specificity (79%) with a cutoff of >11° valgus.
Conclusion: It is possible to discriminate between patients with normal and abnormal hindfoot alignment on coronal MR images with a sensitivity of 86% and a specificity of 79% by applying an adapted Cobey measurement technique with a cutoff of >11° valgus on coronal non-weight-bearing MR images.

SS216

Diagnostic performance of dual-energy computed tomography for the detection of traumatic bone marrow lesions in the ankle: Comparison with magnetic resonance

R. Guggenberger[1], R. Gnannt[1], J. Hodler[1], B. Krauss[2], G. Wanner[1], E. Csuka[1], B. Payne[1], T. Frauenfelder[1], G. Andreisek[1], H. Alkadhi[1]; [1]Zürich, [2]Forchheim (DE)

Purpose: To prospectively evaluate, in patients after ankle joint trauma, the performance of non-calcium images from dual-energy computed tomography (DECT) for the diagnosis of bone marrow lesions in comparison with magnetic resonance imaging (MRI)
Methods and Materials: Thirty consecutive patients (women 15; mean age 34 years, range 19-63 years) after acute ankle trauma underwent 128-section dual-source dual-energy CT (80/140 kVp, with tin-filter) and MRI within one day after trauma. DECT data was post-processed using an optimized three-material decomposition algorithm for generation of non-calcium images. Non-calcium images were graded by two blinded, independent readers using a four-point scale (1=distinct bone marrow lesion to 4=no lesion). CT numbers in non-calcium images were measured in consensus in all regions. Receiver-operating characteristic curve (ROC) analyses with calculation of areas-under-the curve (AUC) were performed. MRI served as reference standard.

Results: Interreader agreement for qualitative gradings of DECT data was substantial (κ=0.66). Visual gradings of DECT data for ankle mortise, talar dome and talar body/head revealed AUCs of 0.795, 0.880 and 0.805 for reader 1, and 0.769, 0.883 and 0.770 for reader 2. CT numbers from non-calcium images revealed AUCs of 0.735, 0.785 and 0.791 for ankle mortise, talar dome and talar body/head, respectively. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of DECT for detecting distinct bone marrow lesions for both readers was 90%, 80.5-81.6%, 25.4-26.5% and 99.1%, respectively.
Conclusion: As compared to MRI, distinct traumatic bone marrow lesions of the ankle joint can be diagnosed on non-calcium images from DECT with high sensitivity, high specificity and excellent NPV.

SS217

MRI relaxometry characterizes in vivo differentiation of muscle precursor cells

N. Chuck, F. Azzabi Zouraq, D. Eberli, A. Boss; Zürich

Purpose: To assess the differentiation process of muscle precursor cells (MPCs) applying magnetic resonance imaging (MRI) relaxometry measurements in a mouse model.
Methods and Materials: MPCs were isolated from biopsies of the M.rectus abdominis. The MPCs were mixed with a collagen carrier and injected subcutaneously in nude mice. Animals with collagen only injections served as controls. MRI of the mice was conducted on a 4.7T small–animal-scanner (BrukerBioSpec) at 5 time-points between day 3-28 post-injection. Relaxometry measurements comprised T1 and T2 measurements using multi-echo-spin-echo (TE 11-99 ms) and saturation-recovery-sequences (recovery time 118-4000 ms) as well as T2* quantification with a multi-echo-gradient-echo-sequence (TE 4.5- ms). Relaxation times were additionally measured in the paraspinal muscles. Animals were harvested at different time-points and the engineered muscle tissue was assessed by histology and immunohistochemistry.
Results: The engineered muscle tissue was measurable at all time points with a decrease in volume over time. In the control mice, the subcutaneous collagen was resorbed between the first and second time-point. Relaxometry measurements revealed a decrease of T1, T2 and T2* relaxation time during differentiation (initial measurement: T1 2072 ms+/-141, T2 191 ms+/-58, T219 ms+/-3, final measurement: T1 1325 ms+/-153, T2 31.5 ms+/-6, T2* 6.3 ms+/-1), thereby approaching the physiological relaxation properties of muscular tissue. Cell differentiation and myofiber formation was confirmed by histology, immunohistochemistry and contractility confirmed by organ bath.
Conclusion: MRI relaxometry measurements are able to accurately describe the differentiation process of muscle precursor cells. This novel method might offer the possibility to non-invasively assess the effectiveness of cellular therapies for muscular disorders in near future.

SS218

Quantitative MRI predicts remaining time until loss of free ambulation in patients with duchenne muscular dystrophy

A. Fischmann, P. Hafner, T. Haas, M. Gloor, O. Bieri, M. Schmid, R. Gonzalez, T. Waltz, U. Pohlmann, C. Stippich, D. Fischer; Basel

Purpose: To compare quantitative thigh muscle MRI (qMRI) to functional abilities in both ambulant and non-ambulant Duchenne muscular dystrophy (DMD) patients.
Methods and Materials: 20 patients with genetically confirmed DMD were recruited. All measurements were approved by the local ethics committee. Physical assessment was performed using the motor function measurement (MFM) scale. Axial 3 T MRI scans of the thighs was performed using T1 weighted in- and opposed phase images (TR 20 ms, TE1=2.45, TE2=3,675 ms, flip angle=15°) to calculate the relative fat fraction according to the 2-point Dixon method. Regions of interest (ROI) were drawn in around the knee extensors, flexors, and adductor muscle group.
Results: Average MFM was 65.3% and correlated negatively to age (r2=0.60). Mean fat fraction (MFF) of the muscle groups positively correlated to age (r2=0.51 to 0.64). MFF of the right/left quadriceps showed a high correlation (r2=0.93/0.91) to the D1 MFM component (standing position and transfers). On average a 5% MFF increase per year could be calculated. With a cut-of point of 50% MFF, loss of ambulation could be predicted with a sensitivity of 100%, at a specificity of 91 – 100%. Time until loss of ambulation can be approximated as: (50% – current fat content) / (5%/year).
Conclusion: MFF correlates highly to physical parameters and can be used to predict disease progression and time until loss of ambulation. Therefore qMRI is a promising endpoint for future clinical trials of new treatments in DMD.

SS219

Diffusion-weighted MR imaging of the spine at 3-T: Feasibility, optimization of b-value and utility to differentiate benign from pathological vertebral compression fractures

G. Fetz, N. Theumann, C. Federau, D. Richarme, P. Hagmann, R. Meuli, F. Becce; Lausanne

Purpose: To evaluate the feasibility, determine the optimal b-value, and assess the utility of 3-T diffusion-weighted MR imaging (DWI) of the spine in differentiating benign from pathologic vertebral compression fractures
Methods and Materials: Twenty patients with 38 vertebral compression fractures (24 benign, 14 pathologic) and 20 controls (total: 23 men, 17 women, mean age 56.2 years) were included from December 2010 to May 2011 in this IRB-approved prospective study. MR imaging of the spine was performed on a 3-T unit with T1-w, fat-suppressed T2-w, gadolinium-enhanced fat-suppressed T1-w and zoomed-EPI (a 2D RF excitation pulse combined with reduced field-of-view single-shot echo-planar readout) diffusion-w (b-values: 0, 300, 500 and 700 s/mm²) sequences. Two radiologists independently assessed zoomed-EPI image quality in random order using a 4-point scale: 1=excellent to 4=poor. They subsequently measured apparent diffusion coefficients (ADCs) in normal vertebral bodies and compression fractures, in consensus
Results: Lower b-values correlated with better image quality scores, with significant differences between b=300 (mean±SD=2.6±0.8), b=500 (3.0±0.7) and b=700 (3.6±0.6) (all p<0.001). Mean ADCs of normal vertebral bodies (n=162) were respectively 0.23, 0.17 and 0.11×10-3 mm²/s with b=300, 500 and 700 s/mm², respectively. In contrast, mean ADCs were 0.89, 0.70 and 0.59×10-3 mm²/s for benign vertebral compression fractures and 0.79, 0.66 and 0.51×10-3 mm²/s for pathologic fractures with b=300, 500 and 700 s/mm², respectively. No significant difference was found between ADCs of benign and pathologic fractures
Conclusion: 3-T DWI of the spine is feasible and lower b-values (300 s/mm²) are recommended. However, our preliminary results show no advantage of DWI in differentiating benign from pathologic vertebral compression fractures

---

SS220

MR imaging frequently changes classification of acute traumatic thoracolumbar spine injuries compared to initial CT examinations

S. Winklhofer, M. Thekkumthala-Sommer, D. Schmidt, H. Alkadhi, G. Andreisek; Zürich

Purpose: To retrospectively evaluate the impact of subsequent MRI on the Thoraco-Lumbar Injury Classification and Severity scale (TLICS) and AO classification compared to initial CT examinations in 100 patients with acute traumatic thoracolumbar spine injuries.
Methods and Materials: Images from 100 patients (24 women; 76 men; mean age, 45±27 years) were retrospectively evaluated by three radiologists in consensus with regard to the AO and TLICS classification systems in two steps. First, all images from the initial CT examination were analysed without knowledge of the MRI findings. Second, three weeks later, CT and MRI images were analysed together. Descriptive statistics was performed to identify, case-by-case, changes in the number of detected fractures and their classification. Wilcoxon test was used to show statistically significant changes of the TLICS classification; a p-value of 0.05 was considered as statistically relevant.
Results: CT alone revealed a total of 162 fractures in the thoracolumbar spine. CT+MRI revealed a total of 235 fractures. Based on CT+MRI the AO classification was changed in 29/100 patients (upgrading, n=27; downgrading, n=2) compared to CT alone. Overall, the TLICS classification was changed in 29/100 (29%) patients (p<0.001). Based on CT+MRI, the TLICS value was changed from values <5 (indication for conservative therapy) to values >=5 (indication for surgical therapy) in 24/100 patients.
Conclusion: Subsequent MRI in patients with thoracolumbar spinal trauma considerably improved detection of fractures when compared to CT alone and significantly changed the overall trauma classification. This may have an impact on patient management and outcome.

SS221

Multi-echo MRI for muscle-fat quantification in patients with low back pain – Comparison to spectroscopy

M. Fischer, R. Guggenberger, D. Nanz, G. Andreisek; Zürich

Purpose: To prospectively compare fat-signal-fractions derived from spoiled-gradient dual-echo (SPGR-DE) and multi-echo (SPGR-ME) MRI with and without correction of T2*-bias for quantification of muscle-fat content (MFC) in patients with low back pain (LBP) using single-voxel spectroscopy as the standard of reference.
Methods and Materials: 41 patients (24 women; 56±16 years) suffering of LBP underwent clinically indicated MRI at 1.5-Tesla including SPGR-DE and SPGR-ME for quantification of fatty degeneration of the erector spinae muscle in a predefined region-of-interest (ROI) at the level L4/5. Fat-signal-fractions (FSF) were determined from signal intensities (SI) on automatically generated fat-/water-only images from both datasets (FSFDE, FSFME) as well as from T2*-corrected fat-/water-only images derived from SPGR-ME (FSFME*) and compared to specroscopically determined fractions (FSFSPEC). Student's t-test and the method of Bland-and-Altman were used to study the agreement between FSF derived from SPGR-DE, SPGR-ME and spectroscopy.
Results: Spectroscopic results were obtained in 34/41 patients bilaterally. Mean FSFSPEC was 20.79±12.85 (range, 0.2-76.5; n=75). Correlation between FSFSPEC and FSFDE, FSFME was significant with correlation-coefficients of r =.814-.828. Mean FSFDE, FSFME* values significantly differed from FSFSPEC (both, p<.01), whereas mean FSFME showed no significant differences (p=.11) and a small mean measurement bias of +0.5% (95% limits-of-agreement, -6.0% – 7.2%) compared to FSFSPEC.
Conclusion: Fat-signal fractions as obtained from both SPGR-DE and standard SPGR-ME* were significantly different than determined by spectroscopic analysis, whereas FSF from SPGR-ME images may allow fast and accurate quantification of MFC in patients suffering of LBP.

SS222

Daily quality control protocol of dual x-ray absorptiometry (DXA) in clinical setting: Analysis of performances of the Swiss-QC centralized process

C. Jegouic[1], C. Le Petit[1], D. Uebelhart[2], D. O. Slosman[1]; [1]Genève, [2]Glion-sur-Montreux

Purpose: Accurate statistical analysis of daily quality control (QC) of DXA apparatus is a prerequisite to properly diagnose osteoporosis and to monitor treatment efficacy. For several years already, some countries installed a national centralized QC protocol to maintain the adequacy of DXA use. The Swiss Association Against Osteoporosis (ASCO/SVGO) elaborated independently such a central program for which the first year of use is reported.
Methods and Materials: Using a dedicated web platform, any DXA user may identify himself and, independently of the DXA manufacturer, characterize his apparatus by a simple procedure performed on site by his technicians. Results of this initial evaluation become the base-line of the statistical evaluation. The daily in vitro spine phantom bone mineral density (BMD) measurement is further reviewed by Shewhart and CUSUM statistics.
Results: To date, 34 users registered 41 DXA apparatus and 2699 QC scans were recorded in the Swiss-QC web platform. Their statistical reviews enabled to generate prospectively 243 Shewhart rules corrective actions and 22 CUSUM alerts. Mean±SD of BMD changes over time were 0.0032±0.001 g/cm² with a maximum of 0.016. Among the 41 DXA apparatus, 11 represented more than 70% of the Shewhart rules warning and 54% of the CUSUM alerts. Their BMD differences ranged from 0.01 to 0.025 g/cm² representing up to 5 times the annual physiological bone loss of post-menopausal women, thus justifying a specific technical intervention.
Conclusion: Actively supported by ASCO/SVGO, Swiss-QC constitutes an independent and efficient method for central daily QC assessment of DXA apparatus.

SS223

Osteogenesis imperfecta: Place of radiology in a multi-disciplinary diagnostic approach

O. Berrebi, D. Ceroni, A. Bottani, S. Hanquinet; Genève

Purpose: As there are new medical and surgical treatments for osteogenesis imperfecta (OI), it is of utmost importance to reach an early diagnosis in order to improve the functional prognosis.
We report the radiological aspects of OI and the input of a multidisciplinary diagnostic approach.
Methods and Materials: We present 6 patients (4 boys, 2 girls) older currently between 2 to 17. The diagnosis of OI were made between birth and 8 years of age.
Three have the disease type I, two type III and one type IV, according to the Sillence classification. Two had OI familial history. First event leading to diagnosis was bone fracture and in the remaining case dentinogenesis imperfecta.
Children have a radiological standard every year and a multidisciplinary consultation including orthopedic, radiologist, geneticist, nephrologist. Additional imaging are discussed: spine MRI, head CT or kidney US.
Results: OI diagnosis is based on history, densitometry, phosphocalcium balance and genetic analysis. Prognosis is variable depending of the type, type III being the most severe except lethal type II. Medical supervision is essential to avoid the side effects of drugs such as nephrocalcinosis. Surgical treatments are adapted as appropriate. The multidisciplinary management comforts both children and parents, and limits X-rays exposition.
Conclusion: Although family history and clinical examination are central tools for making diagnosis of OI, careful radiological examination remains essential in the initial workup and in the multidisciplinary follow-up.

SS224

What place for whole body MRI in pediatric setting?

A. M. Korchi, S. Hanquinet, M. Anooshiravani-Dumont, L. Merlini; Genève

Purpose: Whole body MRI (WBMRI) is a safe and non ionizing imaging modality. The purpose of this work is to present our four-years experience in pediatric WBMRI, to illustrate up-to date indications and to achieve a preliminary evaluation of its usefulness.
Methods and Materials: From 2008 to November 2011, 86 WBMRI in 68 patients were performed, including: 16 malignancies, 2 suspected osteonecrosis , 16 osteomyelitis (5 of them Chronic Multifocal Recurrent Osteomyelitis), 14 suspected Silverman disease, 6 Juvenile arthritis, 9 Neurofibromatosis I, three myopathies , 1 scleroderma and 1 diffuse vascular malformation. In all cases of malignancies WBMRI was compared to PET-CT or scintigraphy. In some cases it was compared to conventional Radiography (RX).
All examinations were performed with a 1.5 T Avanto scanner (Siemens, Germany) using a T1 weighted and 3D SPACE IR T2 weighted sequences in 2008. A 3D FS DWI sequence was added in 2009.
Images quality, interpretation issues, comparison with other techniques and clinical usefulness will be reported.
Results: In malignancies WBMRI sensibility was 100% compared to nuclear medicine examinations; however, specificity was low (64%). In all cases WBMRI performed the diagnosis of osteomyelitis and detected all disease's locations. In Silverman disease, WBMRI detected soft tissue and liver fracture, but was less accurate than RX for bone fracture. In other cases, WBMRI was useful to establish the extent of disease. However, it changed the management only in 30% of our cases.
Conclusion: WBMRI is a promising tool in pediatric setting: however the exact role in clinical management has still to be investigated.

SS225

Arterial spin labelling MRI for assessment of cerebral perfusion in children with moya-moya disease

R. P. Götti, R. O'gorman, N. Khan, I. Scheer; Zürich

Purpose: To evaluate the diagnostic accuracy of cerebral perfusion imaging with unenhanced arterial spin labelling (ASL) MRI in children with Moya-Moya disease compared to Gadolinium-enhanced dynamic susceptibility contrast (DSC) MRI.
Methods and Materials: 5 children (4 female, age 8.5±6.6 years) with Moya-Moya disease underwent cerebral brain perfusion imaging with ASL and DSC on a 3T-MRI scanner (HD.xt TwinSpeed, GE) in the same session. Cerebral perfusion images were acquired with ASL (pulsed continuous 3D-ASL sequence, 32 axial slices, TR=5.5 s, TE=25 ms, FOV=24 cm, matrix=128x128) and DSC (gradient echo EPI sequence, 35 volumes of 28 near-axial slices, TR=2000 ms, TE=36 ms, FOV=24 cm, matrix=96x96, 0.2 ml/kg Gd-DOTA). Cerebral blood flow maps were generated. ASL and DSC images were assessed regarding left and right ACA, MCA and PCA territories at three different levels (level of tentorium, lateral ventricles and centrum semiovale) by two independent readers using a 3-point-Likert scale (1=normal perfusion, 2=moderately reduced perfusion, 3=severely reduced perfusion). Interreader agreement was assessed using kappa statistics, correlation between ASL and DSC with Spearman's rank correlation coefficient. Accuracy of ASL for the detection of reduced perfusion per territory was assessed with DSC serving as the standard of reference.
Results: Interreader agreement was good (k=0.64). Perfusion assessment with ASL and DSC showed a significant correlation (rho=0.64; p<0.001). ASL showed a sensitivity, specificity and accuracy of 93%, 88% and 90% for the detection of reduced perfusion per territory.
Conclusion: In children with Moya-Moya disease, unenhanced ASL enables the detection of reduced perfusion per vascular territory with a good accuracy compared to contrast-enhanced DSC MRI.

SS226

Efficacy of intra-arterial ophtalmic artery chemotherapy for retinoblastoma in children: 3-years Lausanne experience

S. Binaghi, J.-B. Zerlauth, P. Mosimann, M. Beck-Popovic, F. Munier; Lausanne

Purpose: To evaluate prospectively the efficacy of supra-selective ophthalmic artery chemotherapy (chemosurgery) with Melphalan as a tumoricidal agent in children with advanced retinoblastoma in order to avoid surgical enucleation and/or secondary radiotherapy.
Methods and Materials: From November 2008 to December 2011, 24 children (mean age 27 months) affected by group D retinoblastoma underwent intraarterial superselective chemotherapy using Melphalan (0.35 mg/kg) into the ophthalmic artery. This procedure was performed under general anesthesia and repeated for a maximum of 3 sessions separated by an interval of 3-4 weeks in between sessions. A total of 65 procedures were performed. Every endovascular treatment was coupled with local intravitreal Melphalan injection, thermotherapy and/or cryotherapy.
Results: Technical success was achieved in all but two patients without major systemic or thromboembolic complications. 22 patients showed dramatic regression of tumor volume, vitreous and subretinal seeds. In the other 2 cases, severe vasospasm of the femoral artery in one case and of the ophthalmic artery in the other case prevented the successful technical realization of the procedure. Enucleation and external beam radiotherapy could be avoided in all but two treated patients, with a mean follow-up of one year. Local complications consisted of retinal detachment (2), transient ptosis (18), conjunctival and lid edema (6), local skin pigmentation (1), transient carotid artery vasospasm (1), and sectoral choroidal occlusive vasculopathy (2).
Conclusion: Chemosurgery using Melphalan in advanced retinoblastoma has an important local tumoricidal action, can avoid secondary enucleation and/or external beam radiotherapy, and can restore vision in selected cases.

SS227

Image quality of low-dose and ultra-low-dose pediatric chest CT examinations with VEO(TM) iterative reconstruction

F. Miéville[1], L. Berteloot[2], F. Gudinchet[1], S. Schmidt[1], F. Brunelle[2], F. Bochud[1], F. R. Verdun[1]; [1]Lausanne, [2]Paris (FR)

Purpose: In 2011, General Electric introduced the first model-based iterative reconstruction, called VEOTM. This technique takes into account the statistical fluctuations of noise, the system-optics and non-idealities in the data. Three radiologists evaluated the benefits of VEO to reduce dose for pediatric chest CT examinations.
Methods and Materials: In this institutional review board-approved study, twenty pediatric patients separated in two groups, A and B, underwent 100 kVp-chest CT examinations on a 64-MDCT (Discovery 750HD). Group A had one standard examination (1.5±0.7 mSv) and Group B one low-dose examination (0.60±0.3 mSv) follows by one ultra-low-dose examination (0.11±0.03 mSv). Group A images were reconstructed with FBP while those of Group B with FBP and VEO. Three radiologists randomly assessed the visibility of the main chest structures in the axial and coronal plane using a four-point rating scale (from 1=best to 4=worst).
Results: Image noise on low-dose and ultra-lose-dose VEO examinations was significantly lower than those FBP examinations (score 1.3±0.1 vs 2.0±0.1 and 2.1±0.3 vs 3.5±0.3). In the axial plane, the visibility of the structures was slightly improved (score 1.6±0.1 vs 1.9±0.1) and clearly improved (score 2.6±0.1 vs 3.1±0.1) at low-dose and ultra-low-dose, respectively. The coronal plane showed even higher structure visibility. However, VEO images have a different image texture than the FBP ones and at low-dose images in which structures are already visible with FBP, the aspect of VEO images may be disconcerting.
Conclusion: VEO can substantially improve the visibility of anatomical structures but with an image texture different that the FBP one.

SS228

Improvement of image quality in X-ray-imaging of pediatric patients by lowering the tube voltage to 40 kV at fixed effective dose in digital radiography. Simulating radiography of greenstick fractures of pediatric extremities.

J. Gronau[1], U. Neitzel[2], R. Hess[2], R. Wolf[1]; [1]Bern, [2]Hamburg (DE)

Purpose: Radiography of extremities of very young patients shows only little intrinsic contrast because of the still immature bone development. Softer beam quality leads to higher contrast and an improved contrast-to-noise-ratio. In the past, low tube voltages had been avoided, inter alia due to the low sensitivity of conventional screen film systems at soft beam qualities. Nowadays digital systems provide a high detective quantum efficiency even at soft beam quality. We examined whether, at fixed dose, the rate of correctly detected subtle fractures improves at 40 kV compared to 60 kV using a CsI-flatpanel-detector.
Methods and Materials: As a patient model, subtle greenstick fractures were generated in ribs from cadavers of newborn lambs. Ribs were submerged in a 3 cm water surrounding to simulate surrounding tissue. X-ray-imaging was done at 40 kV / 5 mAs and 60 kV / 1,6 mAs before and after fracturing. This presetting led to a similar effective dose, as calculated by the Monte-Carlo-Simulation and verified by measurement. The fractures could only be detected by irregularities in the spongiosa structure; ribs with irregularities in their shape like angulation were excluded. Three radiologists analysed 320 x-rays each in a five-step-scale.
Results: Using the exact Wilcoxon signed-rank test stratified per radiologist confirmed the superiority of 40 kV versus 60 kV ($p<0.0001$).
Conclusion: In digital radiography, the image quality can be improved at fixed dose by lowering the tube voltage to 40 kV.
Alternatively, this might be used to reduce patient dose maintaining sufficient image quality, which will be examined in following studies.

SS229

Imaging of primary pediatric hepatic tumors: Our experience over the past 10 years

A. Dhouib-Chargui, M. Anooshiravani-Dumont, L. Merlini, A. Kanavaki, T. Zand, B. Wildhaber, S. Hanquinet; Genève

Purpose: To illustrate radiological aspects of pediatric primary liver tumors, a rare finding in children.
Methods and Materials: We reviewed data of 16 patients presenting with primary liver tumors from january 2002 to december 2011. Nine boys and seven girls with a mean age of three years and 11 months (ranging from 1 day to 16 yrs) underwent US (16), CT (13), MRI (10). One patient had prenatal MRI.
Results: Six had underlying pathologies: Beckwith-Weidmann syndrome, congenital hepatic fibrosis, congenital porto-systemic shunt, alagille syndrome, spherocytosis, surgical mesenterico-caval shunt. The tumors were: hepatoblastoma (6), hemangioma (3), focal nodular hyperplasia(2), hamartoma (2), embryonic sarcoma (1), myofibroblastic tumor (1), hepatocarcinoma (1). Diagnosis was based on histology in all cases except in hemangiomas. The different imaging findings will be described.
Conclusion: Primary pediatric hepatic tumors are rare; malignant lesions being twice as frequent as benign neoplasms. The knowledge of imaging characteristics of the most common as well as the rare types of hepatic tumors, sometimes associated with underlying congenital pathologies, is important in the pediatric radiology practice.

SS230

Imaging and interventional radiology in congenital porto-systemic shunts

M. Anooshiravani-Dumont, A. Kanavaki, B. Wildhaber, V. Mc Lin, S. Hanquinet, S. Terraz; Genève

Purpose: To review clinical and radiological manifestations of five children with congenital portosystemic shunts (CPSS), as well as treatment and outcome
Methods and Materials: Between 2008 and 2011, five patients (age range, 12 days to 25 months) were admitted in our institution with a diagnosis of CPSS, which was established by US (5), CT (5) and MRI (4). Clinical presentation was hepatopulmonary syndrome (2), hepatoblastoma (1) and liver failure (4). Three patients underwent angiography for further evaluation.
Results: In our series, three CPSS were extrahepatic, whereas two were intrahepatic. Three CPSS were closed by endovascular procedures, with a technical success of 100%. One patient with severe heart and liver failure died one week after the procedure from brain haemorrhage. In one patient, a new small (< 2 mm) intrahepatic shunt was detected on 24-hours US follow-up; the third patient developed partial portal vein thrombosis, which was treated by anticoagulation. Two patients were respectively transplanted two months and one year after diagnosis of CPSS and showed a very good outcome. One patient has so far been managed conservatively due to lack of symptoms.
Conclusion: CPSS is a rare condition and may be related to intrauterine growth retardation, galactosemia, cholestasis and hepatic encephalopathy. It may lead to hepatic tumours, hepatopulmonary syndrome and pulmonary hypertension. Ultrasonography is the first modality for diagnosis, with further work-up by contrast-enhanced CT/MRI, and angiography if necessary. Early detection and management, including interventional radiology, is valuable for the clinical outcome.

SS231

Proposed algorithm for follow-up of prenatally detected congenital lung malformations

L. Alamo, O. Reinberg, F. Gudinchet, Y. Vial; Lausanne

Purpose: Prenatal diagnosis of congenital lung anomalies has increased in recent years as imaging methods have benefited from technical improvements. The purpose of this abstract is to propose a follow-up algorithm of these lesions based on imaging findings during pregnancy and in the immediate postnatal period.
Methods and Materials: We retrospectively reviewed all fetal MRI studies performed at our institution in patients with prenatal echographic diagnosis of pulmonary congenital anomalies (CLA) in the last 10 years. The proposed pre- and postnatal follow-up algorithm for these lesions has been established in cooperation with the Department of Obstetrics and Gynecology and Pediatric Surgery of our Institution after reviewing the clinical evolution of these lesions.
Results: Prenatal US is the most important modality required for characterization and identification of unfavorable prognostic factors. Fetal MRI should be performed in severe, complicated cases. Postnatal studies should include immediate chest Rx for all patients. Contrast-enhanced (CE) chest CT scan is performed in the immediate postnatal period only in symptomatic patients. For asymptomatic patients, CE chest CT scan should be performed at 3-6 months of age to reevaluate the extension of the lesions and to establish the operative indication.
Conclusion: Fetal MRI is performed as additional, complementary imaging method in severe, complicated cases. CE-CT in asymptomatic children in the immediate postnatal period may be limited by the delayed clearance of the normal fetal pulmonary fluid and the immature renal function. Preoperative postnatal CE chest CT scan in asymptomatic patients should be performed at 3-6 months of life.

NSS141

A novel radiotracer for the PET imaging of folate receptor-positive tumors

C. Fischer[1], C. Müller[2], J. Reber[2], A. Müller[1], S. Krämer[1], R. Schibli[2], S. Ametamey[1]; [1]Zürich, [2]Villigen

Purpose: The folate receptor (FR) is upregulated in various cancer types but its expression in healthy tissues and organs is highly restricted to only a few sites (e.g kidneys). Therefore, the FR is a promising target for tumor imaging using folate-based radiopharmaceuticals. Herein, we report the development of a novel folate conjugate for PET.
Methods and Materials: [18F]-fluoro-deoxy-glucose folate (**[18F]1**) was synthesized based on the click chemistry approach using a 18F-labeled glucose and a folate alkyne. The folate alkyne was synthesized via a fragment coupling strategy by condensation reaction of protected pteroic acid and an alkyne substituted glutamic acid part. [18F]-glucose azide was prepared by nucleophilic 18F-substitution of a mannosyl-precursor, followed by hydrolysis. To obtain the final product **[18F]1**, a Cu(I)-catalyzed cycloaddition was performed. The new folate radiotracer was evaluated in vitro using FR-positive KB cancer cells and in vivo in tumor-bearing nude mice.
Results: The non-radioactive fluoro-deoxy-glucose folate showed high FR-binding affinity (IC50=1.6±0.1 nM). The radiotracer **[18F]1** was produced in excellent radiochemical yields (25% d.c.) and high specific radioactivity (90 GBq/µmol). Biodistribution showed a high and specific uptake (10.03±1.12%ID/g, 60 min p.i.) of the radiotracer in FR-positive tumors and kidneys (42.94±2.04%ID/g, 60 min p.i.), which was also confirmed by PET imaging studies. FR-unspecific accumulation of radioactivity was only found in the liver (9.49±1.13%ID/g, 60 min p.i.) and gallbladder (17.59±7.22%ID/g, 60 min p.i.).
Conclusion: Due to its excellent radiochemical yields and high specificity, [18F]-fluoro-deoxy-glucose folate is a highly promising 18F-radiotracer for the PET imaging of FR-positive cancer.

NSS142

PET/CT response analysis in primary mediastinal diffuse large B-Cell lymphoma (PMBL): Preliminary results of the IELSG-26 study

L. Ceriani[1], M. Martelli[2], P. L. Zinzani[3], S. Govi[4], C. Stelitano[5], U. Vitolo[6], E. Brusamolino[7], G. Cabras[8], L. Rigacci[9], M. Balzarotti[10], F. Salvi[11], S. Montoto[12], A. Lopez-Guillermo[13], E. Zucca[1], L. Giovanella[1], P. Johnson[14]; [1]Bellinzona, [2]Roma (IT), [3]Bologna (IT), [4]Milano (IT), [5]Reggio Calabria (IT), [6]Torino (IT), [7]Pavia (IT), [8]Cagliari (IT), [9]Firenze (IT), [10]Rozzano (IT), [11]Alessandria (IT), [12]London (UK), [13]Barcelona (ES), [14]Southampton (UK)

Purpose: The primary endpoint of the IELSG-26 study was to assess the 18FDG-PET response rate following systemic therapy in a single cohort of PMBL patients.
Methods and Materials: The study enrolled 125 patients with PMBL who received R-CHOP(-like) or R-MACOP-B(-like) regimens. 120 underwent consolidation radiotherapy. PET-CT scans were performed at baseline, 3–4 weeks after the end of immunochemotherapy and >2 months after completion of radiotherapy, according to a standard protocol. PET-CT Complete Response (CR) was defined by a negative scan or one having minimal residual uptake (MRU) less than the mediastinal blood pool (MBP) activity. Central review of the PET-CT images has been performed in 109 patients.
Results: The scans showed metabolic CR in 52 pts (48%): in 11 cases (10%) the PET-CT scan was completely negative but in 41 (38%) there was MRU less than MBP. Out of 57 (52%) positive PET-CT scans the MRU was > MBP but < liver uptake in 28 (26%) cases, slightly > liver uptake in 20 (18%) and >> liver in 5 (8%). The agreement between central review and local reporting was only 70%.
Conclusion: The proportion of patients with positive PET-CT scans at end of immunochemotherapy is higher than has been reported in DLBCL. This may be attributable partly to relatively short interval between the end of chemotherapy and imaging, and partly to low level residual uptake at the site of previous bulky mediastinal disease. Analysis of the PET-CT response and its correlation to clinical outcomes in the whole cohort will be presented.

NSS143

Comparison of pretherapeutic 68Ga-DOTATOC-PET/CT and therapeutic 177Lu-DOTATOC-SPECT to predict therapy associated complications

O. C. Maas, F. Forrer; Basel

Purpose: The aim of this study was to evaluate the potential of pretherapeutic 68Ga-DOTATOC-PET/CT to predict side-effects of the 177Lu-DOTATOC-therapy in the treatment of somatostatin-receptor positve tumors.
Methods and Materials: All 18 patients who underwent 177Lu-DOTATOC-therapy including an abdominal SPECT/CT at our institution within 100 days after a 68Ga-DOTATOC-PET/CT were included. Pretherapeutic and therapeutic scans were analysed simultaneously by placing standardized spherical VOIs in the spleen and lumbar spine. SUVmax, average SUV resp. maximum and average counts/pixel were measured, compared and correlated to the decrease in hemoglobin and number of thrombocytes after therapy.
Results: The uptake values of DOTATOC showed a large variance in PET (SUVmax Spleen: 24.3+/-8.5; SUVavg Spleen: 20.3+/-7.5; SUVmax Spine: 1.2+/-0.3; SUVavg Spine: 0.6+/-0.2) and SPECT (Counts/pixel max Spleen: 3782+/-927; Counts/pixel avg Spleen: 3319+/-819; Counts/pixel max Spine: 513+/-317; Counts/pixel avg Spine: 399+/-188). There was no constant ratio between SPECT and PET uptake and no correlation between the uptake and the decrease of hemoglobin and thrombocytes after therapy.
Conclusion: The pretherpeutic 68Ga-DOTATOC-PET/CT is established in pretherapeutic evaluation to prove DOTATOC-uptake within the tumor. Nevertheless the PET-Data can not predict therapy associated anaemia or loss of thrombocytes since the extent of decrease in hemoglobin and thrombocytes after therapy does not correlate to the SUV-values in pretherapeutic 68Ga-DOTATOC-PET/CT.

NSS144

Folate receptor-targeted radionuclide therapy using 177Lu-DOTA-Folate combined with the antifolate pemetrexed

J. Reber, R. Schibli, C. Mueller; Villigen

Purpose: The folate receptor (FR) is overexpressed on a variety of tumor types. An efficient method to increase the generally low tumor-to-kidney ratio of radiofolates is the preinjection of pemetrexed. In the present study we investigated the therapeutic effect of 177Lu-DOTA-folate alone and in combination with pemetrexed, which is supposed to act as a radiosensitizer.
Methods and Materials: The experiments were performed with a DOTA-folate conjugate (Endocyte Inc.) radiolabeled with 177Lu (b--emitter, T1/2=6.7d). Inhibition of cell viability by 177Lu-DOTA-folate and pemetrexed was studied in vitro on FR-positive cervical cancer cells (KB) using MTT and clonogenic assays. In vivo therapy studies were performed with KB tumor-bearing nude mice. Therapeutic doses of 177Lu-DOTA-folate (20 MBq) were administrated (i.v.) in combination with pre-dosed pemetrexed (i.v. 400 µg).
Results: The in vitro studies demonstrated a therapeutic effect of 177Lu-DOTA-folate based on FR-specific uptake (IC50=0.05 MBq/ml). A radiosensitizing effect was observed upon exposure of the cells with moderately toxic concentrations of pemetrexed (1 µM). In a preliminary in vivo therapy study using 177Lu-DOTA-folate combined with pemetrexed tumor growth was clearly inhibited compared to tumors of untreated controls. The median survival of the 177Lu-DOTA-folate treated group was 30% increased over the median survival of control mice.
Conclusion: Pemetrexed enhances radiation-induced cell toxicity in vitro providing a synergistic effect in combination with 177Lu-DOTA-folate. The concept of pre-dosing pemetrexed in order to reduce kidney uptake of 177Lu-DOTA-folate is applicable for therapeutic purposes as it might enhance the anticancer effect by radiosensitizing tumor cells.

NSS145

90Y-Ibritumomab RIT after hematopoietic stem cell transplantation: Efficacy and tolerance

F. Buchegger[1], J. Prior[1], G. Allenbach[1], S. Baechler[1], M. Kosinski[1], Y. Chalandon[2], O. Ratib[2], A. Bischof Delaloye[3], N. Ketterer[1]; [1]Lausanne, [2]Genève, [3]La Conversion

Purpose: Evaluate the efficacy and toxicity of radioimmunotherapy (RIT) in patients with non-Hodgin's lymphoma recurrence after hematopoietic stem cell transplantation (HSCT).
Methods and Materials: We reviewed 9 patients with follicular (FL; n=7) mantle cell (MCL; n=1) and diffuse-large-B-cell lymphoma (DLBCL; n=1) treated with 90Y-ibritumomab-tiuxetan 6-140 months after HSCT. All patients underwent 111In-ibritumomab scintigraphy followed by 90Y-ibritumomab standard activity therapy (n=8); 1 allo-HSCT patient received reduced activity (70%).
Results: 2/7 FL patients experienced CR and 5 PR. One CR patient relapsed after 15 months; the other persists 43.5 months post RIT. 3/5 PR patients relapsed between 13-17 months, 1 persisted until unrelated death at 11.5 months. The 5th PR received adoptive immunotherapy and subsequently showed metabolic (FDG-PET) CR ongoing 45.5 and 41 months post 90Y-ibritumomab and immunotherapy, respectively. The MCL and DLBCL patients progressed or experienced stabilization (5 months), respectively. 6/9 patients had grade 1-3, three grade 4 bone marrow (BM) toxicity. Patients with grade ≤3 and 1/3 with grade 4 recovered within 3 months; one recovered delayed from grade 4. The third patient partially recovered from BM toxicity, was eventually diagnosed with myelodysplasia and allografted. For 6/7 patients who recovered in between 3 months from bone marrow toxicity the interval between RIT and HSCT was >18 months; it was 13 months for 1 patient. The 2 patients who recovered delayed from grade 4 toxicity had RIT 6 and 14 months after HSCT.
Conclusion: RIT post HSCT is an effective rescue therapy for relapsed FL. However, BM toxicity may be important with 2/3 patients treated within 18 months from HSCT experiencing incomplete recovery 3 months after RIT. Reducing 90Y-ibritumomab activity may be considered for patients undergoing RIT less than 18 months after HSCT.

NSS146

Radioimmunotherapy with Lutetium-177-DOTA-Rituximab: Final results of a phase I/II study in patients with relapsing indolent B-cell lymphomas

F. Forrer[1], C. Oechslin-Oberholzer[2], H. Maecke[1], J. Müller-Brand[2], A. Lohri[2]; [1]Basel, [2]Liestal

Purpose: The aim of this study was to determine the maximum tolerated dose (MTD) and to explore the clinical response to 177Lutetium-DOTA-Rituximab (177Lu-D-R) in the treatment of patients with relapsed follicular, mantle cell or other indolent lymphomas such as marginal zone lymphoma.
Methods and Materials: In order to evaluate the MTD, we adjusted the dosage of radiopharmaceutical according to body surface area (BSA). Seven cohorts were treated starting with 20 mCi/m² BSA. Dosimetry was performed in 20 patients.
Results: The MTD using 177Lu-D-R was found to be 45 mCi/m² BSA. Dosimetric calculations from 20 patients resulted in a mean whole body dose of 8.77 mGy/mCi. The mean absorbed dose to the red marrow was found to be 9.70 mGy/mCi. Thrombocytopenia and leukopenia were the dose-limiting toxicities. Significant anemia only occurred at dose level 7. We observed the nadir of platelets after a median of 43 days from baseline (36 days from treatment with 177Lu-D-R) and a nadir of granulocytes after a median of 57 days from baseline (50 days from treatment with 177Lu-D-R). Median time to recovery to the next lower grade of toxicity was 7 days. Non-hematological toxicity was negligible. We observed clinical responses at all dose levels and for all lymphoma entities. Some of the responses were durable; the longest follow up is currently over eight years. At present, 11 patients are alive and 8 patients are disease-free.
Conclusion: In conclusion, our results demonstrate the safety and feasibility of 177Lu-D-R treatment for the lymphoma entities tested in this study.

NSS233

Added value of coronary calcium score over SPECT-MPI alone for risk assessment prior to non-cardiac surgery

J.-R. Ghadri, M. Fiechter, C. Gebhard, T. Fuchs, R. Nkoulou, A. P. Pazhenkottil, F. Kuhn, C. Templin, O. Gaemperli, P. A. Kaufmann; Zürich

Purpose: To evaluate the impact of coronary artery calcium score (CACS) on top of myocardial perfusion imaging (MPI) with single photon emission computed tomography (SPECT) for cardiac risk assessment prior to non-cardiac surgery.
Background: SPECT-MPI is a routinely used imaging technique for preoperative risk assessment prior to non-cardiac surgery. The potential added value of combining SPECT-MPI with CACS is unknown.
Methods and Materials: We included 326 patients referred for SPECT-MPI for preoperative cardiac risk assessment prior to elective non-cardiac surgery. All patients underwent an additional low-dose CT for CACS and SPECT-MPI. Patients were followed-up for a period of 40 days after their index surgical procedure and the occurrence of major adverse cardiovascular events (MACE) including death, myocardial infarction; revascularization, stroke and sudden cardiac death were registered.
Results: Postoperative MACE occurred in 30 patients (9%). Cumulative MACE rate was highest in patients with abnormal SPECT and high CACS (22%), defined by a cut-off value CACS ≥1314, and lowest in patients with normal SPECT-MPI and low CACS (5%) (CACS below 1314). A CACS score of ≥1314 was independently associated with a higher MACE rate in patients with normal (12 vs. 5%) and abnormal perfusion (22 vs. 12%, p <0.05 for all intergroup comparisons).
Conclusion: SPECT-MPI findings and CACS are strong preoperative risk predictors. CACS allows further risk stratification indicating very low risk if CACS <1314 is associated with normal SPECT-MPI. Conversely, in patients with abnormal SPECT-MPI a CACS ≥1314 confers an added value for predicting adverse outcomes.

NSS234

Qualitative 13N-ammonia MPI PET and outcome prediction

M. Fiechter, C. Gebhard, J.-R. Ghadri, T. Fuchs, A. P. Pazhenkottil, R. Nkoulou, B. A. Herzog, F. Kuhn, O. Gaemperli, P. A. Kaufmann; Zürich

Purpose: We assessed the long-term predictive value of MPI with 13N-ammonia PET in a large number of patients with suspected myocardial perfusion abnormality.
Methods and Materials: Cardiac perfusion was visually assessed in 943 consecutive patients after undergoing 13N-ammonia PET, and follow-up was obtained in 698 (74%). 77 patients who underwent early revascularization (<60 days) were excluded and 621 patients were assigned to normal versus abnormal perfusion for outcome analysis. Hard events (cardiac death and non-fatal myocardial infarction) and major adverse cardiac events (MACE; hard events, hospitalization for cardiac reasons and late revascularization) were analyzed using the Kaplan-Meier method. Independent predictors for various cardiac events were identified using Cox proportional hazard regression analysis.
Results: A MACE was observed in 275 patients over a mean follow-up of 5.7±2.5 years, including 102 cardiac deaths and 33 non-fatal myocardial infarctions. Abnormal perfusion (n=469) was associated with a higher incidence of MACE (P<0.001) and hard events (P<0.001) throughout the 10-year follow-up period.
Conclusion: Cardiac perfusion findings in 13N-ammonia PET are strong predictors of long-term outcome.

NSS235

MPI with 13N-ammonia and PET: Added diagnostic value of CFR

M. Fiechter, J.-R. Ghadri, C. Gebhard, T. Fuchs, A. P. Pazhenkottil, R. Nkoulou, B. A. Herzog, F. Kuhn, O. Gaemperli, P. A. Kaufmann; Zürich

Purpose: Quantitative measurement of flow and coronary flow reserve (CFR) has been perceived as an important advantage of PET over SPECT MPI. We analyzed the added diagnostic value of CFR over PET MPI alone as assessed with 13N-ammonia and PET/CT to predict angiographic coronary artery disease (CAD).
Methods and Materials: Seventy-three patients underwent one-day adenosine-stress/rest 13N-ammonia PET/CT MPI and global CFR was calculated. The added value of CFR as an adjunct to MPI for predicting CAD (luminal narrowing ≥50%) was evaluated using invasive coronary angiography as a standard of reference.
Results: Sensitivity, specificity, positive predictive value, negative predictive value and accuracy of MPI for detecting significant CAD was 79%, 80%, 91%, 59%, and 79%, respectively. Adding the cut-off for global CFR<2.0 to MPI findings significantly improved the above values to 96%, 80%, 93%, 89%, and 92%, respectively (P<0.005).
Conclusion: The quantification of the global CFR in 13N-ammonia PET/CT MPI provides a substantial added value in diagnosing CAD. Particularly in patients with normal MPI it helps to unmask clinically significant CAD.

NSS236

Added prognostic value of myocardial blood flow quantitation in rubidium-82 positron emission tomography imaging

K. Bachelard, H. Farhad, G. Allenbach, V. Dunet, J. Prior; Lausanne

Purpose: We studied the predictive added value for major adverse cardiovascular event (MACE) of myocardial blood flow (MBF) and flow reserve (MFR) assessed by Rb-82 PET/CT in patients with known or suspected myocardial ischemia.
Methods and Materials: MBF, MFR and summed difference score (SDS) were assessed in 351 patients, and follow-up was obtained in 335 (95%). Seventeen early revascularized (<60-day) patients were excluded and 318 patients were assigned to different tertile based on their MBF, MFR and SDS. Annualized MACE (cardiac death, myocardial infarction, revascularization or hospitalisation for congestive heart failure or de novo stable angor) rate were analyzed with Kaplan-Meier analysis. Independent predictors of MACE were identified by multivariate analysis.
Results: During a median follow-up (624 days, interquartile range 540–697), 35 MACE occurred. Ischemia (SDS>2) (n=105) was associated with higher annualized MACE rate than no ischemia (14%[95%CI 9.1-22%] vs. 4.5% [2.7-7.4%], P<0,0001). Patients in the lowest MFR tertile (MFR<1.8) had the highest annualized MACE rate (16%[11–25%] vs. 2.9%[1.2–7.0%] and 4.3%[2.1–9.0%], P<0.0001). Similarly patients in the lowest stress MBF tertile had the highest MACE rate (14%[9.2–22%] vs. 7.3%[4.2–13%] and 1.8%[0.6–5.5%], P=0.0005). Quantification with stress MBF or MFR had significant independent prognostic power in addition to semi-quantitative findings. The largest added value was conferred by combining stress MBF to SDS. This holds true even for patients without ischemia.
Conclusion: Myocardial perfusion findings with Rb-82 PET/CT were strong outcomes predictors. MBF quantification had an added value allowing further risk stratification in patients with normal and abnormal perfusion images.

PO01

Diagnostic performance of a non-contrast enhanced magnetic resonance imaging protocol for potential living related kidney donors

R. P. Götti, S. Baumüller, H. Alkadhi, T. Pfammatter, R. Hunziker, G. D. Puippe; Zürich

Purpose: To prospectively evaluate the performance of a non-contrast enhanced magnetic resonance (MR) imaging protocol for preoperative screening of living related kidney donors.
Methods and Materials: Forty consecutive subjects (mean age 52.2±11.3 years, range 29-73 years) underwent MR imaging with T2-weighted sequences (coronal and axial plane), with a non-contrast enhanced respiratory-gated 3D steady state free precession (SSFP) angiography (NCE-MRA) sequence and with contrast-enhanced magnetic resonance angiography (CE-MRA) sequences in the arterial and venous phase. Two blinded readers independently assessed arterial and venous anatomy and potential kidney lesions. Results of non-contrast enhanced images were compared to contrast-enhanced images, and in a subgroup of 21 subjects to surgery as standard of reference.
Results: Regarding arterial anatomy NCE-MRA yielded sensitivity, specificity and accuracy of 100%, 89% and 91% compared to CE-MRA. Three more kidneys with accessory renal arteries were found with NCE-MRA than with CE-MRA. In the subgroup of 21 subjects one surgically proven accessory artery was depicted with NCE-MRA but not with CE-MRA. Accuracy of T2-weighted images regarding accessory veins or variant venous course was 99%, with one missed circumaortic vein at T2-weighted images. Two simple cysts were missed on T2-weighted and NCE-MRA but not on CE-MRA images.
Conclusion: A non-contrast enhanced MR imaging protocol including NCE-MRA and T2-weighted images allows for the accurate screening of living related kidney donors and may serve as an alternative to CE-MRA.

PO02

Dual-energy computed tomography for characterization of the incidental adrenal mass

R. Gnannt, M. Fischer, R. Goetti, C. A. Karlo, S. Leschka, H. Alkadhi; Zürich

Purpose: To evaluate the accuracy of virtual non-contrast (VNC) images reconstructed from contrast-enhanced dual-energy computed tomography (CT) for the differentiation of incidental adrenal masses (IAM) in comparison with non-enhanced CT.
Methods and Materials: One-hundred-forty patients (mean 74±9 y, BMI mean 27.0±4.4 kg/m²) underwent non-enhanced single-energy and contrast-enhanced dual-energy CT of the abdomen. An optimized dual-energy 3-material decomposition algorithm providing CT numbers similar to non-enhanced CT was developed in 5 test patients for reconstruction of VNC images. Two blinded and independent readers measured the attenuation of each IAM on standard non-contrast and on VNC images using this algorithm in 135 patients.
Results: 51 IAM of any size (1.4±0.6 cm, range 0.7-3.1 cm) were found, 39 IAM were ≥1 cm (1.6 cm±0.5, range 1.0-3.1 cm). 29/51 IAM and 22/39 IAM ≥1 cm were classified as benign with non-enhanced CT (i.e. HU<10). There was no significant difference in IAM attenuation between non-enhanced and VNC images for all lesions (5.9±21.0 HU vs. 7.0±20.6 HU, p=0.395) and for those ≥1 cm (6.6±18.5 HU vs. 7.9±18.3 HU, p=0.128). Sensitivity, specificity, and accuracy of VNC for the classification of IAM as probably benign were 76%, 82%, 78% for R1 and 79%, 95%, 86% for R2. Sensitivity, specificity and accuracy of both readers increased to 95%, 100%, 97% and 91%, 100%, 95% for IAM ≥1 cm.
Conclusion: Reconstruction of VNC images from contrast-enhanced dual-energy CT of the abdomen allows for the characterization of the IAM with a good accuracy compared to standard non-enhanced CT, with most favorable results in IAM measuring ≥ 1cm.

PO03

Optimizing the hepatic arterial phase during multiphasic multidetector CT of the liver by using splenic enhancement

D. B. Husarik[1], D. Marin[2], R. C. Nelson[2]; [1]Zürich, [2]Durham (US)

Purpose: To investigate the feasibility of using splenic enhancement for timing the hepatic arterial phase (HAP) during multiphasic MDCT of the liver.
Methods and Materials: 50 patients (mean 60 y) were included and randomly assigned to protocol A (HAP triggered by splenic enhancement >50 HU) or protocol B(HAP triggered by abdominal aortic enhancement >50 HU). A 64-section MDCT-scanner was used (120 kVp, auto mA). For both protocols 150 mL of iodinated contrast material (Isovue 300) was injected at 4 mL/sec. Enhancement of the abdominal aorta, PV (portal vein), HV (hepatic veins), liver parenchyma, spleen, and pancreas were measured. Visualization of the hepatic artery (HA), PV and HV were assessed qualitatively on a three point scale (0=none, 1=little enhancement, 2=strong enhancement). All parameters were compared using a t-test.
Results: There were no differences in patient characteristics between the protocols. Imaging started significantly later in A than in B (A: 36±6 sec, B: 32±3 sec). Aortic attenuation was significantly lower in A than in B (A: 291±88 HU, B: 345±91). Significantly higher attenuation was found in A compared to B in PV (A: 148±44 HU, B: 110±37 HU), the HV (A: 65±26 HU, B: 49±20 HU) and liver parenchyma (A: 72±15 HU, B: 63±13 HU) (P <.05). There was no significant difference in attenuation of the spleen (P=.5) or pancreas (P =.8) between protocols. Qualitative assessment revealed higher visualization of the PV (P<.05) in A, while there was no difference for the HA (P=.3) and the HV (P=.1).
Conclusion: Using splenic enhancement for timing during multiphasic MDCT of the liver yields an optimized hepatic arterial phase with early enhancement of the portal vein.

PO04

Gadoxetate-disodium enhanced MR imaging of the liver: Diagnostic accuracy for detection of vascular anatomic variants

D. B. Husarik[1], R. T. Gupta[2], D. T. Boll[2], S. Agonafer[2], E. Merkle[2]; [1]Zürich, [2]Durham (US)

Purpose: To evaluate the sensitivity and specificity of Gadoxetate-Disodium enhanced MRI of the liver for detection of hepatic vascular variants.
Methods and Materials: 40 patients (23-73 y) who underwent high spatial resolution contrast- enhanced liver MDCT and Gadoxetate-Disodium enhanced liver MRI were included. The sequence protocol consisted of a dynamic 3D GRE T1w dataset (triple arterial, portal venous, late dynamic, and hepatocyte-phase images). Three independent readers reported the presence of hepatic arterial (HA), portal venous (PV), and hepatic venous (HV) vascular variants. Reader's confidence using a five point scale (1=excellent, 2=good, 3=fair, 4=poor, 5=none) and the preferred dynamic contrast phase were also noted. Sensitivities and specificities for the detection of vascular variants were calculated with contrast-enhanced high resolution CT images serving as the gold standard for hepatic vascular anatomy.
Results: Hepatic arterial variants, PV-variants, and HV-variants were present in n=12, 7, and 14 patients, respectively. Mean sensitivity/specificity was **69.5%/96.3%** (range 66.7-75.0%/92.6-100%) for HA-variants, **85.7%/93.8%** (57.1-100% / 87.5-100%) for PV-variants, and **75.6%/89.3%** (64.3-92.9%/76-100%) for HV-variants. Diagnostic confidence was higher for PV-anatomy (mean 1.5) than for HA- and HV-anatomy (both 1.8). Overall, the preferred sequence was the triple arterial phase for assessing HA-anatomy, the portal venous phase for PV-anatomy, and hepatocyte phase images for HV-anatomy.
Conclusion: The sensitivity of Gadoxetate-Disodium enhanced MR images for the detection of hepatic arterial variants is markedly inferior to contrast enhanced MDCT which may preclude its use as a "one-stop shop" modality before liver resection.

PO05

Dual-energy CT for characterization of adrenal adenomas: Are we ready to eliminate the true non-enhanced image series?

D. Botsikas, F. Triponez, P. Meyer, C. Becker, X. Montet; Genève

Purpose: To study the attenuation values of adrenal adenomas on dual-energy CT.
Methods and Materials: Dual-energy CT examination was performed at 140 and 100 kVp in 10 patients with 13 proven adrenal adenomas. Attenuation values of the adenomas were measured on true non-contrast (TNC) images at 140 kVp, 100 kVp and on the corresponding virtual 120 kVp as well as the virtual non-contrast (VNC) series calculated from the portal venous and the late enhanced phase. The enhancement pattern was evaluated by measuring the absolute washout values based on the TNC and the VNC image series, and also on the relative washout based on the iodine concentration. The final diagnosis was established on the basis of histopathology, unenhanced attenuation values between 10 and -10 UH, or stability over at least 6 months.
Results: The mean absolute washout based on VNC images was 80.6±14.2%. These values correlated with the absolute washout values based on the TNC (80,0±9.1%, p > 0.05). The mean relative washout calculated from the iodine concentration on the portal and late phase was 81.7±9.8% and the true mean relative washout was 80.1±15.8% (p>0.05).
Conclusion: All measurements of washout based on VNC images correlated well with those calculated from the TNC images. Our data indicate that TNC images may be eliminated from the imaging protocol in order to reduce the radiation dose.

PO06

Histopathological correlates of computed tomography perfusion imaging in renal cell carcinoma: Systematic evaluation

C. S. Reiner[1], T. Thiesler[1], D. Eberli[1], E. Klotz[2], T. Frauenfelder[1], T. Sulser[1], H. Moch[1], H. Alkadhi[1]; [1]Zürich, [2]Forchheim (DE)

Purpose: To systematically analyze correlation between quantitative computed tomography (CT) parameters of tumor perfusion and histopathological angiogenic and prognostic markers in patients with renal cell carcinoma (RCC).
Methods and Materials: Fifteen patients (12 male; age, 64.5±9.4 years) with RCC underwent CT perfusion imaging (100 kV, 100 mAs/rotation, scan range 10 cm) one day prior to surgery using a dual-source 128-section CT. Resected specimens were systematically matched with CT perfusion images, sectioned, and immunohistochemically stained for quantification of microvessel density (MVD). CT perfusion values measured in the entire tumor cross-section including and excluding necrotic regions and in a small tumor area were correlated with MVD by using Pearson analysis. CT perfusion parameters were also compared with histoprognostic tumor markers.
Results: Whole-tumor coverage (height, 4.4±2.7 cm) was possible in 10/15 (67%) patients with generation of colored parametric maps of tumor blood flow (BF), blood volume (BV) and flow extraction product (KTrans). CT perfusion parameters of the entire tumor cross-section including and excluding necrotic regions correlated significantly with MVD (BF: r=0.60-0.83; BV: r=0.66-0.83; P<.05 each). No significant correlation was found between MVD and KTrans in the entire tumor cross-section both including and excluding necrotic regions (r=0.50/0.22, P=.057/.426). BF and KTrans were significantly different depending on the degree of tumor necrosis (P<.05).
Conclusion: Our systematic prospective study indicates that CT perfusion parameters BF and BV correlate highly with MVD thus representing tumor vascularity of RCC. In addition, BF and KTrans were significantly different in tumors showing different grades of tumor necrosis reflecting an important histoprognostic factor.

PO07

Dual-gradient-echo liver MRI: Three- versus two-dimensional imaging

M. Fischer, O. F. Donati, N. Chuck, I. Blume, R. Hunziker, D. Nanz; Zürich

Purpose: To compare 3D-spoiled-dual-gradient-echo (SPGR-DE) MRI with fat-/water-signal separation to 2D-SPGR-DE in assessment of focal and diffuse fatty-infiltration of the liver.
Methods and Materials: 227 patients (141 men; 56±14 years) referred to 1.5-T liver MRI were imaged with 2D- and 3D-SPGR-DE. Two independent readers assessed image quality, extent of artifacts, lesion detectability and depiction of abdominal anatomy on 2D- and 3D- in- and opposed-phase (IP/OP) images. Liver-fat-content (LFC) was qualitatively and quantitatively (fat-signal index) estimated, based on both IP/OP-images as well as on fat-only images automatically reconstructed from the 3D-SPGR-DE data.
Results: All 2D- and 3D-images were rated with diagnostic image quality by both readers, who identified significantly more breathing artifacts, lower image quality, and an inferior depiction of liver anatomy on 3D SPGR-DE compared to 2D SPGR-DE (all, P<.001). Although significantly more liver lesions were detected on 2D- than on 3D-IP/OP images (both, P<.005), the number of fat-containing liver lesions and the visual LFC estimation were not significantly different to 3D-IP/OP for both readers (P=.334/.317). Visual and quantitative LFC estimations based on 3D-fat-only images implied significantly higher values than evaluations of both 2D- and 3D-IP/OP images (all, P<.001).
Conclusion: 3D- was competitive with 2D-SPGR-DE for the assessment of focal and diffuse fatty-infiltration of liver parenchyma, but 2D-SPGR-DE was more robust in patients with problems holding their breath. Significantly higher LFC are estimated from 3D fat-only images than from 2D-or 3D-IP/OP images, particularly in patients with elevated liver iron.

PO08

Evaluation of the anti-peristaltic effect of glucagon and hyoscine on the small bowel: Comparison of intravenous and intramuscular drug administration

A. Gutzeit[1], C. A. Binkert[2], C. von Weymarn[3], M. A. Patak[1], N. Graf[1], J. Froehlich[2]; [1]Zürich, [2]Winterthur, [3]Basel

Purpose: To evaluate prospectively duration and effectiveness of aperistalsis achieved by glucagon (GLU) or hyoscine N-butylbromide(HBB) following various administration routes.
Methods and Materials: Six volunteers underwent Magnetic Resonance Imaging (MRI) after standardized oral preparation in random order five separate MR examinations with both spasmolytic agents (HBB intravenous(i.v.) or intramuscular(i.m.), GLU i.v. or i.m., and a combined scheme). The MR protocol included a sagittal 2D cross-section of the small bowel with a temporal resolution of 0.55 s acquired over 60 to 90min. To quantify bowel motility, small bowel cross-sectional areas were summated over time.
Results: The anti-peristaltic i.v. effects of HBB and glucagon started on average after 85 s/65 s and ended after 21 min/23.3 min, respectively. By comparison, the anti-peristaltic effects of i.m. HBB and glucagon started significantly later 5.1/11.6 min (P=0.001; Wilcoxon signed ranks test) and lasted for 17.7/28.2 min with greater inter-individual differences (P=0.012; Brown-Forsythe test). The combined scheme resulted in a rapid onset after 65 s with effect duration of 31 min.
Conclusion: Anti-peristaltic effects on the small bowel are drug dependant, i.e., their onset is faster and more reliable when administering i.v. than i.m.. Combining i.v. GLU with i.m. HBB provides an early onset of effect, sustained spasmolysis and the highest degree of motility impairment.

PO09

"Drug mules" as a radiological challenge

P. M. Flach[1], S. Ross[2], G. Ampanozi[1], L. C. Ebert[1], T. Germerott[3], G. M. Hatch[2], M. Thali[1], M. A. Patak[1]; [1]Zürich, [2]Bern, [3]Hannover (DE)

Purpose: The purpose of our study was to retrospectively evaluate the specificity, sensitivity and accuracy of computed tomography (CT), digital radiography (DR) and low-dose linear slit digital radiography (LSDR, Lodox®) in the detection of internal cocaine containers.
Methods and Materials: Institutional review board approval was obtained. The study collective consisted of 83 patients (76 male, 7 female, 16-45 years) suspected of having incorporated cocaine drug containers. All underwent radiological imaging, a total of 135 exams were performed: nCT=35, nDR=70, nLSDR=30. An overall calculation of all "drug mules" and a specific evaluation of body packers, pushers and stuffers were performed. The gold standard was stool examination in a dedicated holding cell equipped with a drug toilet.
Results: There were 54 drug mules identified in this study. CT of all drug carriers showed the highest diagnostic accuracy 97,1%, sensitivity 100% and specificity 94,1%. DR in all cases was 71,4% accurate, 58,3% sensitive and 85,3% specific. LSDR of all patients with internal cocaine was 60% accurate, 57,9% sensitive and 63,4% specific.
Conclusion: CT was the most accurate test studied. Therefore, the detection of internal cocaine drug packs should be performed by CT, rather than by conventional x-ray, in order to apply the most sensitive exam in the medico-legal investigation of suspected drug carriers. Nevertheless, the higher radiation applied by CT than by DR or LSDR needs to be considered. Future studies should include evaluation of low dose CT protocols in order to address germane issues and to reduce dosage.

PO10

Detection of ingested cocaine-filled packets: Comparison of filtered back projection CT with adaptative statistical iterative reconstructed images

J. Rey, J.-Y. Meuwly, A.-S. Knoepfli, V. Mino, R. Meuli, F. R. Verdun, S. Schmidt; Lausanne

Purpose: To evaluate diagnostic value and image quality of CT with filtered back projection (FBP) compared with adaptative statistical iterative reconstructed images (ASIR) in body stuffers with ingested cocaine-filled packets.
Methods and Materials: Twenty-nine body stuffers (mean age 31.9 years, 3 women) suspected for ingestion of cocaine-filled packets underwent routine-dose 64-row multidetector CT with FBP (120 kV, pitch 1.375, 100-300 mA and automatic tube current modulation (auto mA), rotation time 0.7 sec, collimation 2.5 mm), secondarily reconstructed with 30% and 60% ASIR. In 13 (44.83%) out of the body stuffers cocaine-filled packets were detected, confirmed by exact analysis of the faecal content including verification of the number (range 1-25). Three radiologists independently and blindly evaluated anonymous CT examinations (29 FBP-CT and 68 ASIR-CT) for presence and number of cocaine-filled packets indicating observer's confidence, and graded them for diagnostic quality, image noise, and sharpness. Sensitivity, specificity, area under the receiver operating curve (ROC) Az and interobserver agreement between the 3 radiologists for FBP-CT and ASIR-CT were calculated.
Results: The increase of the percentage of ASIR significantly diminished the objective image noise ($p<0.001$). Overall sensitivity and specificity for the detection of the cocaine-filled packets was 87.72% and 76.15, respectively. The difference of ROC area Az between the different reconstruction techniques was significant ($p=0.0101$), that is 0.938 for FBP-CT, 0.916 for 30% ASIR-CT, and 0.894 for 60% ASIR-CT.
Conclusion: Despite the evident image noise reduction obtained by ASIR the diagnostic value for detecting cocaine-filled packets decreases, depending of the applied ASIR percentage.

PO11

Dual energy CT for detection and characterization of urothelial tumors: A preliminary study

C. Hansen, D. Botsikas, C. Becker, X. Montet; Genève

Purpose: To study enhancement characteristics of urothelial tumors on the dual energy CT.
Methods and Materials: Dual energy CT examination was performed at 140 and 100 kVp in 51 patients with known or suspected urothelial tumor. 46 tumors were identified and the diagnosis was confirmed on the basis of cystoscopy for all (n=46) tumors and histopathology for 40. Enhancement of the tumors at the late arterial phase was calculated using the density values derived from the true non-contrast series (TNC) and the virtual non contrast series (VNC). Iodine concentration was also calculated based on the data of the dual energy enhanced series. Moreover lesion conspicuity and diagnostic confidence at the 100 kVp series was evaluated and compared with conspicuity and diagnostic confidence at the virtual 120 kVp series that is used for standard interpretation.
Results: The mean enhancement based on the VNC images was 32+/-18 HU. These values correlated with the mean enhancement based on the TNC (33+/-16), $p>0.05$. The mean iodine concentration for the tumors was 2,2+/-1.2 mglodine/ml. There was a trend towards a better conspicuity and diagnostic confidence for tumoral lesions on the 100 kVp, but which was not statistically significant.
Conclusion: All measurements of enhancement of urothelial tumors based on the VNC images correlated well with those calculated from the TNC image, thus indicating that the TNC series could potentially be eliminated in order to reduce the radiation dose. Further more the systematic reading of the 100 kVp image sets could improve lesion conspicuity.

PO12

Alveolar echinococcosis of the liver: Diffusion-weighted MR imaging findings

A. Pomoni[1], S. Schmidt[2], E. Uldry[2], N. Halkic[2], A. Denys[2], R. Meuli[2], F. Becce[2]; [1]Pully, [2]Lausanne

Purpose: To report the diffusion-weighted (DWI) MRI-finding in hepatic alveolar echinococcosis (AE). To evaluate the usefulness of the apparent diffusion coefficients (ADCs) for differentiating the 5 types of AE (according to Kodama, Radiology, 2003).
Methods and Materials: We retrospectively included 17 patients (10 women, mean age 64,3 years) with 55 liver lesions (>1 cm^2) that had been investigated by 3-Tesla MRI acquiring the standard protocol including DWI (b-values: 0, 300, 600 s/mm^2). In consensus two radiologists assessed lesion characteristics, such as diameter, cystic and/or fibrotic components including Kodama's classification, signal intensity, contrast enhancement, calcifications (on CT) and measured the mean, minimal and maximal ADC of each lesion. AE was confirmed by serology, biopsy and/or surgery in all patients.
Results: Three lesions of Kodama type 1, thirteen of type 2, fifteen of type 3, three of type 4 and twenty-one of type 5 were found. ADCmean (±SD) of all lesions measured 1,23±0,18×10-3 mm^2/s. ADC(mean) (±SD) of Kodama type 1, 2, 3, 4 and 5 lesions measure 1,97±0,27, 1,66±0,13, 1,73±0,12, 1,15±0,27 and 1,76±0,10×10 mm^2/s, respectively. No significant difference was noted between Kodama's types ($p=0,25$) except for type 4 which means a solid thus a fibrotic lesion ($p=0,035$). ADCmin was significantly correlated with fibrotic content ($p=0,0001$), ADC mean correlated with contrast enhancement ($p=0,010$), while presence of calcifications did not show any correlation ($p=0,80$).
Conclusion: ADCs of AE lesions are relatively low compared to other cystic liver lesions which may help suggesting the diagnosis. Although ADCs are not useful for differentiating Kodama's 5 types their value may indicate underlying fibrosis.

PO13

Impact of slice thickness of RGB color maps on diagnostic accuracy of CT-perfusion for the detection of acute stroke

C. Nern, F. J. Ahlhelm, A. Fischmann, C. Stippich, S. Ulmer; Basel

Purpose: In recent years CT-perfusion has become a mainstay as a diagnostic tool in the assessment of acute stroke. Apart from different techniques applied for data acquisition, post-processing has impact on feasibility and diagnostic value. Using modern CT-perfusion acquisition techniques almost whole brain coverage can be achieved with the possibility to generate RGB color maps either as thin slices or conventional slice thickness (i.e. 5 mm). The aim of this study was to determine if a different slice thickness generated by post-processing influences diagnostic accuracy.
Methods and Materials: CT-perfusion was performed on a Siemens definition AS+ scanner and post-processed using syngo software. Different calculations of RGB maps of 24 patients with suspected acute stroke were assessed independently by four experienced neuroradiologists. The observers were blinded to the medical history and post-processing procedures. All patients received follow up MRI including diffusion weighted images to assure the diagnosis.
Results: Sensitivity was significantly higher in 5 mm RGBs versus 1.5 mm maps regarding the assessment of cerebral blood volume (CBV) (mean±SD: 0.48±0.19 vs 0.33±0.18, p≤0.005) and showed a similar trend regarding time to peak (TTP) (0.81±0.07 vs 0.77±0.07, p≤0.058). This was consistent with an overall significantly higher rated image quality of 5 mm RGB maps vs 1.5 mm maps (range 1-5, mean 3.14±0.43 vs 2.10±0.47, p≤0.022). Specificity did not differ between the two groups (each with 0.92±0.17[CBV] and 0.58±0.17 [TTP]).
Conclusion: From our data we conclude that averaged 5 mm RGB color maps are superior to 1.5 mm maps regarding the overall image quality and the accuracy for predicting stroke including tissue at risk.

PO14

Field dependence of the R2*-response of the cortical gray matter to hyperoxic respiratory challenge

C. Rossi, A. Boss, O. F. Donati, R. Luechinger, S. Kollias, A. Valavanis, J. Hodler, D. Nanz; Zürich

Purpose: This work aimed at the quantitative assessment of the field-strength dependence of transverse relaxation-rate (R2*) changes in cortical gray matter induced by hyperoxia versus normoxia in healthy volunteers.
Methods and Materials: Eight healthy volunteers (age, 26±5 years) participated in the study. Parametrical R2* maps were computed by exponential fitting of multi-echo MR-signal acquired with a T1-weighted 3D-Fast-Field-Echo sequence at 1.5, 3, and 7 Tesla (1.5T: FA=60°, TR=113 ms; TE=12, 30, 48, 66, 84, 102 ms; 3T: FA=50°, TR=93 ms; TE=8, 24, 40, 56, 72, 88 ms; 7T: FA=45°, TR=46 ms; TE=3, 11, 19, 27, 35, 43 ms; voxel size=0.5x0.5x1.0 mm^3 at all field strengths). Medical air, 100% O2, and carbogen (i.e., 5% CO2 + 95% O2) were repeatedly administered in a block-designed temporal pattern to induce normoxia, hyperoxia, and hyperoxic hypercapnia, respectively.
Results: Under normoxia, mean R2* values of 13.3±2.7 s-1 (1.5T), 16.9±0.9 s-1 (3T) and 29.0±2.6 s-1 (7T) were measured. Both hyperoxic gas mixtures resulted in a decrease of the relaxation rate constant. The magnitude of the R2* response, ΔR2*, increased quadratically with the field strength (hyperoxic hypercapnia: 0.69±0.20 s-1 [1.5T], 1.49±0.49 s-1 [3T], 5.64±0.67 s-1 [7T]; hyperoxia: 0.39±0.20 s-1 [1.5T], 0.78±0.48 s-1 [3T], 3.86±1.00 s-1 [7T]). For each of the three field strengths, hyperoxic hypercapnia produced larger R2*-changes than hyperoxia. The statistical significance of the R2*-response improved with increasing B0.
Conclusion: The R2*-response to respiratory challenge increases quadratically with the strength of the static magnetic field. Monitoring of R2*-response to respiratory challenges using high field MRI may allow the investigation of the pathophysiology of cerebrovascular diseases in clinical settings.

PO15

Ischemic stroke of the artery of Percheron: Spectrum of imaging findings on MDCT and MRI

A. Anaye, M. O. Treyvaud, A.-L. Saverot, A.-S. Knoepfli, P. Hagmann, R. Meuli, P. Maeder; Lausanne

Purpose: The artery of Percheron is an uncommon anatomic variant that provides bilateral arterial supply to the paramedian thalami and the rostral midbrain.
Ischemic stroke of the artery of Percheron results in a characteristic spectrum of imaging findings.
Learning objectives: 1. To review anatomical variants of the origin of the paramedian thalamic arteries and thalamic vascular territories, 2. To illustrate the different imaging patterns of Percheron infarction, 3. To provide an overview of potential differential diagnoses of bilateral thalamic lesions.
Methods and Materials: Imaging findings of a series of patients from our institution with Percheron infarction from 2000 to 2011 were reviewed retrospectively. Imaging criterion for inclusion was areas of restricted diffusion on MR imaging or hypoattenuation on CT involving bilateral paramedian thalami with or without rostral midbrain involvement. Patients with neoplasic, infectious or inflammatory disease were excluded.
Results: The typical ischemic patterns of Percheron are demonstrated: bilateral thalamic infarction with and without midbrain involvement.
Differential diagnosis of bilateral thalamic lesions that includes metabolic, toxic processes, infection and neoplasic are pictorially outlined.
Conclusion: Knowledge of radiological patterns should improve recognition of ischemic stroke of the artery of Percheron in patients presenting with an acute onset of a neurological deficit.

PO16

Imaging lesions of the cavernous sinus

A. M. Korchi, V. Cuvinciuc, J. Caetano, M. Becker, K. Loevblad, M.-I. Vargas; Genève

Purpose: The cavernous sinus (CS) is a bilateral venous plexus located laterally to the sella turcica containing the internal carotid artery, cranial nerves III, IV, V1, V2 and VI, and sympathetic fibers. The purpose of this educational poster is to review the normal anatomy of the cavernous sinus, and the imaging findings of common and uncommon lesions, thus facilitating their diagnosis and treatment.
Methods and Materials: Retrospective analysis of the CT and MRI examinations of pathologic conditions of the cavernous sinus in 23 patients (16 men, 7 women, mean age 47 years, range: 4 – 81 years) seen during a period of 7 years. High-resolution CT and MR images obtained using MDCT, 1.5T and 3T MR imaging were available for review. Imaging findings were correlated with patient history and histology.
Results: CS lesions may arise from different components of the CS or from adjacent structures and spaces. They can be classified as tumoral, inflammatory / infectious and vascular. Tumoral lesions include benign (meningiomas, pituitary adenomas, schwannomas) and malignant neoplasms (chondrosarcomas, chordomas, nasopharyngeal carcinomas, leukemia, metastases). Inflammatory/infectious conditions comprise: Tolosa-Hunt, abscess, Lemierre syndrome and thrombophlebitis. Vascular lesions include: haemangioma, carotid-cavernous fistulae, aneurysms, arterio-venous malformations. Although imaging features of non-vascular CS diseases are most often non-specific (diffuse, linear or nodular enhancement), careful analysis of the adjacent structures suggests the correct diagnosis. In vascular pathology, characteristic MR imaging findings are observed.
Conclusion: Precise depiction of CS lesions and their relationship with the surrounding structures are essential for diagnosis and therapeutic planning.

PO17

Imaging features of extranodal lymphoma originating in the head and neck

L. Avril, R. Kohler, S. Patsoura, K. Masterson, V. Greloz, M. Becker; Genève

Purpose: Extranodal manifestations of primary head and neck lymphoma (HNL) are rare. Although the definitive diagnosis is made histologically, imaging may help distinguish extranodal HNL from other tumors, especially when biopsy is inconclusive. This educational poster reviews the CT and MRI findings of extranodal HNL with special emphasis on patterns of spread, differential diagnosis and correlation with histology.
Methods and Materials: Retrospective analysis of CT, MRI and clinical/surgical data of 52 consecutive patients with extranodal HNL imaged at our institution since 2000. Imaging characteristics (involved sites, ap-

pearance on CT and MRI, contrast enhancement, perineural, perivascular and meningeal spread and bony involvement) were analyzed and correlated with clinical symptoms, histology and patient outcome.
Results: Most patients were middle aged or older individuals (mean age 61.1 years). Characteristic extranodal manifestation sites (n=58) included: the tonsils and base of the tongue (n=12), salivary glands (n=9), orbits (n=9), paranasal sinuses (n=6), thyroid (n=5), nasopharynx (n=4), skull base (n=3), mandible (n=3), skin (n=4), brachial plexus (n=2) and hypopharynx (n=1). MRI showed bulky, hypointense masses on T2-weighted sequences, very low ADC values and homogenous enhancement. CT showed hypodense, homogenous masses with minor enhancement. Diffuse bone marrow involvement was seen more often on MRI than on CT. Perineural and perivascular spread was seen in HNL originating close to the skull base.
Conclusion: Although imaging cannot replace histology, knowledge of the typical manifestations and characteristic imaging features of extranodal HNL is essential for the correct diagnosis, depiction of extent, planning of biopsy, and/or therapy.

PO18

Contrast-enhanced CT of the neck at 70 kVp: Dose reduction with maintained image quality

R. Gnannt[1], A. Winklehner[1], R. Goetti[1], B. Schmidt[2], T. Frauenfelder[1], H. Alkadhi[1]; [1]Zürich, [2]Forchheim (DE)

Purpose: To assess image quality and radiation dose of CT examination of the neck at a tube voltage of 70 kVp.
Methods and Materials: Twenty patients (7 female, mean age 51.4 years, age range 19-81 years) underwent contrast-enhanced 64-slice CT of the neck at 70 kVp (ATCM, effective tube current-time product 614 eff. mAs, range 467-713 eff. mAs). All 20 patients had a previous neck CT at 120 kVp on the same scanner. Two radiologists assessed image quality and artifacts in the upper, middle, and lower neck. Image noise and attenuation were measured, and the CNR was calculated. Effective radiation dose was calculated.
Results: Inter-observer agreement regarding image quality of soft tissue for 70 kVp and 120 kVp scans was good to excellent. At 70 kVp, soft tissues were of diagnostic image quality in all scans, whereas the lower cervical spine was not of diagnostic quality in 3 and 4 scans per both readers. No difference was found among 70 kVp and 120 kVp scans for soft tissue image quality in the upper-neck, while image quality was significantly better in the middle at 70 kVp ($p<0.05$) and better in the lower-third at 120 kVp ($p<0.05$). CNR was significantly higher at 70 kVp in all levels for both readers ($p<0.001$). Effective radiation dose at 70 kVp was significantly lower (0.88±0.2 mSv) than at 120 kVp (1.33±0.2 mSv, $p<0.001$).
Conclusion: CT of the cervical soft tissues at 70 kVp is feasible, provides diagnostic image quality with improved CNR, and reduces radiation dose by approximately 34% as compared to a standard protocol at 120 kVp.

PO19

How reliable is ultrasound for the detection of salivary gland calculi?

S. Patsoura, R. Kohler, S. Bouayed, M. Becker; Genève

Purpose: To evaluate the diagnostic performance of ultrasound (US) for the detection of salivary gland calculi by comparing the prospective US findings with results of MR sialography, sialendoscopy and surgery.
Methods and Materials: In a prospective study, 45 symptomatic salivary glands in 44 consecutive patients with acute or recurrent parotid or submandibular gland swelling were examined using 7.5-12 MHz linear probes. Two experienced radiologists performed all US examinations. The gold standard was MR sialography alone in 25 salivary glands, MR sialography with additional sialendoscopy in 9 glands and sialendoscopy± surgery in 11 glands.
Results: Sialolithiasis was present in 19 glands, and was absent in 26 glands. The sensitivity, specificity, accuracy, positive and negative predictive values were 79%, 88%, 84%, 83%, and 84%, respectively. Four false negative readings occurred due to calculi with a diameter of 1.5 – 3 mm in non-dilated salivary ducts, whereas 3 false positive findings were caused by ductal stenoses, which were erroneously interpreted as lithiasis due to hyperechoic ductal wall structure.
Conclusion: Even in experienced hands, due to its limited sensitivity and limited negative predictive value, US do not allow reliable exclusion of salivary gland calculi. Therefore, in patients with persisting symptoms and normal US findings, further diagnostic investigations should be performed in order to detect calculi.

PO20

Diagnostic performance of ultrasound guided fine needle aspiration cytology in the assessment of major salivary gland masses: A retrospective analysis

R. Kohler, K. Masterson, J.-C. Pache, P. Dulguerov, M. Becker; Genève

Purpose: To evaluate the diagnostic performance of ultrasound guided fine needle aspiration cytology (USFNAC) in salivary gland masses.
Methods and Materials: The Institutional Ethics Committee approved this retrospective study on a consecutive series of 177 patients addressed to our department for USFNAC of salivary glands lesions. The radiology records of 110 males and 67 females (mean age 59.8 years, range 16-99 years) were reviewed and findings from cytopathological and bacteriological analysis were compared to subsequent histology (n=69), or clinical and radiological follow-up of >8 months (n=91).
Results: 90.4% of USFNAC procedures were performed in the parotid and 9.6% were performed in the submandibular glands on an outpatient basis using 22G and 21G needles. No major complications were noted. 90.4% of all samples were diagnostic and 9.6 % were non-diagnostic. In the 160 procedures with diagnostic cytology, the definitive diagnosis was infectious/inflammatory in 21.9% (n=35), benign tumors in 56.9% (n=91) and malignant tumors in 21.2% (n=34) of cases. The sensitivity and specificity for differentiating benign from malignant salivary gland masses were 88.6% and 97.6%, respectively. The positive and negative predictive values were 91.2% and 96.8%, respectively. With a total of 3 false positive and 4 false negative findings, USFNAC had some difficulties to differentiate benign tumors from low-grade malignancies, mainly mucoepidermoid carcinoma.
Conclusion: USFNAC is a safe and reliable technique with a high negative predictive value for differentiating benign from malignant salivary gland pathologies.

PO21

Could unenhanced cerebral CT examination be used for the initial screening of patients with acute non-traumatic headache? A feasibility study

A. Platon[1], B. Rizk[2], K. Loevblad[1], C. Becker[1], P.-A. Poletti[1]; [1]Genève, [2]Poitiers (FR)

Purpose: To evaluate whether unenhanced cerebral computed tomography (CT) could be sufficient for the screening of patients admitted with suspicion of secondary headache in the emergency department.
Methods and Materials: A retrospective survey including all consecutive patients admitted for acute non-traumatic headache who underwent both unenhanced and intravenous enhanced cerebral CT, was conducted over a three-month period of time. Patients with suspicion of intracranial pathology, which could only be depicted after contrast injection (arterial dissection, venous thrombosis) were excluded from analysis. Unenhanced CT images were reviewed by two radiologists, blinded to the results of enhanced examination, and sorted into three groups: 1) normal; 2) benign findings that could explain headache without need of injection of contrast media; 3) signs of intra-cranial pathology, requiring further injection of contrast-media. Results were compared to enhanced CT images.
Results: During the study period, a brain CT was performed in 105 patients, 74 (70%) met the inclusion criteria; 59 (80%) belonged to group 1, 4 (5%) to group 2 and 11 (15%) to group 3. No finding that could explain the acute headache was depicted on enhanced CT examinations for the patients of group 1 and 2. A significant pathology was confirmed by enhanced CT in all patients of group 3.
Conclusion: Our study suggests that a normal unenhanced CT might be sufficient to exclude the cause of headache in the initial screening of selected patients admitted with headache. Prospective studies should be conducted to substantiate this observation.

PO22

Gunshots to the head: Characteristics on post-mortem CT

G. Ampanozi, T. D. Ruder, L. C. Ebert, M. Thali, P. M. Flach; Zürich

Purpose: We demonstrate the efficiency of post-mortem computed tomography (PMCT) examinations in the depiction of the forensic relevant characteristics of gunshot wounds to the head.
Methods and Materials: Selected cases of gunshots to the head from the PMCT database of our Forensic Institute are presented. The most important, from a forensic point of view, aspects of these injuries are discussed. The benefits of PMCT examinations as well as their limitations compared to classical autopsy are shown.
Results: The presence of metal or bony fragments in the skull cavity, the presence of gas and haemorrhage in the brain parenchyma, the typical

characteristics of entry and exit wounds, the fracture patterns and the presence of gunshot residues can be depicted by PMCT.
Conclusion: PMCT is an excellent tool, which, combined with the external examination, provides important information regarding differentiation between entry and exit wounds, localization of the projectiles and/or its fragments, the path of the gunshot, and in specific cases, the firing distance.

PO23

Sinogram-affirmed iterative reconstruction: Observations in low dose CT of the lung

S. Baumüller[1], A. Winklehner[1], C. A. Karlo[1], R. P. Götti[1], T. Flohr[2], G. D. Puippe[1], E. W. Russi[1], T. Frauenfelder[1], H. Alkadhi[1]; [1]Zürich, [2]Forchheim (DE)

Purpose: To prospectively assess the impact of raw data-based sinogram-affirmed iterative reconstruction (SAFIRE) on image quality of non-enhanced low-dose lung CT as compared to filtered back projection (FBP).
Methods and Materials: Non-enhanced low-dose 64-section lung CT (30 mAs) was performed on 30 consecutive patients (14 women, 50.8±21.6 years) at 100 kVp and on 30 consecutive patients (18 women, 53.8±16.6 years) at 80 kVp. Images were reconstructed with FBP and SAFIRE. Two blinded, independent readers measured image noise; two others assessed image quality of normal anatomic lung structures (five-point scale, score1:excellent, score5:non-diagnostic). Radiation dose parameters were recorded.
Results: Image noise in datasets reconstructed with FBP (57.4±15.9) was significantly higher than with SAFIRE (31.7±9.8,p<.001). Overall image quality at 100 kVp and 80 kVp was significantly superior with SAFIRE as compared to FBP (p<.01, each), without significant difference between FBP at 100 kVp and SAFIRE at 80 kVp (p=.68). Diagnostic image quality was present in 96% with FBP at 100 kVp, in 88% with FBP at 80 kVp, in 100% with SAFIRE at 100 kVp, and in 98% with SAFIRE at 80 kVp. There were significantly more datasets with diagnostic image quality with SAFIRE as compared to FBP at 100 kVp (p<.01) and 80 kVp (p<.01). Mean CTDIvol and DLP were 1.5±0.7 mGy×cm and 47.4±13.4 mGy×cm-1 at 100 kVp, and 1.4±2.8 mGy×cm and 32.7±10.6 mGy×cm-1 at 80 kVp (p<.001), without significant differences in scan length among protocols (p=.028).
Conclusion: Use of SAFIRE in non-enhanced low-dose lung CT reduces noise, improves image quality, and renders more studies diagnostic as compared to FBP.

PO24

Value of CT angiography in pretherapy assessment of hemoptysis to guide transcatheter hemostatic embolization

S. Richter Sgourdos, G. Sgourdos, S. D. Qanadli, R. Meuli, C. Beigelman-Aubry; Lausanne

Purpose: To evaluate the accuracy of CT angiography in the depiction of (1) the anatomy of bronchial arteries (BA) and abnormal systemic non bronchial arteries (SNBA) and (2) the site of bleeding, taking into account the underlying disease as well as other parenchymal and vascular CT findings.
Methods and Materials: Twenty consecutive patients (9 women, 11 men) with a mean age of 52+/-37 years (min 15, max 89) were enrolled in the study. Inclusion criteria consisted of patients with hemoptysis requiring transcatheter embolization (TCE) that had a high resolution CT angiography (n=24). CT findings were divided in (1) vascular characteristics of BA, SNBA and pulmonary arteries (2) non vascular mediastinal and parenchymatous CT findings, including those related to underlying known causes and/or direct signs of bleeding (ground glass opacity, alveolar consolidation). CT findings were compared to TCE data.
Results: Underlying causes included bronchopulmonary carcinoma (n=11), malignant hemangiothelioma (n=1), cystic fibrosis (n=3), COPD (n=1), focal bronchiectasis (n=2) and tuberculosis sequelae (n=1). Twenty-seven bronchial arteries were involved in 21 cases, and 4 SNBA in 3 cases. CT correctly identified 40 BA in 18 patients and abnormal SNBA in 16 patients. Correct prediction of embolization site was obtained in 16 patients with CT. Normal size of embolized bronchial arteries was observed in 7 cases. Pulmonary-systemic fistula was not recognized with CT.
Conclusion: CT findings are effective to predict the optimal location of embolization. Non vascular and parenchymal findings may preclude the correct decision in complex cases.

PO25

Novel 3D diagnostic imaging technology for small breast lesions via ultrasound tomography

V. Marmarelis[1], M. Sofras[2], D. Koulocheri[3], P. Liakou[3], S. Hadjiagapis[2], G. Zografos[3]; [1]Los Angeles (US), [2]Voula (GR), [3]Athens (GR)

Purpose: Initial clinical validation results of the novel 3D diagnostic imaging technology of Multimodal Ultrasound Tomography (MUT) are presented from 100 BIRADS-4 volunteers and demonstrate superior performance of MUT relative to X-ray mammography.
Methods and Materials: MUT performs 3D tomographic scans of the whole pendulous breast in water-bath using transmission ultrasound in a fixed-coordinate system. Specially designed sequences of ultrasonic pulses are used over multiple view-angles in each coronal scanning plane. MUT reconstructs multiple images for each coronal slice, corresponding to measurements of refractivity and frequency-dependent attenuation and dispersion. Multimodal fusion of these images allows reliable lesion differentiation. This capability was tested in 100 female volunteers referred to biopsy (ages 39-79) presenting 38 malignant lesions ranging from 2 to 28 mm (average size: 7.1 mm). The MUT results were validated with histopathology performed on biopsy samples.
Results: MUT was able to detect and classify correctly 37 of the 38 malignant lesions identified in the biopsy samples from 34 patients. About 40% of those lesions (17 out of 38) had maximum dimension <5 mm (3 DCIS lesions were 2 mm in size). In the remaining 66 patients, 76 benign lesions were correctly detected and classified. Only one benign lesion was incorrectly classified by MUT as exhibiting a small malignant sub-region.
Conclusion: Initial clinical results have demonstrated the diagnostic capability of the MUT technology to detect and differentiate small breast cancer lesions in 100 BIRADS-4 volunteers (down to 2 mm in maximum dimension). Based on histopathology of biopsy samples, MUT achieved **97.3% sensitivity and 98.7% specificity**.

PO26

Breast-conserving surgery for non-palpable breast cancer: Relationship of lumpectomy resection margins measurements between remote perioperative ultrasound and postoperative histopathology

C. Lutchmaya-Flick, F. Becce, L. Alamo, J.-F. Delaloye, R. Meuli, J.-Y. Meuwly; Lausanne

Purpose: Tumor-free resection margins (RMs) are mandatory in breast-conserving surgery. On-site perioperative ultrasound (US)-guided tumor resection with extemporaneous histopathological assessment of RMs has been described. Remote perioperative US assessment of RMs is an alternative. The purpose of this study was to evaluate the relationship of lumpectomy RMs measurements between remote perioperative US and postoperative histopathology.
Methods and Materials: In a retrospective IRB-approved review of 100 consecutive lumpectomies performed between October 2009 and April 2011 for presumed non-palpable breast cancer, 71 women were included. Twenty-nine patients were excluded because of absence of cancer at histopathology and/or incomplete data. Measurements of lumpectomy minimal RMs and tumor maximal diameter obtained on remote perioperative US and postoperative histopathology were compared.
Results: Minimal RMs were 0.35±0.32 (mean±SD) and 0.35±0.32 cm on remote perioperative US and postoperative histopathology, respectively. No significant difference was found between these measurements (p=0.37). Tumor maximal diameter was 1.02±0.51 (mean±SD) and 1.33±0.74 cm on remote perioperative US and postoperative histopathology, respectively. US measurements were significantly smaller (p<0.001). The 71 breast carcinoma (CA) consisted of: invasive canalar (n=49), invasive lobular (n=11), in situ (n=3) and other type of CA (n=8). Twenty-nine patients had perioperative re-excision, while 16 patients were re-operated due to insufficient histopathological RMs.
Conclusion: Good correlation of minimal RMs between remote perioperative US and postoperative histopathology warrants the use of both techniques in a complementary manner. Remote perioperative US is helpful in taking rapid decision of re-excision and maintaining low re-operation rate after breast-conserving surgery for non-palpable cancer.

PO27

Evaluation of contrast injection protocols for thoraco-abdominal high-pitch dual-source CT angiography – A phantom study

G. D. Puippe, A. Winklehner, A. Plass, T. Frauenfelder, H. Alkadhi, S. Baumüller; Zürich

Purpose: To evaluate three contrast injection protocols for thoraco-abdominal high-pitch dual-source computed tomography angiography (CTA) with regard to amount and homogeneity of arterial enhancement at different simulated cardiac outputs.
Methods and Materials: A uniphasic, a biphasic and an individually tailored contrast injection protocol were tested using a human thoraco-abdominal vascular phantom. Circulation was accomplished with a cardiac pump. Each protocol was scanned at 5 different cardiac outputs (3-5 L/min, steps 0.5 L/min). The amount of arterial enhancement was measured every 5 cm along the z-axis. Overall mean enhancement of each protocol, and mean enhancement at each cardiac output and protocol were calculated. Homogeneity of enhancement along the z-axis was evaluated for each scan.
Results: The uniphasic protocol yielded significantly higher overall mean enhancement compared to the other two protocols (all p<.05), but the difference between the biphasic and tailored protocol was not significant (p=.76). Changes of the cardiac output always lead to significant differences of mean vascular enhancement (all p<.05), except with the tailored protocol mean enhancement did not significantly differ at cardiac outputs of 3.5 L/min vs. 5 L/min (484±25 HU vs. 476±19 HU, p=.14) and 4 vs. 5 L/min (443±49 HU vs. 476±19 HU, p=.05). Amount of cardiac output inversely influenced amount of enhancement. Independent from cardiac output homogenous enhancement was achieved with the uniphasic and tailored but not with the biphasic protocol.
Conclusion: Results imply that opposed to single-source scanners, homogenous enhancement might be achieved with tailored and uniphasic injection protocols at wide range of cardiac outputs.

PO28

The napkin-ring sign in coronary CT angiography indicates advanced atherosclerotic lesions with large necrotic core

P. Maurovich-Horvat[1], U. Hoffmann[1], C. Schlett[1], M. Kriegel[1], M. Nakano[2], P. Stolzmann[3], R. Virmani[2], H. Alkadhi[3]; [1]Boston, MA (US), [2]Gaithersburg, MD (US), [3]Zürich

Purpose: To determine the accuracy of qualitative assessment of attenuation patterns of non-calcified plaque by CT to differentiate between early and advanced atherosclerotic lesions as defined by histology.
Methods and Materials: Overall 611 histological sections from 21 coronaries were studied, which were filled with iodine and scanned with CT. Histological sections were prepared and matched with CT. The images were read for the presence of non-calcified (NP), mixed (MP), calcified plaque (CP). The NCP and non-calcified portion of MP were assessed for the attenuation pattern and were classified as homogenous (HP) or heterogeneous. Heterogenous plaques were stratified into those with and without napkin-ring sign (NRS and non-NRS).
Results: No plaque was detected in 134, NCP in 254, MP in 191, and CP in 32 CT cross-sections. Among NCP, we identified HP in 207 non-NRS plaque in 200 and NRS plaque in 38 cross-sections. The absence of plaque had excellent sensitivity and NPV (99.3% and 99.3%). The specificities of NCP and MP to identify advanced lesions were moderate (58.1% and 71.9%), similarly to the homogenous and heterogeneous plaques (42.8% and 57.2%). In contrast, the specificity of NRS plaque to identify advanced lesions was excellent (98.9%). The overall diagnostic performance of attenuation pattern analysis to identify advanced lesions was better than the conventional plaque scheme (AUC 0.761 vs. 0.678; p=0.0012).
Conclusion: The CT finding of NRS is highly specific for the presence of advanced atherosclerotic plaque with large necrotic core. The assessment of plaque attenuation pattern has higher accuracy to identify advanced plaques than the conventional CT plaque scheme.

PO29

Adenosine-stress high-pitch dual-source myocardial perfusion CT for detection of reversible myocardial ischemia: Comparison with MRI

R. P. Götti[1], G. Feuchtner[1], O. F. Donati[1], P. Stolzmann[1], S. Leschka[2], H. Alkadhi[1]; [1]Zürich, [2]St. Gallen

Purpose: To assess the accuracy of adenosine-stress high-pitch 128-slice dual-source myocardial CT perfusion (CTP) imaging in comparison with cardiac MRI (CMR).
Methods and Materials: Thirty patients (64±10 years, 2 women) with intermediate to high cardiovascular risk profile underwent adenosine-stress 128-slice dual-source CTP (128×0.6 mm) as well as adenosine-stress CMR (1.5T). The CTP protocol consisted of two scans: first, adenosine-stress CTP using a prospectively ECG-triggered high-pitch (3.4) spiral acquisition mode and second, rest-CTP/coronary-CTA using either high-pitch (heart rate <63 bpm) or sequential "step-and-shoot" prospective ECG-triggering (heart rate >63 bpm). Results were compared with adenosine-stress CMR in all 30 patients and with invasive angiography in 25 patients.
Results: Adenosine-stress CTP for detection of myocardial perfusion defects showed a sensitivity of 96%, specificity of 88%, positive predictive value(PPV) of 93% and negative predictive value (NPV) of 94% per vessel and sensitivity of 78%, specificity of 87%, PPV of 83% and NPV of 84% per segment using adenosine-stress CMR as the standard of reference. For the definition of reversible ischemia compared with CMR, a sensitivity of 95%, specificity of 96%, PPV of 95% and NPV of 96% were found per vessel. In 25 patients who underwent invasive angiography, the accuracy of CTA for detection of stenosis >70% per segment was high (sensitivity, 96%, specificity, 88%, PPV, 67% and NPV, 98.9%). Radiation dose of the complete stress/rest CT protocol was on average 2.5 mSv.
Conclusion: Adenosine-stress 128-slice dual-source high-pitch myocardial CTP allows for simultaneous assessment of reversible myocardial ischemia and coronary stenosis with a good diagnostic accuracy as compared with CMR and invasive angiography, at a very low radiation dose.

PO30

A 3D multi level adaptive compression approach for CT angiography

C. Nakajo[1], M. Firoozbakht[2], J. Dehmeshki[2], R. Meuli[1], S. D. Qanadli[1]; [1]Lausanne, [2]London (UK)

Purpose: To develop a context-based and regions of interest (ROI) based approach for compression of medical images in general and in particular peripheral arteries in CT angiography (CTA) with minimum interactions between user and system.
Methods and Materials: An approach for compression of images from CTA, where a high spatial resolution is mandatory, was developed based on jpeg2000 standard to provide variable level of compression in (x, y) plane as well as in the z axis. The proposed lossy-to-lossless method compresses the multiple ROIs: (1) primary ROI, (2) secondary ROI and (3) background, depending on the degrees of clinical interest. High priority areas were assigned a higher precision (up to lossless) than other areas such as background. ROIs were annotated automatically after automatic segmentation. The method was optimized and applied to the vascular images from CTA for peripheral arteries and compared with the standard medical image codec on 10 patients regarding image quality and diagnostic performances.
Results: The software was implemented successfully and compared with the standard medical image codec over 60 vascular segments. Subjective and objective based comparisons showed in several compression ratio a good image quality. The size of the compressed images can be reduced up to 67% with respect to lossless jpeg2000 standard with no remarkable impairment for the diagnostic accuracy. Accordingly, the transmission time was reduced.
Conclusion: The new developed compression approach reduces significantly storage cost and transmission time while preserving diagnostic value without any remarkable reduction of quality.

PO31

CT-derived pericardial fat volume: Influence of scanning protocol and reproducibility of measurements

L. d'Errico[1], F. Saliturri[2], M. Ciardetti[2], R. Favilla[2], M. Schlueter[2], M. Coceani[2], M. Bianchi[2], A. Mazzarisi[2], L. Faggioni[2], G. Coppini[2], P. Marraccini[2]; [1]Basel, [2]Pisa (IT)

Purpose: The main purpose of the study was to evaluate a computerized method for the quantitative analysis of the epicardial fat volume (EFV) from images obtained by standard computed tomography (CT) acquisition for Coronary Artery calcium Scoring (CAS) and Coronary CT Angiography (CTA).
Moreover the relationship of EFV with the clinical characteristics of patients and with the morphological analysis of coronary plaque burden were assessed
Methods and Materials: 30 patients (61±12.5 years, 73% male, BMI 25.9±6.3 kg/m²) referred to our Institution underwent CT scans with and without contrast medium (CM). EFV was computed with a semiautomatic method using an ad hoc developed software. A densitometric and volumetric analysis of the coronary vessel wall was performed to evaluate the different components of the plaques (fatty, fibrotic, calcified).
Results: Total EFV was 104.53±50.0 mm³ and 64.41±49.93 mm³ (p<0.001) in CAS and CTA images, respectively. The intra-observer repeatability coefficient (CR) in CAS was 12.6 mm³ in O1 and 28.3 mm³ in O2, in CTA series was 9.76 mm³ in O1 and 17.5 mm³ in O2. The inter-observer CR was 29.2 mm³ (95% CI27.3-30.8) and 24.3 mm³ (95% CI22.6-25.6) in CAS and CTA. Right ventricular EFV was 68.35±32.6 mm³ and 39.79±24.8 mm³; left EFV was 37.53±18.4 mm³ and 24.42±17.1 mm³. EFV showed a very close correlation with BMI (rho0.785 p2.81*10-7), and with plaque burden (rho0.378 p0.04). This relationship resulted mainly due to the correlation with fibrotic component of plaque (rho0.453 p0.01)
Conclusion: EFV may be computed by CT with low intra- and inter-observer variability. The reproducibility of measurement could be improved with operator training and using CTA images. The relationship with coronary plaque burden seems to confirm the active role of EFV in the progression of coronary atherosclerosis.

PO32

MRI (T2*) for non-invasive measurement of myocardial and hepatic iron overload: Comparison of bright- and black-blood sequences

A. Rosskopf, M. Ith, P. Keller, D. Ott, H. Hoppe; Bern

Purpose: Purpose of this study was to evaluate our results as a reference center for MRI using T2* sequences to assess hepatic and cardiac iron load and to compare the measurements of black-blood and bright-blood sequences.
Methods and Materials: Forty patients (17 women and 23 men, mean age 45+20 years) with suspected cardiac and/or hepatic iron overload (thalassaemia n=12, hemochromatosis n=14, other n=14) underwent liver and myocardial T2* assessment using a Siemens Sonata 1.5-T scanner with bright- and black-blood sequences. Iron analysis was performed using CMR-Tools (Cardiovascular Imaging Solutions, UK).
Results: Using bright-blood technique: Cardiac iron load was not relevant in 36 patients. One patient presented with mild cardiac iron load, 2 with moderate and 1 with severe iron load. Hepatic iron load was normal in 26 patients, mild in 7 patients, moderate in 6 patients and severe in 1 patient. Comparison of the two different imaging sequences using linear regression analysis revealed a high and significant correlation for cardiac (R=0.75; p<0.001) and hepatic (R=0.96; p<0.001) T2*, respectively. However there seems to exist a small difference between the two methods, because 95%-confidence interval of the slope of the regression curve does not include unity (myocardium: 0.46 – 0.91; liver: 1.01 – 1.29). This might also be the reason why the classification of myocardial iron was different in 3 patients.
Conclusion: Myocardial and hepatic iron load was quantified using both dark- and bright-blood sequences. Further studies with higher patient numbers are needed to determine whether there really is a systematic difference between the two methods.

PO33

Evaluation of different CT protocols for planning of minimally invasive valve surgery

F. Glaser-Gallion[1], L. Desbiolles[1], N. S. Glaser-Gallion[1], P. Stolzmann[2], A. Plass[2], S. Wildermuth[1], H. Alkadhi[2], S. Leschka[1]; [1]St. Gallen, [2]Zürich

Purpose: To evaluate different CT protocols for planning of minimally invasive cardiac valve surgery with regard to image quality and radiation dose.
Methods and Materials: 126 patients referred to elective cardiac valve surgery underwent chest CT for preliminary planning of a potential minimal invasive approach (aortic valve replacement, n=114; mitral valve replacement, n=12). Patients were randomly assigned to an ECG-gated or non ECG-gated chest CT. Image quality of aortic/mitral valve, ascending aorta and thoracic structures was assessed to be measured including 3D display of thoracic cage using a 4-point scale. Effective radiation dose estimates were calculated. Optimal intercostal space distances from the suspected incision site to aorta and cardiac valves were evaluated and measured in 2D and corresponding 3D CT images.
Results: Image quality showed significant difference between the two groups (ECG-gated vs. non-ECG-gated chest CT: excellent IQ 39.5% vs. 4.6%, P<0.001; good IQ 48.8% vs. 17.4%, P<0.001; moderate IQ 11.6% vs. 78%, P<0.001; non-diagnostic 0 vs. 7% P<0.001). The estimated effective radiation dose was significantly higher in ECG-gated compared with non-ECG-gated chest CT (mean 27.3 mSv vs. mean 8.1 mSv; P<0.001). Distance from the ostium of right and left coronary arteries to the aortic annulus showed significant differences between the two groups.
Conclusion: ECG-gated chest CT provides a significantly better image quality, but the use of non-ECG-gated CT still provides an evaluative image quality in 93% of patients at a significantly lower effective radiation dose.

PO34

Emergency CT: What is missed at first reading?

A. Platon, G. Varnay, C. Becker, P.-A. Poletti; Genève

Purpose: To evaluate the accuracy of initial CT interpretation made by radiology residents in the emergency department.
Methods and Materials: A quality survey of all emergency CT reports made by radiology residents was conducted over four periods of 20 consecutive days, between 2004 and 2011. During the survey, attending radiologists prospectively recorded any disparity between their interpretations (reference standard) and the residents' initial reports. Disparities were sorted into 3 groups: group 1 (potential life-threatening pathology if not correctly managed within 12 hours), group 2 (potential life-threatening if not correctly managed within 48 hours) and group 3 (pathologies requiring specific treatment or surveillance on a long time span). Misinterpretations were recorded during regular working hours and during on-call periods, along with time until correction. A rate of disparity was calculated for neuroradiological and for body CT.
Results: A disparity was reported in 145 (4.8%) of 3044 CT examinations; 23 (0.8%) belonged to group 1, 46 (1.5%) to group 2, 76 (2.5%) to group 3. Disparities were more frequent in body than in neuroradiological CT interpretations ($p<0.05$). No difference in rate of disparities was observed between regular hours and on-call period; the mean time for correction was 1.3 hours during daytime and 6.9 hours during on-call time.
Conclusion: Major disparities represent a small proportion of all misinterpretations and are usually corrected at second reading without ominous consequences for the patients. Targeted teaching and efforts to reduce the delay between readings will contribute to decrease both the rate of misinterpretations and their potential clinical impact.

PO35

Teleradiology in Switzerland – What do we need to make it work?

A. Meier, S. Faulhaber, C. W. A. Pfirrmann; Zürich

Purpose: The purpose of this study was to identify the major issues in the use of teleradiology that have to be solved to increase its acceptance and usability.
Methods and Materials: A web-based questionnaire was sent to 695 members of the Swiss Society of Radiology and in a modified form to 720 clinicians from different subspecialties with questions about the use of teleradiology, its current major issues, suggestions for improvement, advantage of teleradiology and willingness to deliver teleradiology services.
Results: Questionnaires were completed by 131 radiologists (19%) and 78 clinicians (11%). Among radiologists, 85% presently use teleradiology services versus 61% of clinicians. The most frequent use was to obtain expert opinions and to cover after hours. Clinicians most commonly seek expert opinions regarding MRIs (76%), followed by CT (61%) and conventional radiographs (52%). For clinicians, service time is crucial. 72% wish to obtain an expert opinion within 24 hours. 88% of radiologists indicate their willingness to read 10 to 20 teleradiology cases a month, 7% 21 to 51 and 5% over 100 in addition to their regular workload. To improve acceptance of teleradiology, uniform standards, faster and saver data transmission, higher availability and easier access are needed. Transparency of costs (clinicians) and transparency of salaries (radiologists) is required. Once these problems have been solved, the vast majority of radiologists (86%) would perform teleradiology services and 70% of clinicians would use teleradiology.
Conclusion: To improve acceptance of teleradiology, uniform standards and easy access is needed as well as transparency of costs and reimbursement.

PO36

Assessment of coronary artery disease by post-mortem cardiac MR

T. D. Ruder[1], R. Bauer[2], G. Ampanozi[1], A. Rosskopf[2], T. Pilgrim[2], O. Weber[3], M. Thali[1], G. M. Hatch[2]; [1]Zürich, [2]Bern, [3]Basel

Purpose: Minimally invasive or virtual autopsies are being advocated as alternative to traditional autopsy, but have limited abilities to detect coronary artery disease. It was the objective of this study to assess if the occurrence of chemical shift artifacts (CSA) along the coronary arteries on non-contrast, post-mortem cardiac MR may be used to investigate coronary artery disease.
Methods and Materials: We retrospectively compared autopsy and CT findings of 30 cases with significant (≥75%), insignificant (<75%), or absent coronary artery stenosis to post-mortem cardiac MR findings. The chi-square test was used to investigate if the occurrence of CSA depends on the presence or absence of stenosis. Sensitivity, specificity and predictive values were calculated for each finding.
Results: CSA indicates the absence of (significant) stenosis ($p<0.001$). The occurrence of paired dark bands in lieu of CSA on post-mortem cardiac MR suggests (significant) coronary arteries stenosis ($p<0.001$). Both findings have a high specificity but low sensitivity.
Conclusion: CSA is a marker of vessel patency. The presence of paired dark bands indicates stenosis. These criteria improve the ability of minimally invasive or virtual autopsy to detect coronary artery disease related deaths.

PO37

CT-guided minimally invasive post-mortem needle biopsy using the B-Rob II needle positioning robot

R. M. Martinez[1], W. Schweitzer[1], W. Ptacek[2], M. Thali[1], L. Ebert[1]; [1]Zürich, [2]Wiener Neustadt (AT)

Purpose: Medical image modalities such as Computed Tomography are increasingly used in forensic post-mortem investigations. In order to retrieve tissue or body fluids samples for histologic tissue diagnoses, for microbiological or toxicological analysis, CT-guided minimally invasive needle biopsy techniques can be used. The purpose of this study is the evaluation of the remote-controlled needle positioning robot B-Rob II, which allows a CT-guided needle positioning.
Methods and Materials: To operate under CT guidance we modified the B-Rob II robotic system and workflow. Accuracy and speed of the procedure was then tested on a gelatin phantom with peas as targets and a series of 21 biopsy procedures. In additional 8 cases, after authorization by the investigating legal authorities, we performed tissue sampling of the lung on human bodies.
Results: The robot performed needle placement with an accuracy average of 1.8 mm (+/-1.1 mm). The procedure required 2:21 minutes in average. The biopsies of lung tissue of human bodies showed histologic pulmonary fat embolism grades similar to the samples taken during the autopsy
Conclusion: Needle placement accuracy as well as the required time appears to be sufficient for forensic post-mortem examinations. Bioptic lung samples delivered histologic pulmonary fat embolism grades comparable to lung sampling during autopsy. Further tests will be performed to test the ability of this technique to perform biopsies on focal organ changes in human bodies.

PO38

Feasibility of post-mortem CT-angiography – yes we (s)can!

P. Steinmann, C. Schulze, N. Schwendener, S. Franckenberg, G. Ampanozi, M. Thali; Zürich

Purpose: The importance of post-mortem angiography in forensic medicine has strongly increased (reviewed in 1). In this preliminary study we investigated if post-mortem CT-angiography is feasible and applicable in the medico-legal daily routine of our institute.
Methods and Materials: Prior to conventional autopsy 7 corpses assigned by the public prosecution department to our institute for forensic autopsy and angiographic imaging underwent native whole-body CT-scanning followed by whole-body or selective CT-angiography, using a Siemens SOMATOM® Dual Source CT. Angiography was performed according to the protocol published by Grabherr et al. (2), using a Medtronic Biomedicus® 550 centrifugal pump for perfusion and PEG (polyethylene glycol) with gastrographin (1:10) as contrast agent.
Results: Our preliminary results show that postmortal contrast agent perfusion and angiographic assessment by CT is reliably feasible with high image quality. Selective perfusion of head or extremities can be appropriately addressed to specific forensic questions.
Conclusion: Particularly in stab injuries (e.g. homicide), heavy blunt trauma (e.g. car accidents) as well as in cases of questionable medical malpractice the localization, assessment and documentation of vascular injuries is of utmost importance in medico-legal practice. Therefore, the importance of CT-angiography in forensic medicine is increasing. Post-mortem angiography procedures have to be optimized and validated in further studies.

PO39

Simple left ventricular area measurement allows for accurately estimating heart weight at autopsy

T. D. Ruder[1], G. M. Hatch[2], J. Thali[2], M. Thali[1], H. Alkadhi[1], G. Ampanozi[1], P. Stolzmann[1]; [1]Zürich, [2]Bern

Purpose: Left ventricular (LV) mass is an independent predictor of mortality. We hypothesize that post-mortem cardiac magnetic resonance imaging (CMR) by means of a single caliper measurement provides an accurate estimate of heart weight.
Methods and Materials: A total of 29 human cadavers (27% female; 49 years, 18 – 83 years) underwent post-mortem CMR an a 1.5-Tesla whole body scanner. CMR included turbospin-echo T2-weighted (T2w) sequences. Three independent readers measured posterior wall thickness (PWT) and the areas included by outer circumferences of left ventricular myocardium in 4-chamber (LV4CH-area) and short axis orientations (LVSA-area) by electronic calipers. Heart weight was subsequently assessed at autopsy using an electronic balance.
Results: Intra-observer reliabilities were excellent (ICCPWT ≥0.90, ICCLV4CH-area ≥0.95, ICCLVSA-area ≥0.81; all $p<0.0001$); inter-observer reliabilities were moderate for PWT (ICCPWT ≥0.42, $p<0.001$), excellent for LV4CH-area (ICCLV4CH-area ≥0.93, $p<0.001$), and good for LVSA-area (ICCLVSA-area≥0.76, $p < 0.001$). Mean heart weight at autopsy estimated 389±89 g, ranging from 220 – 580 g. PTW, LV4CH-area, and LVSA-area were significantly ($p<0.001$) correlated to heart weight with linear regression coefficients r of 0.60, 0.78, and 0.75, respectively. This data transfers to the preferable equation ($R2=0.61$, $p<0.001$) for estimating heart weight on the basis of LV4CH-area: Heart weight [g]=LV4CH-area [mm^2] x 0.1 [g/mm^2] + 3 [g].
Conclusion: Post mortem LV4CH-area represents an easy at hand, robust, and accurate estimate of heart weight and – if elevated – indicates further investigation for causes of cardiac death at autopsy.

PO40

Forensic imaging – Automatic classification of post-mortem lung CT findings

W. Schweitzer, M. Thali, T. D. Ruder; Zürich

Purpose: We supplement autopsy with CT also to preserve scattered distribution of air or fluid which are relevant for pulmonary pathology. We investigated shape vectors for automatic classification of CT-findings in what appeared to be unanimous autopsy diagnoses.
Methods and Materials: From an initial set of 35 cases selected for unambiguity of pulmonary findings, we examined an average of 26 volumes-of-interest (VOI) sized 20^3 mm based on full body CT (Siemens Sensation Open). 11 diagnostic categories were discerned (a: lobar pneumonia, b: bronchopneumonia, c: acute respiratory distress syndrome, d: typical drowning, e: atypical drowning, f: suffocation, g: emphysema, h: blood aspiration, i: atelectasis and k:'normal'). VOIs were segmented into 18 CT density range subsets. Statistical moments, distance distributions, derived FFT and autocorrelation resulted in 1086 initial vector elements for each VOI.
Results: DRDA (descriptive regularized descriptive discriminant analysis) with Lambda 0.8 (minimally quadratic) and Gamma 0.2 (minimal shrinkage to diagonal) resulted in acceptable separation of diagnostic categories (AUC for ROC a: .98, b: .99, c: .97, d: .98, e: .95, f: .78, g: .99, h: .70, i: .75, k: .99).
Conclusion: DRDA of geometrical shape descriptors distinguishes clear and single unanimous pathology in post-mortem CT of lungs with acceptable success that matches autopsy experience. However, such pathology is relatively easy to diagnose at autopsy. CT-based statistical identification of combined or overlapping pulmonary pathology provides a real challenge. Improvements are necessary in medicolegally relevant diagnoses such as drowning, suffocation and blood aspiration. Higher CT resolution and further improvement of the statistical method might provide such results.

PO41

Forensic imaging: 3D visualization of scattered CT-dense particles contained in the skin

W. Schweitzer, M. Thali, T. D. Ruder; Zürich

Purpose: Particles of X-ray dense material like metal, glass or rocks may scatter across superficial skin layers in the course of blunt trauma such as explosions, falls, blows, or other impacts of later interest to police investigation. Yet, visualizing their distribution in a way that is illustrative enough to aid further investigation constitutes an open problem.
Methods and Materials: We applied visualization techniques implemented in IDL (Exelis VIS, Boulder, CO, USA) to a number of clinical and post-mortem cases (1 instance of tiny rocks impaled into the skin, 1 instance of explosive device derived metal particles, 1 instance of glass fragments). From CT data, tracing and distance calculations are used to map volume data information to the body isosurface. We preserve location but magnify size appearance.
Results: Particle visualization massively depends on partial volume effect. Resulting colored 3D surfaces of the CT-derived skin can provide accurate and relevant visualization of tiny particles sufficiently large or CT-opaque. In the instance of the explosion case, reconstructive conclusions could be made as to location and count of blows that significantly added to the investigation rather than merely supplementing it.
Conclusion: Visualization of such particle distribution can be a hard indication for acquiring a post-mortem CT scan as it adds anatomical particle distribution maps which an autopsy can never document in the same way.

PO42

Forensic Radiology: Non-invasive matching of injuries and suspected weapons in virtual autopsy cases

J. Fornaro, S. Leschka, N. S. Glaser-Gallion, F. Glaser-Gallion, P. Laberke, R. Hausmann, S. Wildermuth, D. Eisenhart; St. Gallen

Purpose: Cross-sectional radiological imaging techniques are increasingly used in forensic sciences to document and analyze post-mortem findings. High-resolution multidetector computed tomography (MDCT) allows to extract the three-dimensional (3D) morphology of artificial bone lesions as well as potential injury-causing instruments. The purpose of this study was to evaluate a method to test for a matching between bone injuries and suspected weapons.
Methods and Materials: Post-mortem MDCT of six corpses with penetrating or blunt injuries to the skull and MDCT of the suspect weapons (one to three weapons per corpse) was performed. In the case of metallic weapons like knives (two cases), wrenches (two cases) or a hammer (one case) tube current and voltage were increased to lower beam hardening artifacts to acceptable levels. The cross-sectional imaging datasets were transferred to a workstation equipped with software for rigid landmark-based registration and fused volume rendering. Finally a match between bone injury and potential weapon was qualitatively assessed and accepted or dismissed based on the visualization.
Results: The presented method was simple and time-efficient with post processing times of less than 10 minutes per case (median time 6 minutes, range 4 to 9 minutes). The correct weapon involved was identified in all cases as determined by standard forensic procedures.
Conclusion: The presented method is able to correlate an inflicted bone injury to an injury-causing weapon in a non-invasive and intuitive manner. It could qualify as a dedicated analysis tool in virtual autopsy cases and for demonstrations in the courtroom.

PO43

Post mortem imaging of the mandible and maxilla: Artifact reduction after dentistry by dual-energy computed tomography using monoenergetic extrapolation

P. Stolzmann, H. Alkadhi, N. Schwendener, M. Thali, T. D. Ruder; Zürich

Purpose: The aim of the study was to assess the performance of a dual-energy (DE) computed tomography (CT) to reduce beam hardening artifacts caused by artificial dentition.
Methods and Materials: Thirty human cadavers (50% female, 58±22 yrs) who had undergone dental treatment at lifetime including fillings, bridges, and implants were examined using standard single-energy (SE) and DECT (w/ Sn filtered 140 kVp and 80 kVp spectrums). Post-processing was applied to generate SECT and DECT images, the latter allowing for the representation of image data at specific monoenergies, namely 64, 69, 88 keV and an individually adjusted energy which was chosen to optimize image quality (OPTkeV). Subjective and objective image quality parameters were assessed twice by two blinded radiologists in consensus.
Results: Measures of image quality and artifacts were reliable (k=0.72 and rho=0.96, respectively). Image quality was significantly different ($\chi 2$ $p<0.001$) and correlated (Cramers's V=0.45, $p<0.001$) among data sets. Monoenergetic images achieved superior image quality in 28/30 patients as compared with SECT but did not in 2/2 patients with non-diagnostic studies. Beam hardening artifacts decreased significantly (repeated-measures ANOVA $p<0.0001$) with the use of increasing monoenergies in DECT post-processing. Mean OPTkeV was 108±17 keV (72-141 keV) which differed significantly ($p<0.001$) from monoenergies of 64, 69, and 88 keV.
Conclusion: Monoenergetic extrapolation by DECT significantly improves images quality with reduced artifacts by artificial dentition as compared with SECT. This may impact on CT imaging strategies for the post-mortem identification of individuals, and furthermore clinically evaluating suspected pathologies of the maxilla or jaw as well as strategies in implant dentistry.

PO44

Post-mortem CT and CT angiography of cranial and spinal injuries in victims of motor vehicle accidents

S. Binaghi, J.-B. Zerlauth, F. Doenz, P. Mangin, S. Grabherr; Lausanne

Purpose: Motor vehicle accident victims can suffer from multiple lesions which cannot always completely be detected by the classical forensic examination of the body. CT scan and CT angiography could then be used for this purpose, in order to identify those failing informations.
Methods and Materials: Between October 2008 and December 2010, 45 consecutive victims of motor vehicle accidents underwent whole body CT scan. 22 of them also underwent whole body CT angiography, by using femoral intra-arterial and intravenous injection of contrast media. The lesions concerning the cranial and spinal regions were analyzed and compared with autopsy.
Results: 37 of 45 victims showed involvement of the cranial and spinal regions. CT scan identified skull fractures in 18 victims, skull base fractures in 19, maxillary and facial fractures in 16, fractures of the cervical spine in 12 and of dorsolumbar spine in 18, subarachnoid haemorrhage in 19, intraventricular, cerebral and subdural haemorrhages in 9, and cerebral edema in 8. Autopsy failed to identify all cervical spine fractures and the detail of complex fractures of skull base and maxillary region. CT angiography identified traumatic dissection of intracranial carotid artery in 4 victims, of the external carotid artery branches in 3, and of distal intracranial arteries in 2. None of these lesions were identified on autopsy. 4 victims showed aortic trauma.
Conclusion: Post-mortem CT and CT angiography allow a precise detection of multiple lesions in the cranial and cervical region not visible during autopsy, particularly cervical fractures and cranio-cervical vascular trauma.

PO45

Post-mortem CT-angiography of the craniocervical junction

P. M. Flach[1], G. Ampanozi[1], C. O'Donnell[2], T. Germerott[3], M. Thali[1], L. C. Ebert[1], S. Ross[4]; [1]Zürich, [2]Southbank (AU), [3]Hannover (DE), [4]Bern

Purpose: State of the art routine work of legal medicine is incremental facilitated by unenhanced post-mortem computed tomography (PMCT) with little information about the vasculature due to a lack of contrast. Lately established PMCT-Angiography (PMCTA) is performed in order to provide precise display of vascular and tissue lesions. Vascular pathologies of the head/neck region are cumbersome to dissect manually during autopsy whilst only targeted preparation is feasible and simultaneously destruction of other potential forensic findings will occur. The aim of this study was to evaluate if PMCTA of the craniocervical region is a necessary tool to improve quality of autopsy.
Methods and Materials: A retrospective analysis of 92 consecutive deceased victims with PMCTA was evaluated. All bodies underwent subsequent autopsy. Unenhanced PMCT was performed, followed by subsequent access to the femoral vessels in order to perform PMCTA with arterial and venous injection. A contrast media mixture of polyethylene glycol and Iopentol was administered.
Results: The findings of PMCTA could be validated by autopsy. In cases with rupture, aneurysms or dissection of the basilar, vertebral and carotid artery, venous laceration and severed brain stem injury below the level of the foramen magnum PMCTA even proved to be superior to autopsy.
Conclusion: PMCTA provides the basis of a focused and quality-improved preparation of the craniocervical junction and intracranial vasculature by revealing pathologies that are frequently missed during autopsy. The newly implemented method of PMCTA proved to be an adjunct to classic autopsy detecting neuropathological causes of death.

PO46

Whole body post-mortem magnetic resonance angiography

T. D. Ruder[1], G. M. Hatch[2], L. C. Ebert[1], P. M. Flach[2], S. Ross[2], G. Ampanozi[1], M. Thali[1]; [1]Zürich, [2]Bern

Purpose: To test the feasibility of whole-body post-mortem MR angiography (PMMRA) on adult human cadavers. Combining the soft tissue detail provided by MR and the information afforded by angiography could be very useful in minimally-invasive post-mortem investigations.
Methods and Materials: PMMRA was performed on four adult human cadavers, admitted to our institute for medico-legal investigation. Vascular access was gained via the femoral vessels, using a unilateral vascular cut-down. Diluted contrast medium was injected in the arterial system with a roller pump. Images were acquired a 6-slice helical CT and a 1.5 Tesla MR-unit, equipped with a total-imaging-matrix (TIM) system. Technical quality of PMMRA was assessed relative to post-mortem CT angiography (PMCTA), separately for each body region. Intra-aortic contrast volumes were calculated on PMCTA and PMMRA with segmentation software.
Results: The results showed that technical quality of PMMRA images was equal to PMCTA in 4/4 cases for the head, the heart, and the chest, and in 3/4 cases for the abdomen, and the pelvis. There was a mean decrease of intra-aortic contrast volume from PMCTA to PMMRA of 46%.
Conclusion: This study demonstrates the technical feasibility of whole-body MR angiography in the post-mortem setting. PMMRA combines the soft tissue detail provided by MR and the information afforded by angiography. This technique may extend the radiological tools available for post-mortem investigations, whether they are performed in the course of forensic investigation, or during hospital based morbidity/mortality review.

PO47

Targeted percutaneous cryoablation therapy: How should I do?

A. Pomoni[1], R. Duran[2], A. Denys[2], P. Bize[2]; [1]Pully, [2]Lausanne

Purpose: To explore the technical aspects of the targeted percutaneous cryoablation therapy with a specific regard to the description of the procedure step-by-step.
Methods and Materials: Targeted percutaneous cryoablation therapy is performed by a specially trained interventional radiologist with the aid of imaging guidance techniques such as ultrasound and computed tomography (CT).
Results: Cryoablation therapy is a minimally invasive treatment for solid tumors found in the liver, lungs, kidneys, bone, breast, prostate gland and skin that uses extreme cold to freeze and destroy diseased tissue. It is a minimally invasive procedure that takes place in an interventional radiologic suite. Imaging is used to guide the placement of one or more applicators through the skin to the target site and monitor the freezing process. Liquid nitrogen or argon gas flows into a needle like applicator (a CryoProbe) creating intense cold place in contact to the target. Independent Tempprobes monitor the temperature of surrounding tissue. Extreme cold is maintained for at least 20 minutes followed by active thawing of the „ice ball". The procedure is then repeated for maximum tumor kill. During ablation the „ice ball" can be visualized by US or CT. The overall time of the procedure is approximately 1 hour. The procedure is done on an outpatient basis.
Conclusion: Targeted percutaneous cryoablation is an alternative cancer treatment that has shown to be effective in selected patients. Diseased tissue destructive properties are well established for renal cell carcinoma however further research is needed to determinate its long-time effectiveness in other indications.

PO48

Concordance of morphological and functional response in follow-up imaging after Yttrium-90 liver transarterial radioembolization

Y. Lachenal, P. Bize, A. Boubaker, N. Cherbuin, J. Prior, A. Denys; Lausanne

Purpose: Transarterial radioembolization (TARE) is an emerging treatment for inoperable and chemotherapy-refractory primary and secondary liver malignancies. Tumor response after TARE can be difficult to be assessed. The purpose of this study was to assess the concordance between morphologic and metabolic response in patients treated with TARE.
Methods and Materials: Sixteen patients treated with TARE were monitored using the following response criteria: RECIST, metabolic activity in FDG PET and combined criteria. Agreement between the morphologic and metabolic imaging modalities was assessed. Clinical outcome was integrated.
Results: Using RECIST, we observed Partial Response (PR) in 2/14 (14%), Stable Disease (SD) in 6/14 (43%) and Progressive Disease (PD) in 6/14 (43%) patients. Follow-up CT/MRI was not yet performed in 2 patients. With PET, PR was observed in 6/13 (46%), SD in 1/13 (8%) and PD in 6/13 (46%) patients. PET was not suitable for follow-up in 3/16 (19%) patients because of unsignificant initial FDG uptake. With combined response criteria we observed PR or SD in 8/11 (73%) patients, choosing the best response criteria in conflictual cases. Concordance between morphologic and functional imaging was observed in 3/11 (27%) patients and all of them showing PD. Eight of the 16 patients died within an average of 25 weeks.
Conclusion: Concordance in response between morphologic and functional imaging modalities seems to be limited in PR or SD, but seems to be better in PD. Due to their complementarity, both types of imaging are required to assess response to TARE.

PO49

Complications of totally implantable venous access ports – Imaging findings

C. Hansen, R. Breguet, C. Becker, D. Didier, S. Terraz; Genève

Purpose: To describe the potential early and late complications after placement of a totally implantable venous access ports (TIVAP). To understand the advantages and limits of the different imaging modalities. To illustrate the spectrum of complications and to be familiar with their management.
Methods and Materials: TIVAP are valuable instruments for long-term intravenous chemotherapy and parenteral nutrition of cancer patients, but implantation and use of these devices are each associated with early and late complications, respectively. The complication rate of TIVAP depends on the type of tumour, the patient performance status, the technique of placement of the catheter and port reservoir and the postoperative care.
Results: Typical complications associated with TIVAP are catheter occlusion by fibrin sheath, catheter-related thrombosis, port or catheter infection, catheter migration and leakage through pinch off or kink-crack fractures. Careful fluoroscopic examination with injection of a small amount of contrast media identifies most of these anomalies and helps to monitor lumen reopening during fibrinolysis. Ultrasonography may detect drug extravasation or abscess in soft tissues. Deep venous thrombosis of the upper limbs is diagnosed by Doppler, whereas CT or MR angiography confirms central venous thrombosis. Endovascular procedures under fluoroscopy include catheter repositioning, fibrin sheath stripping and catheter retrieval after embolisation.
Conclusion: In case of clinical dysfunction of TIVAP, knowledge of imaging findings is necessary for appropriate management. Different imaging modalities allow accurate diagnosis, but fluoroscopy with dynamic imaging is the first choice examination to evaluate position, patency and integrity of the materials.

PO50

Towards reducing the cumulative dose from repetitive CT in patients with testicular cancer: Value of automated tube potential selection

R. Gnannt, A. Winklehner, D. Eberli, A. Knuth, T. Frauenfelder, H. Alkadhi; Zürich

Purpose: Evaluate prospectively, in patients with testicular cancer, the radiation dose saving potential and image quality of contrast-enhanced chest and abdominal CT using an automated tube potential selection algorithm.
Methods and Materials: Forty patients (mean age 38±7 years, BMI 25.6±3.9 kg/m², range 18.8-39.6 kg/m²) with histopathologically proven testicular cancer underwent contrast-enhanced arterio-venous chest and portal-venous abdominal CT with automated tube potential selection (scan B; 80-140 kVp). All patients had a foregoing chest and abdominal CT study at 120 kVp (scan A) using the same 64-slice CT machine (chest: 110ref.mAs; abdomen: 210ref.mAs). Two readers semi-qualitatively assessed image quality; two others measured objective image quality parameters. Dose information (CTDIvol) was noted.
Results: In scan B, tube potential was reduced to 100 kVp in 18 chest and 33 abdominal scans and to 80 kVp in 5 abdominal scans. Image quality of both scan A and B was rated diagnostic (scan A: 1.53±0.64 R1, 1.65±0.73 R2; scan B: 1.58±0.71 R1, 1.73±0.75 R2). Image noise was significantly higher in scan B ($p<0.05$). Attenuation in the liver and spleen was significantly higher at scan B. There was no significant difference in signal-to-noise-ratio for the liver ($p=0.06$) and the spleen ($p=0.07$) for scan B compared to scan A. CTDIvol was significantly lower at scan B (chest: 8.6±2.8 mGy; abdomen: 13.0±4.8 mGy) compared to scan A (chest: 9.8±1.8 mGy; abdomen: 14.8±3.8 mGy, reduction by 12%, for each chest and abdominal CT, $p<0.01$).
Conclusion: In patients with testicular cancer, radiation dose of follow-up CT can be considerably reduced when using an automated tube potential selection algorithm, while diagnostic image quality is preserved.

PO51

Peripheral lower limb enthesis in ankylosing spondylitis: Correlation between clinical, radiographic and ultrasonographic scores

M. Chelli Bouaziz[1], M. F. Ladeb[1], W. Hamdi[2], M. M. Ghannouchi[2], M. M. Kchir[2]; [1]Ksar Said (TN), [2]Tunis (TN)

Purpose: To search for correlations between clinical, radiographic and ultrasonographic scores of enthesitis in patients with ankylosing spondylitis (AS).
Methods and Materials: Prospective study of 60 patients (48 men and 12 women with a mean age of 36 years) fulfilling New York modified Criteria for AS. All patients underwent clinical exam[illegible] with evaluation of the specific enthesitis scores (VAS, BASDAI, [illegible]

This abstract has been withdrawn

PO52

Emergency CT and MRI in acute thoracolumbar spine trauma

M. Thekkumthala-Sommer, S. Winklhofer, G. Andreisek, H. Alkadhi, D. Schmidt; Zürich

Purpose: ***Purpose:*** To enable radiologists with different levels of training to accurately use and interpret emergency CT and MRI in acute thoracolumbar spine injuries.
Methods and Materials: ***Learning objectives:*** Recognize typical CT and MRI signs of osseous, ligamentous and neurological pathology.
• Appreciate the additional value of emergency MRI in acute thoracolumbar spine injuries
Results: ***Background:*** Although the mainstay in the evaluation of acute thoracolumbar spine injuries is emergency CT, emergency MRI is increasingly available. CT of the spine allows direct evaluation and classification of fractures for which various classification systems such as AO and TLICS might be used. Evaluation of ligamentous injuries or injuries to the spinal cord and nerves however is often based on indirect signs only. MRI helps to reveal bone bruises or occult fractures (e.g. hyperintense signal abnormalities of bones on fat-suppressed T2-weighted or short-tau inversion recovery [STIR] sequences) and allows direct assessment of the integrity of various structures such as the discs, longitudinal, supraspinous or interspinous ligaments, ligamentum flavum, the spinal facet capsules or the spinal cord and nerves. Recent literature shows a significant added value of complimentary emergency MRI especially with regard to patient management which is frequently changed after MRI.
Conclusion: ***Teaching Points:*** Emergency CT is the mainstay in diagnosis of acute thoracolumbar spine injuries but emergency MRI has a significant added value and might be performed in all patients if available. Therefore comprehensive knowledge of various MRI features of traumatic thoracolumbar injuries is crucial for an exact diagnosis and for a reliable treatment decision.

PO53

Three different cases of humeral shaft fracture during police arrest: Biomechanical aspects and reconstruction of the events

S. Franckenberg; Zürich

Purpose: We are going to present 3 different cases of humeral shaft fractures in young persons, that occurred while being arrested by the police. In each case there were contradictory statements about the event. Were those humeral fractures the result of excessive force by the police? Were the fractures caused by fierce resistance of the victim? How much force is needed to break the humerus of young, healthy persons?
Methods and Materials: (1) We did a literature research on humeral shaft fractures in young, otherwise healthy people for similar fracture patterns. (2) We exposed artificial and human bone models to different forces (rotation, pressure) to evaluate and correlate biomechanical causes to specific fracture types of the humerus. Additionally, all fractured bone models underwent forensic imaging (CT) to be compared to the original X-rays of the cases.
Results: (1) For the occurrence of a spiral fracture, torque forces are necessary. In the absence of soft tissue or adjacent joint lesions we assumed a strong muscular contraction (=fierce resistance of the injured parties). (2)The artificial and the human cadaver bone showed comparable results in our "bone breaker" model regarding the correlation of fracture type to fracture mechanism. We found no big differences between torque force needed to break artificial or osteoporotic female human cadaver bone.
Conclusion: We were able to proof fierce resistance of the injured party. We are not yet able to define the torque force needed for breaking a humerus of a young healthy person due to missing human cadaver bone in that age group.

PO54

New procedure in the treatment of spinal traumatic fracture type Magerl A: Implementation of spine jack system, an early evaluation

R. Marlois[1], P. Browaeys[2], N. Amoretti[3], N. Theumann[2]; [1]Les Cullayes, [2]Lausanne, [3]Nice (FR)

Purpose: The purpose of the study is to assess the clinical impact and fracture reduction after an implementation of a jack vertebral system (SpinejackTM, Vexim) on patients with a traumatic fracture of the thoracolumbar spine.
Methods and Materials: This prospective study included 18 patients with spinal trauma with type A1, A2 and A3 fractures on the Magerl classification, from January to August 2011, who were treated with implementation of a Spinejack System to restore the initial vertebral height. The vertebral height was measured with CT scanner before and after the treatment and was compared to the vertebral heights of adjacent vertebra. The static of the thoracolumbar spine was assessed by measuring the vertebral kyphotic angulation and regional kyphosis on the midline before and after the procedure. The clinical assessment was performed using the visual analogue pain scale (VAS) before the procedure, and 1 day and 3 months later.
Results: Implementation of the Spinejack system resulted in a mean vertebral height restoration of 15,9 ($p<0.01$). Average vertebral and regional kyphosis reduction after the procedure were 6° ($p<0.01$) and 4.5° ($p<0.05$) respectively. The initial VAS was 7.6, 5.5 at day one and 4.4 at three months after the procedure.
Conclusion: The implementation of a Spine-Jack system enables a reshaping of the traumatic vertebra with a significant vertebral height restoration, vertebral and regional kyphosis angulation, and an early clinical improvement. This preliminary study should be enlarged with comparing the impact of the Spine-Jack system with other actual procedures like surgical operation and conservative treatment.

PO55

Reduction of metal artifacts at MR imaging with slice encoding metal artifact correction (SEMAC) and view-angle tilting (VAT) in patients with total hip arthroplasty: Performance of STIR and T1-weighted sequences

R. Sutter[1], E. J. Ulbrich[1], V. Jellus[2], M. Nittka[2], C. W. A. Pfirrmann[1]; [1]Zürich, [2]Erlangen (DE)

Purpose: To determine the performance of the new "WARP" sequence for reduction of both through-plane and in-plane artifacts in patients after total hip arthroplasty (THA).
Methods and Materials: 40 patients with THA were prospectively included. Slice-Encoding Metal-Artifact Correction (SEMAC), view-angle-tilting (VAT), and increased bandwidth were applied by the "WARP"-TSE (turbo-spin-echo) sequence at 1.5T. Coronal STIR-WARP and transverse T1-weighted WARP images, standard coronal STIR and transverse T1-weighted images optimized with high bandwidth (STIR-hiBW/T1-hiBW) were acquired. Signal void was quantified. Qualitative criteria (anatomy, distortion, blurring, noise) were assessed on a five-point scale (1, no artifacts; 5, not visible due to severe artifacts) by two readers. Clinical findings were recorded. Quantitative data were analyzed with a t-test and qualitative data with a Wilcoxon signed rank test.
Results: Signal void around the prosthesis head was smaller for STIR-WARP than STIR-hiBW (21.6 cm^2/42.4 cm^2), and for T1-WARP than T1-hiBW (17.6 cm^2/20.2 cm^2; p=.0001 for all). Anatomic distinction was better on STIR-WARP compared to STIR-hiBW (1.9-2.8 vs. 3.6-4.6; p=.0001), and on T1-WARP compared to T1-hiBW (1.3-2.8 vs. 1.8-3.2; p<.002). Distortion, blurring and noise were lower at WARP than in the standard sequences (p=.0001). Almost half of the clinical findings were missed on STIR-hiBW compared to STIR-WARP (55 and 105 findings; p=.0001), while T1-hiBW was similar to T1-WARP (50 and 55 findings; p=.06).
Conclusion: STIR-WARP and T1-WARP were statistically significantly better for quantitative and qualitative image criteria, but the clinically relevant advantage in artifact reduction was only present for STIR images and not for T1-weighted images.

PO56

High-resolution 3T MRI of nail disorders: How to do it and what to look for?

E. Paulin, A. Syrogiannopoulou, D. Tchernin, D. Arditi, R. Kohler, X.-C. Pham, M. Becker; Genève

Purpose: Although MRI with dedicated surface coils plays an important role for the work-up of a variety of nail diseases, the technique is not widely available. This poster illustrates the MRI technique developed in our institution, and reviews several nail conditions with special emphasis on clinical, imaging and histologic findings.
Methods and Materials: 15 consecutive patients with clinical nail deformity or discoloration and 3 healthy volunteers underwent MRI of the nail at a 3T unit (6 men, 12 females, mean age=51 years). Loop flex or phased-array multichannel wrist coils were used, special attention being given to optimal patient positioning. Our standard protocol included: high-resolution sequences (TSE T1-w, STIR, PD with fat saturation, slices 0.2-3 mm, voxel size 0.11 x 0.11 x 2.5 mm), dynamic angiographic 3D acquisitions (TWIST), T1 Vista, and TSE T1-w sequences with and without fat saturation after iv. Gadolinium.
Results: With the exception of one case with motion artefacts due to poor positioning, the nail plate, the germinal matrix, the nail bed and the proximal nail fold were all well visualised, as well as the underlying dermis and distal phalanx. Typical pathologies and their characteristic MRI aspect in correlation with clinical findings and differential diagnosis are presented: hypervascular, mucoid and solid forms of glomus tumors, onychomatrichoma, subungual ossifying periostitis, subungual infection, osteomyelitis, benign epithelial HPV-related hyperplasia and mucoid pseudocyst.
Conclusion: Tailored, high-resolution MRI sequences and good knowledge of nail anatomy are essential for the correct diagnosis, biopsy planning and precise depiction of extent in nail disorders.

PO57

Noninvasive evaluation of atherosclerosis risk in patients with ankylosing spondylitis (AS)

M. Chelli Bouaziz[1], M. F. Ladeb[2], W. Hamdi[1], M. M. Ghannouchi[1], M. M. Kchir[1]; [1]Tunis (TN), [2]Ksar Said (TN)

Purpose: Recent epidemiological studies have pointed out the increasing of morbidity and mortality in patients with AS. Life mode, associated metabolic disorders, spinal and joint ankylosis, genotype, inflammatry context and use of corticosteroids are the most incriminated factors. The measure of carotid intima-media constitutes an infra-clinical atheromatosis marker and allows a long term prediction of cardiovascular accident risk. The aim of this study was to assess the [illegible]

This abstract has been withdrawn

PO58

Imaging of skeletal complications in children treated for cancer

E. Tenisch, F. Gudinchet, M. Beck-Popovic, L. Alamo; Lausanne

Purpose: These last decades, pediatric oncology has achieved great progress. However, the cost of life prolongation is aggressive chemo and radiation therapy which can induce severe complications, especially in the developing bones. This poster intends to describe the radiological aspect of skeletal complications in children treated for cancer.
Methods and Materials: We retrospectively reviewed all radiological exams performed at our institution in the pediatric population treated in oncology and presenting skeletal complaints or known osteoarticular complications.
Results: The main skeletal complications in pediatric oncology patients were growth problems, bone infarcts, pathological fracture due to osteopenia, radiation-induced marrow replacement as well as secondary tumors, and postural problems after major surgery. Standard radiography is useful in documenting any kind of complication. MRI and CT prove to be helpful in definite situations.
Conclusion: Pediatric radiologists should be aware of the varied presentation of skeletal complications in oncology children. They can be primary, i.e. due to the cancer itself, or secondary to the treatment. Therefore it is essential to have an extended knowledge of the patient's treatment history. Standard radiography remains the first-line examination. CT and MRI should be performed whenever necessary.

PO59

Pseudomass of the aorta: A common mirror artifact in children

T. Dobrocky, E. Stranzinger, R. Wolf; Bern

Purpose: To demonstrate an important ultrasound artifact of the abdominal aorta in pediatric patients. Frequency, characteristical appearance, extension and location of a pseudomass of the aorta is demonstrated and compared with a rare diagnosis of aortic thrombosis in children.
Methods and Materials: Retrospective analysis of all consecutive pediatric abdominal ultrasound examinations (total: 150 patients; age: 1-16; mean 8.3; male 75; female 75) during a one month period was conducted to identify an aortic pseudomass in the area of the coeliac trunk and superior mesenteric artery (SMA). 2 patients with real aortic thrombosis were compared.
Results: An artifact pseudomass of the aorta was noted in 39 patients (26%). In 21 cases (15%) a fusiform reverberation pseudomass artifact localized in the central part of the aorta with no contact to the aortic wall was noted. In 7 of 8 cases the artifact was eliminated by the Clarify™ Vascular Enhancement (VE) Technology.
Conclusion: We assume that reverberation pseudomasses of the aorta are due to a repeatedly reflected echo between the highly reflective anterior and posterior wall of SMA.
In our study the phenomenon was more likely to occur when the sound beam was perpendicular to the SMA. Changing the position of the transducer or utilizing the Clarify™ Vascular Enhancement (VE) technology may help differentiate between a pseudomass and a real thrombus.

PO60

Fetal MRI on detection of abdominal masses

S. Archontaki, C. Lutchmaya-Flick, F. Gudinchet, L. Alamo; Lausanne

Purpose: The detection of fetal abdominal masses has increased the last 10 years due to the systematisation of routine fetal US. Fetal MRI is an excellent complementary imaging technique which enables to precise the localisation and origin of the mass, to evaluate the extension of the lesion and its anatomic relationships with the adjacent organs. This pictorial essay is a retrospective review of the imaging findings in 10 cases of fetal abdominal masses initially detected on US and further characterised on prenatal MRI.
Methods and Materials: We retrospectively reviewed all fetal MRI performed at our institution with suspicion of fetal abdominal tumors on the prenatal US. MRI reports were compared to US reports and to the final diagnosis, obtained by clinical reports, post-natal imaging methods and autopsy reports.
Results: Between 01.01.2002 and 01.10.2011, 300 fetal MRI were practised in our institution. In 10 cases, indication of MRI was the suspicion of fetal abdominal tumors on prenatal US, which revealed to be 2 sacrococcygeal teratomas, 3 hepatic tumors, 2 gynecologic lesions, 2 adrenal hemorrhages and 1 lymphangioma. MRI characterised the lesion in 10 cases and provided additional information to US in 7 cases.
Conclusion: Fetal MRI can accurately characterise fetal abdominal masses, their etiology (tumoral versus non tumoral) and their organ of origin permitting to define the differential diagnosis and to make decisions about the pregnancy's viability and prognosis. Thus, MRI is the most adapted tool for a better prenatal counselling and an improved preoperative planning of pre- and postnatal therapy proceeding.

PO61

Added value of DaTSCAN SPECT to FDG PET semi-automated analysis in the investigation of clinically suspected neuro-degenerative syndromes using ROIs based discriminant analysis

V. Garibotto, M.-L. Montandon, C. Tabouret-Viaud, F. Assal, P. R. Burkhard, M. Allaoua, O. Ratib, H. Zaidi; Genève

Purpose: Neuroimaging is increasingly used to support the clinical diagnosis of patients investigated for cognitive impairment. Dopamine transporter (DAT) imaging, such as DaTSCAN SPECT, tests the integrity of the nigro-striatal pathway, while FDG PET identifies typical pattern of cortical and subcortical hypometabolism. Aim of this study was to assess the relative contribution of DAT and regional glucose metabolism (rCMRglc) assessment to the differential diagnosis.
Methods and Materials: 57 subjects investigated for the clinical suspicion of a neurodegenerative parkinsonian syndrome underwent both FDG PET and DaTSCAN SPECT. We selected patients with a clinical diagnosis of probable Alzheimer's disease (AD: 5), corticobasal degeneration (CBD: 6), Lewy body dementia (LBD: 8), frontotemporal degeneration (FTLD: 4) and Parkinson's disease (IPD: 4). rCMRglc and DAT density were obtained by BRASS (Hermes software). We used a discriminant analysis (SPSS) with a stepwise method and we tested also the results of the leave-one-out cross-validation.
Results: When using the rCMRglc values the 85.2% and 55.6% of the patients were correctly classified for the discriminant analysis and the cross-validation, respectively; when DAT alone was considered, the results were 59.3% and 51.9%, and with the combination of both DAT and rCMRglc 100% and 88.9%.
Conclusion: These preliminary results obtained by an automated approach show that the information coming from the analysis of the rCMRglc and DAT density is not redundant: in fact, taking into account both rCMRglc and DAT density allows a gain in the correct classification of individual patients. These results further support the usefulness of performing both modalities in clinical routine applications.

PO62

Changes in FDG biodistribution in delayed PET-MR studies

O. Ratib, A. Figueral, E. Fleury, M. Lord, M. Viallon, S. Heinzer, H. Zaidi; Genève

Purpose: To evaluate changes in biodistribution of FDG uptake in different organs measured at two different points in time to assess variability of SUV measurements in two consecutive PET studies performed about one hour apart.
Methods and Materials: In the process of evaluation of a new hybrid PET-MR scanner two consecutive PET scans were obtained after injection of FDG in 48 patients undergoing a PET-MR study following a PET-CT scan. The average delay between the first PET study (PET-CT) and the second PET study (PET-MR) was 94±25 minutes ranging from 49 minutes to 138 minutes. Changes in biodistribution of tracer uptake were measured from 10 anatomical regions including brain, cerebellum, lungs, liver, heart, colon, muscle and bones as well as in tumor and metastatic lesions when present.
Results: Significant changes in biodistribution of FDG tracer were observed in different organs. These changes were confirmed form SUV quantitative ROI measurement of different tissue uptake. While in general, pathological tracer uptake in malignant lesions seemed to increase between the first and the second scan, there was significant difference in delayed changes in uptake of different organs.
Conclusion: Very little is known about changes in FDG tissue uptake in normal organs over long periods of time after injection. Our study shows significant variability with different trends in different organs. This enforces the need for very strict control of time delays of image acquisition in comparing SUV between different studies since normal changes in biodistribution can significantly affect these measurements.

PO63

Quality assessment of fluorocholine PET imaging in clinical setting: Validation of standard quality control parameters

C. Le Petit, C. Jegouic, D. O. Slosman; Genève

Purpose: Standardized parameters for quality control (QC) assessment of 18F-fluorocholine PET (F-CHO-PET) were validated in transversal and longitudinal cohorts of patients with prostate cancer to be applied in clinical setting.
Methods and Materials: Protocol was developed to measure standardized pulmonary/hepatic/bone tissues SUVmean (T-SUVmean). Thus 176 PET scans were performed in 142 patients. All patients had standardized 3-phases F-CHO-PET protocol of acquisition using Biograph-16. A set of 30 PET scans was used to calculate intra- and inter-observer reproducibility (CV) and the range of normal values of pulmonary/hepatic/bone tissues SUVmean (Ref-SUVmean). Then T-SUVmean of 142 PET scans (transversal cohort) were measured and compared to Ref-SUVmean. Values out of range were identified. Appropriateness of QC was define as occurrence within patient of Ref-SUVmean out of range i) for a single tissue, ii) for 2 tissues simultaneously, or iii) for the 3 tissues. Similar protocol was applied to determine the longitudinal range (Ref-ΔSUVmean: change between 2 consecutive exams) and to validate QC in a group of 61 pairs of F-CHO-PET.
Results: The intra- and inter-observer SUVmean CV remained under 4.1% and 4.6%, respectively. In the transversal study, none of the 176 PET scans combined the three values out of range, whereas for the longitudinal study, only one of the 34 pairs of consecutive PET scans combined the three values out of range values. Accuracy of SUV measurements was at first related to overweight status.
Conclusion: The validation of a standardized and reproducible F-CHO-PET QC protocol combining measurements of pulmonary/hepatic/bone reference tissues SUVmean allows its use in clinical setting.

PO64

Frequency of incidentaloma on F-18-FDG PET/CT: A first Swiss study

A. Leuenberger, A. Boubaker, J. Prior; Lausanne

Purpose: 18F-FDG PET/CT is used for the cancer staging and it is not rare to discover unexpected findings (incidentalomas). Our aim was to determine the frequency of these clinically silent pretumoral or tumoral lesions in patients who were addressed for an FDG-PET/CT because of an oncological indication.
Methods and Materials: We retrospectively reviewed the 1226 examination reports from August 2009 to July 2010 for consecutive, unselected patients. We noticed every unexpected finding and their localization, before searching how they were handled and which subsequent investigations were made.
Results: We found 309 unexpected foci in 260 patients (25% of all reports). Of these, 216 lesion were found in 169 patients followed at CHUV and 143 lesions were investigated in 129 patients. Finally, we found 34 incidentalomas (2,8%) in 33 patients. Among these, 8 were malignant, 6 premalignant and 20 benign leading to a malignant and premalignant incidentalomas rate of 1,1%. Frequent sites were similar to those published in the literature, including the thyroid gland, the colorectal region (with only premalignant lesions), lymphomas and the lungs. For these last three, frequency was lower as what is described in other studies.
Conclusion: In this first Swiss study, we obtained a rate of premalignant/malignant incidentaloma of 1,1%, which corresponds to the lowest limit reported in the literature. Frequently involved regions were the thyroid gland, the colorectal region, lymph nodes and the lungs.

PO65

Quantifacation of tumor-to-normal tissue ratios with Tc-99m MAA SPECT/CT prior SIRT

J. Bertholet, L. Vionnet, F. Camus, S. Gnesin, J. Prior, A. Boubaker, P. Bize, A. Denys, A. Bay, F. Verdun, S. Baechler; Lausanne

Purpose: Selective Internal Radiation Therapy (SIRT) using SPECT/CT imaging (with Tc-99m-labeled MAA injected intrahepathically to detect extrahepatic shunting to lung and gastrointestinal tract) is promising in the treatment of hepatic malignancies. It however depends on a reliable relative quantification of the activity. This study proposes a methodology for improving the quantification of tumor-to-normal tissue activity ratio (T/N).
Methods and Materials: We imaged the KYOTOKAGAKU phantom mimicking an adult standard liver with 3 metastatic spheres on a SPECT/CT (Infinia Hawkeye 4, GE Healthcare). Data were acquired for 3 different T/N ratios and reconstructed with 52 different methods using a Xeleris workstation (GE Healthcare). We varied the reconstruction algorithms, the filter, the cutoff frequency, the attenuation and diffusion correction, and the iteration-subset product when applicable. Accuracy of relative quantification was assessed in terms of relative recovery coefficients defined as the ratio between observed and true sphere-to-background activities. 3 calculation methods: SUVmax and SUVmean on anatomic ROIs, SUVmean on small ROIs are used.
Results: OSEM reconstructions with Butterworth filter, a high iteration-subsets product: 4x8 and the use of attenuation correction gave the best results. The cutoff frequency and the use of diffusion correction will be discussed. Count density assessed with the SUVmean-like method on small ROIs was optimal except for small spheres (<5 ml) where the SUVmax-like method gave better results.
Conclusion: The methodology proposed is a first step to improve relative quantification with SPECT/CT, and is clinically relevant to accurately determine tumor-to-normal tissue ratios in SIRT planning. More investigations are required to improve absolute quantifications.

Legend

SS SGR-SSR: Scientific Session and Joint SGR-SSR/SGNM-SSNM Scientific Session
NSS SGNM-SSMN: Scientific Session
PO SGR-SSR and SGNM-SSNM Poster Session

LUZERN 2013

www.radiologiekongress.ch

Schweizerischer Radiologiekongress
Congrès Suisse de Radiologie
Swiss Congress of Radiology

KKL Kultur- und Kongresszentrum Luzern
30. Mai – 1. Juni 2013

SGR SSR 100 Jahre 100 Ans 100 Years

100. Jahreskongress SGR-SSR
100ème Congrès annuel SGR-SSR

SGNM SSMN

13. Jahreskongress SGNM
13ème Congrès annuel SSMN

67. Jahreskongress SVMTRA
67ème Congrès annuel ASTRM

36. Jahreskongress SGPR
36ème Congrès annuel SSRP

15. Generalversammlung SGRRC
15ème Assemblée générale SSRCR

SSCVIR

12. Jahresversammlung SSCVIR
12ème Assemblée annuelle SSCVIR

Guest Society

Schweiz. Gesellschaft für Senologie
Société Suisse de Sénologie

Celebrating 100 Years of SGR-SSR

Picture: Luzern Tourism