Montreux
2014

Schweizerischer Radiologiekongress
Congrès Suisse de Radiologie
Swiss Congress of Radiology

Montreux Music & Convention Centre (2m2c)
12. – 14. Juni 2014

Online
Abstract Book

des Schweizerischen Radiologiekongresses

du Congrès Suisse de Radiologie

of the Swiss Congress of Radiology

www.radiologiekongress.ch

Table of Contents

Dear Delegates and Visitors of the Swiss Congress of Radiology 2014, Dear Colleagues!

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

This "Online Abstract Book of the Swiss Congress of Radiology" is the 4th issue which is solely published online. Our society members appreciate the new form as 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 all over the world.

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. It includes all the abstracts of the scientific talks and posters presented at the annual Swiss Congress of Radiology in Montreux.

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 2014, Montreux. Online Abstract Book

We look forward to welcoming you to the Swiss Congress of Radiology 2014 in Montreux.

PD Dr. G. Andreisek, MBA

Member Scientific Committee SGR-SSR

Prof. Dr. D. Weishaupt

President Scientific Committee SGR-SSR

Swiss Congress of Radiology 2014, Montreux

Congress President
R. Meuli, Lausanne

SGR-SSR Executive Board

President
S. Duewell, Frauenfeld

Past President
R. Kubik-Huch, Baden

Secretary
U. Wolfensberger, Horgen

Treasurer
T. Roeren, Aarau

Assessors
B. Allgayer, Luzern
D. Weishaupt, Zürich
C. Becker, Genève
T. Jung, Zürich
C.H. Benoit, Zürich
H.-M. Hoogewoud, Fribourg
H. Alkadhi, Zürich

SGR-SSR Scientific Committee

President
D. Weishaupt, Zürich

Members
G. Andreisek, Zürich
M. Anooshiravani-Dumont, Genève
M. Becker, Genève
G. Bongartz, Basel
J. Bremerich, Basel
K.-O. Lövblad, Genève
R. Meuli, Lausanne
S. Schmidt, Lausanne
H. Thoeny, Bern

Representative SGPR
G. Eich, Aarau

Representative SSVCIR
S. D. Qanadli, Lausanne

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

mci

**Congress Organisation Company
and Exhibition Management**
MCI Schweiz AG
Flughofstrasse 54
CH-8152 Glattbrugg
Phone   +41 44 809 42 85
Fax   +41 44 809 42 01
E-Mail   info@radiologiekongress.ch
Website www.radiologiekongress.ch

Abstract Reviewing Panel SGR-SSR

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

Abstract Reviewing Panel SGNM-SSMN

L. Giovanella, Bellinzona
P. Kaufmann, Zürich
P. Koch, Zürich
T. Krause, Bern
J. Müller, St. Gallen
E. Nitzsche, Baden
J. Prior, Lausanne
K. Strobel, Luzern
D. Wild, Basel
M. Wissmeyer, Genève

Poster Jury

F. Becce, Lausanne
G. Bongartz, Basel
J. Bremerich, Basel
A. Christe, Bern
O. Donati, Zürich
M. A. Fischer, Zürich
G. Goerres, Solothurn
P. Knüsel, Chur
K.-O. Lövblad, Genève
J.-Y. Meuwly, Lausanne
L. Merlini, Genève
P. Mosimann, Lausanne
P.-A. Poletti, Genève
S. Wildermuth, St. Gallen
R. Wyttenbach, Bellinzona

SS101

Use of diffusion weighted imaging (DWI) in PET/MRI for head and neck cancer evaluation

M. Araujo Queiroz, M. Hüllner, F. Kuhn, C. Meerwein, G. Huber, S. Kollias, G. K. von Schulthess, P. Veit-Haibach; Zürich

Purpose: Analyze whether Diffusion-Weighted Imaging (DWI) adds significant information to PET/MRI on lesion detection and characterization in head and neck cancers.

Methods and Materials: Seventy patients with different head and neck were enrolled in this prospective study. All patients underwent sequential contrast enhanced (ce) PET/CT and cePET/MRI using a tri-modality PET/CT-MR setup either for staging or re-staging. First, the DWI alone was evaluated, then the PET/MRI with conventional sequences and in a third step, the PET/MRI with DWI was evaluated. McNemar's test was used to evaluate differences in the accuracy of PET/MRI and DWI compared to the standard of reference.

Results: One hundred and eighty-eight (188) lesions were found, of those 118 were malignant and 70 were benign. PET/MRI as well as DWI detected 120 concurrent lesions, PET/MRI alone identified 48 additional lesions, DWI detected 20 different lesions. However, lesions detected on DWI did not change overall staging. SUV maximum and mean were significantly higher in malignant lesions than in benign lesions. DWI parameters between malignant and benign lesions were not statistically different.

Conclusion: DWI is not needed in PET/MRI protocols for head and neck cancer detection or lesions characterisation.

SS102

Fast and perfectly registered multi-contrast whole body MRI in a single run for PET/MR imaging

B. Delattre[1], P. Koken[2], C. Stehning[2], H. Eggers[2], S. Heinzer[3], G. Mens[4], P. Börnert[2]; [1]Genève, [2]Hamburg/DE, [3]Zürich, [4]Best/NL

Purpose: With the recent introduction of hybrid modalities such as PET/MR, whole-body MRI reinforces its importance in the evaluation of oncologic patients and shows its complementarity to FDG-PET imaging. Whole-body MRI typically includes different contrasts, acquired in several breath-holds with several table movements. Resulting images are potentially misregistered since the breath-hold position differs between multiple breath-holds.

Our purpose is to propose a flexible whole-body MRI protocol using an interleaved multi-station approach in which T_1 and T_2 weighted images are acquired in the same breath-hold with a single table movement, allowing a significant reduction in scan time and improvement in confidence in image interpretation.

Methods and Materials: A new framework was developed to interleave different sequences at almost arbitrary granularity which further simplifies workflow. Experiments were performed on volunteers with three sequences, a 3D T_1-weighted mDIXON, a single-shot T_2-weighted TSE and a diffusion-weighted sequence using a Philips Ingenuity TF PET/MR.

Results: The new protocol ran successfully and provided perfectly registered whole-body images, in particular of the mDIXON and T_2-weighted images in the abdomen. Total scan time for one stack was 1 min 51 where 100% of the time was spent on imaging, in contrast to the conventional protocol which was 27% longer (2 min 21) and required 2 breath-holds for the acquisition of the mDIXON and the T_2-weigthed images (with only 80% of the time spent on imaging).

Conclusion: The proposed framework enhances whole-body MRI for oncologic staging and follow-up of patients notably in the context of PET/MR where registration of images is crucial for interpretation and attenuation correction.

SS103

PET/MR imaging for liver metastasis detection: Protocol requirements and diagnostic accuracy

P. Stolzmann, C. S. Reiner, L. Husmann, I. A. Burger, M. Hüllner, N. Schaefer, G. K. von Schulthess, P. Veit-Haibach; Zürich

Purpose: To compare the accuracy of positron emission tomography (PET)/magnetic resonance imaging (MR) with 18–2-fluoro-2-deoxy-d-glucose (FDG)-PET/computed tomography (CT) and to determine mandatory MRI sequences for the detection of liver metastasis using trimodality PET/CT-MRI.

Methods and Materials: Fifty-five patients (22 women; 61±11 years) with suspected liver metastases from gastrointestinal cancer were included in this single-center, IRB-approved study. Imaging using trimodality PET/CT-MRI (time-of-flight PET, 3T-MRI) comprised PET, low-dose CT, contrast-enhanced (CE) CT of the abdomen, and MRI with T1w/T2w, diffusion-weighted (DWI), and dynamic CE sequences. Two readers evaluated the following image sets for liver metastasis: PET/CT (dataset A); PET/CECT (B); PET/MRI including T1w/T2w (C); T1w/T2w with DWI (D) or CE imaging (E); and a combination thereof (F). The accuracy was determined by receiver-operating-characteristic analysis using B as the reference.

Results: Of 120 liver lesions in 21/55 patients (38%), 79 were malignant (76%); 63/79 demonstrated abnormal FDG-uptake (80%). Accuracies were 0.937 (95% CI: 89.5–97.9%) for image set A, 1.00 (95% CI: 99.9–100.0%) for C, 0.998 (95% CI: 99.4–100.0%) for D, 0.997 (95% CI: 99.3–100.0%) for E, and 0.995 (95% CI: 99.0–100.0%) for F. Differences were significant for D-F (P<0.05) when including lesions without abnormal FDG-uptake. As proven by follow-up imaging, image sets D and both E and F detected metastases in 1 and 3 patients, respectively, and further metastases in the contralateral lobe in 2 patients negative on PET/CECT (P=0.06).

Conclusion: PET/MRI with T1w/T2w sequences results in similar diagnostic accuracy for liver metastases detection as compared with PET/CECT. To significantly improve characterization of liver lesions, we recommend imaging with dynamic CE sequences.

SS104

Head to head comparison of abdominal binding 18F-FDG PET/CT versus magnetic resonance imaging in metastatic liver lesions

V. Soubeyran, J. Feilchenfeldt, J.-P. Coppey, C. Constantin, M. E. Kamel; Sion

Purpose: To investigate the performance of abdominal-binding ^{18}F-FDG PET/CT in identifying metastatic liver lesions versus that of MRI.

Methods and Materials: 21 cancer patients were enrolled. All patients were subjected to abdominal-binding ^{18}F-FDG PET/CT and MRI no more than 2 weeks apart. Abdominal-binding free breathing PET/CT was achieved after applying a conventional abdominal binder over the right hypochondreal region. This approach was previously shown to improve the overall PET/CT performance through reducing the craniocaudal liver movements. Abdominal-binding ^{18}F-FDG PET/CT and MRI interpretations were done by different readers. The final diagnosis was established by histological examination or radiological follow-up (>6months).

Results: There were 55 liver lesions (45 metastases and 10 benign lesions). Thirteen (62%) of the 21 patients had liver metastases, whereas 8 (38%) patients were free from hepatic involvement by their cancers. On lesion based analysis, abdominal-binding PET failed to detect 4/45 (9%) metastases of 4 mm in 1 patient who had already other FDG avid liver metastases. These 4 lesions were detected by MRI. On the other hand, MRI mistook 3 microabscesses in sub-acute phase and 1 hemangioma for liver metastases in 2 patients. These 4 lesions did not show FDG accumulation and were successfully characterized by abdominal-binding PET as of benign nature. The overall sensitivity, specificity, and accuracy of abdominal-binding ^{18}F-FDG PET/CT were 91%, 100%, and 98%. Corresponding values of MRI were 100%, 64%, and 98%.

Conclusion: Abdominal-binding has the potential to improve the overall performance of ^{18}F-FDG PET/CT in the work-up of liver metastases versus that of MRI, showing comparable sensitivity and better specificity.

SS105

Initial staging of locally advanced rectal cancer and regional lymph nodes: Comparison of diffusion-weighted MR-imaging with ^{18}F-FDG PET/CT

M. Cerny, S. Schmidt, J. Prior, D. Hahnloser, R. Meuli, V. Dunet; Lausanne

Purpose: To compare diffusion-weighted MR-imaging (DWI) parameters with 2-deoxy-2-[^{18}F]fluoro-D-glucose positron emission tomography/computed tomography (FDG-PET/CT) in locally advanced primary rectal tumour.

Methods and Materials: Seventeen patients with histologically confirmed and locally advanced untreated rectal adenocarcinoma (T3 and T4) were prospectively enrolled from October 2012 to June 2013. All the patients underwent a whole body 1.5T DWI MRI (b0, b1000) and a whole body FDG-PET/CT within the same week. FDG-PET/CT was considered as the standard reference. In consensus, two independent readers measured maximum and mean FDG standardized uptake values (SUV$_{max}$ and SUVmean) of the rectal tumour and of the pathologic regional lymph nodes on PET/CT and compared these values to minimum and mean values of apparent diffusion coefficient (ADCmin and ADCmean), displayed on maps generated from DWI.

Results: Regarding to the tumour (n=17), we found a significant negative correlation between SUVmean and the corresponding ADCmean values (Spearman's rho=−0.63, p=0.006) and between ADCmin and SUV$_{max}$ (Spearman's rho=−0.55, p=0.02). Regarding to the lymph nodes (n=28), ADCmean showed a significant negative correlation with the corresponding SUVmean values (Spearman's rho=−0.42, p=0.03). There was no significant correlation between ADCmin and SUV$_{max}$.

Conclusion: Our significant negative correlations between ADC and SUV suggest an association between tumour cellularity and metabolic activity in primary untreated rectal adenocarcinoma. Further studies are needed to determine, if DWI can predict histopathological response of the tumour to neoadjuvant chemoradiation.

SS106

Integrated ^{18}F-FDG PET/Perfusion CT for the monitoring of neoadjuvant chemoradiotherapy in rectal carcinoma: Correlation with histopathology

M. A. Fischer[1], B. Vrugt[1], H. Alkadhi[1], D. Hahnloser[2], T. Hany[1], P. Veit-Haibach[1]; [1]Zürich, [2]Lausanne

Purpose: To prospectively monitor changes in the flow-metabolic phenotype (ΔFMP) of rectal carcinoma (RC) after neoadjuvant chemoradiotherapy (CRT) and to evaluate whether ΔFMP of RC correlate with histopathological prognostic factors including response to CRT.

Methods and Materials: Sixteen patients with RC (12 men; mean age, 60.7±12.8 years) underwent integrated ^{18}F-FDG PET/Perfusion-CT (PET/P-CT), followed by neoadjuvant CRT and surgery. In 13 patients, PET/P-CT was repeated after CRT. Perfusion (BF, BV, MTT) and metabolic (SUV$_{max}$, SUVavg) parameters as well as the FMP (BF x SUV$_{max}$) were determined before and after CRT by two independent readers and correlated to histopathological prognostic factors of RC (microvessel density, necrosis index, regression index, vascular invasion) derived from resected specimens. Diagnostic performance of ΔFMP for prediction of treatment response was determined.

Results: FMP significantly decreased after CRT (P<.001), exploiting higher changes after CRT as compared to changes of perfusion and metabolic parameters alone. Before CRT, no significant correlations were found between integrated PET/P-CT and any of the histopathological parameters (all, P>.05). After CRT, BV and SUV$_{max}$ correlated positively with the nectrotic index (R=.67/.70), SUV$_{max}$ with the invasion of blood vessels (R=.62) and ΔFMP with the regression index (R=.88; all, P<.05). ΔFMP showed high accuracy for prediction of histopathological response to CRT (AUC, 0.955; 95% CI: 0.833, 1.000; P<.01) using a cut-off value of -75 mL/100 mg/min.

Conclusion: In RC, ΔFMP derived from integrated ^{18}F-FDG PET/Perfusion CT is useful for monitoring the effects of neoadjuvant CRT and allows prediction of histopathological response to CRT.

SS107

[^{11}C] Choline PET/CT predicts prostate cancer specific survival in patients with biochemical failure during ADT

G. Giovacchini[1], M. Picchio[2], R. Garcia-Parra[3], A. Briganti[2], F. Abdollah[2], L. Gianolli[2], C. Schindler[4], F. Montorsi[2], C. Messa[3], F. Fazio[2]; [1]Zürich, [2]Milano/IT, [3]Monza/IT, [4]Basel

Purpose: Even though [^{11}C] choline PET/CT has been widely used for restaging prostate cancer (PCa) patients with biochemical failure, the prognostic implications of [^{11}C] choline PET/CT are currently unknown.

Methods and Materials: This retrospective study included 195 PCa patients treated with radical prostatectomy that underwent [^{11}C] choline PET/CT from December 1st, 2004 to July 31st, 2007 owing to biochemical failure during androgen deprivation therapy (ADT). PCa-specific survival was computed as the interval from radical prostatectomy to PCa-specific death.

Results: Median interval after radical prostatectomy was 8.9 years (95% CI, 1.7–18.9 years). [^{11}C] choline PET/CT was positive in 57% of patients. Median PCa-specific survival was 16.4 years (95% CI, 14.0–18.8 years) in patients with negative [^{11}C] choline PET/CT and 11.2 years (95% CI, 9.8–12.6 years) in patients with positive [^{11}C] choline PET/CT (log Rank: Chi-Square=19.3, P<0001). At multivariate analysis, statistical significance was obtained for [^{11}C] choline PET/CT (HR=2.53, 95% CI, 1.41–4.53, P=0.002), PSA (HR=1.03, 95% CI, 1.00–1.05, P=0.037), and Gleason score (Gleason score >7: HR=2.49, 95% CI, 1.25–4.95, P=0.009). Patients with pathological [^{11}C] choline uptake in the prostatic bed or in pelvic or retroperitoneal lymph nodes had longer PCa-specific survival (median=12.1 years, 95% CI: 10.5–13.7 years) in comparison to patients with pathological tracer uptake in the skeleton (median=9.9 years, 95% CI: 6.8–13.1 years) (log-rank: P=0.010).

Conclusion: [^{11}C] choline PET/CT allows stratification of PCa-specific survival in PCa patients treated with radical prostatectomy that develops biochemical failure during androgen deprivation therapy. If independent confirmation of these findings is obtained, [^{11}C] choline PET/CT might be more widely used in the follow-up of PCa patients for tailoring salvage therapy.

SS108

CT guided biopsy based on FDG PET/CT findings in a dedicated cancer centre

A. Leimgruber, W. F. E. Lau, R. Hicks; East Melbourne/AU

Purpose: To compare our results on CT-guided biopsies with or without FDG PET/CT information in cancer patients.

Methods and Materials: All CT-guided percutaneous biopsies performed in a dedicated cancer center in 2012 were retrospectively reviewed. The indications and results were compared between biopsies that were performed within 6 weeks of an FDG PET/CT (PET group) to biopsies performed without (non-PET group). Each PET group case was attributed to a PET-assisted category if PET information was considered crucial in PET planning.

Results: Ninety-three CT-guided biopsies were reviewed in 89 patients (58 male and 31 female), median age of 66 (range 29–92). Fifty-seven (61%) were attributed to the PET group. The median time period between the preceding PET/CT and biopsy procedure was 2 weeks (range 0–39 days).

The adequate sampling rate was 93% (53/57) for the PET group and 89% (32/36) for the non-PET group. The sensitivity of malignancy detection in diagnostic samples was 92% (49/53) for the PET group and 81% (26/32) for the non-PET group respectively.

In the PET group, the metabolic information provided by PET was considered crucial in biopsy targeting in 20 (35%) cases, classified as (1) CT-occult (9 cases, 45%, 7 of which in bone), (2) disease heterogeneity (8 cases, 40%) and (3) confirming equivocal CT lesion (3 cases, 15%).

Conclusion: PET-assisted CT guided biopsy is reliable, provides high diagnostically representative sample and a high sensitivity of confirming malignant disease. It may optimize the diagnostic yield of biopsy procedures in specific cases.

SS109

The value of US-guided biopsy of FDG-PET-positive supraclavicular lymph nodes in patients with suspected lung cancer

L. Werner, K. Tornquist, O. Gautschi, J. Diebold, M. Pérez Lago, K. Strobel; Luzern

Purpose: To investigate the value of ultrasound-guided biopsy of FDG-PET-positive supraclavicular lymph nodes in patients with suspected lung cancer.

Methods and Materials: 10 patients with suspected lung cancer and FDG-PET-positive supraclavicular lymph nodes underwent ultrasound-guided fine needle biopsy (n=8) and/or core biopsy (n=7). Cytologic and/or histologic evaluation was performed to confirm initially suspected diagnosis (lung cancer) and to confirm N3 stage.

Results: Ultrasound-guided biopsy of supraclavicular LN was diagnostic in all 10 patients (100%). FNB was positive in 88% and core biopsy in 83%. Cytology/histology showed 1 (10%) SCLC, 6 (60%) adenocarcinomas, 1 (10%) squamous cell carcinoma, 1 (10%) undifferentiated NSCLC and 1 (10%) sarcoidosis. Mean size of the biopsied lymph nodes was 14.3 mm (range from 10 mm to 21 mm). No intervention related complications occured and no additional invasive procedures were necessary.

Conclusion: Ultrasound-guided combined FNB and core biopsy of PET-positive supraclavicular lymph nodes in patients with suspected lung cancer is a safe and effective procedure to confirm N3-stage and to obtain representative histology for therapy planning.

Cardiovascular Imaging and Interventions

SGR Orals

SS110

Impact of contrast agent viscosity and temperature on the aortic enhancement profile in CT angiography: A phantom study

M. Benz[1], J. M. Fröhlich[2], U. Würtemberger[1], G. Stadelmann[1], J. Janetzki[1], S. Erdmann[3], G. Bongartz[1], S. T. Schindera[1]; [1]Basel, [2]Zürich, [3]Ulm/DE

Purpose: To analyze the effect of contrast agent (CA) viscosity and temperature on aortic enhancement characteristics in CT-angiography (CTA) in a phantom.

Methods and Materials: A custom-made, physiologic CT flow-phantom was built to simulate the cardiovascular system in a medium-sized adult. To analyze the effect of CA viscosity on aortic enhancement seven CA were injected both at a rate of 4 ml/s and 6 ml/s at 37°C (CT-Motion, Ulrich Medical) (Iobitridol, Xenetix 300 and 350, Guerbet; Iomeprol, Iomeron 300, 350, and 400, Bracco; Iodixanol, Visipaque 320, GE Healthcare; Iopromide, Ultravist 370, Bayer) (viscosity: 4.5–12.6 mPa.s at 37°C). To investigate the effect of CA temperature on aortic enhancement, two CA (Xenetix 300, Iomeron 400) were injected at a rate of 4 ml/s and 6 ml/s at three different temperatures (22°C, 30°C, and 37°C), respectively. Dynamic CT-images (Somatom Definition Flash, Siemens) were acquired after CA injection with a temporal resolution of 1 image per second for 50 seconds. Peak aortic enhancement (PAE) and the duration of aortic enhancement ≥200 HU (AE200) were measured.

Results: PAE and AE200 are ranked in accordance to iodine delivery rate with the lowest attenuations measured for Iomeron 300 and the highest for Iomeron 400. CA of identical iodine concentrations but varying viscosity reveal comparable aortic enhancement curve profiles (Xenetix and Iomeron 300: viscosity: 6.0 and 4.5 mPa.s; PAE: 321 and 316 HU; AE200: 10 s, respectively at 6 ml/s). CA at different temperatures showed similar aortic enhancement curve profiles.

Conclusion: Neither CA viscosity nor temperature impact aortic enhancement curve profile in CTA.

SS111

Performance of ultra high-pitch dual-source CT for coronary CT angiography: First ex-vivo and patient experience

F. Morsbach, S. Gordic, D. B. Husarik, T. Frauenfelder, H. Alkadhi; Zürich

Purpose: To evaluate the image quality, required heart rate, and radiation dose of ultra high-pitch dual-source CT coronary angiography (CTCA) with prospective ECG-gating.

Methods and Materials: The first study part included an phantom study using a cardiac motion phantom simulating heart rates from 60 to 90 bpm in 5 bpm-steps, which was scanned on a third-generation dual-source 192-slice CT scanner (Somatom Force) with a pitch of 3.2 and a gantry rotation time of 250 ms. Subjective image quality regarding motion artifacts was interpreted on a Likert-scale (1: excellent; to 4: not acceptable). Object distortion was assessed by a calculated distortion vector d ($d=\sqrt{(x^2+z^2}$; (x=outer diameter; z=length). The second study part included 20 consecutive patients (mean age 53 years) undergoing clinically indicated CTCA using the same CT machine and protocol settings. Radiation dose parameters were recorded.

Results: In the phantom, image quality was diagnostic up to 75 bpm and non-diagnostic at higher heart rates. Object distortion correspondingly increased from 0 cm to 1 cm (±0.5 cm) at 80 bpm and above. Patients had a mean heart rate of 63 bpm (range 47–68 bpm). Coronary segments were of diagnostic image quality in all patients. Average effective radiation dose was 0.68 mSv (2.4 mGy [CTDI$_{vol}$]).

Conclusion: Our combined phantom and *in-vivo* study indicates that CTCA with third-generation dual-source 192-slice CT can be performed with a high-pitch and fast gantry rotation time at heart rates up to 75 bpm, at an average radiation dose of 0.68 mSv.

SS112

High-pitch coronary CT angiography with third generation dual-source CT: Limits of heart rate

S. Gordic, D. B. Husarik, E. Lauk, T. Frauenfelder, H. Alkadhi; Zürich

Purpose: To prospectively determine, in patients undergoing high-pitch CT-angiography (CTA) of the aorta, the average heart rate (HR) and heart rate variability (HRV) required for diagnostic imaging of the coronary arteries with third-generation dual-source CT.

Methods and Materials: Fifty consecutive patients (mean age 66±12 years) underwent CTA of the thoracic (n=15) and thoracoabdominal (n=35) aorta with third-generation dual-source 196-slice CT (Somatom Force, Siemens) with prospective ECG-gating at a pitch of 3.2. No β-blockers were administered prior to CT. The motion artifacts of the coronary arteries were graded on a 5-point scale. HR and HRV before and during data acquisition were noted.

Results: The average HR was 72.4±21.0; the HRV was 10±11 bpm. Diagnostic image quality was found for 728 of the 800 segments (91%) in 34 of 50 patients (68%). In 32% of the patients, image quality was non-diagnostic for at least one segment. HR (p=.001) and HRV (p<.05) were significantly higher in patients with at least one non-diagnostic segment compared to those without. All patients with a HR ≤ 69 bpm and HRV ≤ 14 bpm had diagnostic image quality in all coronary segments. The average scan times were 0.54±0.08 s for thoracic and 1.0±0.03 s for thoracoabdominal CTA.

Conclusion: With third-generation dual-source 192-slice CT, coronary CTA in the prospectively ECG-gated high-pitch mode yields diagnostic image quality of the coronary arteries at a HR ≤ 69 bpm and HRV ≤ 14 bpm.

SS113

Automated attenuation-based tube voltage selection for body CTA with third-generation dual-source CT and advanced iterative reconstruction: Radiation dose and image quality

A. Winklehner, S. Gordic, E. Lauk, T. Frauenfelder, H. Alkadhi, D. B. Husarik; Zürich

Purpose: To assess radiation dose and image quality in body CT-angiography (CTA) with automated attenuation-based kilovoltage selection (CarekV) with third-generation dual-source CT (DSCT).

Methods and Materials: 50 patients (mean age 71 years) underwent body CTA with CarekV (ref. kVp 100, ref.mAs 90) using third-generation DSCT (Somatom Force, Siemens) which allows for tube voltage levels from 70–150 kVp at 10 kVp steps. All patients underwent previous body-CTA with 64-slice CT and CarekV using identical scan and contrast media protocols, within a median time interval of 5 months, serving for comparison. Images were reconstructed with advanced iterative reconstruction (ADMIRE strength 3 on third-generation DSCT; SAFIRE strength 3 on previous scans). Image quality was assessed semi-quantitatively (score 1: excellent, score 5: non-diagnostic). Aortic and psoas attenuation were measured at four levels of the aortoiliac system; noise and contrast-to-noise ratio (CNR) were determined. The CT dose index (CTDI$_{vol}$) was compared among scans.

Results: Image quality was similar (p=0.17), all datasets being of diagnostic quality. Mean attenuation and CNRs were higher in images obtained with third-generation DSCT (attenuation: 365±35 HU vs. 260±52 HU, p<0.01; CNR: 30±6 HU vs. 16±6 HU, p<0.01). With third-generation DSCT, selected tube voltage decreased in 40 (80%) patients by 10 kVp, increased in 5 (10%) patients (by 10 kVp), and remained similar in 5 (10%) patients. CTDI$_{vol}$ was lower with third-generation DSCT (4.3±1 mGy vs. 5.4±1 mGy, p<0.01).

Conclusion: Using third-generation DSCT with CarekV in body CTA results in a higher aortic attenuation and CNR as compared to previous 64-slice CT with CarekV, with a further dose reduction of 21%.

Online Abstract Book of the Swiss Congress of Radiology

9

SS114

T1-mapping of the right-ventricular myocardium

N. Kawel-Boehm[1], T. Dellas Buser[2], A. Greiser[3], O. Bieri[4], J. Bremerich[4], F. Santini[4]; [1]Chur, [2]St. Gallen, [3]Erlangen/DE, [4]Basel

Purpose: Cardiac T1-mapping with MRI enables quantification of diffuse myocardial fibrosis of the left-ventricular (LV) myocardium. Mapping of right-ventricular (RV) myocardium, however, is difficult because RV myocardium is thinner. The purpose of this study is to test feasibility of T1-mapping of the (RV) myocardium at systole when myocardium is thicker and to determine the optimal imaging plane.

Methods and Materials: 20 healthy volunteers (11 men; 33±8 years) were imaged on a 1.5T scanner. A modified Look-Locker Inversion-Recovery sequence (MOLLI) was acquired at mid-ventricular short axis (SAX), as horizontal long-axis (HLA) view and as transversal view at systole (mean trigger time 363±37 ms). Myocardial T1-time of the LV and RV myocardium was measured within a region of interest (ROI) on generated T1-maps. The most appropriate imaging plane for the RV was determined by the ability to draw a ROI including the largest amount of myocardium without including adjacent tissue or blood.

Results: At systole, when myocardium is thicker, measurements of the RV myocardium were feasible in 18/20 subjects. In 10/18 volunteers SAX was the most appropriate imaging plane for the RV (p=0.034). Average T1-time of the RV myocardium was 1016±61 ms, and of the LV it was 956±25 ms (p<0.001).

Conclusion: T1-mapping of the RV myocardium is feasible during systole but with a small ROI only. SAX plane was the optimal imaging plane in the majority of subjects. Native myocardial T1 time of the RV is significantly longer compared to the LV, which might be explained by the naturally higher collagen content of the RV.

SS115

Extracardiac findings on cardiac magnetic resonance

V. Dunet, H. Barras, X. Boulanger, S. D. Qanadli, R. Meuli, J. Schwitter, C. Beigelman; Lausanne

Purpose: Cardiac Magnetic Resonance (CMR) is performed in daily practice to assess acute and chronic Heart Disease. Clinically relevant incidental extra-cardiac findings (IEFs) may also be discovered. Our aim was to determine the frequency of IEFs in non-selected patients of our institution.

Methods and Materials: We consecutively included 762 pts (mean age 56±18 y, 247W:515M) addressed to our CMR center between August 2011 and September 2013. All underwent a CMR study including T2W HASTE and post-gadolinium T1W VIBE coronal+transverse sequences, which were prospectively reviewed for minor and major IEFs by two experimented thoracic radiologists blinded for any previous imaging study. Previous imaging studies were secondarily analyzed to classified IEFs as known or unknown, and complementary imaging asked to confirm or infirm new major IEFs.

Results: Of 762 patients 440 (57.7%) had a total of 731 IEFs whom 368 (50.3%) were unknown. Two hundred thirty-nine patients (31.4%) had a total of 304 major IEFs and 201 patients (26.4%) only minor IEF. Liver (137/731), kidneys (107/731) and lung parenchyma (100/731) were the three most frequently concerned organs. Of 304 major IEFs 164 (54%) were unknown. Seventy-three suspected major IEFs were explored and only 20 were confirmed, 91/304 (30%) suspected major IEFs remaining unexplored to date. Interestingly of 164 IEFs, 4 pulmonary embolisms (2.4%) and 3 tumors (1.8%) were confirmed.

Conclusion: Liver, kidneys and lung parenchyma are the structures the most commonly concerned by IEFs. However, pulmonary embolism accounts for 2.4% of unknown IEFs. A systematic reading method including pulmonary vessel analyses is thus mandatory.

SS116

Evaluation of computational wall stress analysis as an additional characterisation tool of small infrarenal abdominal aortic aneurysms

L. Jost, T. D. L. Nguyen-Kim, T. Pfammatter, T. Frauenfelder; Zürich

Purpose: To evaluate the impact of computational wall stress analysis in computed tomography (CT) of ruptured and not-ruptured small infrarenal abdominal aortic aneurysms (AAA) with a diameter of approximately 55 mm as an additional predictor for rupture.

Methods and Materials: 24 patients (median age 72 years) with small infrarenal AAA (mean diameter 52.92±5.2 mm) underwent CT-angiography of the abdomen. Two groups were formed: group1 (9 patients with acute clinical symptoms and ruptured AAA), group2 (15 patients without clinical symptoms and not-ruptured AAA). Using dedicated software (A4clinics VASCOPS) structural analysis of the infrarenal AAA with the finite element method was performed evaluating exterior and luminal diameter, intraluminal thrombus (ILT) thickness, vessel-, luminal- and ILT-volume, peak wall stress (PWS), peak wall rupture risk (PWRR). Additionally the mises-stress and rupture risk-index in the ILT were calculated. Non parametric tests were used for comparison of the two groups.

Results: The maximum exterior diameter, mean total vessel-volume and ILT-thickness did not significantly differ between both groups (group1: 53.6±6.1 mm, 133.3±38.5 cm³, 11.3±9.1 mm; group2: 53.3±5.2 mm, 123.3±52.2 cm³, 14.9 mm±8.3 mm, [p>0.11]). The maximum luminal-diameter and luminal-volume was significantly lower for group2 (group1:47.9±21.9 mm, 70.9±27.4 cm³; group2:39.2±7.5 mm, 54.6±21.7 cm³, p≤0.046), whereas the ILT-volume was significantly higher (group1:42.0±32.1 cm³; group2:51.9±34.1 cm³, p=0.047). In group1 ILT mean/maximum mises-stress (group1:6.3±2.4 kPa/24.5±12.5 kPa; group2:5.6±0.4 kPa/20.1±5.2 kPa) and maximum rupture risk-index (group1:0.41±0.2; group2:0.32±0.08) were significantly higher (p<0.041). Mean PWS and PWRR were lower in group2 (group1:105.9±24.1 kPa; 0.24±0.09; group2:101.4±35.3 kPa; 0.28±0.07), but not significantly different.

Conclusion: In patients with equal small AAA diameters the ILT-volume and the finite element analysis may serve as additional predictors for risk-stratification.

SS117

Hemostatic embolization of spontaneous intramuscular abdominal and pelvic hemorrhages – our experience

Y. Lachenal, S. Breault, F. Doenz, S. D. Qanadli; Lausanne

Purpose: To report our experience of transarterial embolization (TAE) in the management of spontaneous intramuscular hematoma (SIH).

Methods and Materials: Between May 2005 and January 2013, 27 patients have been treated with TAE for SIH. Indication to TAE was made according to an institutional decision tree, which divides SIH in three different types regarding patient clinical history, imaging and medication. Type 2 and type 3 were considered for TAE. Clinical data, co-morbidities, medication, imaging studies, interventions, complications and outcome of all patients were recorded and analyzed.

Results: Twenty-one (78%) patients had type 3 SIH. Two (7.5%) patients were type 2b and two (7.5%) type 2c. 15 (56%) patients showed hemodynamic instability at diagnosis. All of them were embolized. Four (15%) patients were classified as type 2a and managed conservatively before moved to type 2b and be embolized. All patients had coagulation troubles from medication or co-morbidities. CT angiography showed active bleeding in 21 (78%) patients and ruptured muscular fascia in 21 (78%) patients. Angiography showed active hemorrhage in 19 (70%) patients. A total of 41 arteries have been embolized. TAE technical success was 100%. Clinical success was 74%. Seven (26%) patients needed a second angiography and 5 (19%) a second TAE. Two patients (7.5%) needed a third TAE. Eight patients (30%) died at 30 days, with 3 (11%) as direct consequence of hypovolemic shock.

Conclusion: TAE for SIH is safe and efficient. Mortality rate is high as patients are often fragile. Indications to TAE should be risen earlier when patients are still stable.

SS118

Endovascular treatment of pulmonary arterio-venous malformations in Rendu-Osler disease

M. Babaker, S. Breault, F. Glauser, F. Doenz, C. Beigelman, S. D. Qanadli; Lausanne

Purpose: To assess the efficiency and complications of vaso-occlusion of pulmonary arterio-venous malformations (PAVMs) in Rendu-Osler disease (HHT).

Methods and Materials: Twenty seven patients were investigated in our institution for HHT between March 2000 and November 2013. Sixteen (ten women, six men, mean age 59) presented with PAVMs and 11 were treated by vaso-occlusion with a total of 18 procedures. All procedures have been done under local anesthesia and consisted on PAVM exclusion using coils, plugs or combined approaches. Clinical data, immediate technical success, complications, CT follow-up studies were analyzed.

Results: A total of 35 PAVMs were treated: 19 by coils, 14 by plugs and 2 by combined treatment. Mean CT follow-up time was 41 months (1–164). No major complication was observed. One material distal emobilization was observed and treated during the same intervention (coil retrieval). Two PAVMs persisted after treatment (5.7%), both treated by plug embolization. One new PAVM was observed during follow-up.

Conclusion: Vaso-occlusion is the gold standard treatment for PAVMs with a minimal complication rate and low recurrences, whether by coils, plugs, or combined treatments.

Use of DoseWatch as a tool for the establishment of local DRLs

A. Carnicer Caceres[1], J.-C. Stauffer[2], R. Meuli[1], F. Verdun[1]; [1]Lausanne, [2]Fribourg

Purpose: The diagnostic reference levels (DRL) are often partially established from a compilation of values published in the literature, and they are likely to be collected in centres with well optimized procedures. Therefore such values might be not representative of the real practice in common hospitals. DoseWatch (GE Healthcare) is a web-based software for the automatic collection of medical examination data. We investigated the potential of DoseWatch as a support tool for setting local DRLs.
Methods and Materials: An extensive literature review was performed to collect recently published DRLs at an international level for IC procedures. In parallel, data from all available IC procedures and fluoroscopy machines at CHUV were retrieved from DoseWatch for a period of 6 months, and compared to the data published in Switzerland and other countries.
Results: Preliminary results show that DoseWatch data are from 10% to 40% higher than the last Swiss values. For the most common procedures (CA and PTCA), DoseWatch values are also above those published in other countries (45% to 60% for the DAP and 10% to 20% for the fluoroscopy time). Data were only comparable or lower to the US values for the DAP. We found a serious lack of harmonization in the exam type classification in DoseWatch.
Conclusion: DoseWatch provides a practical means to retrieve large amount of data representative of the current clinical practice, and is thus an adequate tool to help setting local DRLs. Improvements are still required, notably in the classification of exam types.

Dose optimisation in computed tomography (CT): To what extent the current DRL is helping us in daily practice

R. Le Coultre, M. Champendal, R. Meuli, F. R. Verdun; Lausanne

Purpose: The Diagnostic Reference Levels (DRL) should guide radiologists in optimizing their practice. We look for correlation between DRLs and our practice to verify the adequacy and pertinence of the current DRL concept.
Methods and Materials: We retrospectively assessed our local CT practice (2008–2012) using the tariffication system (TarMed). We then studied the combinations of the different anatomical regions examined together during a CT examination. Finally, we looked for correlations with the DRLs published by the FOPH in 2010.

Results:	2008–2012 Mean [MIN–MAX]	
Body Region	**Combined scans (%)**	**Separate scans (%)**
Neck	94 [93–96]	6 [4–7]
Chest	74 [72–76]	26 [24–28]
Upper Abdomen	91 [87–95]	9 [5–13]
Full Abdomen	57 [55–59]	43 [41–45]
Pelvis	88 [85–93]	12 [7–15]
Legs	91 [89–92]	9 [8–11]
Trunk area	**73 [72–74]**	**27 [26–28]**

Table 1

We noticed that a large percentage of procedures including the trunk (about 75%) are performed in combination with other anatomical regions (Table 1), in spite of the fact that most of the DRLs are only defined for a unique anatomical region.

	2008–2012 Mean		
	N(mean/year)	**Combined with Head**	**Combined with Chest**
Neck	2379	1507	815

Table 2

As an example, the neck, the frequency of combination with one or both adjacent regions is almost systematic (Table 2). In addition the current DRL are defined only for a single pass.
Conclusion: In their present form the DRL have a limited potential for patient dose optimization. The data we obtained could not only be used to improve the way the DRL are defined but they could also be used to improve the way procedures are named. This is of major importance in a context where automatic dose indicators collection softwares are being proposed by several manufacturers in the framework patient exposure quality control.

Towards a CT benchmarking in the framework of patient exposure optimization

J. Ott, A. Ba, A. Viry, I. Diaz, F. Bochud, F. R. Verdun; Lausanne

Purpose: Over the last decade CT technology has improved and iterative reconstruction algorithms led to changes in image perception. Thus, the aim of this work is to investigate the use of model observer in order to ensure an adequate level of image quality while keeping patient exposure as low as reasonably achievable.
Methods and Materials: For this study we used a specially developed low contrast phantom (QRM, Moehrendorf, Germany) containing targets of different sizes and contrasts (3 to 8 mm; 10 and 20 HU). The phantom was scanned at various $CTDI_{vol}$ levels (0.5 to 15 mGy). Images were reconstructed with Filtered Back Projection (FBP), Adaptive Statistical Iterative Reconstruction (ASIR), model based iterative reconstruction (VEO) and assessed by eight human observers, who performed 4-alternative forced-choice experiment. Two model observers were then applied: NPWE (Non-Prewhitening model with Eye-filter) and CHO (Channelized Hotelling Observer). The comparison was performed using Receiver Operating Characteristics (ROC) analysis.
Results: For a 5 mm and 20 HU target with 5.6 mGy CTDI and FBP reconstruction, the detectability for human was 4.08. NPWE and CHO gave respectively 1.78 and 3.60. Under the same conditions with ASIR, the values reached 4.65 for humans, 2.14 for NPWE and 5.64 for CHO. Switching to VEO the detectability reached 5.00 for humans, 2.22 for NPWE and 5.99 for CHO.
Conclusion: Both models reproduce the same behavior as humans. However NPWE underestimates the detectability, contrary to CHO. Observers and models agreed for a noticeable improvement in the detectability when switching from FBP to ASIR to VEO.

Impact of fully-integrated-digital-"Stellar®" detector on radiation dose and image noise in body CT examinations

K. Schawkat, J. Cullmann, T. Dobrocky, S. Puig; Bern

Purpose: To evaluate the impact of a new fully-integrated-digital detector (Stellar®, Siemens Healthcare) and a conventional "Ultra-Fast-Ceramic" (UFC) regarding image quality and potential reduction in radiation dose in a retrospective analysis.
Methods and Materials: We retrospectively evaluated consecutive routine CT scans performed on a dual source multi-detector CT (Somatom Definition Flash; Siemens Healthcare, Erlangen, Germany) before and after upgrade of the UFC to the Stellar-Detector. 265 routine body-CT examinations (chest, abdomen, thoracoabdominal) of 212 patients with a mean age of 61.6 years were included. The scan settings were kept the same before and after detector upgrade. Following parameters were evaluated: BMI, scan length, kVp, $CTDI_{vol}$ and dose-length-product (DLP). The effective radiation dose (ED) was estimated from the DLP and an organ weighting factor (k): ED [mSv] $\approx$ k × DLP [mGy×cm]. Image noise was assessed by measuring the mean standard deviation of Hounsfield units (HU) in circular regions of interest within the left liver lobe and in the air anterior to the patient.
Results: The estimated ED did not show significant differences (p=.8). In both groups kVp, BMI and total scan length were the strongest predictors for the estimated ED (p<.001). However, image noise was significantly reduced by 13.3% in the liver (p<.01) and 19.2% in the air (p=.04).
Conclusion: Changing the detector unit from a UFC solid-state detector to a fully-digital Stellar® detector leads to a significant decrease of image noise. A dose reduction could not be achieved without adjusting the scan settings.

SS123

Quality control in musculoskeletal radiology: Quality of reports of knee MR examinations in form, content and diagnosis

A. Rosskopf, A. Hirschmann, T. Dietrich, F. M. Buck, Ch. Pfirrmann; Zürich

Purpose: To evaluate the quality of reports of knee MR examinations in form, content and diagnosis in order to plan quality improvement measures.
Methods and Materials: Reports of 500 consecutive knee MR examinations were reviewed by board certified and fellowship trained musculoskeletal radiologists. Following criteria were assessed for form and content: orthographic and speech recognition errors, presence of a comparison to previous examinations, radiological conclusion and answer to clinical questions. All relevant anatomic structures were checked for presence in the report. Diagnostic content was categorized using a five-point scale: I: no deviation; II: undetected finding, clinically irrelevant; III: wrong interpretation of finding, clinically irrelevant; IV: undetected finding, clinically relevant; V: wrong interpretation of finding, clinically relevant. All diagnostic deviations were reassessed by a second radiologist and discrepancies in interpretation and categorization were solved in consensus.
Results: 335 orthographic errors and 54 misspellings due to incorrect speech recognition were found. A conclusion was missing in three reports. In 53 reports the clinical question was not answered. Description of 316 anatomic structures was missing – most often joint effusion (n=67, 7.4%). Discrepancies of content were found in 104 (20.6%) reports and categorized as follows: II: 84 (16.8%); III: 5 (1%); IV: 13 (2.6%); V: 2 (0.4%).
Conclusion: Formal deviations were common. Clinically relevant diagnostic errors occurred rarely and were mostly associated with the detection of lesions rather than its interpretation. Adequate measures should be considered to improve quality of knee MR reports.

SS124

Telementoring: An effective strategy to support technical skill acquisition in endovascular aneurysm repair

A. P. Porretta[1], M. Alerci[1], A. Gallino[1], L. K. von Segesser[2], L. Inglese[3], A. Guerra[1], M. Bogen[4], M. Di Valentino[1], R. Wyttenbach[1]; [1]Bellinzona, [2]Lausanne, [3]Milano/IT, [4]Lugano

Purpose: Telementoring currently represents an effective answer to cost, time and geographical limitations associated to on-site teaching, supporting technical skill introduction from tertiary care centers to remote health care sites. We evaluated, at a remote care center, the 12-year follow-up after a telementoring program for distant teaching of Endovascular Aneurysm Repair (EVAR).
Methods and Materials: According to a well-established telementoring protocol, a university care center team provided distant technical guidance in order to introduce EVAR in a remote vascular care center. From March 1999 to April 2003, 48 EVAR procedures were telementored at the remote center. Telementoring was performed using 3 online audio-video-facilities. Four-ISDN lines allowed image transmission. After the telementoring period, the remote team performed 101 cases from May 2003 to July 2011 independently.
Results: There was no significant difference between telementored and not-telementored procedures in peri-interventional mortality rate (4.2% vs 2.0%, x^2 test p=0.5944) and in the initial technical success rate (93.7% vs 98.0%, p=0.3286). Neither the overall aneurysm-related mortality (6.25% vs 2.0%, p=0.3286) or the overall complication rate (p=0.3771) significantly differed between the two groups. The number of patients developing endoleaks did not significantly differ between the two groups (p=0.5998). The reintervention rate was significantly lower among not-telementored procedures (12.9% vs 35.4%, p=0.0021).
Conclusion: The 12-year follow-up after a telementoring program in a remote care center demonstrates excellent EVAR skill acquisition into routine practice. The learning curve achievement improved technical results, significantly reducing the reintervention rate among not-telementored procedures.

SS125

Structured reporting: A 10-year experience in private radiology clinics

T. Laswad[1], D. Fournier[1], M. Deac[2]; [1]Sion, [2]Morges

Purpose: To review and recommendations of the literature.
To highlight principles of structured reports (SR).
To recognize advantages and disadvantages of SR.
Internal and external assessment regarding SR.
To share our 10-year experience with SR.
Methods and Materials: On the basis of the literature approved by our medical council, we developed 71 templates of structured reports for all modalities.
These templates have been regularly adapted over 10 years by the radiologists and approved by the medical counsel (graphs, layout, inclusion of key images) in order to improve workflow and clarity of communication.
We outline some practical examples of structured reports.
We highlight advantages and disadvantages of SR for the radiologist, the secretaries and the referring doctors.
Results: Structured reports have more advantages than disadvantages. SR are appreciated and preferred by the referring doctors compared to free text reports. SR improves workflow and is appreciated by the secretaries (less errors and shorter turn-around-time).
With some delay, radiologists adopt SR.
Inclusion of key images in the report is highly appreciated by referring doctors as well as by colleague radiologists.
Conclusion: Structured reports are desirable for clinicians, radiologists and secretary.
SR is to be considered as an essential element in communication improvement.
SR seems to enhance the performance of the radiologists and help toward a standardized terminology use in reporting.

SS126

Improving report turnaround-times by a 3-level-monitoring-system

A. Escher, E. M. Merkle, T. Heye; Basel

Purpose: To determine whether a 3-level-monitoring-system improves report turnaround-times.
Methods and Materials: Report turnaround-times (time period from completion of the examination to finalized written report, RTT) were retrieved from radiology information system starting January 2012. Twelve months later, a predefined goal was set asking for a completion rate greater than 95% of all reports within 24 hours. To achieve this goal a 3-level-monitoring system was implemented supplementary. Effective January 2013, RTTs were monitored monthly on a subspecialty level. In March 2013, pseudonymized individual RTTs were published to increase awareness on the level of the individual radiologist. Another three months later, a real-time-monitoring graphic display was implemented helping radiologists in a single subspecialty in keeping track of their work list. This graphic display showed time critical reports, at risk to exceed the 24 hour time limit.
By comparing the 2012 and 2013 data, the effect of the 3-level-monitoring system was analyzed.
Results: By simply defining and monitoring the goal starting 2013, the overall percentage of finalized reports improved from 81.0% (baseline 2012) to 92.7% (2013). Real-time monitoring implemented June 2013 further increased the percentage of finalized reports to 96.3%; reaching the predefined goal (>95%). Compared to baseline, the number of reports not finalized within 24 hours, decreased more than fivefold from 19% to 3.7%.
The median RTT improved from 7:50 hours in 2012 to a level of 3:12 hours since implementation of the real-time-monitoring.
Conclusion: Our results demonstrate that RTTs can be substantially shortened by setting goals which are continuously monitored. Hereby, awareness on a management and personal radiologists' level is essential.

SS127

Reduction of turnaround time of radiologic reports by dedicated communication methods

C. Stern[1], N. Kawel-Böhm[1], K. Wittig[2], T. Böhm[1]; [1]Chur, [2]Hamburg/DE

Purpose: For the economic success of a hospital continuous reduction of turnaround time of radiologic reports is essential. Purpose of our study was to define institutional turnaround time of radiologic reports and to evaluate the influence of dedicated communication methods.

Methods and Materials: The total turnaround time (TTA) of a radiologic report is defined as the time from confirmation of an exam till its approval. Monthly TTA was extracted from the Radiology-Information-System (RIS) by a self-developed calculation tool within the Software RadCentre-Analyzer (Transact GmbH, Hamburg, Germany) for all radiologic exams and separately for each modality – CT, MRI, x-ray and ultrasound – between October 2012 and March 2013. Communication of TTA amongst all radiologists was introduced in late December 2012.

Results: From October till December 2012 the average TTA over all radiologic exams (3 month average) was 33:40:18 (hh:mm:ss), from January till March 2013 it was 25:56:44. The introduction of systematic and regular notification of the turnaround time resulted in a decrease of the TTA over all exams by an average of 7:43:33 (-22,9%). The largest decrease of TTA occurred in reports of ultrasound (-29,5%) and x-ray exams (-27,5%), while differences were smaller for reports of MRI (-3,2%) and CT exams (-2,2%).

Conclusion: Dedicated communication methods are effective to reduce the turnaround time of radiologic reports, however the impact on each modality varies substantially. A longer follow up period is necessary to evaluate the long-term effectiveness of communication methods.

SS129

Differentiating focal nodular hyperplasia from hepatocellular adenoma: Quantitative analysis of gadobenate dimeglumine-enhanced hepatobiliary phase MR imaging

M. Roux[1], F. Pigneur[2], J. Calderaro[2], L. Baranes[2], A. Laurent[2], A. Mallat[2], R. Meuli[1], A. Rahmouni[2], A. Luciani[2]; [1]Lausanne, [2]Creteil/FR

Purpose: To determine the diagnostic accuracy of the quantitative analysis of benign hepatocellular lesions enhancement on Gd-BOPTA-enhanced hepatobiliary phase imaging to differentiate focal nodular hyperplasias (FNH) from hepatocellular adenomas (HCA).
Methods and Materials: This retrospective study was approved by the Institutional Review Board, and informed consent was waived. Fifty-two patients – 43 women and 9 men; mean age 41.8 years ±11.4 – with a total number of 93 lesions – 59 FNH and 34 HCA – were included; 29 lesions – 12 FNH and 17 HCA – in 14 patients were present within a steatotic liver. Regions of interest were manually placed on each lesion and on adjacent liver on four T1-weighted sequences, both on pre-contrast and on hepatobiliary phase images. The hepatobiliary phase signal intensity ratio (SIR) and the lesion-to-liver contrast enhancement ratio (LLCER) were calculated for each lesion and compared between FNH and HCA. Sensitivity and specificity of each ratio to discriminate HCA from FNH were determined with a receiver operating characteristic curve analysis.
Results: The mean SIR and LLCER of FNH were significantly higher than that of HCA on all sequences (p<0.001). On steatotic livers, only the mean LLCER of FNH was significantly higher than that of HCA on all sequences. Using optimal cut-off LLCER values provided sensitivity and specificity of no less than 94%.
Conclusion: Quantitative analysis of lesions enhancement following Gd-BOPTA injection, and especially the LLCER, allows accurate differentiation of FNH and HCA both on non-steatotic and steatotic livers.

SS130

Arterio-portal shunts in the cirrhotic liver: Perfusion CT for distinction of arterialized pseudolesions from hepatocellular carcinoma

M. A. Fischer[1], S. Gordic[1], B. Leidner[2], P. Aspelin[2], H. Alkadhi[1], T. B. Brismar[2]; [1]Zürich, [2]Stockholm/SE

Purpose: To determine perfusion computed tomography (P-CT) findings for distinction of arterio-portal shunts (APS) from hepatocellular carcinoma (HCC) in the cirrhotic liver.
Methods and Materials: A total of 31 APS and 23 HCC in 14 cirrhotic patients (12 men; mean age 69±12), who underwent P-CT using the 4D-spiral-scan-mode of a dual-source CT for evaluation of HCC, were retrospectively included in this dual-center study. Inclusion criteria were (a) visible arterio-portal fistula and (b) imaging follow-up, which served as the standard of reference. All arterial enhancing lesions were categorized according to their shape (wedge, irregular, nodular) by two readers and perfusion parameters including arterial-liver-perfusion (ALP), portal-venous perfusion (PVP), hepatic perfusion index (HPI), blood-flow (BF), blood-volume (BV), time-to-start (TTS) and time-to-peak (TTP) were determined by another reader.
Results: Configuration of APS and HCC was wedge shaped in 18/31 (58.0%) and 0/23 (0.0%), irregular in 11/31 (35.5%) and 10/23 (43.5%) HCC and nodular in 2/31 (6.5%) and 13/23 (56.5%), respectively. There was a significant difference between APS and HCC in lesion configuration (P<0.02) as-well-as in TTS, PVP and HPI (all, P<0.01). However, high-flow APS (n=15) showed no significant difference in PVP and HPI (both, P>0.05) compared to HCC, whereas significant differences were seen between high- and low-flow APS for all perfusion parameters (all, P<0.01) but for TTP and TTS (both, P>0.05).
Conclusion: APS should be considered one of the causes of arterialized liver lesions on P-CT, which can mimic or obscure HCC. Lesion configuration and time-to-start of arterial enhancement allow best for distinction between APS and HCC and should be included in the CT-P analysis in cirrhotic patients.

SS131

Multimodality and multiparametric imaging for the prediction of response and survival after radioembolization of liver metastases

F. Morsbach, B.-R. Sah, N. Schäfer, Th. Pfammatter, C. S. Reiner, H. Alkadhi; Zürich

Purpose: To determine prospectively, in patients with liver metastases, the best predictor for response and survival to transarterial radioembolization (TARE) comparing multi-phase CT, perfusion CT and ^{99m}Tc-MAA SPECT.
Methods and Materials: Forty patients (mean-age 61 years) with liver metastases undergoing multi-phase CT, CT perfusion and ^{99m}Tc-MAA-SPECT were included, who all underwent TARE with [90]Yttrium microspheres. Arterial perfusion (AP) from perfusion-CT, HU-values from arterial phase (a HU) and portalvenous phase from multi-phase CT, and ^{99m}Tc-MAA uptake ratio from SPECT were calculated. Response was evaluated 4 months after TARE (RECIST1.1). One-year survival was calculated with Kaplan-Meier survival curves. Cox proportional hazard model was used to determine predictors of survival.
Results: We found significant differences between responders and non-responders for AP (38± ml/100ml/min vs 12±6 ml/100ml/min, P<0.001) and for a HU (52±13 HU vs 80±24 HU, P=0.005). There were no significant differences for pv HU (6017 HU vs 8021 HU, P=0.096) and for the ^{99m}Tc-MAA uptake ratio between responders and non-responders (4.96±2.9 vs 4.73±5.64, P=0.887). The cut-off for AP (20ml/100ml/min) had a significantly higher specificity (95% for AP vs 53% for a HU, P=0.003) at a similar sensitivity of 91% for determining responders to TARE compared to a HU (55 HU). Patients with an AP >20ml/100ml/min showed a significantly (P=0.010) higher one-year survival (mean survival 345 vs 205 days), whereas an a HU value >55 HU did not result in a significant difference in survival (P=0.123). Cox proportional hazard model revealed AP as the only significant (P=0.004), independent predictor of survival.
Conclusion: Compared to arterial and portal-venous enhancement as well as to the ^{99m}Tc-MAA-uptake-ratio of liver metastases, the AP from CT perfusion is the best predictor for morphologic response and one-year survival to TARE.

SS132

Follow-up and characterization of indeterminate spleen lesions in primary CT after blunt abdominal trauma: Potential of MR imaging

S. Gordic, H.-P. Simmen, G. Wanner, D. Cadosch, H. Alkadhi; Zürich

Purpose: To determine the value of MR imaging for follow-up and characterization of indeterminate spleen lesions in primary CT of patients with blunt abdominal trauma.
Methods and Materials: Twenty-five patients (8 female, mean age 51.6±22.4 years) with an indeterminate spleen lesion diagnosed at CT after blunt abdominal trauma underwent MR imaging with T2- and T1-weighted images pre- and post-contrast material administration. MR images were reviewed by two radiologists. Age, gender, injury mechanism, injury severity score (ISS), management of patients, time interval between CT and MR imaging, and length of hospital stay were included into the analysis. Patient history, clinical history, imaging and two-month clinical outcome including review of medical records and telephone interviews served as reference standard.
Results: From the 25 indeterminate spleen lesions in CT, 11 (44%) were traumatic and 14 (56%) non-traumatic. The ISS (P<.001) and length of hospital-stay (P=.03) were significantly higher in patients with traumatic spleen lesions as compared to those without. All other parameters were similar among groups (all, P>.05). The MR imaging features ill-defined lesion borders, variable signal on T1-and T2-weighted images, focal contrast enhancement indicating traumatic pseudoaneurysm, perilesional contrast enhancement and edema were indicative for traumatic spleen lesions. As compared to CT (2/25), MR images (5/25) better depicted thin subcapsular hematomas as indicator of traumatic spleen injury.
Conclusion: MR imaging shows value for follow-up and characterization of indeterminate spleen lesions in primary CT after blunt abdominal trauma and is helpful for discriminating traumatic from non-traumatic spleen lesions.

Severe pelvic injury: Which type of vascular lesions is detected on ante- and post-mortem CT? Does their bleeding reflect a certain fracture constellation?

M. Hussami, S. Schmidt; Lausanne

Purpose: To report and compare vascular pelvic lesions in severe pelvic injury detected on ante and post mortem CT. To find out if vascular involvement is associated with a certain type of pelvic fracture.

Methods and Materials: We retrospectively included two cohorts of blunt pelvic trauma in whom abdominopelvic CT showed active pelvic haemorrhage. The first one was composed of 45 severely injured patients (12 women, mean age 50.1). Thirty-two out of them immediately went to conventional angiography. The second cohort included 48 cadavers (18 women, mean age 52.1), in whom active pelvic bleeding was shown on post mortem angio-CT. In consensus, two radiologists described type and site of vascular lesions as well as the pattern of underlying pelvic fractures according to Kane's classification.

Results: All 45 pelvic trauma patients demonstrated arterial bleeding without evident venous haemorrhage on CT. In 26 (57%) out of them active contrast extravasation was confirmed on conventional angiography, while in 6 not. Forty-one patients (91%) had ≥2 pelvic fractures, while 4 none. Among the 48 post-mortem studies, 38 (79%) cases showed arterial, 39 (81%) cases venous bleeding. Thirty-nine (81%) cadavers showed ≥2 pelvic fractures, while nine cases none.

Conclusion: Arterial pelvic lesions in patients and cadavers are nearly always associated with ≥2 pelvic fractures with a mean of 3.5 fractures per patient and five per cadaver. A high proportion of venous lesions are visible on post mortem studies unlike in emergency patients, suggesting that venous lesions may not be evident on emergency CT or would have occurred later.

Illegal intracorporeal packets: Assessment of the cocaine concentration by dual CT imaging

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

Purpose: To evaluate whether dual energy CT can be used to assess the concentration of cocaine of intra-intestinal illegal packets.

Methods and Materials: All consecutive conveyors in whom a low-dose abdominal CT revealed the presence of illegal drug packets underwent a dual energy CT series (GE 750 HD), targeted on one container. The mean radiological density (HU) of this packet was obtained on standard series. The effective atomic number (Zeff) was inferred from the 70keV monochromatic series. A chemical analysis was performed after expulsion to select cocaine containing packets and determine their cocaine concentration. Packets filled with other substances than cocaine were excluded from the series. A correlation analysis was performed between HU, Zeff and the percentage of cocaine. This study received the IRB approval.

Results: 54 conveyors were included. The mean cocaine content of the packets was 37% (range 11.2 to 80%), the mean Zeff was 8.7 (range 6.9 to 10.4) and the mean radiologic density was 106 HU (range -33.5 to 317 HU). The cocaine content shows a good correlation with the Zeff (r=0.56, p <0.001), and a weak correlation with the radiologic density (r=0.26, p=0.064).

Conclusion: The Zeff of ingested packets, measured by dual energy CT, is closely correlated with their cocaine content. This imaging procedure could help identify conveyors who are at high risk of lethal cocaine poisoning from a packet rupture.

Mesenteric venous thrombosis in patients with inflammatory bowel disease

N. Vietti Violi, A. Schoepfer, N. Fournier, A. Denys; Lausanne

Purpose: We aimed to describe mesenteric venous thrombosis (MVT) prevalence in patients with inflammatory bowel disease (IBD) and to correlate MVT with IBD radiological signs and patients outcome.

Methods and Materials: We analyzed abdominal MDCT of 160 patients with IBD (89 women, age at IBD diagnosis 27.5 year-old, 121 Crohn's disease CD, 39 ulcerative colitis UC) enrolled in a prospective cohort, looking for MVT at acute (intra-luminal filling defect) or chronic presentation (vein stenosis/occlusion and venous collaterals), separating them in 2 groups: patients with/without MVT. Abnormalities location was noticed. We correlated MVT with IBD radiologic signs and complications.

Results: MVT was present in 43 patients (26.8%) on acute (n=1), chronic presentation (n=38) or both (n=4). Prevalence between CD 35/121 (28.9%) and UC 8/39 (20.5%) was not different (p>.05). One case of MTV was central (inferior mesenteric vein), the others were peripheral (more than 5 cm from the trunk end). Location of thrombosis was different between CD and UC (jejunal or/and ileal veins only for CD; rectocolic veins only for UC [P<.01]). MVT in patients with CD was more frequently associated to bowel wall thickening (p=.01), mesenteric fat hypertrophy (p<.01), ascites (p<.01), lymph nodes (p=.04) and to higher rate of bowel stenosis (p<.001) and intestinal surgery (p=.01). Statistical analyses for patients with UC were not relevant (because of the population size [n=8]).

Conclusion: Peripheral MVT in IBD patients are more frequent than described in the literature. MVT seems to be associated to more severe disease and more complicated outcome.

Improvement of renal diffusion-weighted MR imaging with readout-segmented echo-planar imaging at 3T

I. Friedli, L. A. Crowe, M. Viallon, S. de Seigneux, J.-P. Vallee; Genève

Purpose: A "readout segmentation of long variable echo-trains" (RESOLVE) strategy was compared to single-shot SE-EPI and proposed as an alternative approach for high-quality diffusion-weighted renal imaging.

Methods and Materials: 21 healthy volunteers were scanned on a 3T MR system with 3 diffusion-weighted sequences each with 4 b-values: A reference single-shot SE-EPI as suggested in clinical practice (1), a single-shot SE-EPI with higher resolution, bandwidth and acceleration factor (called thereafter high-resolution EPI) and RESOLVE with the same resolution as high-resolution EPI but a 5 times segmentation of the readout. Images quality was evaluated in terms of susceptibility artifacts, SNR, contrast, image blurring and ADC quantification.

Results: Best image quality, almost free of distortions at sites of susceptibility artifacts, was obtained with RESOLVE. The sharpness (p=0.0196) and the signal contrast and difference in ADC between the cortex and medulla (p=0.0024) were also significantly improved by this sequence. However, RESOLVE was characterized by an SNR drop and an increased acquisition time (5 times longer compared to single-shot SE-EPI).

Conclusion: RESOLVE enhanced significantly the quality of *in vivo* renal diffusion-weighted images by reducing the image distortion and by improving the difference in ADC between the cortex and medulla. These improvements justify further clinical studies on the use of RESOLVE in kidney patients.

1. Thoeny, H.C. and F. De Keyzer, Radiology, 2011.259 (1): p. 25–38.

SS137

Intravoxel incoherent motion analysis of abdominal organs: Computation of reference values in a large cohort of C57Bl/6 mice

C. Eberhardt, M. Wurnig, A. Vuck, M. Lesurtel, A. Boss; Zürich

Purpose: Intravoxel Incoherent Motion Magnetic Resonance Imaging (IVIM-MRI) is increasingly applied for characterization of organ lesions, assessment of diffuse parenchymal pathologies and therapy monitoring. Required IVIM reference parameters for translational research were determined in a large cohort study of C57Bl/6 laboratory mice (n=50).

Methods and Materials: Anesthetized mice were measured in a 4.7T small animal MR imager with a diffusion-weighted spin-echo echo-planar imaging sequence (bvalues 0, 13, 24, 55, 107, 260, 514, 767, 1020 s/mm²). Using a two-step approach to IVIM analysis, tissue diffusivity and perfusion fraction were initially retrieved for b>100 by a linear fit to the log-transformed signal intensities, subsequently the pseudo-diffusivity was calculated from a bi-exponential fit to all measurement points.

Results: Tissue specific diffusion parameters were for the liver $D_t=1.2\pm0.2\times10^{-3}$ mm²/s; $D_p=39.6\pm18.5\times10^{-3}$ mm²/s; $f^p=15.4\pm6.8$, for renal cortex $D_t=1.5\pm0.2\times10^{-3}$ mm²/s; $D_p=24.8\pm18.5\times10^{-3}$ mm²/s; $f_p=11.8\pm5.9$, and for renal medulla $D_t=1.6\pm0.2\times10^{-3}$ mm²/s; $D_p=35.0\pm22.8\times10^{-3}$ mm²/s; $f_p=16.2\pm5.9$. Spleen was characterized by $D_t=0.6\pm0.2\times10^{-3}$ mm²/s; $D_p=45.1\pm24.0\times10^{-3}$ mm²/s; $f_p=10.8\pm5.8$ and small bowel by $D_t=1.1\pm0.2\times10^{-3}$ mm²/s; $D_p=15.8\pm8.4\times10^{-3}$ mm²/s; $f_p=18.9\pm8.7$.

Conclusion: We obtained relatively stable results for Dt, whereas Dp and fp showed higher variability, which may be attributed to residual body motion and physiological tissue variability. The reported values may serve as reference parameters for future studies on small animal disease models using IVIM for tissue characterization.

SS138

Prostate cancer aggressiveness: Assessment with whole-lesion histogram analysis of the apparent diffusion coefficient

O. F. Donati[1], Y. Mazaheri[2], A. Afaq[3], H. A. Vargas[2], J. Zheng[2], C. Moskowitz[2], H. Hricak[2], O. Akin[2]; [1]Zürich, [2]New York/US, [3]London/UK

Purpose: To evaluate the associations between prostate cancer (PCa) aggressiveness and histogram-derived apparent diffusion coefficient (ADC) parameters obtained from whole-lesion assessment of diffusion-weighted (DW) magnetic resonance imaging (MRI) of the prostate and to determine which ADC-metric best differentiates low-grade from intermediate- or high-grade PCa-lesions.

Methods and Materials: The study included 131 men undergoing DW-MRI before prostatectomy for PCa. Clinically significant tumors (>0.5 mL) were identified on whole-mount-step-section histopathology and their Gleason scores (GS) recorded. Mean ADC (ADC_{mean}), median ADC (ADC_{median}), 10th- and 25th-percentile ADC values ($ADC_{10\%}$ and $ADC_{25\%}$, respectively) were determined from whole-lesion histogram and correlated with the GS using Spearman's correlation coefficient (ρ). Each parameter's ability to discriminate GS6 from GS≥7 tumors was assessed using the area under the receiver operating characteristics curve (AUC).

Results: In total, 116 lesions >0.5 mL (89 in the peripheral zone; 27 in the transition zone) were identified in 85/131 (65%) patients. Forty-six patients had no lesions >0.5 mL. For ADC_{mean}, ADC_{median}, $ADC_{10\%}$ and $ADC_{25\%}$, correlation coefficients for correlation with GS were $\rho=-0.31$, $\rho=-0.30$, $\rho=-0.36$ and $\rho=-0.35$, respectively, while AUCs for differentiating GS6 from GS≥7 were 0.704, 0.692, 0.758 and 0.723, respectively. The AUC of $ADC_{10\%}$ was significantly higher than that of ADC_{mean} for all lesions and peripheral zone lesions (p=0.0001).

Conclusion: When whole-lesion histograms were used to derive ADC parameters, $ADC_{10\%}$ correlated with GS better than did other ADC parameters, suggesting that $ADC_{10\%}$ may prove to be optimal for discriminating low-grade from intermediate or high-grade PCa with DW-MRI.

SS139

Semiautomatic superimposition improves radiological assessment of radiographs in scoliosis

N. A. Farshad-Amacker[1], T. D. L. Nguyen-Kim[2], M. Farshad[2], G. Andreisek[2], K. Min[2], T. Frauenfelder[2]; [1]New York/US, [2]Zürich

Purpose: Assessment of scoliotic curve flexibility is essential for selection of the fusion levels in the surgical treatment of adolescent idiopathic scoliosis (AIS). Measurement of curve flexibility is currently based on the difference of the Cobb angle values on standard ap and lateral bending radiographs and are not sufficiently precise. The purpose of this study was to introduce and validate a novel method of superposing radiographs for more reliable measurement of curve flexibility.
Methods and Materials: Twenty-seven patients with AIS (mean age±SD, 17±5.7 years; 23 female) were randomly included. Two independent blinded radiologists (with >6 years and >15 years of radiology experience) measured Cobb angles separately on standard ap and supine lateral bending radiographs. Additionally, the bending radiograph was semiautomatic superposed on the ap radiograph to measure the curve flexibility by the same readers. The interreader agreements between the two independent readers for the two methods were calculated using interclass correlation coefficient (ICC).
Results: With the standard method of assessing curve flexibility only a moderate interreader agreement was achieved in the upper curve (ICC=0.57) and a good agreement was seen in the lower curve (ICC=0.72). With the use of the semiautomatic superimposition almost perfect agreement was achieved for both, the upper and the lower curves flexibilities (ICC=0.93 and 0.97, respectively).
Conclusion: The here introduced semiautomatic superimposition technique for measurements of scolitic curve flexibility in AIS is more precise and reliable than the current standard method.

SS140

Correlation between muscle cross-sectional area measurement and quadriceps femoris volumetry in patients with anterior cruciate ligament (ACL) reconstructions

M. Marcon, B. Ciritsis, C. Laux, M. Fischer, G. Andreisek, E. J. Ulbrich; Zürich

Purpose: Quadriceps femoris atrophy is an important clinical indicator for postoperative knee function after ACL reconstructions. MR volumetry precisely detects atrophy. However, it is time consuming and thus not often used. Purpose was to develop a faster method to estimate the total muscle volume.
Methods and Materials: Prospective IRB approved study with written informed patient consent. Both thighs of thirty-four consecutive patients with ACL-reconstructions (men, 22; women, 12) were imaged at 1.5T using axial 3D spoiled dual gradient-echo (LAVA FLEX) sequences with automated reconstruction of pure fat-only and water-only images. Total muscle volume of both quadriceps femoris (n=68) was determined by one experienced reader on the water-only images dedicated software featuring semiautomatic segmentation with linear interpolation (Myrian 1, Intrasense, France). In addition, the muscle's cross sectional area was measured on a single slice at two different levels, 15 cm (CSA-Up) and 6 cm (CSA-Low) above the knee joint. The correlation between total muscle volume and both cross-sectional area measurements was evaluated using Pearson correlation-coefficient. p<.05 indicated statistical significance.
Results: The quadriceps' total muscle volume was 1949.97±533.71 cm³ (mean±SD) (range, 964.00–3283.00). The mean±SD CSA-Up was 60.59±12.76 cm² (range, 35.58–93.29) and the mean±SD CSA-Low was 14.54±5.18 cm² (range, 4.67–26.09). Pearson correlation showed a weak linear relationship between total muscle volume and CSA-Low (r=.27, p<.05), but a strong linear relationship between total muscle volume and CSA-Up (r=.84, p<.01).
Conclusion: Muscle cross-sectional area measurements 15 cm above the knee joint allow fast and precise estimations of the total quadriceps femoris muscle volume.

SS141

Magnetization transfer (MT)-MRI characterizes *in vivo* fiber formation of muscle precursor cells

M. Rottmar, M. Wurnig, D. Eberli, A. Boss; Zürich

Purpose: Cell based therapies using e.g. muscle precursor cells (MPCs) show great promise to treat stress urinary incontinence. For translating such approaches into clinics, non-invasive *in-vivo* imaging modalities are needed. The aim of this study was thus to assess the muscle fiber formation of hMPCs *in vivo* using magnetization transfer (MT) MRI in a mouse model in correlation to histology and immunohistochemistry.
Methods and Materials: hMPCs were mixed with collagen and injected subcutaneously into nude mice and monitored via MRI (4.7 T scanner) for 4 weeks. Thereafter, the engineered muscle tissue was assessed by histology, immunohistochemistry and western blot. For MT measurements a 3D-spoiled gradient-echo sequence (repetition time TR/echo-time TE 20.4 ms/4.7 ms) was applied with/without a systematically varied MT prepulse (off-resonance frequency 50 Hz to 37'500 Hz, flip angle 800°).
Results: At 2'500 Hz, MT measurements showed magnetization transfer ratios (MTR) of 25.0% at day 1, decreasing to 14.1% at day 7 and increasing strongly to 42.9% by day 14, approximating the MTR of 49.9% from the skeletal muscle reference. A similar trend could be observed over the range of off-resonance frequencies. Cell differentiation and myofiber formation could be confirmed by histology, immunohistochemistry and western blot.
Conclusion: hMPCs form muscle tissue *in vivo* and MT-MRI is able to directly assess muscle fiber formation describing the myogenic differentiation process. The results will be transferable to the clinical setting as a non-invasive biomarker for the assessment of muscle tissue regeneration in patients.

SS142

SWIFT MRI bone imaging for rat knee joint destruction assessment at 14T

L. A. Crowe[1], N. Kunz[2], I. Friedli[1], A. Gramoun[1], K. Grosdemange[1], C. A. Corum[3], R. Gruetter[2], J.-P. Vallee[1]; [1]Genève, [2]Lausanne, [3]Minneapolis/US

Purpose: To study a clinically relevant model of antigen-induced arthritis (AIA) in rat ex-vivo with MRI at 14T in. A GRE method is compared to the emerging SWIFT (1) imaging. This represents feasibility for the first study at 14 T of small rodent bones.
Methods and Materials: Female Lewis rats (n=5, 150–175 g, two months) were sensitized and given AIA in the right knee. Knees were taken after sacrifice at timepoints during disease progression and imaged ex vivo at 14T. MRI used Agilent/Magnex preclinical scanner and in-house 2 cm loop coil with a conventional 3D gradient echo sequence, isotropic resolution 62.5 µm, 4 averages, 1 hour scan time and SWIFT with 3D isotropic 62.5 µm and scan time 20 min (2,3). SWIFT acquisition/reconstruction used CMRRpack v0.4f (http://www.cmrr.umn.edu/swift/).
Results: Bone structure with erosion becomes largely hypointense on GRE, but SWIFT offers the added advantage of short T2 bone visualisation with the same resolution and shorter scan time. GRE: At the later timepoints, the bone matrix and thickened ligaments all appear as hypointense signal. SWIFT: Differences in the bone matrix are clearly visible and distinct from the surrounding ligament structures.
Conclusion: Despite the fact that ligament and muscle contrast is not high on the SWIFT images there is a clear difference in the bone matrix visualization. We present a feasibility study of ex-vivo rodent knee by application of the SWIFT sequence at 14T.
1. Wang, MRM2013; Luhach, MRM2013; Kendi, Arch Otolaryngol Head Neck Surg 2011.
2. Idiyatullin, JMR2006; Idiyatullin, JMR2008.
3. Corum, http://arxiv.org/abs/1307.2926.

SS143

Assessing trabecular bone with ultra-short echo-time MRI at 1.5T, 3.0T and 7.0T – a comparison to micro-computed-tomography

M. Wurnig[1], M. Calcagni[1], M. Vich[1], M. Weiger[1], G. Andreisek[1], F. Wehrli[2], A. Boss[1]; [1]Zürich, [2]Philadelphia/US

Purpose: The goal of this study was to test the potential of UTE MRI at 1.5T, 3.0T and 7.0T for depiction of trabecular bone structure (of the wrist bones), to evaluate whether T2*-times of bone water and parametric maps of T2* of trabecular bone could be obtained at all three field strengths, and to compare the T2*-times to structural parameters obtained from micro-CT as a reference standard.

Methods and Materials: Ex-vivo carpal bones of three wrists were excised en-bloc and imaged at 1.5T, 3.0T and 7.0T in a whole-body MR imager using the head coil. A 3D fat-suppressed UTE-sequence was applied with six different echo-times TE (150/300/600/1200/3500/7000 μs). The T2*-time and pixel-wise computed T2* parametric maps were compared to micro-CT providing trabecular bone structural parameters including porosity, trabecular thickness, trabecular separation, trabecular number, and the fractal dimension (D_k).

Results: T2* relaxation curves and parametric maps could be computed from datasets acquired at all field strengths. Mean T2*-times of trabecular bone were 4340±1140 μs at 1.5T, 2370±670 μs at 3.0T and 1220±320 μs at 7.0T, when averaged over all carpal bones. A positive correlation of T2* with trabecular bone porosity and trabecular separation, and a negative correlation of T2* with trabecular thickness, trabecular number and fractal dimension was detected ($p<0.01$ for all field strengths and micro-CT parameters).

Conclusion: We conclude that UTE MRI may be useful to characterize the structure of trabecular bone comparable to micro-CT.

SS144

Metallic artifacts from internal scaphoid fracture fixation screws: Comparison between C-arm flat-panel, cone-beam and multi-detector CT

T. Finkenstaedt, F. Morsbach, M. Calcagni, M. Vich, Ch. Pfirrmann, H. Alkadhi, V. M. Runge, G. Andreisek, R. Guggenberger; Zürich

Purpose: To systematically compare image quality and extent of artifacts from scaphoid fracture fixation screws using different CT modalities and protocols.

Methods and Materials: Imaging of six cadaveric wrists with artificial scaphoid fractures and different fixation screws was performed in two scanning positions (45° and 90°) using multidetector CT (MDCT) and two flat-panel CT modalities, C-arm flat-panel (FP) and cone-beam (CB) CT; the latter two with a low- and standard radiation dose protocols. Mean cartilage attenuation and metal artifact induced absolute HU changes (=artifact extent) were measured. Two radiologists evaluated different image quality criteria using a five-point Likert-scale. Interreader-agreements (Cohen's κ) were calculated. Artifact extent and quality ratings were compared using Friedman and Wilcoxon signed-rank tests.

Results: Artifact extent was significantly smaller for MDCT and standard dose FPCT compared to CBCT low- and standard dose acquisitions (all $p<0.05$). No significant differences in artifact extent among different screw types and scanning positions were noted ($p>0.05$). MDCT and FPCT standard dose protocols both showed equal ratings for screw bone interface, fracture line- and trabecular bone evaluation ($p=0.06$, 0.2 and 0.2, respectively) and performed significantly better than FPCT low-, CBCT low- and standard dose acquisitions (all $p<0.05$). Good interreader-agreement was found for image quality comparisons (Cohens κ 0.76–0.78).

Conclusion: MDCT and FPCT standard dose acquisition both showed less metal-induced artifacts and better overall image quality compared to FPCT low dose and both CBCT acquisitions. FPCT may provide sufficient image quality to serve as a versatile CT alternative for appendicular bone imaging particularly in view of potential future technological improvements.

SS145

A prototype correction algorithm to reduce metal artefacts in flat-panel detector computed tomography of scaphoid fixation screws

L. Filli[1], M. Marcon[1], B. Scholz[2], M. Calcagni[1], M. Vich[1], T. Finkenstädt[1], T. Pfammatter[1], G. Andreisek[1], R. Guggenberger[1]; [1]Zürich, [2]Forchheim/DE

Purpose: The aim of this study was to evaluate a prototype correction algorithm to reduce metal artefacts in flat-panel detector computed tomography (FPCT) of scaphoid fixation screws. FPCT has gained interest in imaging small anatomic structures of the appendicular skeleton. Angiographic C-arm systems with flat-panel detectors allow fluoroscopy and FPCT imaging in a one stop procedure emphasizing their role as an ideal intraoperative imaging tool. However, FPCT imaging can be significantly impaired by artefacts induced by fixation screws.

Methods and Materials: Commercially available scaphoid fixation screws were inserted into six cadaveric specimens in order to fix artificially induced scaphoid fractures. FPCT images corrected with the algorithm were compared to uncorrected images both quantitatively and qualitatively by two independent radiologists in terms of artefacts, fracture line visibility, and other parameters. A p-value of <0.05 was considered to indicate statistically significant differences.

Results: Metal artefacts were significantly reduced by the correction algorithm ($p<0.001$), and the fracture line was more clearly defined ($p<0.01$). The inter-observer reliability was "almost perfect" (intra-class correlation coefficient 0.85, $p<0.001$).

Conclusion: The prototype correction algorithm in FPCT for metal artefacts induced by scaphoid fixation screws may facilitate intra- and postoperative follow-up imaging.

SS146

Reducing radiation dose in MDCT arthrography of the shoulder: How low can we go?

J. Aguet[1], F. Becce[1], A. Vlassenbroek[2], E. Coche[2], F. Verdun[1], R. Meuli[1], P. Omoumi[1]; [1]Lausanne, [2]Bruxelles/BE

Purpose: To determine in a cadaveric study the lowest possible radiation dose generating diagnostic image quality in MDCT arthrography of the shoulder.

Methods and Materials: Six shoulders of three freshly frozen cadavers were scanned using a 256-detector row CT scanner after the intra-articular injection of iodinated contrast material. Decreasing radiation dose levels ($CTDI_{vol}$: 20, 15, 10, 8, 6 and 4 mGy) and for each dose level, 4 decreasing tube voltages (140, 120, 100 and 80 kVp) were used. Image noise and contrast-to-noise ratio (CNR) were measured.

Two independent observers evaluated the following items on a 4-point scale: severity of artifacts, overall diagnostic image quality and subjective amount of noise.

The impact of dose parameters on image noise and CNR was analyzed using ANOVA statistics.

Results: Below a $CTDI_{vol}$ of 10 mGy and a tube voltage of 100 kVp, image noise levels increased linearly with the voltage and $CTDI_{vol}$, respectively ($p \leq 0.04$).

With a $CTDI_{vol}$ of 10 mGy, there was no statistically significant difference in CNR among protocols with varying tube voltage (pairwise comparisons, all $p>0.2$).

Subjective quality assessment observed a dose cut-off at a $CTDI_{vol}$ of 10 mGy, with an optimal tube voltage of 100 kV.

Conclusion: Diagnostic quality imaging in MDCT arthrography of the shoulder is feasible with a reduction of up to 50% in radiation dose compared with standard-dose protocols, by applying an optimal tube voltage of 100 kV.

SS147

MDCT arthrography of the hip: Value of the adaptive statistical iterative reconstruction technique and potential for radiation dose reduction

F. Tobalem, E. Dugert, F. Verdun, V. Dunet, J. Ott, H. Rudiger, S. Cherix, R. Meuli, F. Becce; Lausanne

Purpose: To assess the impact of the adaptive statistical iterative reconstruction (ASIR) technique on image quality in hip MDCT arthrography, and evaluate its potential to reduce radiation dose.

Methods and Materials: Thirty-seven patients examined with hip MDCT arthrography were prospectively randomized into three protocols: one regular-dose ($CTDI_{vol}$, 38.4 mGy) and two reduced-doses (24.6 and 15.4 mGy). Raw data were reconstructed using both filtered back-projection (FBP) and four increasing percentages of ASIR (30, 50, 70 and 90%). Image noise and contrast-to-noise (CNR) ratio were measured. The conspicuity of several anatomic structures, subjective image noise, artifacts and overall diagnostic image quality were assessed using a 4-point scale. The location and extent of acetabular labrum tears and articular cartilage defects were evaluated.

Results: Reduction in radiation dose resulted in significant increase in image noise (p=0.0009) with concomitant decrease in CNR (p=0.001). The use of ASIR was associated with a significant decrease in image noise (p=0.0001) and increase in CNR (p<0.007) within each CT protocol. Image noise was comparable between the regular-dose FBP and reduced-dose ASIR 30–50% protocols, while CNR was comparable between the regular-dose FBP and ASIR 30–70% protocols. The use of ASIR 30–50% significantly improved image quality scores for subchondral bone (p<0.03), subjective image noise (p<0.001) and overall diagnostic image quality (p=0.04), while it significantly reduced the scores for trabecular bone (p=0.0001), within each CT protocol. Detection and characterization of acetabular labrum tears and articular cartilage defects were not significantly altered by any percentage of ASIR (p>0.05).

Conclusion: The use of ASIR in hip MDCT arthrography helps to significantly reduce image noise, and is useful to reduce radiation dose, while maintaining image quality comparable with that of a regular-dose protocol using FBP.

SS148

Improvement of CT images of the pelvis in hip prosthesis: Value of gemstone spectral imaging with and without metal artifact reduction software

S. Boudabbous, E. Paulin, D. Arditi, A.-L. Hachulla, C. Becker, X. Montet; Genève

Purpose: To assess the improvement of image quality of pelvic organs by using gemstone spectral imaging (GSI) with or without metal artifact reduction software (MARs) for computed tomography of hip prosthesis.

Methods and Materials: CTs were performed on a CT 750 HD (GE Healthcare) using fast kV-switching GSI between 80 and 140 KV and reconstructed with/without MARs and with reconstructed monochromatic energy level in the range of 40–140 keV. 15 patients with hip prosthesis were imaged. Images were retrospectively reviewed in aim to evaluate image quality by focusing on the pelvic organs depiction and severity of beam-hardening artifacts by using a five-point scale (1=marked artifacts with impaired image quality, 5=no artifacts, excellent image quality).

Results: The overall image quality of the CT was graded 2.3±0.7 and 3.1±1 (p=0.03) for the 80 keV without and with MARs, respectively. At 110 keV, the image quality was graded 3.2±0.8 and 3.44±1.2 (p=0.29), without and with MARs, respectively. They were an increase of image quality from 80 to 110 keV (p=0.01) and with the use of MARs technology. The GSI-MARs reconstruction improves the confidence of depiction of pelvic organs and reduces the metal-related artifacts.

Conclusion: CT with GSI-MARs of patients with hip prosthesis reduces metal artifacts and improves the evaluation of pelvic organs and soft tissues.

SS149

Impact of iterative reconstruction techniques and multiplanar reformations on image quality: An ex vivo MDCT arthrography model

E. Dugert, F. R. Verdun, J. Ott, S. Cherix, V. Berclaz, P. Omoumi, R. Meuli, F. Becce; Lausanne

Purpose: To evaluate the impact of two iterative reconstruction techniques (adaptive statistical iterative reconstruction, ASIR; model-based iterative reconstruction, MBIR) and multiplanar reformations (MPRs) on image quality using an ex vivo MDCT arthrography model.

Methods and Materials: Ten fresh bovine patellas with a total of 44 artificially created cartilage defects were bathed in a 25% iodine contrast blend. Images were acquired on a 64-detector row CT scanner at 120 kVp and 96 mAs (pitch 0.984, $CTDI_{vol}$ 7.3 mGy). Raw data were reconstructed in the axial, coronal and sagittal planes using filtered back-projection (FBP), ASIR 40 and 80% and MBIR techniques. Cartilage defects were measured and assessed using a 4-point grading system. Image noise and contrast-to-noise ratio (CNR) were calculated. Physical metrics (noise power spectrum, NPS); modulation transfer function, MTF; and Contrast Transfer Function, CTF) were evaluated with a phantom.

Results: Image noise was significantly lower with ASIR and MBIR than with FBP (p=0.001), while CNR was significantly higher (p=0.001). Changes in noise and CNR were more pronounced with MBIR and in coronal sections. Spatial resolution was similar with different image reconstruction techniques and planes. Detection, measurement and grading of all cartilage defects were not significantly altered with ASIR and MBIR. Edges of cartilage defects were better delineated with MBIR.

Conclusion: Objective and subjective image quality in MDCT arthrography is significantly enhanced with MBIR, compared to ASIR and FBP, in all three planes. The impact of MBIR and ASIR techniques on image quality depends on the reconstruction plane.

Patient and phantom measurements during mammography: Determination of the thyroid glandular dose and of the benefit of a thyroid protection device

M. Pyka[1], R. A. Kubik-Huch[1], C. Fässler[2], S. Scheidegger[2]; [1]Baden, [2]Winterthur

Purpose: To determine the glandular dose of the thyroid gland during mammography with and without protection device in lack of international recommendations.

Methods and Materials: Between April 2013 and June 2013 measurements with an Alderson-Phantom were taken to determine the glandular thyroid dose and exposure of abdominal organs during standard mammography with different phantom-breast sizes (4, 5, 6 and 7 cm thickness) in standard projections (cc, mlo) without and with thyroid protection device. In addition, Monte Carlo (MC) simulations based on Geant4 were performed for the cc irradiation.

Patient measurements are scheduled for February and March 2014, the results will be presented at the congress. A total of 100 patients with three breast-size-categories will be included with measurements in front and behind the protection device. The images will be assessed regarding quality and artefacts.

Results: In the phantom study, the glandular thyroid dose by scattering is mostly dependent of the compression thickness. Highest doses were achieved in mlo projection with 7 cm (mean: 9.16 microGy). Thyroid protection device reduces the glandular dose (mean: 4 microGy). MC simulation results showed a qualitative agreement of the depth dose with abdominal CR imaging plate measurements. No significant exposure of the ovaries compared to the dose values of the thyroid gland has been observed in the measurements and simulation.

Conclusion: Phantom measurements showed that scattering is significantly reduced using thyroid protection device. Based on our experiences on a phantom study, we will start patient measurements in February 2014 and will report the results at the meeting.

Assessment of breast density on mammograms, low accuracy and reproducibility of visual evaluation

A. Lamri Senouci, V. Dunet, V. Monnard, M. O. Treyvaud, L. Alamo, J.-Y. Meuwly; Lausanne

Purpose: Accurate assessment of breast density is of major consent for two reasons:
1. The risk of breast cancer is correlated to breast density with a 4–6 greater risk for breast cancer in women with dense breast compared to whose with fatty breast.
2. The sensitivity of mammography sinks to 30% in women who have dense breast compared to 80% in fatty breast.

The aim of our study was to assess the accuracy and reproducibility of visual evaluation of breast density of mammograms.

Methods and Materials: A set of 38 mammography, which densities were validated by the Volpara® software, was submitted to the evaluation of two groups.
– The first group was composed of 19 radiologists trained in mammography reading.
– The second group was composed of 28 breast Center professional (gynecologists, surgeons, oncologists, radio-oncologists).

The results of reading were compared to the gold standard established with Volpara®.

Results: The radiologists were concordant with the gold-standard in 74.2%. Their accuracy of reading for breast density category 2 and 3 was respectively 64.1% and 51.1%. Interater agreement was moderate (Kappa=0.47).
– For the breast center professionals, concordance was observed in 72.7%. The accuracy of reading for breast density category 2 and 3 was respectively 62.9% and 51.7%. Interater agreement was fair (Kappa=0.39).

Conclusion: Radiologists have a higher interater agreement, however visual assessment of breast density has a low reproducibility. Regarding the impact of an accurate assessment, objective quantification methods have to be promoted.

First evaluation of a new ultrasound-based 3D Mamma-Tomography-System in volunteers: Feasibility in a clinical setting

S. Forte[1], S. Dellas[1], I. Zbinden[1], B. Willi-Sedlacek[2], G. Bongartz[1]; [1]Basel, [2]Bottmingen

Purpose: Multimodal Ultrasound Tomography (MUT) is a new ultrasound technology, which is based on the transmission of the pulses in contrast to normal B-mode. All investigations are conducted on the first clinical installation of MUT worldwide in a clinical setting. The aim of this preclinical study was to introduce the technology into a patient care routine, to identify potential weaknesses of the prototype and to evaluate acceptance in a group of 20 volunteers.

Methods and Materials: 20 female volunteers were consecutively scanned as previously reported by Marmarelis et al at the ECR 2011. Different topics were evaluated during the investigations. Criteria were (a) completeness of the exam, (b) anatomically correct image display, (c) correctness of diagnosis compared to the gold standard of all available clinical data, (d) patient changing time, (e) subjective comfort of the scanning position and (f) overall subjective acceptance of the investigation.

Results: All scans were easily performed without any major technical problem, all results were reported as diagnostic useful. In the volunteer group, one tumor was correctly detected (confirmed by MR and histology). The prone scanning position was well tolerated by all volunteers, although some negligible discomfort was reported. MUT received the best scores regarding comfort and practicability in those patients, mean 1,2, handheld ultrasound 1,3, mammography 3,9 and MRI 5,5.

Conclusion: This is the first evaluation of the MUT in a clinical setting. We neither encountered relevant discomfort nor technical problems. One tumor was correctly identified. The technology was well accepted by all volunteers.

Comparison between fine needle aspiration cytology and core needle biopsy in the diagnosis of breast lesions

J. P. Jablonska, G. Angelelli, A. A. Stabile Ianora, D. A. Carluccio, M. Telegrafo, M. Moschetta; Bari/IT

Purpose: To compare the diagnostic accuracy of Fine Needle Aspiration Cytology (FNAC) and Core Needle Biopsy (CNB) in patients with US-detected breast lesions.

Methods and Materials: 200 breast nodules were detected in 198 patients. 110 FNACs and 90 CNBs were performed. Sensitivity, specificity, diagnostic accuracy, positive predictive (PPV) and negative predictive (NPV) values were calculated for FNAC and CNB.

Results: Sensitivity, specificity, diagnostic accuracy, PPV and NPV of 85%, 89%, 88%, 65% and 96% were found for FNAC, and values of 92%, 82%, 89%, 92% and 82% were obtained for CNB.

Conclusion: FNAC and CNB provide similar values of diagnostic accuracy.

Transthoracic fine 22-gauge needle aspiration biopsy of lung nodules: A valuable approach with minor adverse consequences

M. E. Kamel[1], C. Duc[1], P.-O. Bridevaux[2], M. Christodoulou[1], J.-L. Constantin[1], C. Constantin[1]; [1]Sion, [2]Genève

Purpose: To investigate the diagnostic yield along with the complication rate of using fine 22-gauge needle during CT or US guided aspiration biopsy of lung nodules.

Methods and Materials: 27 patients with single or multiple lung nodules ≤3 cm were enrolled. All patients were subjected to CT or US guided aspiration biopsy of these nodules using a standard aspiration-gun syringe holder technique coupled with 22-gauge Westcott needle. As a routine, aspiration was applied for at least 3 minutes during which continuous gentle in and out movement of the needle tip was kept. The aspirate sample was immediately preserved in CytoLyt solution and its quality was checked before ending the procedures. The diagnostic yield of the technique along with the complication rate, were documented.

Results: The technical success rate of the procedure was 89%. Malignancy was detected in 19 specimens (70%) and benign diagnoses were identified in 5 (19%). Non conclusive results were obtained in 3 (11%) patients. Nodule size ranged from 11 to 30 mm (mean 21 mm±6.5) and the intra-pulmonary path-length ranged from 4 to 38 mm (mean 20 mm±11). The mean procedure time (from first skin puncture to needle withdrawal) was 16 min±7.5 (range 7 to 35 min). Pneumothorax was observed in 7 (27%) patients (mean 13 mm±16, range 2 to 50 mm), whereas parenchymal contusion was noted in 6 (22%) patients. One patient required chest tube placement.

Conclusion: Image-guided aspiration biopsy of lung nodules ≤3 cm using fine 22 gauge needle is a safe technique that yielded a very promising trade-off between diagnostic accuracy and complications rate.

How to estimate the volume of pleural effusions on CT

T. D. Ruder[1], B. Veljkovic[2], S. Franckenberg[1], G. M. Hatch[3], M. Bucher[1], N. Schwendener[4], G. Ampanozi[1], M. Thali[1]; [1]Zürich, [2]Bruderholz, [3]Albuquerque/US, [4]Bern

Purpose: The objective of this study was to determine if area measurements of pleural fluid on computed tomography (CT) reflect the actual pleural fluid volume as measured at autopsy, to establish a formula to estimate the volume of pleural effusion, and to test the accuracy and observer reliability of the estimated volume.

Methods and Materials: 132 human cadavers, with pleural effusion were divided into phase 1 (n=32) and phase 2 (n=100). In phase 1, the acutal volume of pleural effusions was compared to area measurements on axial, sagittal, and coronal CT images. Linear regression analysis was used to create a formula to estimate the volume of pleural effusions. In phase 2, intra-class correlation (ICC) was used to assess inter-reader reliability and determine the agreement between estimated and acutal volumes of pleural effusions.

Results: The actual volume of pleural effusions correlated to a higher degree to measurements on axial CT images (rsmean=0.738; p<0.001) than to sagittal (rsmean=0.679; p<0.001) and coronal images (rsmean=0.709; p<0.001). The volume of pleural effusions is approximately equivalent to 1/10 of the circumferential area of the effusions on axial CT images at the level of the diaphramal tip. Mean difference between estimated and acutal volumes of pleural effusions was less than 40 mL (ICC=0.837–0.874; p<0.001). Inter-reader reliability was higher between two experienced readers (ICC=0.984–0.987; p<0.001) than between an inexperienced reader and both experienced readers (ICC=0.660–0.698; p<0.001).

Conclusion: Pleural effusions may be quantified in a rapid, reliable, and reasonably accurate fashion using single area measurements on CT.

Does iterative reconstruction enhance the detection rate of ground-glass opacity?

I. Bettzieche[1], T. D. L. Nguyen-Kim[2], B. Maurer[2], A. Winklehner[2], O. Distler[2], Th. Frauenfelder[2]; [1]Chur, [2]Zürich

Purpose: In patients with systemic sclerosis (SSc) ground-glass-opacity (GGO) is associated with an active inflammatory process and may be first sign of pulmonary fibrosis. In low-dose computed tomography (CT) iterative reconstruction (IR) technique has the ability to improve image quality relative to filtered back projection (FBP) technique. The purpose is to investigate, if iterative reconstruction has an impact on GGO-detection compared to standard CT.

Methods and Materials: 40 patients (median age 54 years, 2f) with limited SSc (group1) and 25 patients without SSc (group2) (median age 52 years,14f) underwent native chest-CT-scan. Three series were reconstructed: standard FBP (B60f) and two incremental strength-levels of sonogram-affirmed IR (IR3 and IR5, B60f). All CTs were independently assessed by two radiologists (12 years, 5 years experience). For each CT-series noise was obtained. Visual analysis included detection-rate of GGO and reader-confidence (ordinal scale 1to4). Additionally extension of GGO (ordinal scale 0to4; three lung zones: upper, middle, lower, and the sum of all zones) was calculated. Differences in image-noise, detection-rate, reader-confidence and extension-score were analysed by non-parametric tests.

Results: Concerning imaging-noise there was a significant decrease comparing FBP to IR3 or IR5 and IR3 to IR5 (p<0.013). Concerning detection-rate a higher number of cases with GGO were observed in both groups with IR compared to FBP (group1: IR3 +12.5% (n=5), p=0.021; IR5 +30% (n=12), p<0.0002; group2: IR3 +8% (n=2), p=0.07; IR5 +16% (n=4), p=0.012). Concerning the extension of GGO, total-score increased significantly in group1 comparing FBP to IR3 or IR5 and IR3 to IR5 (p=0.011, p=0.00002 and p=0.02) and in group2 comparing FBP to IR5 (p=0.012). For both groups no significant difference in reader-confidence was seen (p>0.08).

Conclusion: In patients with SSc iterative reconstruction technique enhances significantly the detection rate of ground-glass-opacity.

Organ based tube current modulation (XCare) in female chest CT: Impact of breast push up on dose reduction

A. Euler, S. L. Kopp, N. Kawel-Böhm, T. Heye, L. D'Errico, S. Forte, J. Bremerich, T. Niemann; Basel

Purpose: The concept of organ based tube current modulation (XCare, Siemens) is to minimize radiation exposure to radiosensitive organs such as the breasts by considering their anatomic location and lowering the tube current during the anterior rotation. The purpose of our study is to evaluate the impact of a breast push-up belt on breast tissue location and its effects on potential organ dose.

Methods and Materials: In a cohort of consecutive female chest CT (n=153; 246 breasts) aradiolucent breast push-up belt was applied to move radiosensitive glandular tissue inside the dose reduced sector of the tube current modulation. Angles of outer and inner limits (OL/IL) of glandular breast tissue were measured relative to patient's anatomic isocenter. Portion of breast limits and angle volumes within the dose reduced sector of the rotation and the dose-increased remainder were measured. Effects on breast exposure were estimated and correlated with 100% tube current. Location of breast tissue was compared to a 1-year-cohort of female patients without breast push-up (n=1460).

Results: In 97% of breasts OL were situated outside the dose reduced angle rotation. 68% of glandular breast tissue was located inside the dose reduced sector. A mean relative breast exposure of 0.8 was estimated that was significantly reduced compared with 100% non-modulated current (p<0.001). A significant reduction in relative exposure compared with a 1-year cohort without breast push-up could be observed (80 vs. 84%; p<0.001).

Conclusion: A breast-push up belt moving radiosensitive glandular tissue inside the dose reduced area may significantly reduce breast exposure by optimizing the intended effect of organ based tube current modulation.

Contrast enhanced pulmonary CT with a dose of 0.23 mSv: Preliminary observations

A. Neroladaki, A.-L. Hachulla, D. Botsikas, S. Boudabbous, C. D. Becker, X. Montet; Genève

Purpose: The purpose of this study was to investigate the image quality of contrast enhanced pulmonary CT of a dose around 0.2 mSv reconstructed by model based iterative algorithm.

Methods and Materials: The CT data of 67 consecutive patients undergoing enhanced chest CT (GE 750 HD) for suspicion of pulmonary embolism were included in this study. The protocol consisted of a routine dose (100 kV, 250 mA, modulated) CT pulmonary angiography (CTPA) followed by an ultra-low dose acquisition (100 kV, 20 mAs) (ULDCT). The ULDCT was reconstructed with model based iterative reconstruction algorithm (MBIR) whereas the routine CT pulmonary angiography was reconstructed with filtered back projection.

The image quality of both reconstructions was compared by means of a 3 point scale (1=high quality 3=non diagnostic), taking into account normal anatomy of mediastinal structures and pathologic features of the mediastinum and pulmonary parenchyma. Kappa values were also calculated.

Results: The dose length product (DLP) for ULDCT and routine dose CT was 13.69±1.03 and 301.52±117.47 mGy.cm (p<0.001), respectively. The quality of the CT was graded 1.2±0.4 and 1+/0.2 for ULDCT and routine doseCT respectively.

13 patients with lymphadenopathy, 21 with pleural effusion, 14 with pericardial effusion, 15 with emphysema, 22 with consolidation, 9 with nodules and 3 with bronchiectasis were identified. Interreader agreement was 0.821 and 0.894 for ULDCT and routine doseCT reconstructed data sets.

The agreement between the ULDCT and routine doseCT was 0.985.

Conclusion: ULD enhanced chest CT provides images of diagnostic quality despite an x-ray dose of 0.23 mSv.

Magnetization transfer imaging of the lungs in the mouse using a zero echo-time sequence at 4.7T – initial experience

M. Wurnig, M. Wu, W. Jungraithmayr, M. Weiger, K. Pruessmann, A. Boss; Zürich

Purpose: Magnetization transfer (MT) increases in chronic tissue alterations such as fibrosis. Lung MRI, however, is hampered by low spin-density and fast signal decay. In this investigation, we apply zero echo time (ZTE) imaging providing sufficient signal to measure pulmonary MT *in-vivo*.

Methods and Materials: Six C57BL/10 mice underwent MRI at 4.7 Tesla with 3D-MT-ZTE (resolution 0.31x0.31x0.31 mm³, TR 1 ms) with systematic variation of a MT prepulse (duration 10 ms, FA 1.000°/2.000°/3.000°, off-set frequency 2000–15000 Hz, read-out train-length 100, Scan time 3 minutes). Magnetization transfer ratios (MTR) were calculated from region-of-interest analysis, T2*-time of lung tissue was measured with 3D-UTE-sequences (8 TEs, 50–5000 μs).

Results: MTR of non-pulmonary tissues obtained with ZTE showed characteristics known from conventional MT sequences (muscle, white matter: high MTR; fat: low MTR). Lung tissue exhibited MTR between fat and liver tissue, mean MTR at an off-resonance frequency of 5000 Hz, 1000° FA was 12.0±0.5%, for 2000° mean MTR was 25.6±0.9% and for 3000° 33.6±1.4%. The T2*-time of lung tissue was 770±10 μs resulting in a line-width of 413±6 Hz.

Conclusion: We demonstrate that pulmonary MT measurements *in-vivo* are feasible at high field strength and present for the first time quantitative MTR data. Lung tissue showed lower MTR than tissues such as muscle, white matter, or liver but still higher values than fat. Due to the fast signal decay and consequently broad spectral line-width, a higher off-resonance frequency (>4000 Hz) is needed compared to conventional MT measurements to avoid direct saturation. We could show that MTR is still measureable at these high off-resonance-frequencies.

Ultra-short echo-time MRI distinguishes ischemia/reperfusion injury from acute rejection in a mouse lung transplantation model

N. Chuck, M. Wurnig, M. Weiger, Y. Yamada, W. Jungraithmayr, A. Boss; Zürich

Purpose: To investigate whether lung-tissue characterization by computation of spin-density and apparent T2* relaxation-times obtained from ultrashort-echo-time sequence allows distinguishing between ischemia/reperfusion-injury from acute rejection after lung-transplantation in a mouse-model.

Methods and Materials: 12 mice underwent lung-transplantation.6 mice (C57BL/6) received syngeneic (C57BL/6) lung-transplants; the other 6 received an allogeneic (BALB/c) transplant. On the 1st, 3rd and 7th postoperative day the mice were scanned using a small-animal MR-imager (4.7T) equipped with a linearly-polarized-1H-mouse-whole-body-radiofrequency-coil. A T1w-spoiled-gradient-echo-sequence (TR/TE 15 ms/4.7 ms), a T2w-fast-spin-echo-sequence (TR/TE 2500 ms/11 ms) and 3D-UTE-sequences with echo-times TE=50 ms, 75 ms, 100 ms, 500 ms, 1500 ms, 3000 ms, 4000 ms, 5000 ms were acquired (TR=8 ms, matrix 128x128). Quantitative T2* values of lung-transplant-parenchyma and relative spin-density (normalized to the lung on the right side) were compared by region-of-interest-analysis. All samples underwent histological workup.

Results: In the allogeneic-group a distinct pattern of alveolar infiltration as a result of the acute organ rejection was visualized in the UTE-sequences. Quantitatively these findings were reflected by the spin-density (SD) and T2* measurements; significantly higher values in SD as well as T2* were measured in the allogeneic-group at the first time-point (24h postoperative: Tx allogeneic-group SD: 2133.9±516; Tx syngeneic-group SD: 1648.61±271; p=0.0043; Tx allogeneic-group T2*: 1710.16±644 ms, Tx syngeneic-group T2*: 577.16±263 ms; p=4.63132E-05).In the syngeneic-group, a normalization of both, SD and T2* time was noted on the 3rd (SD: 1561.71±284, T2*: 461±159 ms) and 7th (SD: 1562.66±329; T2*: 501.33±211 ms) time-point compared to the allogeneic-group where SD and T2* remained high (time-point 3–SD: 2097.05±324; T2*: 1659.44±1246 ms).

Conclusion: We were able to show that using a UTE-sequence, changes caused by acute rejection after lung-transplantation can be visualized and characterized as they provide different relaxation-properties compared to normal lung-tissue as well as syngeneic lung-transplants which were used a model for ischemia/reperfusion injury.

The relationship between MRI findings and longer term outcomes from CT-guided indirect cervical nerve root blocks

S. Bensler, R. Sutter, Ch. Pfirrmann, C. K. Peterson; Zürich

Purpose: Previous research has shown relationships between MRI findings and pain reduction after direct cervical nerve root blocks for short term. The purpose is to compare MRI findings with long-term improvement after indirect cervical nerve root blocks.

Methods and Materials: MRI findings in 143 consecutive patients with indirect cervical nerve root blocks were compared to pain relief at 15 minutes, 3 month and 1 year post-injection using a numerical rating scale (NRS). Over-all "improvement" was evaluated at 3 months and 1 year with the 7 point Patient's Global Impression of Change (PGIC) scale. The Chi-squared test was used to compare imaging findings; logistic regression to look for predictors of improvement.

Results: Mean pain reduction at PGIC was 56, 3% after 3 months and 65,5% after 1 year. Location of nerve root compromise (intraspinal, foraminal entrance, foraminal) was significantly associated with "Improvement" at 3 months (p=0.026). Patients with foraminal entrance nerve root compromise are more likely to improve. Severity of nerve root compression (contact, deviation, compression) was associated with "Improvement" at 1 year, but not at 3 months (p=0.011). Patients with nerve root deviation have best outcomes and those with only nerve root contact have worst outcomes.

Conclusion: It is possible to make predictions with MRI of the outcome of indirect cervical nerve root blocks. Patients with foraminal entrance nerve root compromise have the greatest pain relief after 3 months and patients with nerve root deviation have the best outcome after 1 year.

Imaging-guided therapeutic shoulder injections: Prospective study comparing the lateral extension of the acromion on conventional radiographs with patients' outcomes

T. Dietrich, B. K. Moor, G. J. Puskas, Ch. Pfirrmann, J. Hodler, C. K. Peterson; Zürich

Purpose: To compare the lateral extension of the acromion on conventional radiographs with patient improvement in pain and shoulder function after subacromial and glenohumeral injections.

Methods and Materials: Institutional review board and informed consent were obtained. Totally 307 patients were prospectively included after therapeutic fluoroscopy-guided subacromial (n=148 patients) or glenohumeral injections (n=159 patients) with local anaesthetics (lidocaine 2%) and long-acting corticosteroids (40 mg of triamcinolone). Postinterventional outcomes were assessed by the patient's global impression of change (PGIC) and visual analogue scale (VAS) pre-injection and at 1 week and 1 month post-injection. Two observers quantified the lateral extension of the acromion by the critical shoulder angle (CSA) and the acromion index (AI) on anteroposterior conventional radiographs. ANOVA and Chi-squared test served for statistics.

Results: Relevant "improvement" one month after subacromial injection was observed in 63% of patients compared to 64% of patients after glenohumeral joint injection. Comparing the three CSA categories after subacromial injection showed a higher percentage of "improved" patients at 1 week (68.2% versus 45.1%) and significantly lower pain levels on the VAS scale at 1 month (2.2±1.9 versus 3.4±3.0, p=0.027) in patients with a short lateral extension of the acromion. No significant association was noted between the clinical outcome (PGIC and VAS scale) and the lateral extension of the acromion (CSA & AI) after glenohumeral joint injections.

Conclusion: Shorter lateral extensions of the acromion were related with better clinical outcomes in subacromial injections but not in glenohumeral injections patients.

SLAC/SNAC arthritis: Does Stage IV exist? Redefining wrist osteoarthritis using magnetic resonance imaging

N. A. Farshad-Amacker, L. Lamont, S. Lee, S. Wolfe, H. G. Potter; New York/US

Purpose: Watson and Ballet introduced the three-stage concept of scapholunate advanced collapse (SLAC) in 1984. The degenerative process was presumed to spare the proximal lunate cartilaginous surface. The purpose of our study was to investigate the staging system of SLAC and scaphoid non-union advanced collapse (SNAC) using magnetic resonance (MRI) cartilage sensitive pulse sequencing.

Methods and Materials: Forty-eight patients with the diagnosis of SLAC (n=25, mean age±SD: 61.7±16.9; male: 18) or SNAC (n=23, mean age±SD: 39.5±17.8; male: 21) who had magnetic resonance imaging at our institution between 2007 and 2012 were included in this retrospective analysis. Cartilage degeneration was graded at the radial styloid-scaphoid junction, radioscaphoid, scaphocapitate, proximal hamate, capitatolunate, radiolunate and distal radio-ulnar joint (DRUJ) by two independent radiologists using a three-point scoring system for cartilage damage (1, normal cartilage; 2, superficial defect; 3, deep defect with exposed bone). The inter-reader agreement of the cartilage scoring and stages were calculated using weighted kappa (wk) statistics.

Results: Inter-reader agreement including all described joints and taking all cartilage defects into account was moderate to good (wk=0.60). The inter-reader agreement for the SLAC stages (0-IV) was good (wk=0.67). Both readers agreed that ten patients (21%) demonstrated deep cartilage defects at the radiolunate joint. Magnetic resonance imaging is capable of defining radiolunate degenerative disease, and we define this as SLAC stage IV.

Conclusion: The stage IV SLAC/SNAC of the wrist is defined with a good inter-reader agreement using MRI. Preoperative MRI may detect focal cartilage defects before other degenerative changes of the joints are present and may alter surgical planning.

Frequency of subclinical axial inflammation in skin psoriasis patients by whole-body MRI

V. Bratu[1], U. Weber[2], P. Häusermann[3], U. A. Walker[3], T. Daikeler[3], V. Zubler[2], U. Studler[3]; [1]Aarau, [2]Zürich, [3]Basel

Purpose: To assess the prevalence of axial skeleton changes by whole-body MRI (wbMRI) in skin psoriasis patients without clinical evidence of arthritis and in age- and sex-matched healthy controls.

Methods and Materials: Twenty-five psoriasis patients without history or clinical evidence of arthritis and twenty-five age- and sex-matched healthy controls were recruited. All subjects underwent unenhanced 1.5 T wbMRI (T1w and STIR). The images were read in a random order and independently by a radiologist and a rheumatologist. The blinded readers recorded the presence of spondyloarthritis (SpA) by a global assessment on a confidence scale of 0–10. The presence if bone marrow edema (BME), fatty marrow infiltration (FI) and erosions (ER) in each SIJ quadrant, spinal BME and FI of all discovertebral units was recorded. The lesion prevalence was expressed as mean percentage of subjects with ≥2 affected SIJ-quadrants or ≥2 spinal lesions. Differences in prevalence between the 2 groups were tested by Fisher's exact test.

Results: 24% of healthy controls and 30% of skin psoriasis patients were assessed as axial SpA by global wbMRI assessment. A high confidence (8–10) with this diagnosis was recorded in 12% of controls and 18% of patients. The differences between the 2 groups were not statistically significant, both for the global and the lesion-based assessment in the spine and SIJ.

	controls	patients	p-value
SIJ BME	32%	40%	>0.05
SIJ FI	20%	29%	>0.05
SIJ ER	4%	10%	>0.05
Spine BME	38%	44%	>0.05
Spine FI	26%	32%	>0.05

Conclusion: On wbMRI every fourth healthy control was falsely classified as axial SpA. Skin psoriasis patients without clinical evidence of arthritis showed a similar frequency of SIJ and spinal changes as healthy controls.

Diffusion-weighted MRI of the spine: Is it helpful to differentiate infectious spondylodisicitis from Modic type 1 vertebral endplate abnormalities?

D. Rotzinger[1], P. Rau[2], C. Federau[1], J.-B. Zerlauth[1], J.-B. Ledoux[1], R. Meuli[1], F. Becce[1]; [1]Lausanne, [2]Etoy

Purpose: To report the diffusion-weighted MRI (DWI) findings in infectious spondylodiscitis and evaluate the potential role of DWI in the differentiation between infectious spondylodiscitis and Modic type 1 vertebral endplate abnormalities.
Methods and Materials: Over a 3-year period, 21 consecutive patients (9 women, mean age 60.3 years) with infectious spondylodiscitis and 20 control subjects (14 women, mean age 63.5 years) with Modic type 1 vertebral abnormalities were prospectively included. DWI was performed on 3-T systems and included a reduced-FOV diffusion-weighted echo-planar sequence (b=0, 300 and 500 s/mm²). Two radiologists independently and blindly measured the apparent diffusion coefficients (ADCs) in normal and abnormal vertebral endplates.
Results: Mean (±SD) ADCs of abnormal vertebral endplates in infectious spondylodiscitis were 772.3±472.4 and 602±398.1 x 10–6 mm²/s for b=300 and 500 s/mm², respectively. Mean ADCs in Modic type 1 vertebral endplate abnormalities were 627.3±66.9 and 569.4±213.3 x 10–6 mm²/s for b=300 and 500 s/mm², respectively. No significant differences were found between infectious spondylodiscitis and Modic type 1 vertebral endplate abnormalities (p=0.255 and 0.750 for b=300 and 500 s/mm², respectively). Mean ADCs of abnormal vertebral endplates were significantly higher than in normal vertebral endplates (196.6±142.2 and 157±131.7 x 10–6 mm²/s for b=300 and 500 s/mm², respectively) (p <0.001).
Conclusion: Although ADCs are higher in abnormal than in normal vertebral endplates, our preliminary results show that DWI offers no advantage in differentiating infectious spondylodiscitis from Modic type 1 vertebral endplate abnormalities.

Lumbar percutaneous herniectomy: A multicentric prospective study

L. Huwart[1], N. Amoretti[2], O. Hauger[3], P. Browaeys[4], P. Foti[2], N. Theumann[4]; [1]Genève, [2]Nice/FR, [3]Bordeaux/FR, [4]Lausanne

Purpose: To prospectively assess the efficiency of lumbar percutaneous discectomy in a multicentric study
Methods and Materials: In a prospective study including three medicosurgical centers, 246 patients who were treated for lumbar radiculopathy resistant to medical treatment and steroid injections were prospectively included between January 2012 and January 2013. All CT- and fluoroscopy-guided percutaneous procedures were performed by using a discectomy probe (Herniatome, Gallini) under local anesthesia. Disk herniations ranging from L3-L4 to L5-S1 were: postero-median in 45/246 patients (18%); and postero-lateral and foraminal in 201/246 (82%). Postprocedural follow-up was performed at Day 1, 1 and 6 months, using visual analogic scale (VAS).
Results: The mean VAS scores±standard deviations (SDs), including all centers and topographical types of disk herniations, were: prior to intervention, 7.5±1.8; at Day 1, 2.0±1.3; at one month, 2.4±1.6; and at 6 months, 1.5±1.1. No significant difference was found between centers (p <0.05). In the group of postero-lateral and foraminal disk herniations, VAS scores±SDs were: 7.6±2.0; 1.8±1.2; 1.9±1.6; and 1.2±1.0. In the group of postero-median herniations, VAS scores±SDs were: 7.3±1.9; 2.3±1.3; 3.1±1.6; and 1.8±0.9.
Conclusion: The results of this multicentric study confirm the efficiency of percutaneous lumbar herniectomy whatever the axial topography of disk herniation.

Femoroacetabular impingement: Normal values of the morphometric parameters in asymptomatic hips

M. Saucier-Lepage[1], B. Vande Berg[2], A. Larbi[2], P. Omoumi[3]; [1]Montréal/CA, [2]Bruxelles/BE, [3]Lausanne

Purpose: To determine the means and the reference intervals of the quantitative morphometric parameters of femoroacetabular impingement in asymptomatic hips with high-resolution computed tomography.
Methods and Materials: We prospectively included 94 adult individuals (188 hips) who underwent computed tomography in our institution for thoracic, abdominal or urologic pathologies. Patients with a clinical history of hip pathology and/or with osteoarthritis or other hip pathologies on computed tomography were excluded. We calculated means and 95% reference intervals for imaging signs of cam-type (alpha angle at 90 and 45° and femoral head-neck offset) and pincer-type impingement (acetabular version angle, lateral center-edge angle and acetabular index).
Results: The 95% reference interval limits were all far beyond the abnormal thresholds found in the literature for cam-type and to a lesser extent for pincer-type femoroacetabular impingement. Reference intervals were similar between males and females for cam-type femoroacetabular impingement morphometric parameters, and slightly differed for pincer-type. Reference intervals were similar between the right and left hips.
Conclusion: The 95% reference intervals of morphometric measurements of femoroacetabular impingement in an asymptomatic patient population were beyond the abnormal thresholds found in the literature, which was especially true for cam-type femoroacetabular impingement. Our results suggest the need for redefining the current morphometric parameters used in the diagnosis of femoroacetabular impingement should be redefined.

Is dedicated extremity 1.5T MRI equivalent to standard large-bore 1.5T MRI for foot and knee examinations?

R. Sutter, F. Tresch, F. M. Buck, Ch. Pfirrmann; Zürich

Purpose: To prospectively compare dedicated extremity MRI and standard large-bore MRI of the lower extremities in the same patient.
Methods and Materials: The institutional review board approved this study. 69 patients were examined both with extremity 1.5T-MRI and standard 1.5T-MRI. Patients completed a questionnaire after each examination (four-point scale: 1-best rating; 4-worst rating). Two readers assessed image quality parameters (five-point scale: 1-best rating; 5-worst rating). Data were analyzed with a paired t-test, a Wilcoxon signed-rank test, and a chi-square test.
Results: Scan duration was significantly longer for extremity MRI (foot 29.9±5.5 min; knee 30.4±5.6 min) than for standard MRI (foot 21.9±5.0 min; knee 20.5±3.9 min) (p<0.001 for all comparisons). Noise reported by the patient was significantly lower at extremity MRI (foot 1.9±0.9; knee 2.1±0.7) than at standard MRI (foot 2.9±1.0; knee 2.9±0.8)(p<0.001). There was a trend towards less claustrophobia for the extremity MRI (1.0±0.0 foot/knee) versus standard MR (foot 1.1±0.4; knee 1.2±0.5) (p=0.06–0.18). Patient satisfaction for both systems was comparable (1.4–1.6 for all)(p=0.2–1.0). Image quality was equivalent for both scanners for foot examinations (p≥0.5), but for knee examinations standard MRI image quality was significantly better than extremity MRI image quality (p≤0.01). Insufficient fat saturation was similar for both scanners for foot examinations (p≤0.6), whereas for knee examinations standard MRI had a substantial advantage over extremity MRI (p<0.001).
Conclusion: Extremity MRI featured less noise and patient claustrophobia than standard MRI, but examination duration was longer at extremity MRI. Patient satisfaction was comparable for both scanners. Image quality at extremity MRI was equivalent to standard MRI for foot examinations, but not for knee examinations.

Qualitative and quantitative MR-imaging assessment of vastus medialis muscle atrophy in asymptomatic patients after anterior cruciate ligament reconstruction

M. Marcon, B. Ciritsis, C. Laux, D. Nanz, M. Fischer, G. Andreisek, E. J. Ulbrich; Zürich

Purpose: To qualitatively and quantitatively assess vastus medialis muscle (VM) atrophy as an important clinical indicator for postoperative knee function in asymptomatic patients with anterior cruciate ligament (ACL) reconstruction using the non-operated leg as control.

Methods and Materials: Prospective IRB approved study with written informed patient consent. Thirty-three asymptomatic patients (men, 21; women, 12) with ACL-reconstruction underwent MR imaging of both legs (axial T1-weighted spin-echo and 3D spoiled dual gradient-echo sequences, the latter with fat-water separating reconstruction). Muscle volume and average fat-signal fraction (FSF) of the VMs were measured. Additionally, two readers classified fatty muscle atrophy according to the Goutallier classification. Significant differences between the legs were evaluated using the Wilcoxon test; and between muscle volumes and FSF using student t-tests. A p-value <.025 and <.05 was assumed to indicate statistical significance in quantitative and qualitative evaluations, respectively.

Results: The VM volume was significantly smaller in the operated (mean±SD, 430.6±119.6 cm³; range, 197.3–641.7 cm³) than in the non-operated leg (479.5±124.8 cm³; 261.4–658.9 cm³) (p<.001). FSF was 6.3±1.5% (3.9–9.2%) in the operatedand 5.8±0.9% (4.0–7.4%) in the non-operated leg with a non-significant (p>.025) difference. The relative muscle-volume and FSF differences were -10.1±8.6% (7.1 to -30.1%) and 10.9±29.4% (39.7–40.1%). The qualitative assessment of muscle atrophy revealed no significant differences between the two sides (p>.1 for both readers).

Conclusion: A significant atrophy of the VM does exist in asymptomatic patients with ACL-reconstruction, but without fatty degeneration.

The grade of cartilage lesions correlates significantly with bone tracer uptake using SPECT/CT

A. Hirschmann[1], A. L. Falkowski[2], M. Dordevic[2], J. Rechsteiner[2], M. T. Hirschmann[2]; [1]Therwil, [2]Bruderholz

Purpose: Do cartilage lesions of knee joints in MRI correlate with bone tracer uptake (BTU) using SPECT/CT?

Methods and Materials: MRI and SPECT/CT images of 63 knees (mean age 49±13 years) were prospectively collected and retrospectively analyzed after approval by the ethical committee. Cartilage lesions were graded in MRI using modified Noyes' grading scale (0=intact; 1=fibrillations; 2=<50% defect; 3=>50%; 4=3+subchondral changes) and measured in two dimensions. 99mTc-HDP-SPECT/CT BTU was volumetrically quantified using validated software (Introspect, Ortholmaging Solutions Ltd., London/UK). Maximum values of each subchondral area (patellofemoral/medial and lateral femorotibial) were quantified and ratio was calculated in relation to a reference region in the femoral shaft, which represented the BTU background activity. Grades of cartilage lesions and BTU were correlated using independent t-test and ANOVA. A p value <0.05 was considered statistically significant.

Results: BTU was low (mean relative uptake of 1.82±1.28) in knees without any present cartilage lesion. In knees with grade 3 and 4 cartilage lesions the relative ratio was significantly higher (3.77±2.31; p<0.01) than in knees with grade 0–2 lesions (1.73±1.05). The larger the diameter of the cartilage lesion is, the higher the BTU. Lesions larger than 4 cm² showed a significant higher BTU than smaller lesions (p<0.01).

Conclusion: SPECT/CT significantly correlates with the degree of cartilage lesion in MRI. Grade 3 and 4 cartilage lesions of the knee joint as well as larger lesions (4 cm²) correlate with a high BTU. Using this information the orthopaedic surgeon is now able to choose a chondral or osteochondral repair strategy.

MRI findings of the first metatarsophalangeal joint in asymptomatic volunteers

T. Dietrich[1], F. L. F. Da Silva[2], M. R. de Abreu[2], G. Klammer[1], Ch. Pfirrmann[1]; [1]Zürich, [2]Porto Alegre/BR

Purpose: To evaluate the frequency and morphology of normal and early pathological findings of the first metatarsophalangeal joints in asymptomatic volunteers on MR images.

Methods and Materials: Institutional review board and informed consent was obtained. Clinical routine MR images consisting of seven sequences without intravenous or intraarticular contrast of 30 asymptomatic forefeet were obtained. Cartilage, bone marrow edema, subchondral cysts, the collateral ligament complex, the intersesamoid ligament, tendons and sesamoid bones were analyzed by two readers.

Results: Reader 1 observed cartilage defects in 26.7% (8/30), small areas of bone marrow edema in 37% (11/30) and subchondral cysts in 20% (6/30). Most of the ligaments of the medial and lateral collateral ligament complex have shown hyperintense, isointense and hypointense areas within the ligament on intermediate-weighted and T1-weighted non fat-suppressed sequences. Hyperintense areas on fluid-sensitive sequences within the collateral ligaments, was between 33% for the accessory medial collateral ligament for reader 1 and 67% for the lateral collateral ligament for reader 2. The extensor hallucis longus tendon, extensor hallucis brevis tendon, hallucis longus tendon and abductor hallucis tendon were nearly always hypointense on intermediate-weighted and T1-weighted images for both readers (97% [29/30] – 100% [30/30]). A bipartite medial sesamoid was noted in 13% (4/30) with an associated bone marrow edema in 75% (3/4).

Conclusion: Bone marrow edema, hyperintense areas on intermediate-weighted and fluid sensitive sequences of the collateral ligament complex were found with an intermediate frequency. An inhomogeneous structure of the collateral ligament complex was very frequent. Cartilage defects and subchondral cysts were not uncommon.

SS223

High-resolution 3T MR protocol for detection and quantification of the vulnerable hemorrhagic plaque

M. I. Vargas, M. Scheffler, B. Delattre, V. Cuvinciuc, I. Barnaure, R. Sztajzel, V. Mendes Pereira, K.-O. Lovblad; Genève

Purpose: To detect carotid hemorrhagic plaque using a black blood fat sat T1 sequence and quantify the degree of stenosis at 3T.
Methods and Materials: The inclusion criteria was the diagnosis of symptomatic carotid plaque; 29 patients (10 women and 19 men, ages 37–89 years, average of 72 years) were studied on a Philips Ingenuity TF PET/MR with an Achieva 3T TX series MR-unit. The technical protocol performed comprised axial diffusion, axial EGT2 and coronal FLAIR of the brain and 3DTOF and a 3DT1 black-blood sequence at the level of the carotid bifurcation. Both carotids were analyzed in each patient and the NASCET scale was used for quantification of degree of stenosis.
Results: We analyzed 58 carotid arteries at the level of the bifurcation; all of our 29 patients had plaques (right=10, left=14, both=5). Hemorrhagic plaque appears as a localized hyperintensity on the black blood 3D T1 sequence. We detected 13 hemorrhagic plaques, and 18 patients without hemorrhagic plaque; 3 carotid arteries in 2 patients (2 right and one left) were not interpretable due to kinetic movement. The NASCET scale measurement showed: 9=40–50% stenosis, 7 between 60–65% stenosis, 3=70%, 3=80% 4=90% stenosis, 4=non significative stenosis.5 patients of 13 patients with hemorrhagic plaques had brain ischemiaNo statiscal difference was found between the 2 groups (with hemorrhagic plaque and without) and the degree of stenosis (p=0.116).
Conclusion: MR with black-blood technique fat sat T1 is a safe, confident and non-invasive tool useful for detection and quantification of hemorrhagic vulnerable plaque.

SS224

Identification of symptomatic carotid plaques – comparison of CTA and dedicated black blood MRI plaque imaging

J. M. Grimm[1], A. Schindler[2], F. Schwarz[2], C. C. Cyran[2], M. Dichgans[2], K. Nikolaou[2], M. Reiser[2], F. Bamberg[2], C. Yuan[3], T. Saam[2]; [1]Lausanne, [2]München/DE, [3]Seattle/US

Purpose: The purpose of this prospective study was to compare the ability of CT angiography (CTA) and black-blood 3T-MRI (bb-MRI) to identify symptomatic carotid plaques.
Methods and Materials: 20 patients with unilateral symptomatic carotid disease who underwent extensive clinical workup at our stroke unit to exclude other causes of ischemic stroke underwent standard CTA and bb-MRI with TOF, pre- and post-contrast fsT1w-, fsT2w- and fsPDw-sequences within 7 days of symptom onset. Both symptomatic and contralateral asymptomatic sides were evaluated. By bb-MRI, plaque morphology and composition as well as prevalence of complicated type VI lesions (AHA-LT6) with haemorrhage, thrombus and/or ruptured fibrous cap were evaluated. By CTA, plaque type (none calcified, mixed, calcified), plaque density in HU and presence of ulceration and thrombus were evaluated. Sensitivity (SE), specificity (SP), positive and negative predictive values (PPV, NPV) were calculated.
Results: For identifying the symptomatic side AHA-LT6 was the best bb-MRI variable and presence of plaque ulceration was the best CTA variable, resulting in a SE, SP, PPV and NPV of 80%, 80%, 80% and 80% for AHA-LT6 as assessed by bb-MRI, 40%, 95%, 65% and 71% for plaque ulceration as assessed by CTA. The SE, SP, PPV and NPV for the combination of AHA-LT6 as determined by bb-MRI and ulceration as determined by CTA were 85%, 75%, 77% and 83%, respectively.
Conclusion: Bb-MRI is superior to CTA at identifying symptomatic carotid plaques, while CTA remains useful for patients who cannot undergo MRI. Results were only slightly improved over bb-MRI when combining both techniques.

SS225

Validation of CO2-BOLD compared to SPECT and PET for assessment of extracranial-endocranial bypass

A. Pellaton, P. Bijlenga, V. Mendes Pereira, K.-O. Lovblad, S. Haller; Genève

Purpose: Extracranial-endocranial bypass is an invasive therapeutic option in stenovascular disease. Assessment of cerebrovascular reserve (CVR) may be used to evaluate the pre-operative risk. Our objective was to validate CO2-BOLD CVR imaging perfusion maps in comparison to the gold standard PET/SPECT.
Methods and Materials: Prospective study with 6 consecutive patients evaluated for an extracranial-endocranial bypass that was already evaluated with SPECT/PET imaging and a routine MRI work up in our institution. We added to the standard protocol CO2-BOLD of 9 minutes with ON-OFF inhalation of 7% of CO2. The CVR maps obtained with this method were compared to those obtained with SPECT/PET by visual reading of two neuroradiologists.
Results: Preliminary results show a good correlation for five patients between the CO2-BOLD and the PET/SPECT maps. In one case, the direct comparison evoked discordant findings. Yet after using the cerebellum as internal reference, relative CO2-BOLD CVR maps corresponded to PET/SPECT maps.
Conclusion: The majority of cases showed a good correlation between the CVR maps obtained with CO2-BOLD as compared to PET/SPECT. As MRI is already part of the routine work up for assessment of extracranial-endocranial bypass, is free of irradiation, minimally invasive and less expensive than supplementary nuclear medicine exams, this specific MRI CO2-BOLD sequence could easily be added to the standard routine protocol. Further validation in a larger group size is warranted and currently ongoing.

SS226

IVIM perfusion imaging in acute stroke

C. Federau[1], S. Sumer[2], F. Becce[1], K. O'Brien[1], R. Meuli[1], M. Wintermark[2]; [1]Lausanne, [2]Virginia/US

Purpose: The perfusion methods currently used in the context of acute stroke, dynamic susceptibility contrast (DSC) MRI and CT perfusion (CTP), both depend on the so-called arterial input function, and might therefore fail to properly take into account leptomeningeal collateral blood flow supply, which is essential for clinical prognosis. Both methods also require i.v. contrast injection, which is time consuming and might be associated with contraindications. Measuring perfusion with Intravoxel Incoherent Motion (IVIM) MRI might theoretically solve those issues, as it is mainly dependent on the local microvascular perfusion and requires no contrast injection.
Methods and Materials: Images were collected at 3 Tesla in 17 patients who presented with symptoms of acute ischemic stroke, using a spin-echo sequence with embedded Stejskal-Tanner pulsed gradients, 16 b-values from 0 to 900 s/mm² in 3 orthogonal directions. IVIM perfusion maps were obtained by fitting the IVIM bi-exponential model, and were evaluated both qualitatively and quantitatively.
Results: Parametric IVIM perfusion maps showed an area of decreased perfusion fraction f in 14/17 stroke patients. A decrease in IVIM perfusion fraction f was observed in the ischemic core in comparison to the contralateral side (0.026 ± 0.019 vs 0.056 ± 0.025; $p = 1.1 \cdot 10^{-6}$).
Conclusion: In the context of acute stroke, IVIM permits the acquisition of both perfusion and diffusion information in a single 3 min MRI sequence, without i.v. contrast injection, permitting a significant gain in time, which is seen as the most critical predictor of positive outcome.

Investigation of sudden cerebral death by performing post-mortem CT angiography

J.-B. Zerlauth[1], J. M. Grimm[1], C. Egger[2], S. Grabherr[1]; [1]Lausanne, [2]Genève

Purpose: Non traumatic cerebral hemorrhage is known to represent about 9% causes of sudden natural death.
The main goal of our study was to determine the causes of cerebral sudden natural death by performing post mortem CT angiography.
Methods and Materials: We reviewed, from January 2010 to October 2013, 120 cases of sudden natural death, which were submitted to a medico-legal investigation at the Lausanne University Center of Legal Medicine. Collected data included conventional autopsy and post mortem CT angiography findings. We excluded from analysis cardiac, accidental and toxic causes of death.
Results: Cerebral causes of sudden death accounted for 9 patients (7.5%). We reported 4 cases of intracranial aneurysm related subarachnoid hemorrhage, 2 cases of hypertensive cerebral hematomas, 1 case of high flow related aneurysm of an arteriovenous malformation rupture, 1 case of cerebral hematoma due to septic intracranial vasculitis, and 1 case of cerebral hematoma due to anticoagulating therapy. CT angiography permitted to determine the exact location of the hemorrhage in all cases, to visualize a leakage of contrast agent in 3 cases. Neuropathological examination founded 1 cerebral aneurysm and multiple cerebral micro-abscesses which were not demonstrated with radiological examination.
Conclusion: Our findings suggest that post mortem CT angiography is clearly powerful to determine causes of cerebral sudden death.

Diffusion weighted MRI with ultra high b-values: A feasibility study

T. Schubert, J. Reinhardt, M. Weigel, M. Amann, C. Stippich; Basel

Purpose: To evaluate the applicability of cerebral DWI imaging with b-values from 1000 to 10000 s/mm² in healthy volunteers regarding SNR and overall image quality using a 3T MR-scanner with a gradient strength of 80 mT/m.
Methods and Materials: For this trial approved by the local ethics board, the brains of 10 healthy volunteers (mean age 34 y) were scanned on a 3T MRI body scanner using a 64 channel head-neck coil. Eleven different DWI scans with b-values ranging from 1000 s/mm² to 10000 s/mm² were applied. The scanning protocol also included a standard FLAIR sequence and a T1 weighted 3D MPRAGE. 3-D realignment of the data sets was performed using FLIRT. T1w volumes were automatically segmented into grey matter (GM) and white matter (WM) using FAST, automated subcortical segmentation into Thalamus, Putamen and Pallidum was performed using FIRST.
Results: SNR values decreased exponentially about 82% from b=1000 to b=10000 for WM and about 92% for GM respectively with the major SNR decrease from b=1000 to b=5000 with 74% for WM and 84% for GM. Even at b=10000, SNR was sufficient to achieve acceptable image quality.
Conclusion: In this work we were able to demonstrate that diffusion weighted imaging with ultra high b-values up to 10000 s/mm² is feasible with reasonable SNR when employing 80 mT/m gradient-strength MR-scanners. As the SNR curves drop with increasing b-values differentially between grey and white matter, this finding may be exploited for tissue specification and/or clinical differential diagnosis.

The role of diffusion tensor tractography and spectroscopy MR in diagnostic of dementias

P. Zukowski[1], G. Bodendörfer[1], A. Laszlo[2], A.-I. Gasser[2]; [1]Riaz, [2]Bulle

Purpose: The aim of this study was to determine the efficacy of diffusion tensor tractography (DTT) and spectroscopy MR (SMR) in diagnose of dementias.
Methods and Materials: We studied 53 patients who underwent SMR in posterior cingulate region, also in 15 patients from these 53 ones had also DTT performed in cingulate bundle. In cases of SMR we measured the valor of NAA/CR, i cases of DTT we measured fractional anisotropy (FA) and mean diffusivity (MD) in posterior cingulate fiber tract. 16 patients had an Alzheimer disease (AD) just confirmed in neuropsychological tests. 24 patients had a mild cognitive impairment (MCI). 13 patients had only a suspicion of dementia.
Results: Values of FA in cingulate bundle were significantly lower for patients with AD than for controls. Also, values of MD were significantly greater for patients with AD than for controls. In SMR only in 9 patients a NAA/CR ratio was significantly lower, also in 12 cases (50%) of MCI we detected an significant diminished of NAA/CR ratio
Conclusion: White matter tracts can be evaluated independently by using diffusion tensor tractography, which appears to be a promising technique for determining changes in white matter in dementive diseases. Result of SMR is not very satisfactory. Further investigation into utility of DTT and SMR is ongoing, especially in DTT.

Fast and high resolution T1 mapping as a marker of normal brain development: A pilot study

S. Eminian, P. Hagmann, P. Maeder, R. Meuli; Lausanne

Purpose: T1 relaxation time is a marker of myelination that may be useful to characterize myelin diseases or abnormal white matter maturation developmental trajectories. Usually costly in time, new fast and high resolution T1 mapping techniques are becoming available. With such a technique we study during normal development between 1 and 18 years changes in T1 relaxation at 3T and look at its relation diffusion ADC, another quantitative marker of brain maturation.
Methods and Materials: MP2RAGE, a 3D GRE high-resolution T1 mapping technique and DTI with ADC estimation are collected on 30 patients which were retrospectively recognized as having normal imaging and no signification medical history. A region of interest analysis was performed by placing ROIs in thalamus, internal capsule, putamen, caudate, corpus callosum, occipital and frontal white matter.
Results: In all ROIs we obtain monotonically decreasing T1 relaxation time as a function of increasing age. Best fit is logarithmic with fastest change in the first 5 years of life. On the other hand ADC changes are also significant but linear with respect to age. There is a good correlation between T1 and ADC (for occipital white matter r=0.65 and p=0.0002).
Conclusion: Monotonically decreasing logarithmic correlation of T1 relaxation with respect to age is identified and normative age dependent T1 values are inferred. T1 relaxation as measured with MP2rage is a valuable marker of normal brain maturation and myelination and may give new chances to characterize myelination and developmental disorders during childhood.

SS231

MAVERIC sequences for artifact reduction in PET/MR for patients with dental alloys

J. M. Gunzinger, G. Delso, M. Porto, P. Veit-Haibach, I. A. Burger; Zürich

Purpose: Dental alloys cause substantial artifacts in the oral cavity and can impair diagnostic accuracy. The goal of this study was to evaluate new MR sequences for their capability of artifact reduction. A high-bandwidth T1 fast spin echo (FSE) sequence and two new MAVRIC (GE Healthcare) sequences were evaluated.
Methods and Materials: Sixteen patients referred for an oncology examination were scanned using a GE Discovery 750w 3-MR system. The in-phase images of a dual-echo gradient echo pulse sequence (LAVA-Flex) were used as reference. A T1-FSE sequence with increased bandwidth (3.2 minutes) as well as a MAVRIC sequence (6 minutes: TR 4000 ms) and an optimized MAVRIC fast sequence for shorter acquisition time (3.5 minutes, TR 3000 ms) were compared. The signal void was measured for every implant. The absolute and relative reduction in signal void was calculated. Statistical significance was tested using the Wilcoxon Signed Rank Test.
Results: There was an absolute and relative reduction of signal void from LAVA sequences to the T1 weighted FSE sequences of 2.4 cm² (range 0.04–12.8 cm²), to MAVRIC 3.0 cm² (range 0.12–13.8 cm²) and to MAVRIC fast 3.0 cm² (range 0.4–13.4 cm²). The relative reduction in signal void was significantly larger for MAVRIC compared to T1 FSE (-80% vs. -65%, $p<0.001$) and even higher for MAVRIC fast compared to MAVRIC (-84% vs. -80%, $p=0.014$).
Conclusion: MAVRIC could become useful for artifact reduction in PET/MR for patients with dental alloys. This might improve diagnostic accuracy and MR based attenuation correction.

SS232

Cone beam computed tomography studies in surgical planning of impacted third molars

M. Pregarz; Peschiera del Garda/IT

Purpose: Impacted third molar surgical planning studies with Cone Beam Computed Tomography (CBCT) has particular importance due to the three-dimensional anatomical structures informations, to prevent Inferior Alveolar Nerve (IAN) impairment and to reduce radiation dose.
Methods and Materials: 187 studies of third molars (152 bilateral and 35 monolateral) were reviewed for the last three years.
It was evaluated the morphology of the roots and their relationship with the Inferior Alveolar Canal (IAC). We identify the IAC buccal to the third molars in 38% cases, lingual in 41%, inferior to the apices of the roots in 12% and between the roots in 9%.
Results: Child and adolescents were radiographically examined for the evaluation of impacted third molars because of presence of pain, pericoronitis, carious lesion, cysts or adjacent teeth root resorption. CBCT allows a significant radiant dose savings compared to conventional Computed Tomography.
For the superior third molars is enough the demonstration of the anatomic location, orientation and relations with neighboring structures.
For the inferior third molars as well as the location and orientation is essential to provide the surgeon the exact location of the IAC and report any anatomical variants.
Conclusion: CBCT studies of impacted third molar provide the surgeon accurate surgical planning, reducing the risk for IAN impairment with a significant radiation dose saving.

SS233

CT – a planning tool for singers' career

S. Potthast[1], C. Storck[2], F. Unteregger[3], S. Zwicky[3];
[1]Schlieren, [2]Basel, [3]Zürich

Purpose: Classical singers will be confronted with the problem of finding the optimal singing voice type. Since the voice type is necessarily a function of the anatomy of the voice generating apparatus (i.e. the larynx with the vocal folds) and of the resonating space (from the larynx to the oral cavity), it should be possible to predict a singer's voice type on the basis of anatomical parameters. As the singing voice pitch depends primarily on the length and the tension of the vocal folds, vocal fold length and the type of the crico-thyroid joint (CTJ) would intuitively appear to be one of the most likely parameters to determine singing voice type.
Methods and Materials: Ethical consent and informed consent of all individuals are available. 50 professional singers (25 sopranos and 25 altos) were included. Multislice CT (MSCT) of the neck in three different octaves was acquired. Postprocessing imaging was performed using MIMICS®. Determination of the CTJ type and measurement of vocal fold length were performed.
Results: In all larynges, the different types of CTJ could be distinguished with MSCT. Vocal fold elongation was larger in sopranos than in altos.
Conclusion: MSCT is a feasible method to distinguish the type of CTJ. We assume that CTJ type influences the elongation of the vocal fold. These data will increase the understanding of what determines a singer's optimal voice type.

Quantitative cerebral perfusion imaging in children and young adults with Moyamoya disease: Comparison of ASL-MRI and H$_2$[^{15}O]-PET

R. P. Götti, G. Warnock, F. Kuhn, R. Guggenberger, R. O'Gorman, A. Buck, N. Khan, I. Scheer; Zürich

Purpose: To evaluate the correlation of quantitative cerebral blood flow (CBF) measurements performed with ASL-MRI and H$_2$[^{15}O]-PET in children and young adults with Moyamoya disease.
Methods and Materials: Thirteen children and young adults (8 females, age: 9.7±7.1 years, range: 1–23 years) with Moyamoya disease underwent cerebral perfusion imaging with H$_2$[^{15}O]-PET (GE Discovery STE PET/CT, 3D FORE FBP, 128 x 128 x 47 matrix, 2.34 x 2.34 x 3.27 mm³ voxel spacing) and ASL (GE 3 Tesla scanner, 3D pCASL sequence, 32 axial slices, TR=5.5s, TE=25 ms, FOV=24 cm, 128 x 128 matrix, 1.875 x 1.875 x 5 mm³ voxel spacing) within less than two weeks of each other. Perfusion of left and right ACA, MCA and PCA territories was qualitatively assessed for ASL-MRI and H$_2$[^{15}O]-PET by two independent readers using a 3-point-Likert scale. Quantitative correlation of relative cerebral blood flow with cerebellar normalization (rCBF) between ASL-MRI and H$_2$[^{15}O]-PET was evaluated in a volume-based approach for each vascular territory after 3D image coregistration.
Results: Interreader agreement was good (κ=0.67–0.69), and strong and significant correlations were found between ASL-MRI and H$_2$[^{15}O]-PET for both qualitative perfusion scoring (ρ=0.77; p<0.001) and quantitative perfusion assessment of rCBF (r=0.67, p<0.001).
Conclusion: In children and young adults with Moyamoya disease, quantitative evaluation of CBF is possible using ASL-MRI without ionizing radiation or contrast injection with a good correlation to H$_2$[^{15}O]-PET after cerebellar normalization.

Factors influencing accuracy of image-guided percutaneous needle biopsy of pediatric tumors and potential for improvement

M. Laurent[1], E. Blondiaux[2], E. Audureau[3], S. Boudjemaa[2], M. Lenoir[2], C. Garel[2], A. Coulomb[2], H. Ducou Le Pointe[2]; [1]Genève, [2]Paris/FR, [3]Créteil/FR

Purpose: This study aimed to assess the diagnostic performance of percutaneous core needle biopsies (PCNBs) of pediatric tumors and identify areas for improvement.
Methods and Materials: A retrospective study was conducted on PCNBs undertaken between 1986 and 2012 in the radiology department of the Trousseau Hospital, Paris. We retrieved data relating to 396 PCNBs of tumors in children (mean age 7.4 years). The following data were analyzed: PCNB procedures (sedation use, ultrasound/computed tomography guidance, number of passes and repeated biopsies), lesion histological type and anatomical location and pathological techniques (frozen storage, conventional morphology and molecular biology). The pathological results of the PCNBs were compared with the final diagnosis reference established from post-surgical results and/or clinical follow-up.
Results: Overall, PCNB showed excellent sensitivity (87.7%), specificity (98.3%), accuracy (90.9%) and a low complication rate (2.5%). Time-trend analysis revealed a significant improvement between 1986 and 2012 for sensitivity (p=0.036). Despite a trend towards reduction, the rate of non- diagnostic biopsies (false negative and positive) remained incompressible over the last two time periods ([1986–1996] 14.0%; [1997–2006] 6.6%; [2007–2012] 7.4% [p=0.073]). Factors associated with increased accuracy were the number of passes (diagnostic biopsies, mean 3.96 vs. non-diagnostic biopsies, 3.6; p=0.049), younger patient age (7.2 years vs. 9.7; p=0.008), and histological techniques (e.g. 83.9% [immunohistochemistry] vs. 97.1% [no immunohistochemistry]; p<10−4).
Conclusion: PCNBs are highly efficient and safe for the diagnosis of pediatric tumors. Our study has demonstrated improvement of the technique over the last 26 years mainly due to the pathological analysis progress.

3D ultrasound of the femoro-patellar articulation in newborns

E. Stranzinger, A. Bähler, J. Heverhagen, K. Ziebarth, H. Kohlhof; Bern

Purpose: To establish a 3D ultrasound screening method of femoro-patellar dysplasia in newborns.
Methods and Materials: From 2012–2013, we prospectively imaged 160 consecutive femoropatellar joints in 80 newborns from the 36th to 61st gestational week that underwent a hip sonography (Graf) and presented with a type I hip. A pediatric radiologist performed the 3D ultrasound of the femoro-patellar joint in 30° flexion of the knee. Axial, coronal and sagittal reformats were used to standardize a reconstructed axial plane through the femoral condyle and the mid-patella. The sulcus angle, the lateral-to medial facet ratio of the trochlea and the shape of the patella (Wiberg) were evaluated.
Results: All 3D exams were diagnostic and feasible for reconstructions in a standardized axial plane. The mean trochlea angle was 149.1° with ad STD of 4.9°. There was no statistical difference between boys and girls. The lateral to medial facet ratio of the trochlea ratio was 1.3 with a STD of 0.22. Wiberg type I patella was found in 95% of the babies and type II in 5%.
Conclusion: 3D ultrasound is a reliable technique to image the cartilaginous femoro-patellar joint in newborns. The shape of the femoro-patellar articulation in newborns is already preformed in its adult form, which justifies this screening method for femoro-patellar dysplasia. Performing a 3D ultrasound with standardized reconstructions of the axial plane allows sonographic measurements to be made. This may have the benefit of lower operator dependency.

Lung MRI in cystic fibrosis

C. E. Amaxopoulou, R. Gnannt, R. P. Götti, A. Jung, C. J. Kellenberger; Zürich

Purpose: To describe MRI findings in patients with cystic fibrosis (CF) compared to other patients.
Methods and Materials: Retrospective analysis of studies from 25 children with CF (mean age 5 y, range 1–20 y) and 12 children (mean age 3 y, range 0.3–9 y) undergoing MRI for other diagnoses. All MRI was performed at 1.5T including T2-weighted respiratory-triggered Propeller FSE and fast dynamic contrast-enhanced imaging (single dose Dotarem, temporal resolution 1–2s). Any morphologic change was described and perfusion abnormalities assessed qualitatively and by measuring signal enhancement and time to peak.
Results: Frequent findings in CF patients were consolidation (22/25, 88%) including dependant atelectasis (14/25, 56%), bronchial wall thickening (24/25, 96%), bronchiectasis (5/25, 20%), mucus plugging (2/25, 8%) and prominent mediastinal and tracheobronchial lymph nodes (20/25, 80%). Perfusion defects of varying degrees were seen in 21/25 patients (84%), with decreased enhancement and prolonged time to peak. All consolidations demonstrated increased enhancement. Dependant atelectasis showed similar time to peak as normal lung, while more ventrally located consolidations as in lingula or middle lobe showed prolonged time to peak.
Conclusion: Lung MRI can demonstrate the typical CF findings as described by CT. In addition, dynamic contrast-enhanced imaging reveals lung perfusion abnormalities and may allow differentiation between chronic consolidations and acute atelectasis due to sedation.

Fetal brain morphology after in-utero repair of open neural tube defects

C.-N. Nasiadko, I. Scheer, M. Meuli, U. Moehrlen, N. Ochsenbein, C. J. Kellenberger; Zürich

Purpose: Various neuroanatomical abnormalities, including Chiari-malformation type II are seen in children with open neural tube defects. Since the randomized MOMS-Trial, fetal surgery has become a new therapy in selected cases of spina bifida. While clinical outcome has been investigated, there is only sparse information on postoperative morphology. Aim of our study was to compare associated abnormalities before and after fetal surgery, as well as assess morphometric changes of the posterior fossa.

Methods and Materials: Retrospective review of pre- and postoperative fetal MRI of 9 children who underwent in-utero repair of the open neural tube defects. Between December 2010 and December 2013 a total of 18 MR-studies were performed. Ventricular width, width of the external CSF spaces, tonsillar/cerebellar displacement, cerebellar length, posterior fossa area and associated hydrocephalus, heterotopia or aqueductal stenosis were evaluated.

Results: Preoperative findings were Chiari-malformation type 2 in all cases and heterotopia in one case. After in-utero closure of the spinal defect the hindbrain herniation was reversed in all cases within 4 weeks. In 7/9 individuals (78%) aqueductal stenosis was unmasked in the postoperative studies. Ventricular width decreased in 1/9 case (11%), was stable in 1/9 case (11%) and increased in the other 7/9 cases (78%). The preoperatively diagnosed heterotopia was confirmed postoperatively and newly detected in 3/9 other cases (33%). The spinal defect was completely closed in all cases.

Conclusion: Fetal MRI 4 weeks after in-utero repair of the open neural tube defect shows reversal of hindbrain herniation and of other Chiari-2 associated changes.

Arterial spin-labeling (ASL) in routine clinical pediatric practice: Preliminary results

L. Merlini, E. Maturana, M. Laurent, A. Dhouib, S. Hanquinet, V. Cuvinciuc; Genève

Purpose: to describe our experience with pulsed arterial spin labeling (ASL) through different pediatric cases in order to test imaging quality and feasibility in children and also possible clinical use in every-day practice.

Methods and Materials: 76 ASL were performed between 2011 and 2013 at 1.5 T Siemens, on 73 children (30 M and 40, F 0 months–16 year old) investigated for different clinical indication involving brain perfusion (asphyxia, sickle cell disease, migraine, epilepsy etc.) Pulsed (PALS) sequences with EPI readout were used, 3D PACE prospective motion correction, tissue segmentation, flow quantification, and creation of color CBF maps were additionally built. Two radiologists performed visual inspection of the color map and results were given by consensus. Correlation with conventional sequences in particular with Diffusion weighted MR was considered.

Results: At visual inspection 12 exams were excluded because of insufficient quality, 39 were considered as normal and 25 pathological. We describe artifact types (i.e. motion, transit time effects, susceptibility artifact etc.) We describe hypoperfusion and hyperperfusion patterns in different diseases. We present cases in which ASL provided useful information in comparison to conventional sequences.

Conclusion: ASL is a promising tool for pediatric perfusion imaging. Based on our observations, future possible lines of research can be proposed: 1) the timing of ASL abnormalities in comparison to DWI findings in ischemic/asphyxiated newborn and in preterm baby, 2) the ability to predict neurological complications in sick cell disease and 3) the role of ASL in the management of neurological complications of pediatric cardiac surgery.

Lactate-edited MR spectroscopy in neonatal hypoxic ischemic encephalopathy

R. O'Gorman[1], C. Sabandal[1], V. Bernet[1], C. Hagmann[1], R. Noeske[2], I. Scheer[1]; [1]Zürich, [2]Berlin/DE

Purpose: To evaluate the relative sensitivity of a lactate editing MR spectroscopy sequence in comparison to standard PRESS MR spectroscopy for detecting lactate in neonates with suspected hypoxic ischemic encephalopathy.

Methods and Materials: The patient group included 10 infants referred for cerebral MRI for suspected perinatal asphyxia. PRESS MR spectra (TE/TR=35/3000 ms) and lactate-edited MR spectra (TE/TR=144/3000 ms) were acquired from a voxel in the left basal ganglia. Lactate-edited MR spectra were collected using a BASING sequence with editing pulses applied at ±77 Hz. Lactate and NAA concentrations were calculated with LCModel using an experimental basis set including propylene glycol in addition to the standard metabolites. The average lactate concentration and lac/NAA ratio was calculated for each spectrum, and the reliability of lactate detection was assessed from the Cramer-Rao lower bounds (CRLB) of the LCModel fit.

Results: Water-scaled lactate concentrations and Lac/NAA ratios were higher for the lactate-edited spectra relative to corresponding values from short TE (35 ms) PRESS (p=0.06, 2-tailed). The short TE (35 ms) and lactate-edited spectra show comparable sensitivity to lactate using a lenient CRLB cutoff (25%), but the fit reliability was higher (eg CRLB were lower) for the lactate edited spectra.

Conclusion: While short TE PRESS MRS shows adequate sensitivity to high concentrations of lactate, overlap with lipid resonances can reduce the reliability and specificity of lactate detection. Lactate-edited MRS can improve the specificity and reliability of lactate detection in neonates with suspected HIE, particularly in the presence of strong lipid signals.

The role of 3.0 tesla MRI-imaging for the diagnosis and characterization of anomalies in children with currarino triad

J. Hirsch, B.-J. Meyrat, F. Gudinchet, L. Alamo; Lausanne

Purpose: To evaluate the efficacy of 3T MRI in the identification of sacral dysplasia, ano-rectal malformations (ARM), presacral masses, CNS abnormalities and postoperative complications in Currarino triad patients.

Methods and Materials: All patients treated from Currarino triad in our institution between 2000 and 2013 with pre- and/or postoperative 3T MRI studies from pelvis and spine were retrospectively reviewed. Sacral dysplasia, characterization of presacral masses, classification of ARM, detection of associated CNS abnormalities and complications after surgery were evaluated and compared with operative findings and/or postoperative clinical data.

Results: 13 3T MRI pelvic and spinal studies (3 pre- and 10 postoperative) were performed in 8 patients with Currarino triad. All patients presented sacral dysgenesis, presacral masses and ARM. Correct pre-and postoperative characterization of presacral masses by imaging was obtained in all cases (2 anterior meningocele, 2 presacral lipoma, 2 lipomyelomeningocele and 2 teratoma). MRI allowed a correct classification of ARM in the 3 patients with preoperative studies (2 high, 1 intermediate type). Tethering cord secondary to the presacral mass was observed in 7 from 8 patients. Postoperative exams showed no complications.

Conclusion: 3T MRI allows an excellent characterization of presacral masses and an optimal evaluation of the pre- and postoperative ano-rectal and sphincter anatomy in patients with Currarino triad. Moreover, associated CNS abnormalities, present in almost all evaluated cases, are also appropriately detected. Therefore, routine spinal MRI should be performed in all patients with Currarino triad.

SS242

Prenatal MR imaging of congenital hepatic tumors:
A report of three cases

L. Perrin[1], M. Anooshiravani-Dumont[2], Y. Vial[1], R. Meuli[1], L. Alamo[1];
[1]Lausanne, [2]Genève

Purpose: Congenital hepatic tumors (CHT) are rare. The three main types are hemangioendothelioma (HAE), mesenchymal hamartoma (MH) and hepatoblastoma (HB). The generalization of ultrasound (US) screening studies during pregnancy has increased the detection of these tumors. Prenatal MRI is increasingly used as a complementary imaging study. In this article, we discuss the advantages and limits of the technique for characterizing CHT.

Methods and Materials: We retrospectively reviewed all cases of CHT detected in utero at US pregnancy screening, which were then investigated with complementary prenatal MRI and followed up in our institution over a 10 year period. Prenatal imaging findings at US and MRI were evaluated and correlated with pathology records and/or postnatal imaging studies.

Results: Three CHT were detected in utero, including two HAE and an atypical MH. Prenatal imaging findings and the clinical expression of these tumors showed a significant variability.

Conclusion: The characterization and differentiation of CHT detected in utero based on imaging findings is challenging. The main role of complementary prenatal MRI is not to identify the type of tumor, but to improve information about the possible origin of the lesion, its anatomical extension and any related complications. This information can reduce the differential diagnosis and influence tumor management during pregnancy and/or in the immediate postnatal period.

Novel folic acid radioconjugate with an albumin binding entity: Improved anti-tumor efficacy and reduced side effects

S. Haller, R. Schibli, C. Müller; Villigen

Purpose: Conventional folic acid radioconjugates show a low tumor uptake and an unfavorable tumor-to-kidney ratio. Therefore, we recently developed a DOTA-folate conjugate containing an albumin binder (cm09) to enhance the blood circulation time. The application of ^{177}Lu-cm09 resulted in a 10-fold increased tumor-to-kidney ratio compared to a conventional radiofolate (^{177}Lu-EC0800). The goal of this study was to compare the therapeutic efficacy and potential side effects of ^{177}Lu-EC0800 and ^{177}Lu-cm09.

Methods and Materials: A therapy study was performed in KB (FR+) tumor xenografted mice using 20 MBq of ^{177}Lu-EC0800 and ^{177}Lu-cm09, respectively. Body weight and tumor growth were monitored over 3 months. Kidney function was investigated in mice without tumors over 8 months by performing quantitative SPECT using ^{99m}Tc-DMSA and by determining blood plasma parameters.

Results: The tumor volume was 5-fold increased compared to the initial volume after ~9 days for control mice and after ~16 days for mice treated with ^{177}Lu-EC0800. ^{177}Lu-cm09 therapy resulted in complete tumor remission. At terminal state creatinine and blood urea nitrogen values were ~5.5-fold and ~6.6-fold increased in mice injected with ^{177}Lu-EC0800 but only ~2-fold and ~5-fold higher in mice which received ^{177}Lu-cm09 compared to control animals. The ^{99m}Tc-DMSA studies revealed also more severe nephrotoxic side effects after ^{177}Lu-EC0800 therapy than after application of ^{177}Lu-cm09.

Conclusion: Our results demonstrate that the binding of the radiofolate to serum albumin is a strategy to increase the tumor-to-kidney ratio and consequently improve the anti-tumor efficacy and reduce radionephrotoxicity. Nevertheless, further optimization is required in perspective of a clinical application of therapeutic radiofolates.

Synthesis and biological evaluation of ^{18}F labeled fluoropropyl tryptophan analogues as potential PET tumor imaging agents

A. Chiotellis[1], L. Mu[1], A. Müller[1], S. Selivanova[1], C. Keller[1], R. Schibli[2], S. Krämer[1], S. M. Ametamey[1]; [1]Zürich, [2]Villigen

Purpose: Most malignant lesions show an increased demand for amino acids due to their increased metabolic needs which is expressed via enhanced amino acid transport relative to normal cells. Therefore, amino acids based tracers represent a promising class of tumor metabolic imaging agents. We recently reported on 5-(2-[^{18}F] fluoroethoxy) tryptophan (5-[^{18}F] FEHTP) as a PET probe for tumor imaging and quantification of LAT1 (L amino acid transporter subtype 1) activity [1]. In this study, two new tryptophan analogues, namely 2-(3-[^{18}F] fluoropropyl)-DL-tryptophan ([^{18}F] 2-FPTRP) and 5-(3-[^{18}F] fluoro-propyl)-DL-tryptophan ([^{18}F] 5-FPTRP) were synthesized and characterized *in vitro* and *in vivo*.
[1] Krämer et al., J Nucl Med 2012, 53, 434–442.

Methods and Materials: Reference compounds and precursors were prepared by multi step approaches. Radiosynthesis was achieved by nucleophilic [^{18}F] fluorination of mesylate precursors and subsequent deprotection. *In vitro* cell uptake studies were performed using the endocrine small cell lung cancer cell line NCI-H69. *In vivo* experiments were performed on NCI-H69 and PC-3 xenograft bearing NMRI nude mice.

Results: Both compounds could be efficiently labelled in 29–34% decay corrected yields, high specific activities (30–82 GBq/µmol and radiochemical purity over 99%. *In vitro* assays showed that both tracers are substrates for amino acid transport, performed almost exclusively via LAT transporter(s). Small animal PET imaging showed high tumor/background ratios for [^{18}F] 2-FPTRP which was superior than 5-[^{18}F] FEHTP and comparable to the well established tyrosine analogue O-(2-[^{18}F] fluroethyl)-L-tyrosine ([^{18}F] FET). Radiometabolite studies showed no evidence of involvement of a biotransformation step in tumor accumulation.

Conclusion: It is concluded that [^{18}F] 2-FPTRP is a promising PET probe for the LAT activity of malignant lesions.

Development of radiotracers for the PET imaging of CB2 receptor

R. Slavik[1], U. Grether[2], S. D. Krämer[1], A. Müller[1], L. Gobbi[2], M. Weber[3], R. Schibli[4], S. M. Ametamey[1], L. Mu[1]; [1]Zürich, [2]Basel, [3]St. Gallen, [4]Villigen

Purpose: The cannabinoid receptor type 2 (CB2) has very low expression level in brain tissue under basal condition. However, it is up-regulated in cerebellum, cortex and brainstem under pathological conditions such as neuroinflammation and neurodegenerative diseases including Parkinson's and Alzheimer's disease. Our goal is to develop highly specific and selective brain PET tracers towards CB2.

Methods and Materials: Two series of novel CB2 ligands were designed and synthesed. *In vitro* competitive binding assays were performed with membranes containing human CB2 and CB1, respectively, using [3H]-CP-55940. The most promising ligands (designated as 1 and 2) were radiolabeled with C-11 isotope. *In vitro* studies including lipophilicity and autoradiography were performed. [^{11}C] 1 and [^{11}C] 2 were further evaluated *in vivo* under baseline and blocking conditions.

Results: *Ki* values for the new derivatives of both classes of compounds towards the CB2 receptor ranged from 0.7–1220 nM, with a selectivity towards hCB2 over hCB1 >10'00. Both [^{11}C] 1 and [^{11}C] 2 were obtained in 99% radiochemical purity with high specific radioactivity at the end of synthesis. Autoradiography experiments on rodent spleen tissue demonstrated high specific binding to CB2 for both radioligands. Specific binding to CB2 could also be shown *in vivo* in biodistribution experiments in rats with and without CB2 specific blocking agent GW405833. Compared to [^{11}C] 2, [^{11}C] 1 exhibited a better *in vivo* stability.

Conclusion: [^{11}C] 1 is a very promising CB2 PET tracer which might serve as a novel tool for the investigation of CB2 receptor levels in healthy tissues and different brain disorders.

^{68}Ga-labeled NODAGA- and DOTA-neurotensin analogs for targeting breast, prostate and pancreas cancers

F. Buchegger[1], D. Tourwe[2], M. Kosinski[1], D. Viertl[1], T. Stora[3], L. Buehler[3], R. Miralbell[3], J. Prior[1]; [1]Lausanne, [2]Bruxelles/BE, [3]Genève

Purpose: Neurotensin (NT) was shown to induce EGFR-, c-Src- and Stat5b-dependent proliferation of prostate cancer PC-3, while a commercial NT antagonist tested on breast cancer cells expressing NT receptor1 (NTR1) inhibited their growth. Radiolabeled NT-analogs may be relevant tracers for imaging these cancer receptors implicated in proliferation.

Methods and Materials: HT-29 human colon and PC-3 human prostate cancer cells (both NTR+) were grafted in SCID mice for biodistribution experiments. DOTA-NT-XIX, NODAGA-NT-20.3 and NODAGA-PEG-NT-X chelate-NT analog conjugates were obtained at >95% purity from CSBio, CA. Peptide conjugates were radiolabeled with generator-eluted ^{68}Ga and biodistributions studied in tumor bearing mice. ^{99m}Tc-NT-XIX (Maes V. et al., J Med Chem 2006, 49:1833 ff) was used as positive system control.

Results: Labeling of ^{68}Ga-DOTA- and NODAGA-chelate-NT analogs yielded radiotracers of high radiochemical purity similar to ^{99m}Tc-NT-XIX, the latter radiolabeled via tricarbonyl. Unexpectedly, ^{68}Ga-DOTA-NT-XIX did not reveal any measurable, specific HT-29 tumor uptake, while ^{99m}Tc-NT-XIX showed a specific uptake of 4.7±0.9% ID/g in accordance with previous observations (Garcia-Garayoa et al, 2009, Eur J Nucl Med Mol Imaging 36:37 ff). ^{68}Ga-NODAGA-NT20.3 and ^{68}Ga-NODAGA-PEG-NT-X showed specific localization in HT-29 and PC-3 tumors that was inhibited by unlabeled NT-XIX. Though tumor uptake was highest with ^{99m}Tc-NT-XIX in% ID/g, the 2 ^{68}Ga-labeled NODAGA-NT conjugates showed markedly higher tumor-to-normal tissue ratios including tumor-to-intestines with only kidneys showing higher concentrations of ^{68}Ga- than ^{99m}Tc- labels.

Conclusion: These studies show that ^{68}Ga-NODAGA-NT tracers might be valuable for clinical evaluation of NTr-expressing tumors.

68Ga-NODAGA-MJ9 tumor uptake and mouse derived dosimetry projection for a GRP-receptor PET study in prostate cancer patients

F. Buchegger[1], H. Maecke[2], M. Kosinski[1], D. Viertl[1], E. Deshayes[1], S. Baechler[1], R. Miralbell[3], J. Prior[1], R. Mansi[2]; [1]Lausanne, [2]Freiburg/DE, [3]Genève

Purpose: Gastrin releasing peptide receptor (GRPr) is highly expressed in prostate and breast cancer. 68Ga-NODAGA-MJ9 is a new GRPr antagonist selected by 2 of us (HRM, RM). We studied tumor localization in mice and extrapolated a prospective dosimetry for human GRPr PET.
Methods and Materials: NODAGA-MJ9 (CSBio, CA) was 68Ga-labeled (68Ge/68Ga-generator IGG100, Eckert & Ziegler) using the Modular-Lab unit (PharmTracer, Eckert & Ziegler). 68Ga-NODAGA-MJ9 alone or with 20 nmol unlabeled peptide was i.v. injected in prostate cancer PC-3 bearing SCID mice and these were analyzed at 0.7 and 1 h. Mouse biodistributions measured between 10 and 90 min after injection were used for calculation of tissue residence times and these were considered conserved in human beings in an OLINDA-based dosimetry.
Results: 68Ga-labeling of NODAGA-MJ9 yielded >98%-purity radiopeptide. PC-3 tumor uptake of 68Ga-NODAGA-MJ9 was 26.1±7.7 and 27.9±4.5% injected dose per gram (% ID/g) at 0.7 and 1 h, respectively, while after co-injection with unlabeled peptide it was 2.7±1.0% ID/g (1 h). Pancreas uptake was high at 40 min (55% ID/g) and then decreased. Mouse whole-body effective half-life of 68Ga-NODAGA-MJ9 and that of most organs was about 25 min. Pancreas uptake was highest at 10 min with 45.0±6.1% ID/g and decreased thereafter. Assuming a bladder voiding interval of 30 min, the prospected ED was 0.028 mSv/MBq with highest radiation dose for pancreas and urinary bladder wall (0.41 and 0.19 mGy/MBq, respectively).
Conclusion: The high GRPr-mediated tumor uptake of 68Ga-NODAGA-MJ9 is promising for a PET study in prostate cancer patients. The ED extrapolated here from mice is equal to a similar peptide, 68Ga-DOTA-RM2, already studied in human (Roivainen et al. J Nucl Med 2013; 54:867–72).

First-in-man biodistribution and radiation dosimetry of 68Ga-NODAGA-RGDyK as determinated by whole-body PET/CT scans

P. Mitsakis, S. Gnesin, M. Kosinski, S. Baechler, F. Buchegger, J. Prior; Lausanne

Purpose: Our aim was to present a first human dosimetry study for 68Ga-NODAGA-RGDyK, which can visualize the integrin αvβ3 thanks to its peptide Arg-Gly-Asp (RGD). The integrin αvβ3, plays an essential role in the regulation of tumour growth, local invasiveness and metastatic potential, but it is also highly expressed on activated endothelial cells during angiogenesis.
Methods and Materials: Cyclic NODAGA-RGDyK was radiolabeled with the eluted of the 68Ge→68Ga generator using an automatic processor unit PharmTracer. Three males patients (mean age 61 y) scheduled to undergo endarterectomy were included in this study. For each patient three low-dose, whole-body PET/CT scans at 10 min, 1h10 min and 2h post-intravenous injection of 200 MBq 68Ga-NODAGA-RGDyK were performed. The evaluation of the 68Ga-NODAGA-RGDyK biodistribution was based on measuring 68Ga activity concentration contained in up to 13 source regions (thyroid, lungs, heart, liver, spleen, stomach, kidneys, urinary bladder, red bone marrow, pancreas, large intestine, small intestine and whole-body). Mono-exponential fit was used to derive the time-integrated activity for OLINDA dosimetry assessment.
Results: Effective Dose according OLINDA for male human beings was 0.015±0.001 mSv/MBq, with highest radiation dose exposure for the kidneys, spleen and urinary bladder wall with 0.056, 0.038 and 0.029 mGy/MBq, respectively.
Conclusion: This first-in-man study confirmed similar biokinetics and dosimetry data of 68Ga-NODAGA-RGDyK among patients with an estimated radiation dose exposure of about 3 mSv for a 200 MBq injection. This value is very close to what had previously been estimated from mice biokinetics data extrapolation by our group.

Variation of cellular uptake of 177Lu-[DOTA, Thi8, Met (O2)11]-Substance P in different glioblastoma cell lines

C. A. Fischer, D. Cordier, A. Bauman, L. Mariani, T. L. Mindt; Basel

Purpose: Intratumoral injection of radiolabeled substance P (SP) derivatives has been applied in clinical trials for peptide receptor radionuclide therapy of gliomas, overexpressing neurokinin type 1-receptor (NK1R). Despite proven NK1R expression of the tumors, inhomogeneous response was observed in some patients. To identify factors that may influence the response to NK1R-targeted therapy we evaluated different glioblastoma cell lines for their uptake of a radiolabeled SP derivative.
Methods and Materials: [DOTA, Thi8, Met (O2)11]-SP was synthesized by solid phase peptide synthesis and radiolabeled with 177LuCl3 under standard conditions. Cell binding and internalization of 177Lu-[DOTA, Thi8, Met (O2)11]-SP were examined _in vitro_ in four commonly used glioblastoma cell lines (LN71, LN229, LN319, and LN405). In addition, the RNA-levels of full-length (NK1R-_fl_) and truncated (NK1R-_tr_) NK1R-isoforms were investigated for all cell lines by reverse transcription PCR analysis.
Results: [DOTA, Thi8, Met (O2)11]-SP was radiolabeled with 177LuCl3 in high radiochemical yield and purity (>99.5%) at a specific activity of 3.3 GBq/μmol. Specific binding and internalization of 177Lu-[DOTA, Thi8, Met (O2)11]-SP could only be observed with cell line LN319. The RNA levels and the ratio of NK1R-_fl_ to NK1R-_tr_ of the examined cell lines differed. The highest level of NK1R-_fl_ was found in cell line LN319.
Conclusion: Of the four glioblastoma cell lines evaluated, only cell line LN319 internalized 177Lu-[DOTA, Thi8, Met (O2)11]-SP. Differences in the level of expression of NK1R-_fl_-isoform appear to influence the cell binding and internalization of radiolabeled SP derivatives. Pre-therapeutic screening for NK1R isoforms may therefore be appropriate before initiation of NK1R-targeted glioma therapy.

A comparison of three 67/68Ga labeled exendin-4 derivatives for β-cell imaging: The influence of the conjugation site of the chelator

A. Jodal[1], R. Schibli[1], M. Behe[2]; [1]Villigen, [2]Basel

Purpose: An increased activity of β-cells can lead to hyperinsulinism while a decreased activity may lead to diabetes. Noninvasive imaging of the GLP-1 receptor expressed on β-cells could allow the assessment of β-cell diseases (e.g. diabetes, insulinoma). We investigated three 67/68Ga-labelled derivatives of the potent GLP-1R agonist Exendin-4 both _in vitro_ and _in vivo_. The conjugation of the chelator NODAGA to resident lysines either at positions 12, 27 or the C-terminally attached lysine 40 was also examined.
Methods and Materials: _In vitro_ binding and internalisation of 67Ga-Ex4NOD12, 67Ga-Ex4NOD27 and 67Ga-Ex4NOD40 was tested on CHL cells stably transfected to express the human GLP-1 receptor (hGLP-1R). _In vivo_ biodistribution of 68Ga-labelled peptides was tested in CD1 nu/nu mice with subcutaneous CHL-hGLP-1 positive tumours; the specificity of the binding was determined by pre-injecting excess peptide.
Results: The peptides were successfully labeled with a radiochemical yield >95% and high specific activity.
All peptides showed good binding, however in comparison to Exendin-4, lower affinity for the hGLP-1R _in vitro_ in the range of 29 to 54 nM. Both 67/68Ga-Ex4NOD40 and 67/68Ga-Ex4NOD12 showed a high internalisation of >30% and a high specific uptake in GLP-1R positive tissue. However, high non-GLP-1R mediated re-uptake leads to high accumulation of activity in the kidneys.
Conclusion: We showed that Ga-Ex4NOD12 and Ga-Ex4NOD40 have the most favourable _in vitro_ properties and _in vivo_ binding to GLP-1R positive tissue. We conclude that the lysines in position 12 and 40 are best suited for modifying Exendin-4.

NSS158

First results of a pre-clinical evaluation of a combined treatment of neuroendocrine tumous with Lu-177-DOTA-Exendin-4 and mTOR-Inhibitor

O. C. Maas, V. Pretre, M. Fani, A. Wicki, D. Wild; Basel

Purpose: Treatment of pancreatic neuroendocrine tumours with radio-labelled peptides or the mTOR inhibitor Everolimus is well established. Not much is known about the combination of both. This study investigates the potential and limitation of a combination in a transgenic mouse model. Furthermore we aim to better understand the physiology that lies behind these therapies.

Methods and Materials: Rip1Tag2 mice, developing insulin producing, mTOR dependent, GLP-1-receptor bearing tumours in the pancreas, were treated with Lu-177-DOTA-Exendin-4, Everolimus and the combination of both. Biodistribution studies of Lu-177-DOTA-Exendin-4 with Everolimus pre-treatment over 7 or 10 days in 3 different doses were performed. Studies addressing treatment response with both treatments alone and the combination of both are in progress. One series is carried out over 10 days, a second series will last up to 9 month, evaluating "survival". Microvessel density, apoptosis, mTOR suppression and tumour size is evaluated.

Results: Pre-treatment with Everolimus with 10 mg/kg significantly reduces tumour uptake of Lu-177-Exendin-4 (135.6 ± 45.8 vs. 296.6 ± 72.1, $P = 0.02$) and suppresses mTOR (71% of control). Pre-treatment with 1 or 5 mg/kg Everolimus doesn't alter the tumour uptake of Lu-177-Exendin-4 (338.5 ± 84.6, $P = 0.27$ resp. 237.1 ± 139.5, $P = 0.33$) but leads to up-regulation in mTOR when given over 10 days (148% resp. 117% of control). Results of histology are still under investigation.

Conclusion: mTOR inhibitors might have a significant impact on PRRT. Everolimus pre-treatment leads to reduced tumour uptake of Lu-177-DOTA-Exendin-4 in comparison to control when given at a high dose that effectively down regulates mTOR in Rip1Tag2-mice. Analyses of tumour histology to better understand these effects and studies addressing treatment efficacy will be available in Montreux.

NSS243

In vivo imaging of fibroblast growth factor-2

A. Moscaroli[1], G. Jones[2], T. C. Luehmann[2], L. Meinel[2], R. Schibli[1], M. Behe[1]; [1]Villigen, [2]Wuerzburg/DE

Purpose: Fibroblast growth factor-2 (FGF-2) is an important cytokine localised in the extracellular matrix (ECM) involved in wound healing. Interestingly, FGF-2 has the ability to stimulate the growth of endothelial cells during angiogenesis in tumours. The aim of this project is to investigate the poorly- understood regulatory mechanisms for FGF-2 signalling via *in vivo* monitoring of ^{111}In-radiolabelled FGF-2 using SPECT/CT imaging. The notorious instability of the protein makes this project particularly challenging.

Methods and Materials: FGF-2 was radiolabelled with ^{111}InCl$_3$ using maleimide DTPA as chelator, leading to labelling yields higher than 97% (specific activity 5 MBq/nmol). The affinity of ^{111}In-DPTA-FGF-2 to the receptor was estimated performing binding assays on fibroblast cells, while isothermal titration calorimetry was used to determine the binding to heparin. ^{111}In-DTPA-FGF-2 wastested *in vivo* in healthy CD1 nu/nu mice by SPECT/CT.

Results: A K_d of 40±16 nM was obtained from the binding assay, which corresponds to publish data for the native protein. Both ^{nat}In-DTPA-FGF-2 and FGF-2 showed similar affinity to heparin (K_d: 0.6±0.07 μM and 0.33±0.03 μM). After 4 hours p.i., ^{111}In-DTPA-FGF-2 accumulated predominantly in the liver and kidneys. Activity was also detected in the retina, salivary glands and the pituitary gland. In fact, specific receptors for FGF-2 are expressed in these regions. However, it is still unclear if the uptake is specific.

Conclusion: These results suggest that ^{111}In-DTPA-FGF-2 behaves very similarly to the native FGF-2 and it is ready for further biodistribution studies in tumour-grafted animal models.

NSS244

Promising prospects for PET imaging with Scandium-44: Cyclotron production and preclinical evaluation in tumor-bearing mice

C. Mueller[1], M. Bunka[2], K. Domnanich[1], S. Haller[1], N. van der Meulen[1], A. Tuerler[2], R. Schibli[1]; [1]Villigen, [2]Bern

Purpose: Herein, we propose ^{44}Sc ($t_{1/2}$=3.97 h, $E\beta^+_{av}$=632 keV) as a valuable alternative to ^{68}Ga ($t_{1/2}$=68 min, $E\beta^+_{av}$=830 keV) for PET imaging of cancer prior to ^{177}Lu-based radionuclide therapy. The aim of the study was the preclinical evaluation of cyclotron-produced ^{44}Sc using a DOTA-folate conjugate.

Methods and Materials: ^{44}Sc was produced via the ^{44}Ca (p, n)^{44}Sc-nuclear reaction at a cyclotron using highly enriched ^{44}Ca-targets (10 mg ^{44}CaCO$_3$, 97.00%). Separation from the target material was carried out by a semi-automated process using extraction and cation exchange chromatographies. The DOTA-folate conjugate (cm09) was radiolabeled with ^{44}Sc under standard conditions. ^{44}Sc-cm09 was investigated *in vitro* using KB tumor cells and *in vivo* by PET/CT imaging of tumor-bearing mice.

Results: Under the given irradiation conditions and amount of ^{44}Ca, cyclotron-produced ^{44}Sc was obtained in a maximum yield of 350 MBq at high radionuclide purity (>99%). Semi-automated isolation of ^{44}Sc from ^{44}Ca-targets allowed formulation of up to 1 GBq ^{44}Sc in a volume of 500 μL within only 20 min. Radiolabeling of cm09 was achieved with a radiochemical yield of >96% at a specific activity of 10 MBq/nmol. ^{44}Sc-cm09 showed specific binding to KB tumor cells *in vitro* and allowed PET imaging of an excellent quality.

Conclusion: In this study we demonstrated the feasibility of using cyclotron-produced ^{44}Sc for the preparation of a folate radioconjugate. A proof-of-concept study revealed favorable features of ^{44}Sc for PET imaging. The results hold promise for future application of ^{44}Sc-radiopharmaceuticals in cancer patients prior to the application of ^{177}Lu-based radionuclide therapy.

NSS245

^{161}Terbium improves outcome of anti-L1CAM radioimmunotherapy (RIT) compared to a ^{177}Lutetium-based RIT in mice bearing human ovarian cancer

D. Lindenblatt[1], E. Fischer[1], S. Cohrs[1], H. Dorrer[1], N. van der Meulen[1], A. Tuerler[2], R. Schibli[1], J. Gruenberg[1]; [1]Villigen, [2]Bern

Purpose: In this study we directly compared the therapeutic efficacy of anti-L1CAM RIT against human ovarian cancer under equitoxic conditions with the radiolanthanids ^{177}Lutetium and the potential alternative ^{161}Terbium.

Methods and Materials: Biodistribution data (n=3) was obtained 144 h post injection of 1 MBq (30 μg) ^{177}Lu-DOTA-chCE7 or 1.5 MBq (30 μg) ^{161}Tb-DOTA-chCE7. An *in vivo* therapy study was performed in female nude mice (n=8) bearing subcutaneous IGROV1 ovarian cancer xenografts. Mice were injected with a single dose of 6 MBq ^{177}Lu-DOTA-chCE7 (50% MTD) or 5 MBq ^{161}Tb-DOTA-chCE7 (50% MTD). Controls received unspecific ^{177}Lu- or ^{161}Tb-labeled isotyp matched mAbs. Tumor growth delay was evaluated and mice reaching a defined end point were euthanized.

Results: Biodistribution studies showed comparable high tumor uptakes for both radioimmunoconjugates (RICs) of 37.2%±1.0% (^{177}Lu-DOTA-chCE7) and 43.6%±3.4% (^{161}Tb-DOTA-chCE7) 144 h post RIC injection (p>0.05). Tumor growth inhibition of ^{161}Tb-DOTA-chCE7 RIT was increased by 82.6% compared to the ^{177}Lu-DOTA-chCE7 RIT. The average relative tumor volume (RTV) was significantly reduced in the ^{161}Tb-therapy group compared to mice treated with the ^{177}Lu containing RIT (p<0.05).

Conclusion: In this study we demonstrated for the first time, that ^{161}Tb improves the RIT efficacy compared to the clinically-utilized ^{177}Lu in an ovarian cancer model. Whether this effect is caused by increased amounts of double strand breaks or bystander effects, induced by Auger-electrons additionally emitted by ^{161}Tb, is currently under investigation.

NSS246

Reducing the impact of respiratory motion on FDG activity measurements in hepatic metastasis from colorectal cancer using a histogram based background subtracted lesion activity metric

G. Li[1], I. A. Burger[2], R. C. Schmidtlein[1], C. Ridge[3], S. B. Solomon[1], J. L. Humm[1]; [1]New York/US, [2]Zürich, [3]Dublin/IE

Purpose: To assess the impact of respiratory motion on the variability of FDG activity ($SUV_{max/mean}$) and total tumor activity (total lesion glycolysis [TLG]/background subtracted lesion activity [BSL]) for hepatic metastasis on PET imaging, through a comparison between free-breathing (FB) and respiration-suspended (RS) PET images.

Methods and Materials: During FDG-PET/CT image guided radiofrequency tumor ablation, the patients breathing was suspended for 2 minutes, to achieve near-motionless RS PET images. RS and FB PET/CT images were acquired in 20 patients prior to ablation of hepatic metastasis from colorectal cancer. The relative difference between RS and FB was calculated for SUV_{max}, SUVmean, $TLG_{50\%}$ and for a novel histogram based metric, which determines PET background based on a Gaussian fit to most frequent value in a SUV-volume histogram, and subtracts the Gaussian to calculate BSL.

Results: Respiratory motion caused SUV_{max} and SUVmean to decrease from RS to FB by -16%±11% and -20%±9%, respectively. There was an increase for $TLG_{50\%}$ (18%±36%) and the associated, segmented volume ($VOL_{50\%}$ 47%±52%, p=0.01). BSL activity and the associated BSL volume between FB and RS were only minimally reduced by -8%±10% and 0%±16% (p=0.94), respectively.

Conclusion: This is the first comparison of motion-free PET images of liver metastasis in human with free-breathing PET. The BSL shows more consistent results for calculation of tumor activity and volume between RS and FB PET images compared to $TLG_{50\%}$ and $VOL_{50\%}$ suggesting that BSL can provide a reasonable estimate of tumor activity also in the presence of respiratory motion.

NSS247

Clinical image quality perception and corresponding NECR measurements in PET

M. Araujo Queiroz[1], S. Wollenweber[2], G. K. von Schulthess[1], G. Delso[1], P. Veit-Haibach[1]; [1]Zürich, [2]Waukesha/US

Purpose: Describe the relation of NECR – an objective measurement of PET systems – measured in patients, to visual image quality (IQ) of PET and their relation to FDG activity and patient's weight.

Methods and Materials: A total of 71 consecutive patients were evaluated in this retrospective study. All data was analysed using Maltab to estimate the noise-equivalent count rate. Then, IQ was evaluated according to two subjective scores: the *IQ local score*, assigned to each bed position; and the *IQ global score*, assigned evaluating coronal whole body PET. Patient data was also analysed concerning weight, body mass index, FDG dose at the start of acquisition (D_{Acq}), presence of bowel uptake and presence of FDG-positive pathologic lesions. Two additional parameters were defined for each patient: the ratio between D_{Acq} and patient weight (R_{DW}) and the ratio between D_{Acq} and patient BMI (R_{DBMI}).

Results: Clinically perceived IQ in PET has a significant positive correlation with NECR measured in patients, R_{DW}, R_{DBMI} and presence of pathologic lesions. Clinical IQ furthermore has significant negative correlation with Weight, BMI and presence of bowel uptake. Thresholds of R_{DW} and R_{DBMI} in which clinical IQ is at least good in more than 90% of the patients were 2.6 and 8.0, respectively.

Conclusion: Clinically perceived image quality in PET is strong related to NECR measured in patients. An optimal threshold for the R_{DW} and R_{DBMI} was defined. With this data, it is possible to extrapolate technical as well as clinical IQ to other PET system and to predict clinical image perception.

NSS248

PET/CT Imaging with body weight adapted FDG dosage regimens: Intraindividual comparison of image quality

L. Husmann[1], J. H. Geismar[2], B.-R. Sah[1], I. A. Burger[1], G. K. von Schulthess[1], P. Stolzmann[1]; [1]Zürich, [2]Villigen

Purpose: To investigate into the relationship between 18–2-fluoro-2-de-oxy-d-glucose (FDG) dosage and image quality in positron emission tomography (PET)/ computed tomography (CT) in the same patient and to establish body-weight adapted FDG dosage regimens.

Methods and Materials: In this single center observational, IRB-approved cohort study, 61 patients (27 women; 60±14 yr) were included who had undergone clinically indicated follow-up PET/CT imaging twice (time interval, 133±66 d) with a high (HDS, 5 MBq/kg BW) and low dosage scanning protocol (LDS, 4 MBq/kg BW) using a Discovery VCT64 scanner, GE Healthcare, MI. Two blinded and independent readers randomly assessed image quality of PET using a 5-point Likert scale and signal-to-noise ratio derived from regions of interest.

Results: Glucose levels and uptake times were similar in each patient at time of HDS and LDS (all p>0.05); BMI was significantly lower at LDS (p<0.05) and represented a significant predictor of signal-to-noise (rho=-0.34, p<0.01). Mean administered activity of 340 MBq at HDS resulted in significantly higher image quality (p<0.001) and signal-to-noise ratio as compared with a mean of 264 MBq at LDS (F-value=23.5, p<0.001, mixed model ANOVA adjusted for covariate BMI). Insufficient image quality at LDS was observed in patients with a mean BMI of 24±3 kg/m² (95% CI: 22–26 kg/m²).

Conclusion: FDG dosage significantly predicts image quality and signal-to-noise in PET/CT as demonstrated in the same patient with an optimal image quality achieved at 5 MBq. PET/CT imaging at 4 MBq can only be recommended in patients with a BMI smaller than 22 kg/m² to maintain diagnostic image quality.

NSS249

Paediatric radiation dosimetry for positron-emitting radiotracers using anthropomorphic phantoms

T. Xie, H. Zaidi; Genève

Purpose: PET plays an important role in clinical diagnosis, staging and surveillance of a variety of diseases using specific molecules labelled with positron-emitting radionuclides to provide valuable biochemical and physiological information. However, the radiation dose delivered to the paediatric population is a matter of concern since children present a higher cancer risk from radiation exposure compared to adults.

Methods and Materials: We evaluate the dosimetric aspects of monoenergy photons/electrons, positron-emitting labelled radiotracers using anthropomorphic paediatric models, including the newborn, 1-, 5-, 10- and 15-year-old male and female, using MCNP-based Monte Carlo calculations.

Results: The self-absorbed SAFs and S-values for most organs were inversely related to the age and body weight. For most source-target pairs, Rb-82 and Y-86 produce the highest self-absorbed and cross-absorbed S-values, respectively. The dependence of self-absorbed S-values of annihilation photons varies to the reciprocal of 0.76 power of the mass whereas the self-absorbed S-values of positrons vary according to reciprocal mass. Among the considered radiotracers, ^{18}F-FBPA and ^{15}O-water resulted in the highest and lowest effective dose in the paediatric phantoms, respectively. The MIRD-type model overestimates the effective dose for most studied radiotracers. The ICRP 103 updated tissue weighting factors decrease the effective dose in most cases.

Conclusion: The generated dosimetric database can be exploited for the assessment of the radiation dose delivered to the paediatric population from new PET radiotracers used in clinical and research settings. The mass scaling method for positron-emitters can be used to derive patient-specific S-values from results obtained on reference phantoms.

NSS250

Assessment of future remnant liver function using mebrofenin clearance rate in patients undergoing major liver resection

S. Adib, M. Pracht, M. Rumo, N. Cherbuin, P. Bize, A. Denys, J. Prior; Lausanne

Purpose: We aimed to evaluate a locally developed software calculating Tc-^{99m}-mebrofenin clearance rate for assessing liver function and future remnant liver (FRL) function before major liver surgery.

Methods and Materials: Processing included assessing time-activity curves (TAC) on left ventricular, entire liver and total field of view regions applied to anterior and geometric mean data 150–350s after injection. Mebrofenin clearance rate was calculated according to Ekman's formalism implemented on a Xeleris workstation. A 3-D analysis (fast SPECT/CT acquisition centered on peak hepatic TAC) with PMOD software was performed to establish relative FRL function from the activity in each liver part (30%-threshold of maximal voxel counts).

Results: Six scintigraphic studies (n=5 patients, 3 before right lobectomy, 1 before right lobectomy and after portal vein embolization, 1 before radioembolization of the right liver, and 1 before left hepatectomy and segment-IV resection) were processed by two operators and twice by one. The mean clearance rate was 7.3±2.8%/min/m² [range 3–10.7] for a mean functional liver volume of 1930 mL [1015–3000]. There was no correlation between Mebrofenin clearance rate and functional liver volume. Mebrofenin FRL clearance rate was ≥2.7%/min/m² (advised cut-off for major resection) in 3 cases. Intra-observer and inter-observer reproducibility were excellent (Lin's concordance correlation coefficient ≥0.988).

Conclusion: Local software was developed to calculate Mebrofenin clearance rate for assessing liver function; it was user-friendly with high inter-/intra-observer reproducibility and can be prospectively used to establish local cutoff values for predicting liver failure after surgery based on FRL clearance rate.

NSS251

Agreement between predictive dosimetry based on ^{99m}Tc-MAA SPECT/CT and post-treatment dosimetry based on ^{90}Y TOF PET/CT in radioembolization of hepatocellular carcinoma

S. Gnesin, L. Canetti, S. Fresard, S. Adib, N. Cherbuin, M. Kosinski, P. Bize, A. Denys, J. Prior, F. Verdun, S. Baechler, A. Boubaker; Lausanne

Purpose: Yttrium-90 microsphere radioembolization is a valuable therapeutic option in unresectable hepatocellular carcinoma (HCC). Partition-model based predictive dosimetry relies on differential tumoral/non-tumoral liver perfusion evaluated on a pre-treatment ^{99m}Tc-MAA SPECT/CT acquisition. The goal of this study was to evaluate the agreement between predictive dosimetry based on ^{99m}Tc-MAA SPECT/CT and post-treatment dosimetry based on ^{90}Y TOF PET/CT in HCC patients.

Methods and Materials: We compared ^{99m}Tc-MAA SPECT/CT-based dosimetry in twelve patients with HCC who underwent ^{90}Y radioembolization with post-treatment dosimetry based on ^{90}Y TOF PET/CT. For each patient, 3-D voxelized dose-maps were computed from ^{99m}Tc-MAA SPECT/CT and ^{90}Y TOF PET/CT. Furthermore, the mean absorbed dose (D) was evaluated to compute the following dose ratio for each patient: $DR = D^{99mTc,\ SPEC}/D^{90Y,\ PET}$ in both tumoral and non tumoral tissue.

Results: The administered activity ranged from 1 to 3.4 GBq and tumor volumes ranged from 11–1630 mL. The mean dose tum-$D^{90Y,\ PET}$ was 155 Gy and nontum-$D^{90Y,\ PET}$ was 63 Gy. The mean value±SD for DR_{tum} was 1.27±0.27 [range 0.97–1.83], while DR_{nontum} average value was 0.9±0.19 [0.58–1.35]. We also observed that DR_{tum} for tumor volumes <150 mL (1.44±0.28) was larger than DR_{tum} for tumor volumes ≥150 mL (1.1±0.1).

Conclusion: In HCC radioembolization, predictive dosimetry based on ^{99m}Tc-MAA SPECT/CT provided good estimates of absorbed doses calculated from post-treatment ^{90}Y TOF PET/CT, for both tumoral and non-tumoral tissues. Predictive tumor dosimetry slightly overestimates the post-treatment tumor mean dose, especially in small-volume tumors.

Utility of F-18-FET PET and F-18-FCH PET for initial grading of untreated brain glioma

V. Dunet[1], M. Nicod-Lalonde[1], B. Lhermitte[1], P. Mitsakis[1], C. Pollo[2], J. Bloch[1], P.-P. Maeder[1], J. Prior[1]; [1]Lausanne, [2]Bern

Purpose: Our aim was to determine the usefulness of dynamic ^{18}F-Fluoro-ethyl-tyrosine (FET) and [18]Fluoro-choline (FCH) PET for the initial grading of untreated brain glioma.

Methods and Materials: Twenty-one patients (M/W ratio: 2.5, age 45±13 y) with suspected brain glioma on MRI were prospectively included and underwent both dynamic FET (0–60 min) and FCH (0–25 min) PET within a week. FET and FCH PET images were analysed and quantitative parameters recorded for tumour areas with both high FET and FCH uptake, as well for areas with high FET but low FCH uptake, as visually assessed by two nuclear physicians in consensus. Targeted histology of these areas was subsequently obtained by either stereotaxic or frameless biopsy, which were analysed by a pathologist blinded to imaging results. Quantitative parameters were finally compared according to glioma grade using the Kruskal-Wallis rank sum test.

Results: All patients had glioma. Thirty-five biopsies were obtained from 21 patients. Seventeen biopsies demonstrated high-grade gliomas (WHO III or IV) and 18 low-grade gliomas (WHO I or II). All gliomas presented high FET uptake. FET SUV_{max} (1.9±0.7 vs. 2.2±0.7 g/mL, P=0.08) and FCH SUV_{max} (1.9±1.2 vs. 2.2±1.1 g/mL, P=0.11) tended to be higher in high-grade gliomas. From all other FET and FCH dynamic parameters, only FCH 1-to-25-min average SUV (0.6±0.3 vs. 0.9±0.6 g/mL, P=0.016) was significantly different according to glioma grading.

Conclusion: While FET is highly relevant for the detection of brain glioma, FCH uptake allowed distinguishing between low and high-grade tumors.

Glyoxia: Integrated analysis of glucose metabolism under hypoxia with ^{18}F–fluoromisonidazole (FMISO) and ^{18}F–fluorodeoxyglucose (FDG) PET in high grade glioma patients

A. Leimgruber, K. Hickson, S. T. Lee, H. Gan, L. Cher, J. Sachinidis, G. O'Keefe, A. Scott; Heidelberg/AU

Purpose: Tumor hypoxia is a centerpiece of disease progression mechanisms that cripple radiotherapy strategies. Early identification of regions at risk for recurrence and prognostic-based classification are a necessity to devise tailored therapeutic strategies. We hypothesized that combined FDG PET with FMISO PET hypoxic imaging allow representation of glucose metabolism under hypoxia and may help attain these objectives.

Methods and Materials: Glyoxia is a disease-independent automated software that offers qualitative and quantitative analyses of FDG and FMISO PET. Glyoxia produces DICOM-coregistered representations and an attractive single-screen summary of maximum slice and maximum intensity projections combined with quantitative analysis of hypoxic volume (HV), hypoxic glycolytic volume (HGV) and total glycolytic volume (TGV) with MRI coregistration. This system was applied to a prospective clinical trial of 10 high-grade glioma patients with post-operative, pre-radiotherapy and post-radiotherapy FDG and FMISO PET studies.

Results: Fifteen out of 18 FMISO PET studies performed showed detectable hypoxia (HV range 0.74–28.4 ml). Seven patients survived to complete post-radiotherapy studies. Post-radiotherapy hypoxic region detection was successful in 6 patients. HGV increased in 3 patients (range 71%–127%), while HV changes were less prominent (range 43%–55%). These patients had 85 days mean progression-free interval and 416 days overall survival from diagnosis, versus 152 and 649 days respectively for the 3 other patients. HGV images were consistent with disease relapse topology.

Conclusion: The Glyoxia software allows unique information on tumour metabolism and hypoxia to be evaluated with PET, providing a greater understanding of tumour biology and potential response to therapy.

Can we use the PET/CT imaging for local staging in advanced glottic cancer? Clinical impact and comparison with conventional imaging

G. Paone[1], G. Treglia[2], T. Ruberto[2], L. Ceriani[2], L. Giovanella[2]; [1]Lugano, [2]Bellinzona

Purpose: This study assessed the role of [(18) F-FDG PET-CT] (PET/CT) to detect the cartilage and commissure infiltration during staging of advanced glottic cancer in comparison with conventional imaging (CI) [ComputedTomography and/or Magnetic Resonance].

Methods and Materials: We retrospectively analyzed 26 patients with glottic squamous cell carcinoma stage III and IV, treated in our institute between 2006 and 2011, comparing the PET/CT, used to staging and radiotherapy planning, and the CI findings. Cohen's K was used to compare concordance between the two techniques. Imaging findings were correlated with endoscopic evaluation and biopsy results.

Results: Sensitivity, specificity and accuracy of PET/CT was 95%, 83% and 92.3% respectively and 85%, 83% and 84.6% for CI. All lesions shown by CI were also highlighted by PET/CT imaging and in 6 cases more lesions were emphasized offering a better definition of local infiltration with PET/CT then CI (5 CT and 1 MRI). Cohen's K was 0.69.1 FN and 1 FP were observed with PET/CT and 3 FN and 1 FP with CI.

Conclusion: The PET/CT is useful to evaluate the local invasion, in terms of cartilage and commissure infiltration, in advanced glottic tumours showing a higher sensitivity and accuracy compared to CI. Therefore, PET/CT could be used as imaging method of choice also for local staging in these cases integrating the traditional endoscopic techniques.

Added value of SPECT/CT in addition to whole-body scintigraphy augmented with prone lateral views in patients with well-differentiated thyroid carcinoma

N. Atasayar, J. Prior, G. Allenbach; Lausanne

Purpose: We aimed to determine the impact of SPECT/CT performed in addition to whole-body scintigraphy with prone lateral views in patients with well-differentiated thyroid carcinoma.

Methods and Materials: This retrospective study included 60 patients (24 female, 36 male, mean age 45 years) with well-differentiated thyroid carcinoma (39 papillary, 17 follicular, 1 Hürtle cell and 3 poorly differentiated) treated with radioiodine therapy (2200–7400 MBq). Patients were referred for either first postsurgical treatment (n=20) or recurrent disease (n=40). Two nuclear medicine physicians interpreted the scans in consensus (first whole-body scintigraphy with prone lateral view, then SPECT/CT) reporting abnormal iodine uptake in the thyroid bed, lymph nodes and distant metastasis. The corresponding ATA risk score is calculated for each patient before and after SPECT/CT, as well as change in disease extension.

Results: The analysis showed a difference between scintigraphy and SPECT/CT in n=8 lesions: 5 were described as suspicious on scintigraphy and could be considered as benign on SPECT/CT (2 corresponded to local iodine uptake, 2 to lymph nodes metastases and 1 to distant metastases); The others 3 corresponded to lymph nodes metastasis that weren't seen on whole-body scintigraphy augmented with prone lateral views. In 5/60 (8%) patients, we observed a change in ATA risk stratification, with a risk increase in two of them (3%).

Conclusion: SPECT/CT allowed detecting 3 focal lesions missed on planar scintigraphy, and to precise benignity of 5 suspicious lesions on planar scintigraphy. SPECT/CT improved the risk stratification in 1 in 12 patients with a significant change in the patient management.

Predictive value of the [18]FDG PET-derived quantitative parameters in primary mediastinal diffuse large B-cell lymphoma (PMLBCL)

L. Ceriani[1], E. Zucca[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], P. Johnson[14], L. Giovanella[1]; [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: To assess the value of the main [18]FDG PET-derived quantitative parameters to predict the response to treatment in the patients with PMLBCL enrolled in the IELSG-26 trial.

Methods and Materials: The maximum Standard Uptake Value (SUV_{max}), the metabolic tumor volume (MTV) and the total lesion glycolysis (TLG) were measured following a standard protocol in 100 patients baseline and after the end of immunochemotherapy; 93 patients also underwent radiotherapy. Cut-off values of the MTV, TLG and SUV_{max} and their changes (delta) during treatment were calculated using the ROC-curve. Survival probabilities and survival curves were estimated using the life tables and the Kaplan-Meier method, respectively.

Results: After a median follow-up of 36 months the Progression Free Survival (PFS) rate was 90%. All the quantitative parameters considered had very high Negative Predictive Value (NPV=0.94–1) but low Positive Predictive Value (PPV=0.18–0.45). The SUV_{max}, MTV and TLG of the residual end-treatment lesion performed better than the same values estimated baseline and their changes during immunochemotherapy. The end-treatment TLG was the best predictor (AUC=.93 ; NPV=1 PPV=0.45): the patients with lower end-treatment TLG had significantly better PFS (Log-rank p<0.0001). Nevertheless, the performance of the end-treatment TLG was similar to that provided by the visual analysis using the Deauville criteria (AUC comparison p=ns).

Conclusion: The PET-derived quantitative parameters predict the response to treatment in the patients with PMLBCL. This study also suggests TLG is a better prognostic measures than other functional parameters. Nevertheless, the quantitative assessment of PET findings does not improve significantly the results provided by the qualitative analysis.

Monitoring hematopoiesis under cytotoxic chemotherapy for non small cell lung cancer with [18]F-3′-deoxy-3′-fluoro-l-thymidine (FLT)

A. Leimgruber[1], A. Moeller[2], S. Everitt[1], M. Chabrot[1], D. Ball[1], B. Solomon[1], M. Macmanus[1], R. Hicks[1]; [1]East Melbourne/AU, [2]Herston/AU

Purpose: The PET agent [18]F-3′-deoxy-3′-fluoro-l-thymidine (FLT) is under investigation in clinical trials focusing on the proliferative activity of malignancies, such as non-small cell lung cancer (NSCLC). It is of paramount importance to monitor the toxicity to hematopoietic organs during chemotherapy. This study evaluates FLT as a tool to monitor medullary and extramedullary hematopoiesis during chemo-radiotherapy in NSCLC patients.

Methods and Materials: NSCLC patients candidates for radical chemo-radiotherapy, with either two cycles of cisplatin-etoposide (C/E) with Week 2 to Week 4 break or weekly carboplatin-paclitaxel (C/P), were included. A baseline FLT PET/CT scan was performed within 2 weeks prior to treatment and during Week 2 and 4 of chemo-radiotherapy

Results: This prospective study included 60 patients. Twenty-eight (47%) received C/E and 32 (53%) C/P. C/E patients median spleen SUVmax was 2.4, 1.6 and 3.8 at baseline, Week 2 and Week 4, respectively (p<0.001 between all time points). Median bone marrow SUV_{max} was 8.7, 6.0 and 8.6 (p<0.01 between consecutive time points and p>0.05 between baseline and Week 4). For C/P patients, median SUV_{max} values were 2.7, 2.0 and 3.5 (p<0.001) in the spleen and 9.1, 8.2 and 7.6 (p>0.05) in the bone marrow. FLT anticipated a reduction in neutrophil counts only after week 2.

Conclusion: FLT PET/CT is capable of monitoring medullary and extramedullary hematopoiesis in NSCLC patients. This demonstrates potential for monitoring hematotoxicity in the treatment of cancer patients and requires further evaluation as part of a personalized treatment strategy.

The impact of DOTATOC therapy on the management of metastasized insulinoma: Long-term results of a phase 2 clinical trial

M. L. Braun[1], G. Nicolas[1], E. Christ[2], D. Wild[1], B. Goichot[3], T. O'Dorisio[4], M. A. Walter[2]; [1]Basel, [2]Bern, [3]Strasbourg/FR, [4]Iowa/US

Purpose: The control of hypoglycaemia is a central objective in the management of patients with malignant insulinoma. Herein, we assessed the value of DOTATOC therapy in the clinical control of progressive, malignant insulinoma.

Methods and Materials: Patients with metastasized insulinoma were treated with repeated cycles of Yttrium-90-DOTATOC or with consecutive cycles of Yttrium-90-DOTATOC and Lutetium-177-DOTATOC. Changes in clinical management, transient and prolonged toxicities after DOTATOC therapy were systematically assessed (median follow up of 17 months, range: 2 to 107 months).

Results: A total of 16 patients were enrolled; 14 patients received Yttrium-90-DOTATOC only (number of cycles: 1–3; median cumulative activity per patient 13 GBq; range: 5.6–14.8 GBq) and 2 patients received Yttrium-90-DOTATOC (1 cycle; 5.9 GBq and 8.1 GBq respectively) plus Lutetium-177-DOTATOC (number of cycles: 2; with totally 13 GBq and 14.8 GBq respectively). Fourteen of 16 patients experienced grade 1/2 hematotoxicity (88%), no grade 3 hematotoxicity or higher occurred. One patient (6%) developed grade 4 renal toxicity (with pre-existing grade 2 kidney disease). All four patients that had required permanent glucose infusion could discontinue the infusion already after the first cycle of DOTATOC therapy. In, 10 of 16 patients (63%), anti-hypoglycemic medication could be reduced after DOTATOC therapy.

Conclusion: DOTATOC therapy is able to reduce anti-hypoglycaemic medication in a significant proportion of patients with progressive, malignant insulinoma. These results make DOTATOC a promising therapeutic option for patients with metastatic insulinoma.

NSS260

FDG uptake pattern in patients with anti-NMDA receptor encephalitis

G. Allenbach, J. Novy, A. Rossetti, J. Prior; Lausanne

Purpose: To describe FDG uptake pattern in patients with anti-NMDA receptor encephalitis.

Methods and Materials: FDG-PET of the brain was performed in 5 patients with serologically documented anti-NMDAr encephalitis. FDG uptake was measured using the PMOD software in a 67-VOIs model fitted to a T1-weighted MRI acquisition for each patient. These patients were compared to a healthy control group, processed similarly. We tested different previously-described patterns known to be altered in anti-NMDAr encephalitis (such as basal ganglia increased uptake or frontotemporal-to-occipital gradient).

Results: FDG brain uptake normalized to classical area (cerebellum, whole brain, brain stem) showed no significant abnormal difference. However, computing the uptake ratio between cortical area and occipital brain showed a significant increase in following areas: superior motor area (p=0.019), olfactory cortex (p=0.034), cingular anterior and medial (p=0.015), postcentral gyrus (p=0.018), paracentral lobule (p=0.001), caudate nuclei (p=0.02), parietal (p=0.008), frontal cortex (p=0.01), and the precentral gyrus (p=0.019). Considering the seven first cortex area, the lowest cortex-to-occipital ratio in the patients group was higher than the highest ratio in the control group.

Conclusion: In this rare population, we could identify a pattern specific to patients with anti-NMDAr encephalitis. The ratio of cerebral-to-occipital uptake was significantly increased in the patient group in 9 areas. The fact that some of these patterns could be found in all patients and not in healthy control group suggests that PET could be clinically useful in individual patients.

NSS261

CSF total tau, but not Aβ42 levels correlate with regional hypometabolism in patients with amyloid-related dementia

V. Garibotto, A. Baskin, D. Zekry, G. Allali, H. Zaidi, O. Ratib, P. R. Burkhard, F. Assal; Genève

Purpose: Cerebrospinal fluid (CSF) tau and β–amyloid peptide 1–42 (Aβ42) levels and cerebral glucose metabolism on fluoro-deoxyglucose positron emission tomography (FDG PET) are validated biomarkers of Alzheimer's disease (AD) pathology. Tau levels and glucose hypometabolism are considered both markers of synaptic dysfunction and neuronal injury, but their relationship remains unclear and inconsistent results are found in the literature. Aim of this study is to determine whether CSF AD markers concentration correlates with regional metabolism, in a population with suspected dementia and a biological indicator of amyloid-related pathology.

Methods and Materials: We retrospectively analyzed all subjects investigated for dementia at our institution, who performed FDG PET and CSF tau and Aβ42 measurement. We included the subgroup having Aβ42 levels below normal range: this consisted of 55 subjects (mean age 70±8, range 51–87). We analyzed voxelwise the correlation between relative glucose metabolism and CSF levels of tau and Aβ42 by statistical parametric mapping (SPM8), taking into account age as confounding factor.

Results: We demonstrated a significant correlation between CSF tau levels with glucose metabolism in temporal cortex, parietal cortex and precuneus, bilaterally (p<0.05, applying family-wise error correction for multiple comparisons at cluster level). No correlation was found between glucose metabolism and Aβ42 levels.

Conclusion: We observed an association between reduced relative glucose metabolism and total tau increase in regions typically affected by AD related pathology in patients with biological evidence of amyloid deposition. This association supports the current view that CSF biomarkers and glucose metabolism provide converging information on neuronal dysfunction in amyloid-related dementia.

NSS262

Prediction of selective serotonin reuptake inhibitors (SSRI) response in major depressive disorder (MDD) on cerebral F-18-FDG PET

M. Khawam[1], P. Progin[2], G. Allenbach[1], S. Valloton[2], M. Preisig[2], J.-N. Despland[2], P. Marquet[2], J. Prior[1]; [1]Lausanne, [2]Prilly

Purpose: Identify future responders to treatment with SSRI through the study of brain metabolism using FDG-PET.

Methods and Materials: In an ongoing prospective longitudinal study we included 4 patients with a major unipolar depressive episode and to be started on treatment with SSRIs. Two brains FDG-PET were performed, the first prior starting treatment and the second during the third week of treatment. We studied alterations in brain metabolism and looked for correlation to clinical response. Clinical response was assessed at 3 months using a depression scale and responders were identified as having a significant decrease in depression scores. Brain imaging analysis was performed with Statistical Parameter Mapping (SPM) comparing them to a database of normal volunteers and differences Δ=Z (PET2 vs. normal) – Z (PET1 vs. normal) was calculated.

Results: Currently SPM analysis was performed in only 2 patients and Z scores differences allowed to observe changes in cerebral metabolism between baseline and during SSRI treatment. Scales Z scores for n1 patient go from -1.5 to -1.04, +1.04 to +1.5 for p <0.15, and from -1.8 to -0.93, +0.93 to +1.8 for p <0.175 for the patient n2. It is not useful to define any specific brain regions until more patients are included.

Conclusion: These preliminary results show significant brain metabolism differences at the single patient level between depressed state and shortly after SSRI initiation.

NSS263

Prognostic implication of revascularizing hibernating myocardium in elderly patients with stable coronary artery disease: A PET/CT study

G. Amzalag, I. C. Mainta, R. Bonvini, S. Noble, F. Mach, O. Ratib, R. Nkoulou; Genève

Purpose: To determine whether cardiac ^{18}F-FDG positron emission tomography/computed tomography (PET/CT) could assist in the selection of elderly patients with stable coronary artery disease (CAD) benefiting from a revascularization procedure.

Global trends in life expectancy herald an increased burden in elderly patients with CAD but restricted access to end-stage cardiac failure treatments. This population is often excluded from prospective randomized trial and particularly, sparse information is available on the role of FDG PET/CT as a triage tool before revascularization of suspected hibernating myocardium.

Methods and Materials: 90 elderly patients (>65 yo, mean 74±7 yo) with stable CAD and decreased left ventricular ejection fraction (LVEF) were prospectively followed after a cardiac FDG PET/CT with decision to revascularize taken by referring physician. Cardiac and sudden deaths as well as subsequent hospitalizations in relation to acute cardiac condition were reported as clinical end-points. Statistical analysis was performed to identify predictors of fatal events in patients with hibernating myocardium (>1 myocardium segment/20).

Results: 89 patients were successfully followed with 25 presenting no viability and 64 patients with hibernating myocardium (37 and 27 patients with and without subsequent revascularization, respectively). The change in LVEF during follow-up was 3.8±6.6% (P=0.013) and -0.75±2.6% (P=0.170) in patients with and without revascularization, respectively. Log-rank (P=0.037) and multivariate analysis (Wald: 4.86, P=0.027) confirmed presence of hibernating myocardium as a significant indicator of fatal events.

Conclusion: Cardiac FDG PET/CT might assist in decision making with regard to indication to revascularization in elderly patients with stable CAD and suspected hibernating myocardium.

Cardiac Rb-82 PET/CT: Optimization of image acquisition and reconstruction parameters

P. Chilra[1], S. Gnesin[1], G. Allenbach[1], J. Prior[1], L. Vieira[2], J. Jorge[1];
[1]Lausanne, [2]Lisboa/PT

Purpose: To investigate the influence of Time-of-Flight (TOF), Point Spread Function (PSF) corrections and reconstruction parameters in ordered-subset expectation maximization (OSEM) algorithms in cardiac [82]Rb PET/CT.

Methods and Materials: Rest and adenosine stress listmode data from 6 healthy and 6 cardiac perfusion abnormalities patients were retrospectively reconstructed with OSEM, OSEM+TOF and OSEM+TOF+PSF for dynamic and gated series. Three hundred and twenty reconstructions with gaussian filters of 4 mm, 6 mm and 8 mm and 2x24; 2x16; 3x16; 4x16 iterations and subsets numbers were performed. Rest and stress global, regional, segmental Myocardial Blood Flow (MBF) was computed, myocardial flow reserve (MFR) calculated and the differences to the reconstruction used in clinical routine analyzed. To compare segments we used Bland-Altman (BA) plots.

Results: The mean changes of each reconstruction protocol compared to the one used in the clinical in MFR were between -0.19 and 0.06 and standard deviation varied between 0.26 and 0.34. The biggest changes could be observed in reconstruction without TOF. In 2 patients the differences were very obvious. BA plots show a few stress series outside the limit of agreement. Changes in iteration and subsets numbers tended to have less influence on MBF. In individual segments these changes could reach 2.7.

Conclusion: Changes in reconstruction parameters in rest and stress perfusion rubidium studies may influence MBF measurements. These differences can be important in specific segments/series and difficult to predict. TOF or PSF showed the most important effects. We recommend using always the same parameters for these studies.

Myocardial SPECT perfusion: Attenuation maps from contrast enhanced spectral imaging coronary CT angiography

T. A. Fuchs, O. F. Clerc, M. Possner, J. Stehli, B.-R. Sah, S. Dougoud, P. Kaufmann; Zürich

Purpose: In cardiac hybrid imaging combining SPECT myocardial perfusion imaging (MPI) with contrast enhanced coronary CT angiography (CCTA) an extra unenhanced CT scan is required for SPECT attenuation correction (AC). A novel spectral CCTA technique allows virtual subtraction of iodine from CCTA images. We evaluated the feasibility of SPECT AC with attenuation maps from virtual unenhanced CCTA.

Methods and Materials: Thirty consecutive patients underwent a stress-rest SPECT MPI protocol with CT AC and contrast enhanced prospectively ECG triggered single-source dual-energy CCTA (separate scanner) allowing to obtain virtual unenhanced images by material decomposition. The latter were used to create attenuation maps for SPECT MPI. Segmental myocardial percent uptake using standard versus virtual unenhanced AC were compared using correlation analysis and Bland-Altman (BA) limits of agreement were assessed (20-segment model). Additionally clinical agreement for both standard and virtual unenhanced AC was evaluated.

Results: There was an excellent correlation between the two methods for segmental myocardial percent uptake at stress (r=0.93, P <0.001, low dose) and at rest (r=0.90, P <0.001, high dose) with narrow BA limits of agreement (-6.8% to 7.8% and -7.8% to 7.4%, respectively). The levels of clinical agreement of SPECT MPI corrected with standard versus virtual unenhanced CT AC were 99% per coronary territory and 97% per patient.

Conclusion: Our results suggest that AC of MPI using a virtual unenhanced CT scan synthesized from a contrast enhanced CCTA is feasible and reliable, rendering an extra unenhanced CT scan for AC unnecessary.

CT attenuation corrected myocardial perfusion SPECT with real-time respiratory triggering: Impact of deep inspiration breath-hold acquisition

O. F. Clerc, R. R. Buechel, T. A. Fuchs, M. Possner, S. Dougoud, P. Kaufmann; Zürich

Purpose: To assess the impact of deep inspiration breath-hold acquisition on myocardial SPECT with CT attenuation correction (CT-AC).

Methods and Materials: 40 patients underwent 1-day ^{99m}Tc-tetrofosmin pharmacological stress/rest myocardial perfusion SPECT using a cadmium-zinc-telluride gamma camera. SPECT was performed with regular free-breathing acquisition and repeated with respiratory triggering by intermittent acquisition confined to deep inspiration breath-hold. Low-dose CT was performed at deep inspiration for attenuation correction of both SPECT acquisitions. We compared free-breathing and breath-hold CT-AC SPECT regarding relative segmental tracer uptake and visual analysis of scar, ischemia and image quality as assessed by two blinded readers, using Wilcoxon signed-rank test and McNemar's test.

Results: Compared to regular CT-AC SPECT, breath-hold CT-AC SPECT led to a significant increase of relative segmental tracer uptake in inferobasal segments (mean±SD difference: stress +3.23%±1.56 p=0.046; rest +3.64%±1.23 p=0.010) and to a significant uptake reduction in apical and anteroseptal segments (mean±SD differences ranging from -2.48%±0.95 to -4.36%±1.21, all p<0.05). Diagnosis of scar and ischemia did not differ significantly between regular and breath-hold SPECT. However, image quality scores improved significantly with breath-hold SPECT (mean±SD: +0.47±0.71, p=0.001).

Conclusion: Compared to regular free-breathing myocardial perfusion CT-AC SPECT, deep inspiration breath-hold CT-AC SPECT leads to small but significant regional changes in segmental tracer uptake, particularly in the inferobasal, anteroseptal and apical segments. While diagnosis of ischemia and scar is not significantly affected, image quality improves significantly, hinting at the potential of respiration triggering of myocardial perfusion SPECT in daily clinical routine.

The immune co-stimulatory molecule CD80 in atherosclerotic plaque imaging

R. Meletta[1], A. Müller[1], L. Mu[1], A. Chiotellis[1], N. Borel[1], Z. Rancic[1], P. Kaufmann[1], S. M. Ametamey[1], R. Schibli[2], S. D. Krämer[1]; [1]Zürich, [2]Villigen

Purpose: Vulnerable atherosclerotic plaques are the primary cause for myocardial infarction and stroke. We have identified the co-stimulatory molecule CD80 as candidate target for vulnerable plaque imaging. Here, we present the target evaluation in human carotid plaques and the *in vitro* evaluation of two CD80 inhibitors as candidate Positron Emission Tomography tracers for CD80 imaging.

Methods and Materials: Human carotid plaques obtained from carotid endarterectomy were classified into stable and vulnerable plaques by visual and histological analysis. CD80 expression in carotid plaques was assessed by real-time polymerase chain reaction and immunohistochemistry (IHC). CD80 affinity of the radiotracers to recombinant CD80 was determined by equilibrium dialysis. Tracer accumulation in human carotid plaques and CD80 positive tissue was examined by *in vitro* autoradiography.

Results: Relative CD80 mRNA and protein expression was highest in vulnerable atherosclerotic plaques. Both radiotracers bound with K_D<50 nM to CD80 and showed specific accumulation in vulnerable human carotid plaques and CD80 positive tissue *in vitro*. Tracer accumulation correlated with CD80 expression determined by IHC.

Conclusion: Target evaluation on mRNA and protein level identified CD80 as a promising indicator for plaque vulnerability. The CD80 specific radiotracers showed high binding affinities to human CD80 and accumulation *in vitro* in human vulnerable plaques. These factors are a prerequisite for vulnerable plaque imaging. The *in vivo* evaluation of these radiotracers is in progress.

The value of SPECT/CT for therapy response assessment of jaw osteomyelitis

K. Tornquist, A. della Chiesa, M. Pérez Lago, J. Kuttenberger, K. Strobel; Luzern

Purpose: To evaluate the performance of SPECT/CT for therapy response assessment of jaw osteomyelitis.
Methods and Materials: 84 SPECT/CT investigations were performed in 33 patients (22 female, 11 male; mean age 50.4 years, range: 11–86) for baseline and therapy response assessment of proven osteomyelitis (OM) of the jaw. Morphologic features on CT (remodeling, disappearance of osteolysis, sequestrum, periosteal reactions) and intensity of radionuclide uptake (4-grade scale: 0=no, 1=minor, 2=intermediate, 3=high) were assessed retrospectively. Response was defined as follows: complete response (CR): bone remodeling, disappearance of osteolysis and sequestrum and resolution of uptake, partial response (PR): partial disappearance of osteolysis and sequestrum and decrease of uptake, stable disease (SD): no change, progressive disease PD/exacerbation: new osteolysis or sequestrum and increased uptake. Imaging results were compared with clinical follow up.
Results: 6 (18%)patients showed clinically CR concordant with CR in SPECT/CT. 3 (9%)patients showed clinically CR but SD in SPECT/CT. 15 (46%) patients showed clinical CR but PR in SPECT/CT with residual minor (13 patients) or intermediate (2 patients) uptake. 3 (9%) patients with clinical PR showed PR in SPECT/CT. 1 patient (3%) with clinical PD showed PR in SPECT/CT. 1 (3%) patient with clinical CR showed PD in SPECT/CT. 2 (6,6%) patients with clinical PR showed PD in SPECT/CT. 2 (6,6%) patients with clinical PD showed PD in SPECT/CT. In 2 patients with no or minor residual uptake after therapy dental implants were placed successfully without exacerbation of OM in the follow-up.
Conclusion: SPECT/CT is useful for therapy response assessment of OM. Minor residual uptake after therapy in asymptomatic patients is a common finding and seems to represent bone remodeling and not persistent inflammation.

The impact of multislice SPECT/CT in diagnosis and clinical management of unexplained foot and ankle pain

V. Fernandes Vieira, T. Dos Santos, N. Reymond, P. Omoumi, J.-A. Collinot, F. Becce, X. Crevoisier, J. Prior; Lausanne

Purpose: SPECT/CT is an emerging hybrid imaging modality for assessing foot and ankle disease. The integration of both functional and anatomical imaging provides precious clinical information in evaluating these complex structures. Our study aims to address the value of SPECT/CT in the clinical management of patients with unexplained foot and ankle pain.
Methods and Materials: Over a 9-month period, 27 patients underwent a standard 3-phase bone scintigraphy with SPECT/CT because a definite diagnosis could not be achieved after a well-conducted clinical examination by an orthopaedic surgeon and conventional radiologic evaluation. An experienced orthopaedic surgical team dedicated to foot and ankle pathologies retrospectively assessed the clinical impact of the SPECT/CT in the patient management using a 24-question evaluation questionnaire derived from a few sample cases.
Results: SPECT/CT information was able to define a precise diagnosis in 17 (63%) patients leading to a modified treatment in 15 (55%) of them. Moreover, additional disease in a nearby structure was found in 6 (22%) patients with subsequent treatment in 4 (15%) of them. Overall, a treatment plan was defined according to SPECT/CT in 21 (78%) patients. In 24 (89%) cases, the SPECT/CT gave clear anatomical information on where the treatment should be applied. In 24 (89%) patients, the clinician was satisfied by the SPECT/CT information and would be likely to request it again in a similar case.
Conclusion: For the referring physician, SPECT/CT imaging has high informative value for the assessment and treatment planning of unexplained foot and ankle pain.

Systematic dual SPECT/CT versus targeted SPECT-CT bone scan for metastatic workup of oncological patients

O. Rager, G. Amzalag, R. Nkoulou, V. Garibotto, C. Tabouret-Viaud, M. Lord, O. Ratib; Genève

Purpose: Our aim was to evaluate the value of a systematic dual SPECT/CT protocolover planar bone scintigraphy with "targeted" SPECT-CT for metastatic workup.
Methods and Materials: 212 consecutive patients with history of any cancer underwent a bone scan for the detection of bone metastasis. Whole-body planar bone scintigraphy with targeted SPECT-CT and systematic dual SPECT/CT covering from the base of the skull to the proximal femurs were separately, blindly and retrospectively reviewed by two experimented specialists in nuclear medicine. The exams were categorized as no metastasis (A), equivocal (B), or metastatic (C) in both modality. Number of lesions per patient and peripheral skeleton spreading was also assessed.
Results: Planar with targeted SPECT-CT vs systematic dual SPECT-CT agreement was very good to categorize patients (k=0.831) but dual SPECT-CT changed the category in 14 patients out of 212 (6.6%, CI95 [3.7–10.8]). Agreement was substantial (k=0.760) for the number of metastases and most of changes occurred in unique or oligometastasic patients. SPECT/CT didn't miss any patient with peripheral metastases. Agreement was very good between the two methods (k=0.882) to identify periphereal spreading and dual SPECT-CT was even able to highlight peripheral lesions not seen on planar with targeted SPECT-CT in 5 patients (2.4% CI95 [0.8–5.4]).
Conclusion: It thus appears that dual SPECT/CT alone, covering from the base of the skull to the proximal femurs, could be the modality of choice for the screening of metastasis on bone scan, combining a better diagnostic performance with a more reproducible protocol.

Case series of high ^{99m}Tc-HDP uptake in synthetic bone implants

C. Tabouret-Viaud[1], E. Rust[2], I. C. Mainta[1], O. Rager[1]; [1]Genève, [2]Strasbourg/FR

Purpose: A physiological increased uptake of bone seeking agents used in nuclear medicine has been described for ocular hydroxyapatite implants, but to our knowledge, this is the first case series reporting some tracer uptake in synthetic bone substitutes.
Methods and Materials: Inclusion criteria were patients with history of ceramic bone substitution and referred for a bone scan. A ^{99m}-Tc-HDP bone scan with early and late phases and with late SPECT-CT was performed and two nuclear physicians from two different hospitals analyzed independently planar bone scan and SPECT-CT images of 5 consecutive patients, with a total of 7 implants.
Results: On the early phase, there was no uptake within the implant in one case, mild uptake in two, moderate uptake in two and intense uptake in two. On the late phase, all the cases were positive, with a mild uptake in one case, a moderate uptake in three and an intense uptake in three others. The uptake intensity was not related with the time from surgery. Follow-up was negative for an infection or an inflammation.
Conclusion: This study demonstrates that some synthetic bone substitutes can be associated with an increased physiological ^{99m}-Tc-HDP uptake, sometimes on both phases of bone scan, which should not lead to a false diagnosis of pseudarthrosis, inflammation or infection, even 9 years after surgery, and supporting the evidence that high ^{99m}-Tc-HDP uptake in these implants belongs to the normal post operative pattern. The porous structure of these implants, analogous to the architecture of cancellous bone and its composition may explain those results.

NSS305

Detection rate of Tc-^{99m}-MIBI SPECT/CT in patients with primary hyperparathyroidism: A meta-analysis

G. Treglia[1], R. Sadeghi[2], C. Caldarella[3], L. Ceriani[1], L. Giovanella[1]; [1]Bellinzona, [2]Mashhad/IR, [3]Rome/IT

Purpose: Parathyroid scintigraphy using Tc-^{99m}-MIBI SPECT/CT could provide additional information compared to planar Tc-^{99m}-MIBI scintigraphy and SPECT only in patients with primary hyperparathyroidism. The aim of our study is to meta-analyze published data about the detection rate (DR) of Tc-^{99m}-MIBI SPECT/CT in patients with primary hyperparathyroidism.

Methods and Materials: A comprehensive literature search of studies published through December 2013 was performed. Only articles reporting sufficient data to calculate the DR of Tc-^{99m}-MIBI SPECT/CT were included. The pooled DR of this scintigraphic method was calculated on a per patient and on a per lesion-based analysis. Separate analyses considering all parathyroid lesions (adenomas and hyperplastic glands) and adenomas only were performed. An I-square index was used to test for heterogeneity between studies. For publication bias evaluation, funnel plots and Egger's test were used.

Results: Nineteen articles including 946 patients with primary hyperparathyroidism were included in the meta-analyses. The pooled DR of Tc-^{99m}-MIBI SPECT/CT was 88% (95% CI: 84–92%) and 87% (95% CI: 81–91%) on a per patient and on a per lesion-based analysis, respectively. The included studies were statistically heterogeneous in their estimates of DR. No significant publication bias was found. No significant improvement of the DR considering parathyroid adenomas only was found.

Conclusion: In patients with primary hyperparathyroidism Tc-^{99m}-MIBI SPECT/CT is an accurate method in detecting the hyperfunctioning parathyroid glands.

NSS306

Occult breast lesion localization with or without sentinel node localization: Initial experience in 33 patients

T. Cazaentre[1], D. Constantinescu[1], M.J. Chevenement[1,2], C. Becciolini[1], B. Christen[2], M. Wissmeyer[1]; [1]La Chaux-de-Fonds, [2]Neuchâtel

Purpose: To prospectively assess the accuracy and effectiveness of the ROLL (radioguided occult lesion localization) and SNOLL (ROLL plus sentinel node localization) procedure in terms of success of breast lesion localization, sentinel node (SN) localization and free surgical margins.

Methods and Materials: From November 2012 to October 2013, we prospectively included 33 consecutive patients for 39 procedures; ROLL=11 cases, SNOLL=28 cases. All of them presented with non-palpable but ultrasound-positive breast lesions. All were eligible for breast-conserving therapy.

Under ultrasound guidance, we injected 21.4±6.8 (mean±SD) MBq of ^{99m}Tc-nanocolloid intratumorally, with a complementary periareolar injection of 10.8±4.5 (mean±SD) MBq for the SNOLL procedure. Planar preoperative lymphoscintigraphy for SN localization was performed at least 1 h after radiotracer injection. Surgery was performed the next day, 19.4±1.8 (mean±SD) hours after.

Results: Intraoperative breast lesion localization was successful in all cases but one (38/39), yielding a localization rate of 97.4%. The intraoperative SN localization rate was 100% despite the fact that in one patient, no SN was visible on the preoperative lymphoscintigraphy. The surgery was sufficiently radical (free margins) in 30 of the 31 patients (96.7%). Additional excisions to ensure free tissue margins were performed in the same procedure for 6% of them (2/31).

Conclusion: Our results encourage the careful consideration of the SNOLL/ROLL technique in the management of non-palpable nodular breast cancer.

NSS307

Feasibility study of radioguided occult breast lesion localization (ROLL) plus sentinel node biopsy (SNOLL) and comparison study to conventional wire-guided localization (WGL)

M. Sainmont[1], P.-L. Giacalone[1], A. Bourdon[2], P. Do Trinh[2], G. Rathat[2], P. Taourel[2], M. Rossi[2]; [1]Lausanne, [2]Montpellier/FR

Purpose: To evaluate the feasibility of ROLL and SNOLL techniques in occult breast lesions and compare it to conventional WGL.

Methods and Materials: The feasibility study prospectively included 88 patients (36 ROLL, 52 SNOLL) candidate to conservative breast surgery. The comparison study retrospectively included 43 SNOLL and 86 WGL patients with invasive lesion and measurable opacity. ROLL/SNOLL was performed the day before the surgery, under stereotaxic/echographic guidance, by single intratumoral Tc-^{99m} nanocolloids injection (110–120 MBq/0.2 mL) to both label tumor and sentinel lymph node (SLN). A lymphoscintigraphy was performed 2 hours after injection.

Results: All radioguided procedures were safe, effective, and well-tolerated by the patients. Tumor localization was successful in all ROLL/SNOLL patients with a peroperative probe. In SNOLL patients, at least 1 sentinel lymph node was successfully detected (methylene blue and/or isotopic) and resected. SNOLL compared to WGL allowed a significantly higher rate of tumor-free nearest margins >9-mm in the first specimen (53% vs. 34%, p=0.037), a better tumor centricity (p=0.008), and fewer additional needed resections during the initial surgery (14% vs. 31%, p=0.026). Although preoperative lymphoscintigraphic visualization of SLN was lower in SNOLL as compared to WGL, this did not reach significance (79% vs. 90%, p=0.11). Furthermore, peroperative sentinel lymph node detection rate was similar in both groups (98% vs. 93%, p=0.4, respectively).

Conclusion: We demonstrated the clinical feasibility of isotopic localization of occult breast lesions and obtained better performances in terms of the surgical resection completeness and re-resection rate as compared to the conventional wire-guided technique.

NSS308

First results of thoracoscopic ectomy of radiactively marked pulmonary nodules with the help of free-hand SPECT

J. Müller, T. Schneider, F. Baty, J. Kick, A. Eberl, C. Zeisel; St. Gallen

Purpose: In the Cantonal Hospital of St. Gallen an average of 30–40 patients will have a pulmonary nodule surgically removed for diagnostic or therapeutic reasons. In such cases, a thorascopic resection is more advantageous for the patient as opposed to full thoracotomy. Restrictions on the feasibility of thorascopic resection are small nodules or nodules deeper in the lung, thus in many cases a (mini-) thoracotomy is often necessary.

Methods and Materials: Detection of small pulmonary nodules should be improved by radioactive marking. The new technical development of the handheld-SPECT, which can be used in the operating theatre, is currently being tested. The nodules are punctured under CT guidance and a small quantity of Tc-^{99m} MAA is administered. With the help of the gamma probe and the handheld-SPECT the nodules can be found intraoperatively and thoracoscopic resection is possible.

Results: At present 3 patients have been included in the study. The CT-guided marking were successful in each case. Besides a very small pneumothorax, no complications occurred. In two cases the Tc-^{99m}-MAA was found within the pulmonary round nodule, in one case the activity was situated within 0.8 cm distance. Intraoperativly the nodules were found easily in each patient. The handheld-SPECT allowed for precise location of the nodules, and a conversion to thoracotomy was not necessary. Histopathologic findings showed complete resection of a granulomatous inflammation, a very rare entity of a clear cell tumour and a metastasis.

Conclusion: Preliminary results showed that CT-guided radioactive marking of pulmonary round nodules, with resulting gamma probe and handheld-SPECT guided thoracoscopic resection, is feasible.

Intraoperative hysteroscopical application of radiotracer for SLN mapping using laparoscopic freehand SPECT

J. Müller, A. Markus, R. Hornung, D. Bolla; St. Gallen

Purpose: Laparoscopic SLN biopsy is a promising technique for nodal staging of early endometrium cancer patients. Its adoption in the routine is challenged by a) a steep learning curve, b) high user dependency and c) the complicated logistics of the tracer application the day before surgery. Freehand SPECT is an intraoperative imaging and navigation tool that can replace conventional preoperative lymphatic scintigraphy and thus enable intraoperative image-guided localization of the SLNs

Methods and Materials: Up to date 7 endometrium cancer patients (41–68 y, BMI 23–42) were injected hysteroscopically with Tc-^{99m}-nano-coll in into the myometrium beneath the tumor. After preparation of the surgical field a 3D freehand SPECT image of the lymphatic basins on each pelvic side and along the aorta was acquired by scanning with a laparoscopic gamma probe. The freehand SPECT image was then used for image-guided localization of SLNs. After resection a new freehand SPECT image was created to verify complete resection

Results: Lymphatic mapping using freehand SPECT failed in 2 patients (1 pT1a, 1 pT3a) and was successful in 5. The 2 failed were the 2 patients with an indicated radical lymphadenectomy. In remaining 5 patients, 9 SLNs were found (2 in fossa obturatoria, 6 in along A. iliaca externa, 1 paraaortal).

Conclusion: Intraoperative hysteroscopical application of the tracer for SLN mapping using laparoscopic freehand SPECT imaging is feasible and safe in patients with early endometrial cancers. Laparoscopic freehand SPECT enables easy and fast localization of SLNs. Our findings suggest that patient selection plays a role in detection rate of SLNs.

PO01

Diagnostical value of multidetector CT in acute colitis

C. Thierrin, S. Schmidt; Lausanne

Purpose: To evaluate the diagnostic value of multidetector CT (MDCT) in patients with acute colitis, and to assess the sensitivity of MDCT for the distinction between the different types of acute colitis.
Methods and Materials: This work is a retrospective analysis of patients' endoscopic, radiological and medical files that after admission to the CHUV between August 2008 and October 2011, were investigated by endoscopy (colonoscopy or rectosigmidoscopy) for clinical suspicion of acute colitis, and also underwent MDCT at the same time. We finally included 89 patients (41 women, average age: 61.2 years) and compared their data with our gold standard (histopathology and final diagnosis at discharge). An experienced radiologist blindly reviewed all the MDCT-images.
Results: Acute colitis can be detected on MDCT's images in most of the cases (86.25%): among the 80 patients with colitis 69 have well been detected, while 11 were not recognized. Concerning the 9 cases without colitis, 7 have correctly been recognized on MDCT (77.78%). The agreement between MDCT and the gold standard for the diagnosis of colitis was kappa=0.44, thus moderate.
MDCT is able to distinguish between the different types of colitis with an agreement of kappa=0.35, thus fair, compared to our gold standard.
Conclusion: The MDCT is a good technique to detect acute colitis, but it is not able to determine the etiology with absolute certitude, because radiological findings remain little specific and overlap with each other for the different types.

PO02

Assessment of image quality and low-contrast detectability in abdominal CT of obese patients: Comparison of an integrated circuit with a conventional detector at different tube voltages

A. Euler[1], T. Heye[1], M. Kekelidze[1], G. Bongartz[1], Z. Szucs-Farkas[2], B. Schmidt[3], S. T. Schindera[1]; [1]Basel, [2]Biel, [3]Forchheim/DE

Purpose: To assess image quality and low-contrast detectability of an integrated circuit (IC) detector (Stellar, Siemens) in abdominal CT of obese patients compared with conventional detector technology at different tube voltages.
Methods and Materials: A phantom with 45 hypoattenuating lesions was placed in a water container mimicking an obese patient. Scans using the IC and conventional detector were performed at 80, 100 and 120 kVp (two different scanners, SOMATOM Flash, Siemens) using constant technical parameters. Image noise was measured and the CNR was calculated. Low-contrast detectability was performed by three radiologists independently. Radiation dose was estimated by the $CTDI_{vol}$.
Results: The image noise was 37.6, 15.0 and 6.0% lower and the CNR was 72.7, 21.8 and 15.5% higher with the IC compared with the conventional detector at 80, 100 and 120 kVp, respectively. The IC-detector resulted in an increased lesion detection rate at 80 kVp (38.1% vs. 17.2%, P=0.003) and at 100 kVp (57.0% vs. 41.0%, P=0.006). There was no significant difference in detection rate at 120 kVp (60.7% vs. 62.2%, P=0.67). Furthermore, there was no significant difference in detection rate between the IC-detector at 100 kVp and the conventional detector at 120 kVp (57% vs. 62.2%, P=0.11). The $CTDI_{vol}$ at 80, 100 and 120 kVp was 4.5–5.2, 7.3–7.9 and 9.8–10.2 mGy, respectively.
Conclusion: The IC detector improved substantially the image quality and low-contrast lesion detection in obese patients at lower tube voltages compared with the conventional detector. Furthermore, the IC detector demonstrates similar image quality and lesion detection at 100 kVp compared with the conventional detector at 120 kVp while reducing the radiation dose by 37%.

PO03

Acute mesenteric vein thrombosis: Factors associated with evolution to chronic mesenteric vein thrombosis

N. Vietti Violi, N. Fournier, S. Schmidt, P. Bize, R. Duran, B. Guiu, A. Denys; Lausanne

Purpose: Acute mesenteric venous thrombosis (MVT) signs at multidetector computed tomography (MDCT) are well described but literature lacks studies assessing their evolution. We aimed to describe radiological evolution of isolated acute MVT and associated prognostic factors.
Methods and Materials: Patients with isolated acute MVT with a follow-up of minimum one month with MDCT were selected. Images at the acute phase and on follow-up were reviewed in consensus reading. Following abnormalities were searched: for acute MVT: low-attenuated intraluminal filling defect, and for chronic MVT: vessel stenosis/occlusion associated with collateral mesenteric veins. Treatment, thrombosis risk factor, symptoms, location, length and diameter of mesenteric venous thrombosis were reported and correlated with evolution over time.
Results: Twenty patients (9 women, mean age 52 year-old) were selected. Four patients recovered without radiological sequelae, 16 developed chronic MVT signs. Anticoagulation did not influence recovery (p-Value=1). Patients with recovery, compared than patients with chronic MVT, shown more frequent central lesions (p-Value=0.03). At diagnosis, thrombosed segment was shorter and larger in the complete radiological recovery group compared to the chronic MVT signs group (respectively mean length: 6.25 cm [SD 3.21] and 12.81 cm [SD 5.96] [p-Value=0.01]), mean transverse diameter: 1.82 cm (SD 0.42) and 1.12 cm (SD 0.34) (p-Value=0.01]). Mesenteric fat infiltration at diagnosis was more frequent in chronic MVT signs group than in the complete recovery group (p-Value=0.03).
Conclusion: Most cases of acute MVT evolve towards chronic form with vein stenosis/occlusion and development of collateral veins. Location, length of MVT, transverse diameter of the vein and mesenteric fat infiltration at diagnosis are determinant factors for MVT evolution.

PO04

Intraductal papillary mucinous neoplasm: Most reliable signs and/or associations of signs indicating progress of disease in dysplasia and malignancy in magnetic resonance imaging follow-up

P. Tinazzi Martini, S. Gobbo, M. Pregarz; Peschiera del Garda/IT

Purpose: Magnetic Resonance Imaging (MRI) and Magnetic Resonance Colangio Pancreatography (MRCP) are recommended in Intraductal Papillary Mucinous Neoplasm (IPMN) follow-up, in order to exclude progression to malignancy.
In this paper we have retrospectively tried to define the most reliable signs and/or association of signs indicating progress of disease in dysplasia and malignancy.
Methods and Materials: We evaluated retrospectively 20 cases of iPMN (main duct type and branch side type) surgically resected for suspected progression to malignancy and histopatologically graded.
Results: Two skilled readers with at least 10 years experience in MRI abdominal imaging reevaluated MRI images and indicated presence or absence of signs suggesting progression to malignancy (main duct enlargement, volume enlargement of branch type ducts, post contrast enhancing nodules inside dilated ducts, mass forming tissue) and the results were compared to final histological diagnosis.
Conclusion: MRI /MRCP images were correlated with the final histological results in order to define each sign's and signs association's reliability in assessing progression toward malignancy.

PO05

Interreader and intrareader agreement in assessing treatment response following transarterial therapy for hepatocellular carcinoma

O. F. Donati[1], R. K. G. Do[2], J. Zheng[2], C. Moskowitz[2], C. Beattie[2], K. Johnson[3], K. T. Brown[2]; [1]Zürich, [2]New York/US, [3]Tampa/US

Purpose: To evaluate interreader and intrareader agreement in applying size- and necrosis-based response assessment criteria after transarterial therapy for hepatocellular carcinoma (HCC), using two different methods of applying the European Association for the Study of the Liver (EASL) criteria.
Methods and Materials: Seventy-four patients (median age, 67 years) from a prospectively accrued study population were included in this study. Two radiologists independently evaluated CT-data at 2–3 (1st follow-up) and 10–12 (2nd follow-up) weeks after transarterial therapy and assessed treatment response using size-based (World Health Organization [WHO], Response Evaluation Criteria in Solid Tumors [RECIST]) and necrosis-based criteria (mRECIST, EASL) criteria. Enhancing tissue was bidimensionally measured ($EASL_{meas}$) and also visually estimated ($EASL_{est}$). Interreader and intrareader agreement were assessed using intra-class-correlation-coefficient (ICC) and κ-statistics. Association between response and overall survival (OS) was assessed with landmark analysis.
Results: Interreader agreement for all response assessment methods ranged from moderate to substantial (κ=0.493–0.698) at 1st follow-up and substantial to excellent (κ=0.654–0.806) at 2nd follow-up. Intrareader agreement was substantial between WHO and RECIST (κ=0.726 and 0.799, 1st FU; κ=0.776 and 0.782, 2nd FU) and excellent between $EASL_{meas}$ and $EASL_{est}$ (κ=0.910 and 0.912, 1st FU; κ=0.844 and 0.877, 2nd FU). Overall survival did not differ significantly between responders and non-responders for any response assessment method (p=0.056–0.994).
Conclusion: Size- and necrosis-based criteria both show moderate to excellent interreader agreement in evaluating treatment response after transarterial therapy for HCC. Intrareader agreement regarding $EASL_{meas}$ and $EASL_{est}$ was excellent, suggesting that either may be used.

PO06

Whole-body CT-based imaging algorithm for multiple trauma patients: Radiation dose and time to diagnosis

S. Gordic, S. Hodel, H.-P. Simmen, G. Wanner, K. Sprengel, H. Alkadhi; Zürich

Purpose: To determine the number of imaging studies, radiation dose, and the time to complete trauma-related diagnosis in multiple trauma patients before and after introduction of whole-body CT (WBCT) into early trauma care.
Methods and Materials: 120 consecutive patients before and 120 consecutive patients after the introduction of WBCT into our hospitals' trauma algorithm were compared regarding number and type of CT, X-ray, focused assessment with sonography for trauma (FAST), additional CT studies (defined as CT of same body regions after X-ray and/or FAST), and the time to complete trauma-related imaging work-up.
Results: In the WBCT cohort significantly more patients underwent CT of the head, neck, chest, and abdomen ($P<.001$) as compared to the non-WBCT cohort, whereas the number of X-rays of the cervical spine, chest and pelvis and of FAST studies were significantly lower ($P<.001$). There were no significant differences between cohorts regarding the number of X-rays of upper ($P=.56$) and lower extremities ($P=.30$). We found significantly higher effective doses in the WBCT (29.5 mSv) as compared to the non-WBCT cohort (15.9 mSv, $P<.001$), but less additional CT for completing the work-up were needed in the WBCT cohort ($P<.001$). The time to complete trauma-related diagnosis was significantly shorter in the WBCT (12 min) as compared to the non-WBCT cohort (75 min, $P<.001$).
Conclusion: Use of WBCT for initial diagnostic work-up of multiple trauma patients is associated with higher radiation dose, but less additional CT is needed and the time to obtain the complete trauma-related diagnosis is shorter.

PO07

Feasibility and value of iterative reconstructions for urinary stone characterization on single-source dual-energy CT

F. Morsbach, M. Wurnig, H. Alkadhi; Zürich

Purpose: To evaluate the feasibility and accuracy of single-source dual-energy CT (SS-DECT) with sequential data acquisition and co-registration motion correction for urinary stone characterization and to evaluate the value of iterative reconstructions (IR) in DECT.
Methods and Materials: Thirty-five urinary stones placed in cylindrical phantoms (diameters 30 cm and 40 cm) were scanned with 64-slice CT with SS-DE consisting of two sequential acquisitions at 80 and 140 kVp, with phantom movement between acquisitions. Images were reconstructed with FBP and IR, and data were coregistered. Two readers evaluated image quality. Image noise and HU values of stones were measured; the dual-energy index (DEI) was calculated.
Results: The motion correction algorithm achieved a good coregistration. Image quality was significantly higher on IR in the 40 cm phantom as compared to FBP (P<0.05). Stone visibility was significantly higher for both phantoms on IR images (P<0.05). Noise was reduced by 31% in the 40 cm phantom with IR (P<0.001). The DEI was similar in FBP and IR datasets for both phantoms (P=0.116, P=0.544). DEI was significantly different between UA-containing stones, cystine and struvite stones, and stones of other compositions (P<0.001). Post-processing software classified all stones correctly as UA- or non-UA containing stones. In the 40 cm phantom, false-positive colored voxels found in the FBP datasets disappeared on IR images.
Conclusion: SS-DECT with sequential acquisitions and using co-registration motion correction is feasible and accurate for characterizing urinary stone composition. Use of IR in DECT reduces noise, improves image quality and visibility of stones and helps avoiding false stone classifications.

PO08

Computed tomography of the abdomen helps to predict the clinical outcome of patients with decompensated alcoholic liver disease

R. Breguet, L. Spahr, C. Hansen, S. Boudabbous, C. Becker, S. Terraz; Genève

Purpose: Prognosis of alcoholic hepatitis is based on clinical and biological severity scores. The information brought by abdominal imaging is not known. We studied the morphometric parameters on baseline CT and their impact on short term outcome.
Methods and Materials: Data obtained from a prospective randomized trial on decompensated alcoholic liver disease and bone marrow transplantation were analysed. 58 patients, mean age 55 y, M/F 44/14, cirrhosis 100%, mean MELD 19, were treated with standard care alone, including steroids (n=30), or associated with bone marrow transplantation (n=28). CT parameters analysed were: liver steatosis, liver volume/body weight, spleen/liver ratio and parietal/visceral fat. Patients were qualified as responder or non responder based on a decreased of >3 points at 3 months from baseline MELD.
Results: The univariate analysis (t-test, chi-square) showed that the liver volume/body weight, the parietal fat quantification and the spleen/liver ratio were statistically significant factors that predicted response to treatment. The multivariate logistic regression analysis revealed that the liver volume/body weight (OR 3, 95% CI 1.3–7.2, p=0.01) and parietal fat quantification (OR 1.01, 95% CI 1.00–1.02, p=0.05) were associated with the non responders.
Conclusion: Theses results put forward the prognostic value of abdominal imaging and suggest radiological markers of poor nutrition and liver atrophy could indicate a suboptimal regeneration response following injury.

PO09

Intestinal pneumatosis revisited: A pictorial essay

M. O. Treyvaud, R. Meuli, S. Schmidt; Lausanne

Learning Objectives: To revisit the radiological feature "gastric or intestinal pneumatosis" in order to work out its significance depending on the underlying clinical condition.

Background: Intestinal pneumatosis (IP) means the presence of gas bubbles within the bowel wall and has originally been described as critical sign of acute intestinal ischemia. It has traditionally been associated with high mortality. Given the increasing use of abdominal CT in todays' emergency departments together with the higher sensitivity of CT, PI seems to be more and more frequently detected, even in asymptomatic patients. We have been wondering if the significance of PI has changed.

Imaging Findings or Procedure Details: A search of our database yielded consecutive series of 182 patients in whom abdominal CT performed between January 2006 and November 2013 had revealed the diagnosis "intestinal pneumatosis" including or not the finding "portal venous gas". Minor patients and CT of inadequate technical quality were excluded. Jointly, two radiologists reviewed the imaging findings and correlated them to the underlying clinical and anatomopathological conditions as well as subsequent patients' management. We will describe the possible causes of PI, illustrate the various imaging findings, and report on patients' outcome.

Conclusion: IP remains the most often indicative of underlying acute bowel ischemia. However, rarely, it also occurs in other clinical situations. Thus, IP imperatively needs to be correlated to the clinical context in order to be correctly reported.

PO10

Liver MRI for follow-up of primary liver cancer after minimal invasive and loco-regional treatment

M. Hauser, A. Denys, P. Bize, S. Schmidt; Lausanne

Learning Objectives: 1. Discuss loco-regional treatment options for patient with primary liver cancer according to indications as disease stage and comorbidity, and contra-indications of each technique as surgical resection, thermo-ablations (radiofrequency), trans arterial chemoembolization (TACE), intra-arterial chemotherapy and radio-embolization. 2. Illustrating the typical MR features after loco-regional treatment depending on individual technique used in order to better understand cured, residual or new tumor.

Background: In our center, we perform about 3 liver MR examinations per day in patient treated for hepatocellular carcinoma (HCC) by loco-regional methods.

The incidence of liver cancer in Switzerland per 100'000 is 11.3 in men and 3.1 in women.

Five-year survival rate is less than 3% in absence of curative treatment.

80% of HCC patients have cirrhosis, thus limiting the treatment options.

Imaging Findings or Procedure Details: Identify changes of MR signal and/or size, if any, that demonstrate the treatment response specific for each treatment technique discussed above.

Conclusion: We can exactly identify certain MR-imaging features typical of each technique we describe. They consist of changes of sizes and signal quite specific of each treatment technique discussed above.

PO11

Iterative reconstruction in CT: evaluation criteria to analyze the reduced radiation dose images

B. Pauchard, F. R. Verdun, F. Becce, R. Meuli, S. Schmidt; Lausanne

Learning Objectives: To provide a method for analyzing low-dose images in comparison with standard-dose images, reconstructed with the filtered-back projection (FBP) algorithm and considered as reference standard

Background: Radiation dose reduction has become necessary because the number of CT exams have significantly increased over the past decades. CT machines vendors are developing software at full speed to reduce the radiation dose, but "clinical validation" does not always follow. Thus, we need a system to "validate" these new images, not only using phantoms, but also in clinical life. Radiation dose reduction must be balanced by an acceptable level of image quality and the diagnosis must be adequately maintained.

Imaging Findings or Procedure Details: We compare «standard» CT-images (FBP and 50% ASIR [adaptive statistical iterative reconstruction]) with follow-up CT-images obtained with 50% or 20% of the initial radiation dose (DLP, CTDI$_{vol}$), using VEO iterative reconstruction.

For objective image analysis, the image noise, signal-to-noise ratio (SNR) and contrast-to-noise ratio (CNR) are calculated at several predefined anatomical structures. Four radiologists (two juniors, two seniors) estimate the subjective image quality, using a 5-point-evaluation scale for different criteria (noise, sharpness, blotchy appearance, and diagnostic confidence). Finally, the standard-dose images are evaluated for focal lesions (high contrast, i.e. calcifications, and low contrast, i.e hepatic metastases) and compared to the reduced-dose images for lesion detection.

Conclusion: The new techniques of image reconstruction allow for an important decrease of radiation dose in CT, but we should always ensure their sufficient quality. We do not need "beautiful" images, but "useful" and "diagnostic" images.

PO12

Complications of renal transplantation

N. Firmenich, G. Varnay, J.-P. Vallee, K. Hadaya; Genève

Learning Objectives: The aim of this poster is to provide a differential diagnosis of the renal transplantation complications, with an emphasis on the clinical, radiologic and histological features, allowing the identification of the complication.

Background: Renal transplantations can lead to early or late post-operative complications. Non-invasive imaging techniques have developed considerably in recent years, allowing improved detection of vascular and non-vascular diseases. The purpose of this educational poster is to summarize the clinical presentations, the imaging findings and the histological features of post-operative renal transplantation complications.

Imaging Findings or Procedure Details: Early complications include acute rejection, acute tubular necrosis, hematoma, pyelonephritis, abcess, urinoma, ureteral obstruction, vascular complications such as arterial stenosis and thrombosis, arterio-venous fistula and arterial pseudo-anevrism, renal vein thrombosis, and graft torsion.

Late complications include chronic rejection, other causes of ureteral obstruction, lymphocele, cyst, post-transplantation lymphoproliferative disorder, renal cell carcinoma and transitional cell carcinoma of the graft, complications due to immunosupression such as lymphoma and opportunistic infections involving the transplanted kidney.

Typical imaging features of the complications are described using US, CT and MRI modalities.

Conclusion: The early identification of complications from renal transplantation is critical to ensure transplantation success. The clinical presentation and the combination of US, CT and MRI modalities, correlated with histological findings, allow differential diagnosis of eventual complications, leading in turn to a correct diagnosis.

A longitudinal VBM study monitoring treatment with erythropoietin in patients with Friedreich ataxia

W. M. Santner[1], M. Schocke[2], S. Boesch[2], K. Egger[3]; [1]Baden-Dättwil, [2]Innsbruck/AT, [3]Freiburg/DE

Purpose: Recombinant human erythropoietin (rhuEPO) has received considerable attention because of its neuroprotective properties. It has recently been reported that rhuEPO increases frataxin levels in combination with clinical improvement in rhuEPO treated patients with Friedreich ataxia (FRDA). The present magnetic resonance imaging (MRI) study was performed to determine possible therapy dependent intracranial volume changes after treatment with rhuEPO using voxel-based morphometry (VBM).

Methods and Materials: Nine FRDA patients were scanned on the same 1.5 Tesla MRI scanner before and after treatment with rhuEPO. FRDA patients received 5000 IU rhuEPO thrice weekly subcutaneously for a time period of 8 weeks followed by 2000 IU thrice weekly over six months. To test for retest reliability a control group of twelve healthy volunteers were scanned twice on the same scanner without rhuEPO treatment. Neurological state was defined by the Friedreich Ataxia Rating Scale (FARS) and the Scale for the Assessment and Rating of Ataxia (SARA). Statistical parametric mapping software was used for image processing and statistical analysis.

Results: When comparing follow-up scans after rhuEPO treatment with baseline scans ($p < 0.001$ uncorrected) an increase of gray matter volume was observed bilaterally in the Pulvinar and the posterior parietal cortex. Moreover, clinical improvement detected using specific Ataxia scores correlated with VBM results in the pulvinar.

Conclusion: Given the limitation of small sample size, further confirmation of our findings are of major interest. In conclusion our study confirms previous findings that MRI may serve as reliable biomarker in neurodegenerative diseases as well as in monitoring of microstructural changes representing disease progression and/or therapy effects.

MRI diagnostics of anterior displaced disc of temporomandibular joint

D. Zadravec[1], T. Badel[1], M. Laškarin[2], I. Krolo[1]; [1]Zagreb/HR, [2]Šibenik/HR

Purpose: To compare radiological and clinical characteristics in the sample of patients with disc displacement (DD) of temporomandibular joint (TMJ).

Methods and Materials: A prospective study included 92 patients (mean age 33.97 ± 16.41 years, 80.4% female) with clinical signs and symptoms of DD of TMJ (pain, clicking, limited mouth opening). Clinical diagnostics was confirmed by magnetic resonance imaging (MRI) using a 1.5T scanner. Pain intensity was rated on a visual-analogue scale (VAS 1–10). Pain duration (in months) was recorded before the first examination.

Results: Partial DD with reduction was found in 16.9% joints, total DD with reduction in 20.7% and DD without reduction in 20.1% of patients' TMJs. Flattened condyle head was found in 30.4% of the joints, whereas the more severe sclerosation was determined in 15.8% of joints. Hypomobility of the joint in open mouth position was present in 39.1% of the TMJs. By comparing various diagnoses of DD a correlation was found between the condyle hypomobility in DD without reduction ($p = 0.0248$) and pain during palpation on VAS scale ($p = 0.0463$). Patients with partial DD could open their mouth significantly wider than those with DD without reduction ($p = 0.0354$). The pain experienced by the patients prior to the first examination lasted 10.7 ± 14 months and had a significantly positive correlation with pain on VAS during palpation ($p < 0.05$).

Conclusion: MRI is the gold standard in diagnostics of intraarticular structures of TMJ. Clinical parameters cannot fully differentiate between certain forms of DD shown on MRI. Deplaning is the most common condyle change considered a physiological variation.

Arterial wall imaging on 3-Tesla MRI for detection of active cerebral vasculitis

M. El-Koussy, K. Hsieh, J. Mathys, P. Mordasini, F. Kellner-Weldon, C. Zubler, J. Aellen; Bern

Purpose: The MRI findings of cerebral vasculitis using conventional sequences are rather non-specific ranging from vessel irregularities to cerebral parenchymal changes. The aim of this study is to examine the diagnostic value of dedicated sequences for imaging direct signs of arterial wall inflammation in patients with suspected cerebral vasculitis.

Methods and Materials: We prospectively examined 18 consecutive patients (12 women, age 16–65 years) with suspected cerebral vasculitis in a 3-Tesla clinical scanner (Magnetom Verio, Siemens, Erlangen, Germany). In addition to the standard MRI and the MR-angiographic series, the following sequences were performed: isotropic ultrathin heavy-T2-weighted sequence (CISS), time-of-flight MR-angiography before and after intravenous gadolinium administration as well as double inversion recovery, dark blood gadolinium enhanced T1-weighted images. Several follow-up MRIs were performed if necessary.

Results: In 11 patients a vessel wall enhancement was detected with dark blood gadolinium enhanced T1-weighted images, involving the anterior circulation arteries in 9 patients and the posterior circulation arteries in 2 patients (affecting the posterior cerebral artery). In 9 of these cases the vasculitis involved only the CNS.

In the 8 patients without vessel wall contrast enhancement, 4 were diagnosed with a non-inflammatory disorder of the cerebral arteries (1 arteriosclerosis, 1 reversible cerebral vasoconstriction syndrome, 1 migraine, 1 takayasu arteritis with involvement of the brachial arteries). In the remaining 4 patients, 2 fulfilled the criteria of a primary angiitis of the CNS vasculitis, whereas 2 had only a probable PACNS.

Conclusion: Dedicated vessel wall MRI can allow for standardized follow-up examinations for cerebral vasculitis, thus guiding therapeutic decisions.

Is there a role for diffusion-weighted MR imaging for differentiation of primary skull base tumours?

U. Müller[1], R. A. Kubik-Huch[1], C. Ares[2], D. C. Weber[2], F. J. Ahlhelm[1]; [1]Baden, [2]Villigen

Purpose: The potential impact of Diffusion-weighted imaging (DWI) for characterization of skull base tumours has been assessed in a patient collective referred for proton radiation therapy.

Methods and Materials: Between 2007–2010, 19 patients with skull base tumours (n=11 chordoma, n=8 chondrosarcoma) underwent MRI in preparation for Proton Radiation Therapy planning at the Paul Scherrer Institute. MR DWI and in particular measurements of apparent diffusion coefficient (ADC) values were evaluated. Two differently sized regions of interest (ROI) within each tumour of the subgroup were assessed on axial images. Small ROI sizes ranged from 10.5–38.7 mm², whereas large ROI's ranged from 15.8–69.4 mm². Apparent diffusion coefficient (ADC) values were compared to histopathology.

Results: Chordomas were associated with lower ADC values (mean ADC $1263.5 \pm 100.2 \times 10^{-6}$ mm²/s) compared to chondrosarcomas with significant higher values (mean ADC $2017.2 \pm 139.9 \times 10^{-6}$ mm²/s). Two different intratumoural ROI's were measured in each tumour. The median ADC value of all acquired ROI's of the two subgroups was 1268.1×10^{-6} mm²/s for the Chordoma patients and 2051.7×10^{-6} mm²/s for the Chondrosarcoma patients regarding a total number of 19 patients (Mood's Median-Test $p = 0.001$). There was no statistically significant intra-tumoural heterogeneity of ADC calculated for small and large ROI's.

Conclusion: Chondrosarcomas showed significantly higher apparent diffusion than chordomas. These data suggest that DWI and ADC could be used to differentiate these two tumour entities.

PO18

The role of DTI-HR in transient global amnesia

A. Kawkabani Marchini, C. Lutchmaya-Flick, R. Meuli, P. Maeder; Lausanne

Learning Objectives: Patients with transient global amnesia (TGA) present with a characteristic clinical syndrome although often, other diagnoses have to be ruled out. Diffusion- weighted imaging (DWI) represents a highly specific diagnostic tool in the context of TGA; however, standard clinical DWI often fails to detect the small characteristic hippocampal lesions due to its lack of resolution. A high resolution DTI sequence with thin slices and milimetric in plane resolution is far superior to detect small foci of restriction in the CA1 portion of the hippocampus.
Background: TGA is an amnestic syndrome, manifesting as anterograde memory loss that usually resolves within a few hours in the absence of focal neurological sign or epilepsy. Several aetiological factors, such as migraine-related mechanisms, focal ischaemia, venous flow abnormalities, and epileptic phenomena, have been suggested to be involved in the pathophysiology.
Imaging Findings or Procedure Details: TGA lesions typically manifest on DWI, as focal hyperintensities in the hippocampus with hyposignal on ADC. The lesions detected by DWI are small and punctuate (1–3 mm), and are located within the CA1 portion of the hippocampus. The most adequate time window for imaging seems to be of 24–72h after the amnestic episode. Imaging characteristics that permit to differentiate TGA from stroke, seizure and limbic encephalitis are discussed.
Conclusion: Patients with TGA would benefit from a 3T high resolution DWI which represents a sensitive and specific diagnostic tool in this situation.

PO19

Neuroradiologic findings in alcohol related brain disorders

M. Tozakidou, C. Stippich, A. Fischmann; Basel

Learning Objectives: To present examples of imaging findings in alcohol related brain disorders, such as Marchiafava-Bignami disease, central pontine myelinolysis or Wernicke encephalopathy.
Background: Alcohol is one of the most commonly used addictive substances. Related brain changes are thought to be either due to direct toxic action on neurons or due to secondary effects because of liver cirrhosis or coagulopathies even though in many clinical conditions the exact pathomechanism is not yet clear.
Imaging Findings or Procedure Details: Most common imaging findings include volume loss, most pronounced in the cerebellar vermis and the mamillary bodies. Thiamine deficiency results in bilateral changes of the thalamus. Osmotic changes or direct toxic effect can result in central pontine myelinolysis. Marchiafava-Bignami disease results in necrosis of the central corpus callosum.
Conclusion: Alcohol-related encephalopathies can represent as life-threatening conditions and are often characterized by nonspecific neurologic presentation. Early recognition of neuroimaging findings is important for diagnosis and treatment.

PO20

Anatomic variants of supra-aortic trunks and intracranial vessels: Recognition as such and awareness of associated pathology

M. Scheffler, V. Mendes Pereira, C. Becker, K.-O. Lövblad, M. I. Vargas; Genève

Learning Objectives: The aim of this poster is to show the most important anatomic variants of the cerebral and neck vessels with hints to differentiate them from acute pathology such as dissection or occlusion. Epidemiological background is provided as well as information on possibly associated other vascular malformations, aneurysms in particular.
Background: Computed tomography angiography (CTA) and magnetic resonance angiography (MRA) are frequently requested studies in daily clinical practice to search for signs of acute ischemic stroke or to rule out vascular anomaly in settings of severe headache, intracranial bleed, or subarachnoid hemorrhage. The interpreting radiologist may encounter variants of normal vasculature with an inherent risk of confounding them with emergencies such as occlusion or dissection.
Imaging Findings or Procedure Details: Presented are the imaging findings (CTA, MRA) of 21 patients with the following variants: azygos and triple anterior cerebral artery, trigeminal artery, basilar artery fenestration, aberrant subclavian artery, aortic origin of the vertebral artery, internal carotid artery duplication, vertebral artery duplication, posterior cerebral artery duplication, superior cerebellar artery duplication, anterior cerebral artery fenestration, vertebral artery fenestration, and bihemispheric posteroinferior cerebellar artery. For better illustration, multiplanar maximum intensity projection (MIP) and three-dimensional volume-rendered (VR) reconstructions are shown.
Conclusion: A large variety of anatomic variants of the supraaortic trunk and intracranial vessels exist. The radiologist should be familiar with these findings to differentiate them from acute pathology. Knowledge of epidemiology and awareness of associated other vascular malformations is stressed. Findings should be correctly documented in the patient's chart for possible future vascular surgery or four-vessel angiography

PO21

Imaging of impacted teeth: What the radiologist should know

V. Lenoir, A. Ailianou, B. Imholz, A. Terzic, T. Lombardi, P. Scolozzi, M. Becker; Genève

Learning Objectives: After reading this poster, the reader will be able to:
1. Describe the key imaging findings affecting the management of impacted teeth
2. Identify the lesions that predispose to intraoperative complications
3. Correctly evaluate impacted teeth and related pathology
Background: Evaluation of impacted teeth constitutes a frequent indication for cross-sectional imaging of the maxillofacial region because treatment options depend upon radiologic findings. The purpose of this educational poster is to review the role of CT, cone beam CT (CBCT) and MRI for the pre-therapeutic work-up of impacted teeth and to provide a systematic approach for the assessment of associated pathology.
Imaging Findings or Procedure Details: First we review the key imaging findings affecting the management of impacted teeth: exact position of crown and apex, shape of crown and root, 3D morphology, depth and direction of impaction and proximity to important anatomic structures, such as the inferior alveolar nerve canal or paranasal sinuses. Special emphasis is put on radiologic factors predicting nerve exposure during surgery. Then pathologic lesions associated to impacted teeth are discussed such as caries, pericoronal and periradicular inflammation, resorption of adjacent tooth roots, ankylosis, fracture due to bone weakening, infection, cysts, tumors and tumor-like lesions. Special emphasis is put on what the radiologist needs to know and how to report the findings in a comprehensive fashion.
Conclusion: This educational poster is a learning tool for the interpretation of key imaging findings required for the confident assessment of impacted teeth and related pathology.

PO22

Pictorial review of CADASIL

H. Barras, J. Forget, P. Hagmann, R. Meuli, P. Michel, C. Wider, J. Ghika, P.-P. Maeder; Lausanne

Learning Objectives: Identification of Cerebral Autosomal Dominant Arteriopathy with Subcortical Infarcts and Leukoencephalopathy or CADASIL on MRI neuroimaging.
Recognition of main differential diagnoses: chronic hypertensive encephalopathy (Binswanger disease), multiples sclerosis, MELAS, familial hemiplegic migraine.

Background: CADASIL is a disease mostly related to NOTCH3 gene mutations on chromosome 19; it is the most common form of hereditary cerebral angiopathy. Main clinical features are migraine, recurrent stroke, and cognitive impairment. The severity of cognitive impairment varies in different stages, and early recognition is crucial to differentiate CADASIL from similar diagnoses. CADASIL still does not have any etiological treatment. It is characterized by the presence of multiple and deep cerebral lacunar infarcts, deep white matter (WM) lesions, and nonatherosclerotic, nonamyloid angiopathy primarily involving small, deep perforating cerebral arteries.

Imaging Findings or Procedure Details: In our case series (2000–2013) at CHUV, ten patients were diagnosed positively and we identify two families, whose certain members revealed a positive diagnosis and the most pathognomonic pattern of CADASIL as confluent lesions of both anterior temporal lobes deep WM (T2/FLAIR hypersignal). Involvement of the external capsule has also a high specificity. WM lesions may be identified by increased water diffusion at the acute phase.

Conclusion: Existence of bilateral temporal WM lesions is the main pattern differentiating CADASIL from other diagnoses. An accurate and adequate follow-up of the cases can confirm the diagnosis of CADASIL in cohesion with the genetic analysis that may produce some false negatives as only some exons may be examined.

PO23

Susceptibility-weighted imaging in acute stroke

M. El-Koussy, C. Kiefer, R. K. Verma, S. Jung, C. Weisstanner, K. Hsieh, P. Gratz; Bern

Learning Objectives:
– Introduce the basics of susceptibility-weighted MR imaging (SWI) sequence
– Common indications for SWI in neuroimaging
– Indications for SWI in acute ischemic and hemorrhagic stroke
– SWI in stroke mimics
– Utility of SWI with intravenous Gadolinium

Background: SWI is a 3-dimensional T2*-gradient-echo magnetic resonance imaging technique, initially called the blood oxygen level dependant (BOLD) venography. The combination of magnitude and phase images results in SWI images which are highly sensitive to structures or regions with different magnetic susceptibility. Thus this technique is extremely sensitive for blood by-products, especially deoxygenated blood as well as iron deposits and calcifications.

Imaging Findings or Procedure Details: In the clinical setting of acute stroke SWI can exclude intracranial hemorrhage. In case of ischemic stroke it can accurately detect the occluding thrombus and give a good estimate of its length and the thrombus fragments. Thrombus length is important to decide which type of thrombolysis is to be applied. The increased oxygen extraction in the ischemic parenchyma causes locally increased levels of deoxyhemoglobin resulting in prominent hypointense cortical veins the extent of which matches the region of hemodynamic compromise and thus can help define the ischemic penumbra at risk. Such prominent veins are also seen in cases of migraine which can be clinically mistaken for a stroke. SWI is sensitive in imaging of cerebral microbleeds which may possibly affect the outcome of stroke patients treated with thrombolysis. SWI can detect the mural hematoma in intracranial artery dissections.

Conclusion: Susceptibility-weighted imaging is becoming indispensable in acute stroke providing valuable information which significantly affects the therapeutic decision.

PO24

Temporal encephalitis and its differential diagnosis

J. Forget, H. Barras, P. Hagmann, R. Meuli, P. Maeder; Lausanne

Learning Objectives: To identify temporal encephalitis (TE) at an early stage of the disease with MRI neuroimaging.
To distinguish TE from numerous differential diagnoses that may exhibit similar patterns.

Background: Reactivation of herpes simplex virus is the most common cause of sporadic viral encephalitis, with a predilection for the temporal lobes. The clinical presentation can range from fever and aseptic meningitis to altered consciousness. MRI is the best neuroimaging tool to assess it and to evaluate the evolution of the disease, but radiological semiology may be poor at the onset of the disease. The overlap of imaging findings with other types of TE may be a confounding factor if the clinical context is coherent with limbic encephalitis or gliomatosis cerebri for example. Other diagnoses including status epilepticus, stroke, and trauma can be more easily excluded.

Imaging Findings or Procedure Details: TE manifestations are bilateral hyperintensity signals on T2-weighted images and restricted diffusion with a limbic distribution, preferentially mesial-temporal, not respecting hippocampal borders. Basal ganglia are usually spared. Patchy hemorrhagic foci can be detected by using GRE imaging and MRI spectroscopy may also show elevated Choline peak, decreased NAA peak and presence of lactate. Gadolinium patchy enhancement on T1-weighted images can be observed at subacute stage.

Conclusion: Early diagnosis is important to select adequate treatment. In some clinical contexts some differential diagnosis cannot be easily excluded and an appropriate knowledge of the radiological semiology of TE at the acute phase and its evolution is a key element when the symptomatology is non specific and the PCR for HSV if often falsely negative.

Dual-energy CT angiography and metal artifact reduction algorithm in patients with metallic implants

E. Monnard, S. Richard, A. Devaud, H.-M. Hoogewoud; Fribourg

Purpose: The aim of this study is to determine if using a dual-energy acquisition and a metallic artifact reduction algorithm (MAR) is useful in diminishing beam hardening effects and increasing diagnostic accuracy in CT- angiography on patients with metallic implants (MI).

Methods and Materials: 20 patients with MI including hip (13) and knee (6) prosthesis, spondylodesis (4), tibial osteosynthesis (4) and iliac coiling (1) underwent CT-angiography using a protocol mixing a standard CT thin slice 120 kV acquisition with a dual-energy acquisition on regions with MI in a single run. Post-processing included monochromatic reconstructions implementing a metallic artifact reduction algorithm (MAR).

The shortest distance between the arterial wall and the MI and the dose-length product (DLP) were measured. The diagnostic quality of the image of the arterial segment in the vicinity of the MI was assessed and scored by consensus of two radiologists: very good (=4), good (=3), mild (=2) or poor (=1) and compared to non-monochromatic images (NMI) reconstructed without MAR.

Results: 26 arterial segments were assessed. The mean distance between the MI and the arterial wall was 12.92 mm ($\pm$6.79) and the mean DLP was 28.06 mGy ($\pm$3.77). The mean score of the NMI was 2.33 ($\pm$1.07) and the mean score of the dual-energy acquisition was 3.42 ($\pm$1.00). A significant difference was found as the p value was 0.02 ($<$0.05).

Conclusion: Dual-energy acquisition and MAR improve diagnostic accuracy in CT-angiography on patients with MI.

Cardiothoracic ratio in post-mortem computed tomography: Reliability and threshold for the diagnosis of cardiomegaly

S. Winklhofer, N. Berger, T. D. Ruder, P. Stolzmann, M. Thali, H. Alkadhi, G. Ampanozi; Zürich

Purpose: Aim of this study was to evaluate the reliability of the cardio-thoracic ratio (CTR) in postmortem computed tomography (PMCT) and to assess a CTR threshold for the diagnosis of cardiomegaly based on the heart weight derived from autopsy.

Methods and Materials: PMCT data of 170 deceased were retrospectively evaluated. The CTR was measured in axial slices and the actual cardiac weight was derived from conventional autopsy. Inter-rater reliability, sensitivity, specificity and receiver operating characteristics curves were calculated to assess enlarged heart weight by CTR. The autopsy definition of cardiomegaly was based on normal values of the Zeek and the Smith method.

Results: Intra-class correlation coefficients demonstrated excellent agreements (0.983). In 62% cases the CTR in PMCT was >0.5, indicating enlarged heart weight. The mean heart weight measured in autopsy was 405$\pm$105 g, resulting in an interpretation of 67% cases of enlarged heart weight regarding the normal values of Zeek and in 59% according to Smiths normal values. The sensitivity/specificity of the 0.5 cut-off of the CTR for the diagnosis of enlarged heart weight was 78%/71% (Zeek), and 76%/59% (Smith), respectively. The discriminative power was 79% (Zeek) and 74% (Smith) to differentiate between normal heart weight and cardiomegaly. Changing the CTR threshold to 0.57 resulted in a minimum specificity of 95% for both definitions of cardiomegaly.

Conclusion: With a CTR threshold of 0.57, cardiomegaly can be ruled in with a very high specificity, which may be useful if PMCT is used by forensic pathologists as a screening tool for medico-legal autopsies.

Thoracic triage CT – 2 years of experience – 101 cases

G. Bodendörfer[1], J. Burnand[1], P. Zukowski[1], T. Wantz[2], A. Jaff[1]; [1]Riaz, [2]Magnedens

Purpose: Newer generation CT-scanners have come up to cardiac imaging in a routine setting. We took benefit in offering ecg-gated poly-valent Chest Triage CT, also called Triple-Rule-Out (TRO)-CT to elderly patients referred for CT of Pulmonary embolism without clear clinical evidence of PE or with franc indicators of other, as cardiovascular disease.

Methods and Materials: 256 slice CT (i-CT, Philips, Nl) was installed in september and we started our series dec 1st 2011. X-ray dose was controlled with recent iterative reconstruction (i-dose, Philips, Nl) and standard Voltage shifted from 120 to 100 keV. Prospective gating protocol was applied at 75% heart cycle, 40% at heart rates (HR) beyond 80–105/min. Nitro compounds and – if possible – Beta-blockers were given. Patient mean age was 66 years, 65 in men (48) and 67 in women (53).

Results: ECG-gated triage CT is equivalent if not superior to standard PE-CT for lung and pulmonary vascular disease – in trade off to an only moderately higher dose of radiation and contrast agent. Despite the restrictions of our emergency only setting and some patients not allowing for Beta-Blockers or otherwise at high HR Triage CT showed close to normal C-CT, enabling patients to be rapidly assigned to correct therapy.

Conclusion: Thoracic Triage CT is a stable technique, that allows for comprehensive thoracic imaging and rapid recognition of therapeutic needs. It should be readily offered to selected patients, if the technical setting is given to apprehend coronary and other vascular disease.

Validating multiphase post-mortem computed tomography angiography – preliminary results of a European multicenter study

J. M. Grimm[1], S. Grabherr[1], A. Heinemann[2], G. Guglielmi[3], K. Wozniak[4], F. Eplinius[5], F. Dedouit[6], F. Fischer[7], G. Rutty[8], B. Morgan[8], H. Wittig[9], P. Mangin[1], R. Dirnhofer[10]; [1]Lausanne, [2]Hamburg/DE, [3]Foggia/IT, [4]Krakow/PL, [5]Leipzig/DE, [6]Toulouse/FR, [7]München/DE, [8]Leicester/UK, [9]Basel, [10]Bern

Purpose: Post-mortem CT-angiography has been shown to significantly enhance the diagnostic power of post mortem computed tomography. While different approaches are being pursued across the world, the need for validation and standardization of the method increases in order to pave it's way from research into daily routine. With this aim, an international working group has been performing a prospective multicenter study to validate the technique, define its indications and evaluate its advantages and limitations, especially compared to conventional autopsy.

Methods and Materials: We report the results of the first 200 of 500 planned cases. All cases received previously published Multi Phase Post Mortem Angiography (MPMCTA) followed by conventional autopsy. All findings were recorded for each method and categorized by anatomical structure (bone, parenchyma, soft tissue, vascular) and importance for the forensic case (essential, useful, not important).

Results: Most findings were visualized with both techniques. MPMC-TA was superior to autopsy at identifying skeletal and vascular lesions, where it detected a number of significant lesions that could not be seen at autopsy. On the other hand, conventional autopsy provided better information about parenchyma lesions and was the only way to distinguish post-mortem and intra-vital vascular occlusions with certainty. Best results were obtained when combining both techniques.

Conclusion: MPMCTA can reveal important findings, not visible at conventional autopsy. Still, some diagnoses remain autopsy-diagnoses. Optimal results are obtained by combining both techniques. When finished, the ongoing study will provide researchers and practitioners with a solid data base and help promote acceptance of MPMCTA in the medico-legal community and it's transition into daily routine.

PO29

Mitral annular circumference in healthy subjects and patients with mitral regurgitation: 2D versus 3D measurements from cardiac CT

S. Gordic, T. D. L. Nguyen-Kim, R. Manka, S. Sündermann, T. Frauenfelder, F. Maisano, V. Falk, H. Alkadhi; Zürich

Purpose: To determine mitral annular (MA) dimensions and circumferences in healthy subjects and in patients with moderate and severe functional mitral regurgitation (FMR) with CT using 2D- and 3D-approaches.
Methods and Materials: 15 patients with no cardiac abnormalities (ie, normals), 13 with moderate and 15 with severe FMR determined by echocardiography underwent cardiac CT. With dedicated software, the area, intercommissural distance (CC), septolateral distance (SLD), and the anterior and posterior circumference of the MA were measured in diastole.
Results: We found significant ($P<.001$) differences between normals and patients with severe FMR for area, SLD and posterior circumference in 3D and 2D ($P<.001$). Similarly, the SLD and posterior circumference in both 3D ($P=.002$) and 2D ($P=.001$) were significantly smaller in patients with moderate as compared to severe FMR. In contrast, there were no significant differences among groups regarding the CC and anterior circumference both in 3D and 2D (all, $P>0.05$). Measurements in 3D differed significantly from those with 2D for all circumference measurements and groups ($P<.01$), with a systematic underestimation of the posterior circumference of 2.1±1.5 mm in normals, 1.8±1.3 mm in patients with moderate FMR, and 1.9±1.9 mm in patients with severe FMR for 2D.
Conclusion: Our study provides *in-vivo* human CT data on dimensions and circumference of the MA measured in 2D and 3D in healthy subjects and in patients with FMR. Significant differences exist between patients for the posterior circumference and SLD but not for the anterior circumference and CC. Systematic differences exist between 2D and 3D measurements for all circumferential measurements.

PO30

Quantitative comparison of 2D and 3D late gadolinium enhancement MR Imaging for cardiomyopathies

F. Morsbach, S. Gordic, R. P. Götti, M. Niemann, C. Gruner, H. Alkadhi, R. Manka; Zürich

Purpose: To determine whether the quantification of myocardial fibrosis in patients with Fabry disease and hypertrophic cardiomyopathy (HCM) using a late gadolinium enhancement (LGE) single-breath-hold three-dimensional (3D) inversion recovery magnetic resonance (MR) imaging sequence is comparable with a clinically established two-dimensional (2D) multi-breath-hold sequence.
Methods and Materials: 40 consecutive patients (18 men; mean age 50±17) with either Fabry disease (n=18) or HCM (n=22) were enrolled in this prospective study. Studies were conducted on a 1.5-T clinical MR imaging system. Spatial resolution was the same for 3D and 2D images. Datasets were analyzed for subjective image and quantitative evaluation of myocardial mass (grams), fibrotic mass (grams) and total fibrotic tissues percentage. Statistical analysis included Wilcoxon-signed-rank test, student's t-test for paired samples.
Results: There was no significant difference in subjective image quality between acquisitions ($P>0.1$) for either disease. In patients with Fabry disease there was no significant differences in myocardial mass between 3D (100.7 g±30.8 g) and 2D acquisition (99.9 g±31.9 g; P=0.55), as well as for fibrous tissue mass (3.9 g±6.4 g vs 4.0±6.4 g; P=0.89) and total fibrous percentage (3.4%±5.5% vs 3.4±5.5; P=0.89). In patients with HCM there was no significant differences in myocardial mass between 3D (115.5 g±33.3 g) and 2D acquisition (116.7 g±33.6 g; P=0.48), as well as for fibrous tissue mass (5.6 g±8.6 g vs 5.7 g±8.7 g; P=0.6) and total fibrous percentage (4.3%±6.4% vs 4.3%±6.5%; P=0.89). Acquisition time was significantly shorter for 3D sequences (24.9 seconds±5.2 seconds) as compared to 2D sequence (349.1 seconds±62.3 seconds, P<0.001).
Conclusion: 3D LGE imaging enables comparable quantification of fibrous myocardial tissue compared to a 2D sequence at a faster acquisition rate.

PO31

ECG-gated coronary CT angiography using high-pitch and iterative reconstruction: Radiation dose and image quality preliminary results

J. Gariani, A.-L. Hachulla, S. Noble, J.-P. Vallee, D. Didier; Genève

Purpose: To study dose length-products (DLP), image quality and contrast-to-noise ratio (CNR) of coronary CTA obtained with a high-pitch CT imaging protocol using sinogram-affirmed iterative reconstruction (SAFIRE®) compared to filtered back projection (FBP) algorithms.
Methods and Materials: 38 patients with suspected coronary disease underwent ECG-gated coronary CTA on a Somatom Definition CT with Flash protocol using a pitch of 3.2 with both SAFIRE® and FBP reconstruction algorithms with or without β-blockers. CNR between vessels and myocardium was calculated for the aorta and coronary arteries. Subjective image quality of the coronary arteries was graded on a 3-point scale and stenosis were reported and compared to the coronarography in 13 patients.
Results: High-pitch acquisition protocol resulted in a DLP of 96±44 mGy.cm (1.34 mSv) for an acquisition of 150±40 mm depending on the need for coronary By-pass associated analysis.
Global image quality was excellent in 35 patients and sufficient for diagnosis in 3 with a mean heartbeat of 63±8 beats per minute. CNR (ascending aorta vs myocardium) was 15±6 and 22 ±9 for FBP and SAFIRE® algorithms respectively (p<0.0001). CNR (coronary arteries vs myocardium) was 13±6 and 20±8 for FBP and SAFIRE® algorithms (p<0.0001). 542 coronary segments were analyzed for image quality assessment. They were graded excellent or good but acceptable for diagnosis in 520. In the sub-group of patients with coronarography, 28/30 stenosis were confirmed by catheterization (Kappa: 0.86, Se: 0.92, Sp: 0.97).
Conclusion: ECG-gated Coronary CTA using high-pitch acquisition reconstructed with SAFIRE® allows better CNR than with FBP alone and diagnostic accuracy for coronary disease with a low radiation dose.

PO32

Post-mortem cardiac diffusion tensor imaging: Detection of myocardial infarction and remodeling of myofiber architecture

S. Winklhofer, C. Stoeck, N. Berger, M. Thali, S. Kozerke, H. Alkadhi, P. Stolzmann; Zürich

Purpose: To investigate the accuracy of post-mortem diffusion tensor imaging (DTI) for the detection of acute and chronic myocardial infarction (MI) and to demonstrate the feasibility of helix angle (HA) calculation to study chronic remodeling of myofiber architecture.
Methods and Materials: Cardiac DTI at 3 Tesla (Achieva, Philips Medical Systems) was performed in 26 deceased prior to autopsy for medico-legal reasons. Two readers independently determined fractional anisotropy (FA) and mean diffusivity (MD). Accuracy was determined on a per-segment, -territory, and -patient basis with pathology as the reference standard. HA were calculated, distributions of HA were compared visually in healthy myocardial segments and segments with MI.
Results: Autopsy demonstrated MI in 61/440 segments (13.9%) in 12/26 cases (46%). Healthy myocardial segments demonstrated significantly higher FA (p<0.05) and lower MD (p<0.05) as compared with segments with MI. FA and MD did not significantly differ between segments with acute and chronic MI (p=0.89 and p=0.72). Multivariate logistic regression demonstrated that both FA (p<0.10; coefficient -4.5±2.4, β=0.01) and MD (p=0.02; coefficient 2.5±1.1; β=12.77) predicted MI with good model fit (c-statistics, 0.65). Joint histograms of transmural HA distributions demonstrated remodeling of myofiber architecture by means of decreasing HA in subendocardial locations.
Conclusion: Post-mortem cardiac DTI allows for the differentiation between healthy and infarcted myocardial segments. HA assessment allows for demonstration of remodeling of myofiber architecture following chronic MI.

PO33

Cardiac viability assessment using ¹⁸F-FDG and delayed gadolinium enhancement: First clinical experience on a hybrid PET/MR

I. C. Mainta, G. Amzalag, J.-P. Vallee, D. Didier, R. Nkoulou, B. Delatre, O. Ratib; Genève

Purpose: We aimed at integrating the different morphologic and functional information gathered from PET and MRI to define an acquisition and reporting protocol for hybrid PET/MR cardiac viability studies.

Methods and Materials: Twenty consecutive patients referred after findings of fixed defects by myocardial perfusion SPECT/CT underwent an ¹⁸F-FDG PET and cardiac magnetic resonance imaging (CMR) including late gadolinium enhancement (LGE) after a glucose load on a hybrid PET/MR system (Gemini TF PET/MR). Presence of regional contractile dysfunction was correlated to perfusion findings (SPECT/CT and CMR). In akinetic or hypoperfused segments, information gathered from the extent of LGE (normal, <25%, 25–75% or >75%) and ¹⁸F-FDG uptake (<50 for reduced segmental uptake) was integrated to report segments with potential or neglectable improvement upon revascularization.

Results: Nineteen patients completed the hybrid PET/MR study with acquisition duration within seventy five minutes. Almost 13% and 9.8% of significantly hypoperfused segments by SPECT/CT and perfusion CMR could be reclassified after findings of normal contractility (p=NS). Equally, 41% and 46% of akinetic segments denoted no perfusion defect by SPECT and CMR, respectively (p=NS). After LGE, 13 of 68 akinetic segments (19%), 15 of 66 moderately to severely hypoperfused segments (22%) by SPECT/CT and 13 of 55 segments (23%) with rest perfusion defect by CMR displayed intermediate gadolinium enhancement (25–75%) and could be subclassified according to ¹⁸F-FDG uptake.

Conclusion: Integrative approach using hybrid PET/MRI systems for cardiac viability studies may improve the diagnostic yield with potential added-value on the prognosis of patients suitable for coronary revascularization.

PO34

Radiological profile of lipomatous hypertrophy of the interatrial septum

S. Malekzadeh, C. Sierro, V. Soubeyran, C. Constantin, M. E. Kamel; Sion

Learning Objectives: To show both morphological and functional features of lipomatous hypertrophy of the interatrial septum (LHIS).

Background: Despite its clinical importance, LHIS is still an underrecognized benign entity. It represents a relatively frequent disorder (prevalence of up to 8%). Being primarily formed of mature adiposites, LHIS is characterized by a smoothly outlined homogeneous hourglass shape separated by a narrow waist that corresponds to the fossa ovalis. It is generally agreed that most patients with LHIS are asymptomatic, however, symptomatic cases with supra-ventricular arrhythmia or atrial inflow obstruction should be considered for surgical resection since the disease may lead to sudden death.

Imaging Findings or Procedure Details: LHIS on CT and MRI is manifested as a non-enhanced bilobed space occupying lesion that extends from the coronary sinus to the aortic root. Increased thickness of the interatrial septum >20 mm along with a homogenous fatty appearance that devoids nodular components are considered two essential diagnostic criteria. Similarly, direct invasion of the atrial cavity or the pericardium invalidates the diagnosis of LHIS. Brown adipose tissue, which can be a constituent of LHIS, is often responsible for increased FDG uptake within the interatrial septum during oncologic PET/CT imaging. This can be easily differentiated from metastatic deposit within the interatrial septum by virtue of the aforementioned characteristic structural changes of LHIS upon the concomitant native CT of PET/CT.

Conclusion: LHIS should be considered whenever a pathological thickening of the interatrial septum is identified. Its typical radiological profile is an invaluable clue in narrowing the differential diagnosis with other interatrial septum space occupying lesions like myxoma, rhabdomyoma, rhabdomyosarcoma, and liposarcoma.

PO35

Incidental extracardiac findings on cardiac MR: What should radiologist not miss

V. Dunet, H. Barras, X. Boulanger, M.-G. Vincenti, R. Meuli, J. Schwitter, C. Beigelman; Lausanne

Learning Objectives: The aim of this work is to highlight the potential of gadolinium-enhanced fat-sat T1-weighted sequences during cardiac magnetic resonance (CMR) for the diagnosis of incidental extracardiac findings (IEFs) thanks to a systematic reading method and to compare it to enhanced-computed tomography (CT) images.

Background: CMR is performed in daily practice in numerous situations such as to explore chest pain or dyspnea. In addition, IEFs may be discovered, some of them being clinically relevant.

Imaging Findings or Procedure Details: Though a CMR cannot replace a dedicated work-up for extracardiac diseases, as pulse sequences are designed for cardiac pathologies and slices do not cover systematically extracardiac organs in the chest, a systematic reading of CMR for cardiac and non-cardiac pathologies is needed. Other causes of chest pain or dyspnea can thus be incidentally discovered when an analysis of the aorta and pulmonary arteries is performed followed by a search for the presence of thyroid and thymus glands anomalies, lymph nodes, pulmonary nodules, interstitial lung diseases or chest wall abnormalities. Abdominal abnormalities may also be discovered. Despite the lower spatial resolution of MR as compared to CT, the great potential of gadolinium-enhanced fat-sat T1W sequences will be demonstrated by using equivalent CT images. The recognition of false positives findings including confusing flow artifacts and technical tips will be described.

Conclusion: Incidental extracardiac findings can be a source of significant clinical abnormalities that may explain patient symptoms. A careful analysis of each chest compartment and the mastery of potential artifacts is thus required to guide further dedicated imaging modalities.

PO36

To stent or not to stent, that is the question! Cardiac hybrid imaging to guide invasive coronary treatment

O. F. Clerc, R. R. Buechel, T. A. Fuchs, M. Possner, S. Dougoud, P. Kaufmann; Zürich

Learning Objectives: To understand how hybrid cardiac imaging can guide treatment of coronary artery disease.

Background: Coronary angiography evaluates coronary stenoses anatomically, but does not assess their functional significance. Hybrid imaging with SPECT or PET combined with coronary CT (SPECT-CT, PET-CT) allows assessment of anatomy and functionality. Using clinical cases, we will demonstrate the role of hybrid imaging to guide coronary revascularization.

Imaging Findings or Procedure Details: A patient with angina pectoris undergoes SPECT-CT. CT demonstrates stenoses of the distal left anterior descending (LAD) and second diagonal branch (RD2). SPECT demonstrates an anterior to anterolateral ischemia. Hybrid reconstruction links ischemia to RD2. Treatment: stenting of RD2. Another patient with angina pectoris, open stents in LAD and circumflex artery (LCX), occluded but treatable first diagonal branch (RD1) and occluded, non-treatable posterior lateral branch from LCX (PLB/LCX) is sent for PET-CT. PET demonstrates a lateral, basal to apical ischemia. Hybrid PET-CT reconstruction reveals a major contribution of PLB/RCX and a very minor contribution of RD1 to ischemia. Treatment: conservative therapy, no stenting of RD1. A third patient with angina pectoris undergoes SPECT-CT. CT demonstrates subtotal stenoses of LAD and right coronary artery with an apical collateral network between ramus intermedius and distal LAD. SPECT reveals light apical ischemia and small septoapical scar. Treatment: optional stenting of LAD.

Conclusion: Hybrid imaging using SPECT-CT and PET-CT is an invaluable tool to evaluate the hemodynamic significance of coronary stenoses. Dialogue between coronary angiography and imaging departments then allows choosing the optimal treatment for patients with coronary artery disease.

Subjective and objective assessment of image quality for lung analysis at ultra-low dose CT

C. Nakajo[1], S. Heinzer[2], V. Dunet[1], P. Bize[1], S. Montandon[3], H. Imperiano[1], R. Meuli[1], C. Beigelman[1]; [1]Lausanne, [2]Zürich, [3]Gland

Purpose: To compare subjective and objective assessments of the diagnostic image quality for lung analysis among different reconstruction kernels and matrices at ultra low dose (ULD) chest CT, by using the formula of merit based on the relationships between image characteristics and dose.
Methods and Materials: From January to July 2013, 20 ULD CT were performed for location scouting or control after an interventional chest procedure, at 100 kV and 10 mAs in accordance with ALARA principle.
ULD examinations were reconstructed with a standard FBP algorithm and a level 6 Philips iDose[4] iterative reconstruction algorithm (iD6), with 2 matrix sizes (512^2 and 768^2) and 2 kernels of reconstruction (YA and B, Philips Healthcare), resulting in 8 image datasets for each ULD acquisition.
Two radiologists blinded to the randomisation ranked the 8 ULD series by evaluating the image quality. Concordance with the results of the formula of merit was then established.
Results: The series reconstructed with iD6, filter B and matrix size 512^2 was considered as the best subjective image quality with a good inter-observer concordance (kappa value=0.65, p<0.0001).
There was a perfect agreement between the visual assessment of image quality and results of the formula of merit for both readers.
Conclusion: Iterative reconstruction (IR) ensures a better assessment of lung analysis than FBP reconstruction at ultra-low dose, the image noise being more critical than spatial resolution for image quality at such dose parameters.

Post-mortem whole body computed tomography of heroin and methadone fatalities: Frequent findings and comparison to autopsy

S. Winklhofer, E. Surer, G. Ampanozi, T. D. Ruder, P. Stolzmann, A. Oestreich, T. Kraemer, M. Thali, H. Alkadhi, W. Schweitzer; Zürich

Purpose: Aim of the study was to assess frequent findings in whole body postmortem computed tomography (PMCT) in cases of fatal heroin and methadone intoxication.
Methods and Materials: Routinely performed whole body PMCT scans of 55 cases of non-traumatic death, in which heroin and/or methadone had been found responsible for death were retrospectively evaluated (drug group). PMCT data as well as the CT images of an age and sex matched control group (n=55) were analyzed for pathologic findings and imaging results were compared with conventional autopsy results.
Results: Most common findings in the drug-cases were: pulmonary edema (95%), aspiration (66%), distended urinary bladder (60%), cerebral edema (49%), pulmonary emphysema (38%), and fatty liver disease (36%). A significant correlation (p<0.05) between frequent PMCT findings for the diagnosis of drug associated death compared to the control group was found for brain edema and pulmonary edema, pulmonary emphysema, aspiration, fatty liver disease and distended bladder. The combination of lung edema, brain edema and a full urinary bladder was seen in 26% in the drug group, and none in the control group. Defining those three findings as indicative for drug related death, a sensitivity of 26% and a specificity of 100% were calculated.
Conclusion: This study demonstrates characteristic findings of whole body PMCT in cases of fatal heroin and methadone intoxication. The characteristic constellation of brain edema, lung edema and a distended full urinary bladder was highly specific for heroin and methadone associated cases of death. Their combination in PMCT should raise suspicion of intoxication.

Iodine mapping by dual-energy CT in normal and pathological lung, preliminary observations

M. Babaker[1], D. Botsikas[2], A.-L. Hachulla[2], C. Becker[2], X. Montet[2]; [1]Lausanne, [2]Genève

Purpose: To assess iodine distribution in normal lung as well as to investigate potential changes in iodine distribution in emphysematous lung, pneumonia, atelectasis and pulmonary embolism.
Methods and Materials: A retrospective study (July 2011 to January 2012) of 171 consecutive dual-energy CT comprising the lung was performed. Normalized iodine maps were generated. The concentration of iodine in normal lung, as well as in case of emphysema, atelectasis, pneumonia and pulmonary embolism is reported.
Results: Normalized iodine concentration measured were 0.13±0.004, 0.2±0.05, 0.41±0.03 and 0.08±0.01 for normal lung, pneumonia, atelectasis and PE, respectively. There was a statistically significant difference in the iodine concentration between normal lung, pneumonia, atelectasis and PE (p <0.0001).
Conclusion: This study showed that iodine concentration, derived from dual energy CT is able to 1) found a physiological distribution of iodine in normal lung, and 2) discriminate atelectasis from pneumonia and PE. Nevertheless, due to overlaps between the values, the applicability to a single patient is still difficult.

Ultra low dose chest CT for pulmonary nodule detection: First performance evaluation of single energy scanning with spectral shaping

S. Gordic[1], F. Morsbach[1], S. Baumüller[1], P. Stolzmann[1], D. B. Husarik[1], S. Leschka[2], T. Frauenfelder[1], H. Alkadhi[1]; [1]Zürich, [2]St. Gallen

Purpose: To evaluate image quality (IQ) and sensitivity of ultra-low dose single-energy CT with tin filtration (Sn) for spectral shaping and advanced iterative reconstructions (IR) for the detection of pulmonary nodules (PN).
Methods and Materials: Single-energy CT was performed with third-generation dual-source 192-slice CT at 70 kVp/100 kVpSn/150 kVpSn with tube current adjustments resulting in standard dose ($CTDI_{vol}$ 3.1 mGy/effective dose 1.3 mSv), 1/10th dose (0.3 mGy/0.13 mSv), and 1/20th dose (0.15 mGy/0.06 mSv) in a chest phantom with randomly distributed solid PN. Images were reconstructed with advanced model-based IR (ADMIRE strength 3 and 5) and were compared to those from second-generation dual-source CT at lowest possible dose at 120 kVp (0.28 mGy). Noise, IQ, confidence, and sensitivity of PN detection were determined.
Results: Image noise was highest in images acquired with second-generation DSCT. At both 1/10th and 1/20th dose noise at 100 kVpSn was significantly lower than in 70 kVp and 150 kVpSn images (ADMIRE 3: p<0.01; 5: p<0.05). Confidence and sensitivity for pulmonary nodule detection was significantly higher at 100 kVpSn than at 70 kVp and 150 kVpSn (ADMIRE 3: p<0.05, 5: p<0.01) at 1/10th and 1/20th dose. Lowest numbers of false positive ratings occurred in 1/10th and 1/20th dose images at 100 kVpSn (ADMIRE 3 and 5).
Conclusion: Our study suggests that chest-CT for detection of PN can be performed with third-generation DSCT at a high IQ, sensitivity and diagnostic confidence at a very low effective dose of 0.06 mSv with a single-energy protocol at 100 kVp using spectral shaping and advanced IR.

Prevalence of pulmonary embolism during pregnancy

V. Ilic, V. Dunet, R. Meuli, S. Schmidt; Lausanne

Purpose: Pregnancy is a physiological hypercoagulable state associated with an increased risk of pulmonary embolism (PE), which is the leading cause of maternal mortality in developed countries. Our aim was to determine the prevalence of PE in pregnant patients requiring computed tomography pulmonary angiography (CTPA) because of clinical suspicion.

Methods and Materials: We retrospectively included all pregnant women admitted to our hospital and investigated by CTPA for clinically suspected PE over a 10-year period from January 2004 to November 2013. All underwent a dedicated low-dose CTPA protocol. We also recorded gestational age, symptoms and D-dimers values and performed subgroup comparison using the Kruskall-Wallis test.

Results: A total of 132 patients (mean age 32 years±6) with a mean gestational age of 28±7 weeks were included. One-hundred five (80%) women had chest pain, 107 (81%) had dyspnoea and 25 (19%) had oxygen desaturation. Two scans (1.5%) were non-conclusive for technical reasons. PE was detected in 7 of 130 analyzed patients (5.4%), consisting of lobar filling defects in 3 women and segmental or proximal sub-segmental filling defects in 4 patients. Alternative diagnoses (6.2%) revealed by CTPA included pneumonia (n=7) and rib fracture (n=1). D-dimer was available in 112 women. Gestational age, symptoms and D-dimer concentrations were not different between patients with or without PE.

Conclusion: In pregnant women, PE is often considered in the differential diagnosis of chest pain or dyspnoea. CTPA is mainly performed to exclude PE given the low percentage of positive findings.

Pulmonary embolism: Is there a place for routine clinical use of lung perfusion CT?

M. Scheffler, A. Platon, C. Becker, P.-A. Poletti; Genève

Purpose: To determine the additional value of lung perfusion computed tomography (PCT) in screening for pulmonary embolism (PE).

Methods and Materials: Parenchymal iodine material density (MD) maps were reconstructed for 21 patients with positive PE on CT pulmonary angiography (CTPA), acquired on a single-source dual-energy GE Discovery CT750 HD scanner. The MD maps were compared with the CTPA images to correlate vessel occlusion sites with parenchymal perfusion defects. Visual perfusion defects on the MD images were noted and absolute iodine concentration measured within normal lung and affected segments.

Results: Sixty-nine clots were detected, 14 were occlusive and 55 subocclusive. 100% of the occlusive clots and 84% (46/55) of the subocclusive clots were associated with a visible perfusion defect on the MD maps. Only one perfusion defect had no associated clot on the CTPA. Iodine concentrations (median, minimum, maximum) in normal lung and in areas of visually diminished perfusion were: 1.99 mg/mL (1.3–3.18 mg/mL) for normal lung, 0.35 mg/mL (0.05–0.86 mg/mL) for defects associated with occlusive emboli, and 0.76 mg/mL (0.15–2.46 mg/mL) for visible defects in the perfusion bed of subocclusive emboli. 16% (9/55) of subocclusive clots presented diminished iodine concentrations at 1.72 mg/mL (0.48–2.47 mg/mL) in associated lung segments that were not visually conspicuous.

Conclusion: PCT is useful in the screening of PE, raising the interpreter's confidence in calling doubtful vessel occlusion sites positive when confirming associated segmental parenchymal perfusion defects. Moreover, 16% of subocclusive emboli showed a reduced iodine concentration within the associated parenchymal irrigation bed, even in the absence of a visible perfusion defect.

Unenhanced chest CT at 100 kV-20 mA using a model based iterative reconstruction algorithm (MBIR): Radiation dose, image quality and diagnostic accuracy preliminary results

A.-L. Hachulla, D. Botsikas, A. Neroladaki, C. Becker, X. Montet; Genève

Purpose: To evaluate the image noise, the image quality and the diagnostic accuracy of unenhanced chest CT at 100 kV–20 mA using Model Based Iterative Reconstruction (MBIR) algorithm.

Methods and Materials: This prospective study was approved by our institutional review board. 36 consecutive patients underwent a routine unenhanced Chest CT on a GE 750 HD CT scan (100 kV, 250 mA, modulated), immediately followed by an ultra-low-dose (ULD) CT (100 kV, 20 mA). The routine-CT raw data was reconstructed using a standard filtered-back-projection (FBP) algorithm whereas the ULD-CT raw data using a MBIR algorithm.

Image noise was measured around the patient, as background noise.

Two blinded readers evaluated the image quality of normal chest structures and pathologic features using a 5-point scale (0: non diagnostic – 5: excellent). Kappa values were also calculated.

Results: The dose length product for routine-CT and ULD-CT was 319±127 and 19.9±3.2 mGy.cm (p<0.001), respectively. Mean image noise for routine-CT and ULD-CT was measured at 28.3±7.2 HU and at 7.7±1.6 HU, respectively (p<0.001). Global image quality was graded 3.9±0.05 for routine-CT and 3.12±0.2 for ULD-CT but still sufficient for diagnosis.

14 patients with nodules, 19 with micronodules, 15 with emphysema, 17 with consolidation were identified. Interreader agreement was 0.9 and 0.87 for routine-CT and ULD-CT reconstructed data sets. The agreement between the routine-CT and ULD-CT was 0.902.

Conclusion: ULD-CT reconstructed with MBIR allows a reduction of the image noise without significant loss of diagnostic accuracy compared to a routine Chest CT, despite a dose of 0.27 mSv.

Focal pleural thickening: An interpretation algorythm

M. Babaker, S. Hajdu, J.-W. Fitting, S. D. Qanadli, R. Meuli, C. Beigelman; Lausanne

Learning Objectives: Faced with the presence of FPT, the initial step is to recognize the false-positives created by normal structures of the intercostal space. The reversible nature of most posterior non-calcified FPT must then be proven by an additional acquisition in prone position. Persistent FPT may be related to infectious sequelae, pleural plaques, granuloma coalescence or pleural metastasis. Associated anomalies, such as TB sequelae, interstitial pattern concordant with asbestosis, parenchymal bands, rounded atelectasis, perilymphatic micronodules as seen in silicosis or sarcoidosis, lung nodules, lymphangitic carcinomatosis, calcified and non-calcified lymph nodes must be identified. The proposed algorithm is based on medical history, professional exposure, FPT location and associated findings including PET results.

Background: Focal pleural thickening (FPT) is frequently observed in routine CT practice. While mostly functional, the nature of persistent FPT may vary from pleural plaques secondary to asbestos exposure to pleural metastasis.

Imaging Findings or Procedure Details: CT findings: normal structures of the intercostal space, infectious sequelae (TB), pleural plaques, granuloma coalescence or pleural metastasis, interstitial pattern concordant with asbestosis, parenchymal bands, rounded atelectasis, perilymphatic micronodules.

Conclusion: After exclusion of false positives and reversible FPT, an algorithm based on clinical data, professional exposure and associated imaging findings may guide the radiologist to the correct diagnosis of persistent FPT. All peculiar location of FPT should evoke pleural metastasis and should be correlated with PET results.

PO45

Radiological patterns in pulmonary tuberculosis: A review

S. Hajdu, M. Babaker, J.-W. Fitting, S. D. Qanadli, R. Meuli,
C. Beigelman; Lausanne

Learning Objectives: In current classification, a significant overlap between primary pulmonary TB, progressive pulmonary TB and reactivation TB is observed. A classification based on the predominant morphologic pattern appears more appropriate. Typical forms such as ganglionic, cavitary and disseminated forms and their correlation to immune status are described. Additional findings such as pleural involvement and tuberculomas that may be seen at all stages of the disease are also reviewed. Atypical presentations such as distinctive aspects of immune reconstitution syndrome (IRIS) observed in both HIV positive and negative immunodeficient patients and sequelae associated complications are described.

Background: Pulmonary tuberculosis (TB) remains a major health problem with significant challenges related to the emergence of multidrug resistance, the growing number of immunodeficient patients at high risk and of the exposed population in developing regions. The purpose of this exhibit is to review the various typical and atypical presentations of tuberculosis according to the predominant radiological findings as it relates to immune status.

Imaging Findings or Procedure Details: Different forms of TB (on CT): ganglionic, cavitary and disseminated forms, pleural involvement, tuberculomas, immune reconstitution syndrome (IRIS)

Conclusion: Pulmonary TB is better classified based on the predominant morphological pattern. Recognition of atypical or peculiar presentations is of the utmost importance.

PO46

Quality control of radiology reports: Experience in a private group

T. Laswad[1], M. Deac[2], D. Fournier[1]; [1]Sion, [2]Morges

Purpose:
1. To define the main quality criteria for radiology reports.
2. To present a simple and reproducible quality-control model.
3. To identify the most frequent errors in a radiology report.
4. To suggest actions for improvement.

Methods and Materials: 32 quality criteria (9 major, 23 minor) for radiology reports, covering the main imaging modalities, were defined.
125 anonym reports were independently reviewed by 2 radiologists, resulting in a total of 250 evaluations.
Each radiology report received a score, based on whether or not each quality criteria was met, with a maximum possible score of 100.
14 radiologists participated in the study.

Results: The average score of the 250 evaluations was 97/100.
33% of the reports scored 100; 34% scored between 97–99 points, and 33% scored below 97. The lowest score was 84 points.
Sub-group analysis identified the most frequent reporting errors both globally for the entire group, as well as for each individual reporting radiologist.
The most frequent reporting errors were: inappropriate study title, vague conclusion, and not answering the clinician's question.
Following this study, we designed a checklist for all pertinent criteria that must be included in every structured report in our institution.

Conclusion: This project enhanced radiologists' awareness concerning their most frequent errors.
Peer review was appreciated by radiologists as it enables to share knowledge.
Quality improvement of structured reporting must be a continuous process of implementation and adaptation (continuous quality improvement principle).

PO47

Safety and efficacy of the celt ACD percutaneous arterial closing device

S. Archontaki, F. Glauser, R. Meuli, S. D. Qanadli; Lausanne

Purpose: To retrospectively evaluate the efficacy and safety of the Celt ACD device for percutaneous femoral artery closure in an unselected patient.

Methods and Materials: Thirty-four patients who had undergone percutaneous closure of femoral arterial access between 1.2.2013 and 30.7.2013 were included in this study. Patients had received heparin intra-arterially during the intervention. All patients underwent a colour-coded doppler ultrasonography in the two hours following the intervention. After 1 and 3 months a clinical and sonographic examination were performed in every patient.

Results: The closure device was deployed in 33 patients, one patient needed compression because of faulty material. Immediate hemostasis was achieved in 33 patients. Three patients had minor immediate complications (1 small hematoma,1 focal dissection above the puncture site. 1 AV fistula). No delayed complication occurred in the 30 patients who underwent a follow up after 1 and 3 months.

Conclusion: Percutaneous femoral artery closure of the Celt ACD device is a feasible and safe procedure with a low rate of major and minor complications.

PO48

Implanted venous access device salvage using a percutaneous endovascular technique

S. Breault, Y. Lachenal, F. Glauser, M. Babaker, F. Doenz, S. D. Qanadli; Lausanne

Purpose: Implanted venous access devices (IVAD) are often used in patients who require long-term IV drug administration or frequent venous puncture. Most common causes of device dysfunction include fibrin sheath formation and catheter adherence to vessel wall. A percutaneous endovascular salvage technique was developed in our institution to restore catheter function. The aim of this study was to evaluate the feasibility, safety and efficacy of this technique.

Methods and Materials: Eighty patients (mean age 54 years) with dysfunctional IVAD, who underwent a salvage procedure in our institution between 2005 and 2013, were included in the study. The procedure consists on removing fibrin sheath around IVAD catheter using a snare (stripping). If catheter tip is adherent to vessel wall, additional maneuvers that we call "mechanical adhesiolysis" is performed to free catheter tip and allow stripping. Data included clinical background, catheter tip position, success rate, length of procedure, recurrences and rate of complications.

Results: Eighty-eight procedures were performed during the study period with a global success rate of 93.2%. No complications were noted. Using mechanical adhesiolysis or other additional maneuvers after failed primary stripping allowed an increase of success rate by more than 10%. Catheter malposition and/or vessel wall adherences were the main causes for technical failure.

Conclusion: Our IVAD salvage technique is safe and efficient. When catheter is adherent to vessel wall, using additional adhesiolysis maneuvers allow catheter mobilization and give a higher success rate, with no additional risk of complication. In patients who still require long-term use of their TIVAD, these procedures can be performed safely to avoid catheter replacement.

PO49

Experimental comparison of an optical and a magnetic tracking navigation system for percutaneous punctures in a liver model

Y. Lachenal, B. Guiu, A. Monier, P. Bize, A. Denys; Lausanne

Purpose: To experimentally compare an electromagnetic and an optical navigation tracking system, investigating their performances in conditions as close as possible to clinical practice.

Methods and Materials: Two operators, with 10 years' experience and no experience in interventional radiology, performed 40 punctures toward metallic targets in an anthropomorphic liver fantom using an optical and an electromagnetic navigation tracking system. Procedures were performed in interventional CT suite in clinical settings. Needle tip position was assessed with CT. Accuracy was estimated with measure of target position error (TPE) (euclidian distance between needle tip and target position) and its lateral (LaE) and longitudinal (LoE) components relatively to needle axis. Time for setup, planning and navigation was recorded. Results were compared between operators and machines.

Results: Average TPE, LaE and LoE were 5.99 mm, 3.97 mm, -1.01 mm for optical and 4.57 mm, 3.12 mm and -1.83 mm for EM navigation system. Differences weren't significant. For experienced operator, average TPE with optical (3.10 mm) and electromagnetic (5.01 mm) systems were almost significantly different (p=0.06). For inexperienced operator, these values were respectively 8.88 mm and 4.18 mm (p=0.01). Average electromagnetic and optical systems setup time (140s vs 145s, p>0.05) and planning time (49s vs 77s, p>0.05) were similar. Average navigation time was significantly shorter for electromagnetic compared to optical system (63s vs 167s, p=0.0016).

Conclusion: Optical system achieved a better accuracy if put in experienced hands, meaning there exists a progression margin and learning curve for inexperienced operators. Electromagnetic system has a little less good accuracy, but performances are smoothened between operators and it takes less time to reach the target.

PO50

Biliary and portal complications after chemo-embolization of hepatocellular carcinoma

A. Monier, A. Denys; Lausanne

Purpose: Our study compares the risk of biliary and portal injury after conventional chemo-embolilzation (cTACE) and chemo-embolization using drug eluting beads (DEB TACE) for hepatocellular carcinoma (HCC) in cirrhotic liver.

Methods and Materials: Medical and radiological information of 151 patients (23 women/128 men) with HCC treated by chemo-embolization were collected in the hospital and radiological database after authorization by the local ethics committee. 130 patients were included in the study (19 women/111 men) that had a clinical and radiological follow-up by MRI. 123 sessions using DEB-TACE (100–300 microns, 150 mg doxorubicin) and 163 using cTACE (Lipiodol, 50 mgr doxorubicin) were carried out in these patients.

Two experts, blinded to the type of treatment, reviewed in concensus MRI images looking for focal or diffuse biliary dilatation, biliary casts, intrahepatic biloma, portal vein thrombosis or stenosis.

Results: After a mean Follow-Up of 25 months, biliary or portal lesions were found more frequently after DEB TACE (68 events/63 patients; 68 events/123 cures) than after cTACE (24 events/67 patients; 24 events/163 cures; p<0.05). Biliary complications consisted in biliary casts (17.5%), biliary dilatation (43%:88% segmental, 12% lobar), intrahepatic biloma (39.5%). Portal vein complications were portal thrombosis (42%) and portal stenosis (58%). These complications occurs after a delay of 158±185 days (mean±SD) and 1.8 sessions after DEB TACE and a delay of 178±198 days and 2 sessions after conventional TACE.

Conclusion: DEB-TACE carries a much higher rate of biliary and portal toxicity than cTACE. These complications may be severe and can occur in a short delay after treatment.

Optimization of radiation protection in interventional radiology and cardiology procedures using a mobile application

N. Ryckx[1], N. Goy[2], J.-C. Stauffer[3], J.-J. Goy[3], R. Meuli[1], A. Carnicer Caceres[1], F. R. Verdun[1]; [1]Lausanne, [2]Yvorne, [3]Fribourg

Purpose: The number and complexity of interventional radiology and cardiology (IR/IC) procedures has been steadily increasing over the last twenty years. This implies an increased risk of stochastic and even deterministic effects to the patient, as well as an increased exposure of IR/IC staff. Radiation protection must thus become of prime importance and should be promoted by all possible means.

Methods and Materials: We have developed a mobile application that rests on a two-pronged approach. Firstly, it should give the prescribing physician an insight of the orders of magnitude of patient doses for different radiological procedures. Secondly, it should help the operating physician to evaluate his/her current state of practice regarding radiation protection. The data used in the application source code comes either from the Swiss Federal Office of Public Health (FOPH) or from large IR/IC centers (http://www.xray-protect.com/).

Results: Giving the patient more information about his/her personal risk will greatly improve his/her follow-up to minimize negative side effects of a high dose IR/IC procedure. As for the staff, it will help them with their daily practice by giving them useful tips aiming to reduce the dose delivered to the patient and, as a consequence, their own personal dose.

Conclusion: Although our application seems to fill a gap in the field of radiation protection, it suffers from a statistical bias. Indeed, our database is still incomplete, especially regarding IR procedures. Obtaining data from automatic dose-collecting software, such as DoseWatch (GE Healthcare) might improve the reliability of our application.

Radiofrequency ablation of HCC versus metastasis: Are post ablation volumes different?

F. Gay, A. Denys, M. Pracht, E. Uldry, B. Guiu; Lausanne

Purpose: Radiofrequency ablation (RFA) is a recommended curative technique for early HCC but not yet for liver metastases. The literature claims that ablation is more efficient in chronic liver disease than in normal liver due to the oven effect. Our aim is to compare ablation volumes and transverse diameters obtained after application of RFA in HCC and metastatic group.

Methods and Materials: Out of 109 patients treated by ablation in our institution, we selected a group of 70 patients (20 women, mean age 64.5 yo) bearing 36 liver metastases and 53 HCC. Lesions were treated using the cluster needle Covidien system with one or two times 12 minutes application. Lesions volume and transverse diameter were measured on CT at day 0 immediately post-ablation at one and 3 months (C1 and C2) using a dedicated software.

Results: The mean average diameter were the same on the metastasis and HCC group at 45 mm on D0, 38 mm on C1 and 35 mm on C2; volume was measured at 33 cm^3 ($\pm$26.9) on D0, 20 cm^3 ($\pm$11.0) in C1 and 15 cm^3 ($\pm$9.3) on C2 for metastasis versus 33 cm^3 ($\pm$34.8), 19 cm^3 ($\pm$11.6) and 14 cm^3 ($\pm$9.7) for the HCC group. No significant difference by one-way ANOVA test between the 2 groups for diameters and volumes at D0, C1 or C2 ($p < 0.05$) Volume and diameter decreases with time with the same kinetics in the metastasis group and the HCC group.

Conclusion: Post RF scar decreases in size and volume with the same kinetics over time. The oven effect described in cirrhosis does not seem to influence the results

Combined treatment with radiofrequency and transarterial chemoembolization

Y. Lachenal, A. Denys, P. Bize; Lausanne

Learning Objectives: To know indications, techniques and results of combined Radiofrequency Ablation (RFA) and Transarterial Chemoembolization (TACE) treatments for hepatocellular carcinoma (HCC).

Background: RFA is a potentially curative treatment for HCC up to 3.5 cm in diameter. Incomplete ablation risk increases along with target lesion size. Moreover, lesions are sometimes invisible under ultrasound or native CT, making RF needle positioning sometimes difficult. TACE is a palliative treatment for multifocal HCC. Its embolic effects can enhance RFA efficacy by allowing a larger diffusion of energy and a widening of ablation zone up to 6 cm. Conventional TACE with chemotherapy mixed with lipiodol® (Guerbet, France) also has the property to reveal lesions invisible under native CT or ultrasound, allowing a better positioning of RF needle.

Imaging Findings or Procedure Details: Lesions of 3 to 6 cm of diameter and invisible smaller lesions under native CT and ultrasound are eligible for a combined treatment. Both TACE and RFA can be performed in the same session. RF needle positioning should be performed before TACE under ultrasound guidance or after TACE under CT guidance for target visibility reasons. Embolization should be superselective whenever possible and performed with chemotherapy mixed with lipiodol followed by 100–300 µm particles. RF energy is then delivered with standard ablation protocol. Control of ablation zone is made with contrast-enhanced CT performed at end of intervention.

Conclusion: Combination of RFA and TACE allows safe and reproducible treatment of HCC lesions up to 6 cm in diameter as well as invisible smaller lesions. Formerly considered palliative patients can henceforth benefit from curative treatments.

Whole-body intravoxel incoherent motion imaging – a feasibility study

L. Filli, M. Wurnig, R. Lüchinger, C. Eberhardt, R. Guggenberger, A. Boss; Zürich

Purpose: The purpose of this study was to investigate the technical feasibility of whole-body intravoxel incoherent motion (IVIM) imaging. The concept of IVIM separates between true molecular diffusion (measured with the apparent diffusion coefficient ADC) and "pseudodiffusion" due to fast moving water molecules in the capillaries (D*). Furthermore, it allows calculation of the perfusion fraction (F_p). IVIM protocols have been reported for lesion characterization in different organs.
Methods and Materials: Eight healthy volunteers were evaluated in a 3.0 Tesla MR scanner. Whole-body diffusion-weighted images were acquired using single-shot echoplanar imaging (EPI) with different b-values (0, 10, 20, 50, 150, 300, 500, 800 s/mm²). Whole-body maps of ADC, D*, and F_p were calculated using the Matlab programming language. ADC, D*, and F_p values were evaluated placing regions of interest (ROIs) in different organs (liver, kidney, psoas muscle) on axial images.
Results: ADC and F_p maps showed good image quality, whereas D* maps were noisy. ADC [10^{-3} mm²/s], D* [10^{-3} mm²/s], and F_p [%] values were as follows (mean±standard deviation): liver (1.0±0.1; 4.4±1.5; 25.1±4.3), renal cortex (1.7±0.04; 13.8±2.6; 9.8±1.0), renal medulla (1.5±0.1; 10.7±0.2; 14.7±4.5), psoas muscle (1.4±0.1; 7.4±4.1; 15.8±2.9).
Conclusion: Whole-body IVIM imaging is technically feasible. Potential applications include tumor detection and control of treatment response.

Biodistribution of red blood cell-derived microvesicles in healthy compared to septic mice assessed by [51]Chromium labeling

D. Zecher, R. Jevremovic, S. Vomstein, A. Cumpelik, J. A. Schifferli, T. Mindt; Basel

Purpose: Critically ill patients were reported to have a worse clinical outcome following transfusion of aged red blood cells (RBC) compared to matched patients receiving freshly prepared blood. During aging, RBC shed microvesicles (RBC-MV). We have previously shown in a mouse transfusion model that RBC-MV amplify systemic inflammation in endotoxemic mice whereas healthy mice are protected. We hypothesized that the biodistribution pattern of RBC-MV following intravenous injection differs between healthy and septic mice with a longer presence in the circulation predisposing to cause pathology in the latter.
Methods and Materials: [51]Chromium-labeled aged mouse RBC-MV was injected i.v. into healthy or lipopolysaccharide-treated mice. 5, 30, 120 and 240 min later, organs (blood, lung, liver, spleen and kidneys) were harvested. Organ-specific accumulation of RBC-MV was determined measuring radioactivity of individual organs with a gamma counter.
Results: Within 5 minutes, 80% of injected RBC-MV had disappeared from the blood and accumulated in liver and spleen in both groups of mice over time. Significantly more RBC-MV accumulated in the lungs of septic compared to healthy mice over time, although the absolute number was less than 5% of total RBC-MV injected at all time points studied. We found no difference in the kinetics of RBC-MV clearance from the circulation between healthy and septic mice.
Conclusion: Given the small differences observed between the groups studied, the biodistribution pattern does not explain the higher toxicity of RBC-MV observed in septic compared to healthy mice.

Intercomparison of CT-scanners: Deviation between displayed and measured CTDI- and DLP-values

G. Lutters[1], B. Markert[1], S. Scheidegger[2]; [1]Aarau, [2]Winterthur

Purpose: In order to compare applied patient doses between CT scanners using Dose Length Product (DLP) or Computed Tomography Dose Index (CTDI) values a precise calibration is required. This work compares displayed CTDI- and DLP-values with the measured values for clinical protocols.
Methods and Materials: The elliptical ZHAW-Body* phantom together with a CTDI ionisation chamber was used to measure the DLP in CT-scanners of different manufacturers in several hospitals throughout the German-speaking part of Switzerland. CT Protocols for "thorax"-, "abdomen"- and "pelvis"-examination sites were made in clinical scan mode. From the displayed DLP-value a CTDI-value can be calculated and compared to those displayed.
Results: For most scanners the displayed CTDI is well calibrated and deviations were within tolerance of ±30% for DLP values. For some scanners, however, the calibration for CTDI was outside the ±20% tolerance range. The range of CTDI/DLP used for the same examination sites in different hospitals can vary by a factor of 4–5.
Conclusion: Recommendations have to be given as to how to avoid wrong patient dose estimations. By calculating the ratio of measured and displayed values a correction factor has to be determined to correct the displayed doses and compare them to published DRL reference values and to allow comparisons between dose levels at different hospitals. Further in depth analysis needs to differentiate between scanner generations.

* Haller K, Markert B, Lutters G, Scheidegger S (2013): Dosimetric comparison of the elliptical ZHAW-CTDI-phantom with the standard CTDI phantom. *SSRMP annual scientific meeting* 2012, P07, 58

Vital signs in postmortem computed tomography (PMCT) without intravenous contrast

Y. Bütikofer; Bern

Learning Objectives: Most clinical radiologists are not familiar with postmortem CT scans without intravenous contrast. Therefore examples of forensically important postmortem findings, preselected focused on vital signs, will be presented and differentiated from regular postmortem findings.
Background: One major task of forensic medicine is to determine the cause of death. For that purpose discrimination of antemortem from postmortem wounds is crucial and done using so called "vital signs". Since its implementation in forensic medicine, PMCT has proven to be a valuable tool, complementary to autopsy in detection of such vital signs.
Imaging Findings or Procedure Details: We will present examples of PMCT images of air embolism, pulmonary embolism, foreign body embolism, subcutaneous emphysema, pericardial tamponade and aspirations together with regular postmortem findings. And we will explain the meanings for the findings for the forensic investigation.
Conclusion: Clinical radiologists reading postmortem CT and MR images should be aware of these vital signs and should be able to discriminate them from regular postmortem findings.

PO58

Comparison of 3T and 14T MRI in a rat antigen-induced arthritis model

L. A. Crowe[1], N. Kunz[2], I. Friedli[1], A. Gramoun[1], K. Grosdemange[1], L. Maurizi[2], G. Coullerez[2], M.-G. Beuzelin[2], R. Gruetter[2], H. Hofmann[2], J.-P. Vallee[1]; [1]Genève, [2]Lausanne

Purpose: To compare super paramagnetic iron oxide nanoparticle up-take at 3T and 14T in a clinically relevant antigen-induced arthritis (AIA) rat model. SPION uptake is assessed after intra-venous or intra-articular injection.

Methods and Materials: "SPION" are amino-PVA-SPIONs. Female Lewis rats (n=16, 150–175 g, 2 months) with right knee AIA were given intra-articular (6 µg) or intra-venous (7 mg) SPION 5 days after disease induction.

MRI scanning used a clinical Siemens Magnetom Trio 3T and 4 cm loop coil, and a Varian/Magnex 14T preclinical scanner and homemade 2 cm loop. 3T protocol – 3D T1 gradient echo; TE 5.9 ms, isotropic resolution 0.16 mm, 14T protocol – 3D GRE; TE 6 ms, isotropic resolution 0.0625 mm, both with acquisition time 1 hour.

Results: Statistically improved SNR and CNR is obtained at 14T (p<5x10–5). SPION gives signal loss in high-resolution images in 1 hour at 3T (160 µm) and 14T (62.5 µm). The improved resolution and visualization of SPION, bone matrix, erosion, cartilage, ligaments and synovium at 14T allows more accurate localization of SPION. In particular, a clear differentiation of synovial SPION from bone cortex and cartilage is possible at 14T, unlike 3T. Comparison with histology and non-SPION AIA (n=7) confirms SPION in synovial macrophages and distribution in good agreement with this robust, validated model.

Conclusion: In a comparable time, the bulk magnetization gain at 14T and dedicated RF coil resulted in net improvement in image resolution and SNR, despite shorter T2*. Nevertheless, both fields provided an accurate localization of the SPION particles, and with more detailed anatomical information at 14T.

PO59

Is an annular tear a predictor for accelerated disc degeneration?

N. A. Farshad-Amacker, A. P. Hughes, A. Aichmaier, R. J. Herzog, M. Farshad; New York/US

Purpose: It is questionable whether an annular tear (AT) is a predictor for accelerated degeneration of the intertervertebral discs. The aim of the present study was to answer this question via a matched case control study design that reliably eliminates potential confounders.

Methods and Materials: Presence or absence of AT, defined as a hyperintense lesion within the annular fibrosus on T2-weighted non-contrast magnetic resonance imaging (MRI) images, was documented in 450 intervertebral lumbar discs who could be followed up for at least 4 years with MRI. Discs with an AT (n=36) were matched to control discs according to the level, degree of intial disc degeneration on MRI using the Pfirrmann classification, age, BMI and interval to the follow up-MRI. The degree of disc degeneration after a minimum follow up of 4 years was graded on the follow up MRI in both groups according to the Pfirrmann classification and were compared using Fischer's exact test or Chi-square test.

Results: One-forth (25%) of the 36 discs with an AT on the inital MRI exam progressed in degeneration. This was similar to the rate of the matched control discs with no AT, in which also around one-forth (22%) showed a progression of degeneration (p=1.00), also without any difference in the degree of degeneration.

Conclusion: Discs with a Pfirrmann grade >2 with an AT, defined by a hyperintense signal intensity on MRI, are not prone to accelerated degeneration if compared to discs without an AT. Therefore, the presence of an AT per se does not predict accelerated disc degeneration.

PO60

Merits of anatomical landmarks for correct numbering of the lumbar vertebrae in lumbosacral transitional anomalies

N. A. Farshad-Amacker, A. Aichmaier, R. J. Herzog, M. Farshad; New York/US

Purpose: Anatomical landmarks are well described in subjects with normal lumbar spine anatomy, however larger sized studies are lacking for subjects with LSTV. The purpose of this study was to determine the merits of anatomical landmarks visible on lumbar MRI in subjects with LSTV to correctly number the vertebrae.

Methods and Materials: After IRB approval, 71 subjects (57±17 years) with and 62 controls without LSTV (57±18 years), all with imaging studies that allowed correct numbering of the lumbar vertebrae by counting down from C2 (n=118) or T1 (n=15) were included. Commonly used anatomical landmarks (ribs, aortic bifurcation (AB), right renal artery (RRA) and iliac crest height) were documented to determine the ability to correctly number the lumbar vertebrae. Further, a tangent to the top of the iliac crests was drawn on a coronal MRI image to introduce the "iliac crest tangent sign". The accuracy, sensitivity, specificity, positive and negative predictive values and the interreader agreement were calculated.

Results: While the level of the AB and the RRA were found to be unreliable in correct numbering of the lumbar vertebrae in LSTV subjects, the iliac crest tangent sign had an accuracy, sensitivity, specificity, positive and negative predictive value of 73–85%, 81–81%, 64–88%, 71–88% and 76–81%, respectively. The interreader agreement of the iliac crest tangent sign was good (k=0.75).

Conclusion: While anatomical landmarks are not always reliable, the "iliac crest tangent sign" can easily be performed without advanced knowledge in MRI and seems to be most useful to correctly number the vertebrae in subjects with LSTV.

PO61

Intervertebral disk degeneration analysis in MRI

G. Koch, J. Galley, G. Maestretti, H.-M. Hoogewoud; Fribourg

Learning Objectives: Knowing the appropriate MRI protocols for intervertebral disk analysis.
Knowing intervertebral disk degeneration progression steps and scores.

Background: The assessment of the intervertebral disk degeneration is an important element in the preoperative workup. Methods of analysis include the Pfirrmann and the Modic classifications based on T1 and T2 weighted images and MRI quantitative methods such as T1 and T2 mapping analysis.

Imaging Findings or Procedure Details: In case of lower back pain or lumbar radiculopathy the MRI protocol must contain at least sagittal T1 and T2 weighted images and transverse T2 weighted images. Quantitative and qualitative aspects of disk hydratation can be obtained by the use of T1 and T2 mapping techniques.

The Pfirrmann classification ranges from 1 to 4 and is based on measurement of the disk height and its signal on T2 images. The Modic classification uses the T1 and T2 signal of the vertebrae adjacent to the disk to sort disorders in 3 groups.

T1 and T2 mapping images allow analysis of disk early degenerative states by quantifying its hydratation. The T1 and T2 values of the disks can directly be mesured and can be displayed on couloured maps for visual analysis.

The different techniques will be explained and demonstrated.

Conclusion: MRI protocol for intervertebral disk analysis must contain basic sequences such as sagittal T1 and T2 and axial T2. Further steps include the use of quantitative sequences to study the disk hydratation.

PO62

Value of diffusion-weighted MRI in musculoskeletal imaging

A. L. Saverot, M. Koehli, C. Federau, J.-B. Ledoux, E. Dugert, R. Meuli, F. Becce; Lausanne

Learning Objectives: The purpose of this pictorial review is to provide an overview of the various clinical applications of diffusion-weighted MRI (DWI) in musculoskeletal imaging, illustrated with cases from our institution.
Background: MRI plays a predominant role in the diagnosis, staging and follow-up of various musculoskeletal disorders. Over the past decade, new sequences have emerged, including diffusion-weighted sequences, which provide information on the microscopic movements of water at the cellular level. In the literature, several groups of musculoskeletal disorders (tumoral, inflammatory and infectious lesions) have been evaluated with this technique.
Imaging Findings or Procedure Details: To detect bone metastases, DWI combined with T1-weighted sequences provides the higher specificity compared with other imaging techniques, with no use of ionizing radiation. DWI also helps to differentiate benign from pathological vertebral body compression fractures. Moreover, DWI has recently been proved to help distinguish inflammatory lesions in axial spondylarthropathies from degenerative changes in the spine and sacroiliac joints. DWI may further help to differentiate infectious spondylodiscitis from Modic type 1 vertebral endplates abnormalities. For non-myxoid tumors, studies have shown that malignant tumors have significantly lower ADC values than benign lesions. DWI also shows promising results in the differentiation between large enchondromas and low-grade chondrosarcomas. Finally, the assessment of post therapeutic response in osteogenic and Ewing sarcomas is also interesting, as mean ADC values increase with the amount of tumor necrosis.
Conclusion: Diffusion-weighted MRI is a helpful additional tool in the evaluation of several tumoral, inflammatory and infectious musculoskeletal disorders.

PO63

Charcot foot: Simple goals and recommendations for diagnosis, complications and post-operative imaging

M. Hamard, E. Paulin, J.-D. Nicodème, C. Becker, S. Boudabbous; Genève

Learning Objectives: Charcot Neuropathic Osteoarthropathy (CNO) is a relatively frequent and serious consequence of peripheral neuropathy, with diabetes mellitus being the most common cause. The mechanism is still controversial but seems to be mediated by a process of uncontrolled inflammation and osteolysis.
Our aim is to briefly review the indications of each imaging modality and clarify important findings in the diagnosis, detection of complications and in the post-operative setting.
Background: 64 patients underwent imaging in our institution from 2005–2013 for diagnosis or follow-up of CNO. Two musculoskeletal radiologists and one orthopedic surgeon specialized in diabetic foot surgery retrospectively studied the indications and findings of 787 exams.
Imaging Findings or Procedure Details: Radiological studies of Charcot foot should be conducted along several axes depending on the indication: location, stage and existence of complications. Location was described according to the Sanders and Frykberg anatomic classification. She three main stages of evolution (acute, subacute and chronic) were distinguished using the Eichenholtz radiographic classification. The existence of complications was suspected clinically and confirmed radiologically.
Radiographs (79% of exams) are the initial imaging modality from diagnosis to surgery. CT and MRI (10%) help to confirm CNO or the presence of complications, MRI being more sensitive in the detection of bone marrow edema and CT used principally for pre-operative management.
Conclusion: CNO is a complex entity and interpretation of imagery can be simplified by the knowledge of the classical evolution and the expected complications of the disease.

PO64

Non-visualisation of intervertebral disruption in acute flexion teardrop fracture on MRI

D. Bodenmann, L. Carow, S. Künzle, F. Messmer, S. Duewell; Frauenfeld

Learning Objectives: Disruption of the vertebral disk in a tear drop fracture in patients with severe osteoarthrosis of the cervical spine with fibrosis/sclerosis of the intervertebral disk may show no vertebral body marrow edema or fracture line within the intervertebral disk.
Background: MRI is the gold standard in detecting occult fractures due to bone marrow edema and the display of a fracture line, even if there is no displacement. It is known for patients with severe, chronic ankylosing spondylitis, to show nearly no bone marrow edema in acute fractures due to extensive sclerosis. The same mechanism may apply for patients with severe osteoarthrosis in case of acute trauma.
Imaging Findings or Procedure Details: We present the case of a 70 yrs old patient with severe osteorthrosis of the cervical spine with an acute flexion tear drop fracture of C5 with anterior column failure. MRI showed edema within the anterior longitudinal ligament and the dorsal cervical muscles indicating hyperflexional trauma. But there were no changes in SI on FLAIR or T2w sequences within the vertebral body or intervertebral disc; therefore giving no indication for an unstable cervical fracture. Nevertheless, on surgery, a complete disruption of the vertebral disc and the longitudinal ligaments was found.
Conclusion: In patients with severe osteoarthrosis of the cervical spine, fractures may be missed on MRI since they may display no bone marrow edema or fracture lines. In such cases, it is important to take into account other criteria like soft tissue injury, trauma mechanism and indirect signs (e.g. teardrop fragment).

PO65

Atypical hip impingement: What the radiologist needs to know

R. Sutter, Ch. Pfirrmann; Zürich

Learning Objectives: To recognize common imaging findings of atypical hip impingement on radiographs, CT, and MRI.
Background: There are many reports in the literature about imaging of femoroacetabular impingement (FAI). However, the different forms of atypical hip impingement are less well-known, even though a growing number of studies have focused on this entity. As symptoms of atypical hip impingement are often nonspecific, imaging plays an important role in establishing the correct diagnosis in these patients.
Imaging Findings or Procedure Details: Subspine impingement is commonly seen in adolescent male athletes. It is characterized by an enlarged anterior inferior iliac spine, which is protruding inferiorly and causes a mechanical conflict with the anterior portion of the femoral neck. Ischiofemoral impingement is most commonly seen in elderly women: The quadratus femoris muscle is compressed between the lesser trochanter of the femur and the ischial tuberosity, resulting in muscle edema and atrophy. Abnormal femoral antetorsion is associated with different hip diseases and can be assessed with CT or MRI. While a reduced femoral antetorsion is typically associated with cam-type FAI, there are a number of patients without classic FAI where a markedly abnormal femoral antetorsion causes atypical hip impingement. Less common forms of atypical hip impingement include iliopsoas impingement, abnormal pelvic tilt, as well as repetitive extreme hip motion in ballet dancers and athletes.
Conclusion: While some forms of atypical hip impingement can occur combined with classic FAI, most are encountered as separate entities. Knowledge of the imaging findings of atypical hip impingement is essential for reaching the accurate diagnosis in these patients.

Normal and pathological aspects of the endplate in spine imaging: What the radiologist should know

A. Pellaton, E. Paulin, S. Boudabbous, C. Becker, K.-O. Lövblad, M.-I. Vargas; Genève

Learning Objectives: Imaging of the spine is frequently realised in a radiology department often with the detection of endplate abnormalities on radiographs, CT and MRI. Our aim is to provide a diagnostic approach to the detection of normal versus abnormal endplates and discuss commonly encountered pathologies.

Background: An average of 11,000 radiological exams of the spine are annually performed in our hospital of which 50% are conventional radiographs, 20% are CT scans and 30% are MRI. We conducted a retrospective analysis, using a keyword search in our institutional database, of all patients between 2005–2013 undergoing spinal imaging with the identified endplate abnormalities described in the definitive report. A sampling of the common pathologies is illustrated.

Imaging Findings or Procedure Details: We focused our research on patients who underwent conventional imaging, scanner and MRI to establish a broad iconography for each case.

The most frequent pathologies selected are degenerative (Modic, Schmorl), infectious (spondylitis), traumatic/iatrogenic (fracture, post-discectomy, Scheuermann's disease), endocrine (renal osteodystrophy), hematologic (sickle cell disease), inflammatory (spondylarthopathy), congenital (notochord remnants, osteopetrosis), pseudo-tumor (Paget) and tumor. The most relevant findings were catalogued and will be illustrated.

Conclusion: Radiologists should be familiar with commonly encountered normal variants and endplate pathologies to avoid numerous diagnostic pitfalls.

PO67

PET/MRI and PET/CT in follow-up of head and neck cancer patients

M. Araujo Queiroz, M. Hüllner, F. Kuhn, C. Meerwein, G. Huber, S. Kollias, G. K. von Schulthess, P. Veit-Haibach; Zürich

Purpose: Assess contrast enhanced (ce) PET/MRI compared to cePET/CT in patients with suspected recurrence of head and neck cancer (HNC).

Methods and Materials: Eighty-seven patients underwent sequential cePET/CT and cePET/MRI using a tri-modality PET/CT-MRI setup. Diagnostic accuracy for the detection of recurrent HNC was evaluated using cePET/CT and cePET/MRI. Furthermore image quality, presence of unclear FDG – findings of uncertain significance and the diagnostic advantages of use of gadolinium contrast enhancement was analysed.

Results: CePET/MRI showed no statistically significant difference in diagnostic accuracy compared to cePET/CT (91.5% vs. 90.6%). Artefacts grade was similar in both methods, but their location was different. CePET/CT artefacts were primarily located in the supra-hyoid area, while on cePET/MRI, artefacts were more equally distributed among the supra and infra-hyoid neck regions. CePET/MRI and cePET/CT showed 34 unclear FDG-findings; of those eleven could be solved by cePET/MRI and five by cePET/CT. The use of gadolinium in PET/MRI did not yield higher diagnostic accuracy, but helped to better define tumour margins in 6.9% of patients.

Conclusion: Our data suggest that cePET/MRI may be superior compared to cePET/CT to specify unclear FDG uptake related to possible tumour recurrence in patients with follow-up after HNC. It seems to be the modality of choice for the evaluation of the oropharynx and the oral cavity because of a higher incidence of artefacts in cePET/CT in this area mainly due to dental implants. However, overall there is no statistically significant difference.

PO69

Response criteria in oncologic imaging: Most common mistakes

M. Kekelidze, P. Lodise, M. Rasmus, J. Hohmann, G. Bongartz; Basel

Learning Objectives: To illustrate 10 of the most frequently made mistakes in radiologic tumor response monitoring.
To demonstrate negative consequences caused by these mistakes and to provoke alertness to avoid them.

Background: Response criteria in oncologic imaging currently use a validated size-based system and adapt new tumor response concepts providing a standardized post-treatment monitoring. When these systems are applied incorrectly, a false interpretation may occur, resulting in negative implications for patient care.
In this exhibit we demonstrate a spectrum of main pitfalls related to tumor response interpretation and provide practical tips how to avoid them in clinical practice.

Imaging Findings or Procedure Details: The most prominent mistakes in radiological tumor response evaluation are related to the following topics:
1. Assignment of non-qualifying target lesions (number, size, pseudo-lesions);
2. Measurement of non-reproducible targets;
3. Assessment of Ill-defined lesions (merging/splitting, irregularly shaped lesions);
4. Evaluation of cystic/necrotic tumors;
5. Consideration of reappearing lesions;
6. Definition of Baseline/Nadir as reference;
7. Choice of adequate criteria (e.g. RECIST, Choi, Cheson, mRECIST, PERCIST);
8. Calculation of time-point response (e.g. mixed response);
9. Additional imaging or clinical data outside main follow-up;
10. Comparison of inconsistent modalities and/or protocols.

Conclusion: Radiologists should be aware that even minor mistakes in radiologic tumor response evaluation can dramatically influence oncologic treatment decision. Tumor response criteria must be chosen based on treatment and type of tumor. Proper application of available response criteria with thorough knowledge of possible pitfalls and limitations can lower the negative implications for patient care and increase the efficiency of imaging based tumor response evaluation.

The anterior tilt of the tibia in infants:
A significant radiological sign of trampoline related fractures

L. Leidolt[1], P. Klimek[2], G. Eich[2], E. Stranzinger[1]; [1]Bern, [2]Aarau

Purpose: Evaluation of the anterior tilt of the proximal tibia in children, which suffered a tibia fracture while jumping on the trampoline compared with a normal population.

Methods and Materials: 62 children (32 females, 30 males) between age 2 and 5 years (average 2.9 years, SD 0.9) with radiographs in two views of the tibia were included in this retrospective study. 27 children with proximal tibia fractures were injured while jumping on the trampoline. A normal age-mapped control cohort of 35 children was compared. The anterior tilt angle of the tibia was defined as an angle between the proximal tibia growth plate and the distal tibia growth plate on a lateral view. Two radiologists evaluated all radiographs for fractures and the anterior tilt in consensus. An unpaired student T-test was used for statistical analysis (SPSS). Original reports were reviewed and compared with the clinical presentation and follow up radiographs.

Results: The average anterior tilt angle in the normal cohort group, was -3.1°, SD±2.9°, compared to +4.2°, SD±2.9°, in the group with trampoline fractures (P<0.0001). In 6 patients (22% of all patients with confirmed fractures) the original report did not comment on a proximal tibia fracture.

Conclusion: Infants between 2–5 years of age have a high risk suffering proximal tibia fractures while jumping on a trampoline. Measurement of the anterior tilt angle on lateral radiographs is helpful to detect trampoline fractures.

Dose reduction in pediatric body-CT due to fully-integrated-digital "Stellar®" detector

J. Cullmann, K. Schawkat, D. Ott, T. Dobrocky, S. Puig; Bern

Purpose: Evaluation of potential dose reduction in pediatric body-CTs after implementation of a fully-integrated-digital-detector (Stellar®, Siemens) compared with a conventional "Ultra-Fast-Ceramic"-(UFC)-solid-state-detector.

Methods and Materials: 152 routine CT-scans of 114 children (age: 1 day – 16 years) were included. Age, scan length, maximum body diameter, $CTDI_{vol}$, dose-length-product (DLP) were recorded. Effective radiation dose (ED) was estimated from the DLP and an organ weighting factor (k): ED [mSv] ~k × DLP [mGy×cm].

All examinations were performed on the same dual-source multi-detector CT (Somatom Definition Flash; Siemens), 93 examinations with a UFC-detector, 59 with the Stellar®-detector. Scanning protocols were kept constant before and after replacement of the detector unit.

Independent two-sample t-tests were used for statistical analysis (level of significance p=.05).

Results: Age and body diameter didn't show significant differences in both groups. The mean $CTDI_{vol}$ was 16% lower after detector change (1.77 vs. 1.52 mSv). This difference was statistically not significant (p=.30). The mean ED was significantly lower with the digital Stellar-detector (0.74 mSv±.6) compared with the UFC-detector (1.09 mSv±1.3) (p=.02). This was mainly achieved due to a significantly lower mean scan-length of 270 mm±123.6 vs. 231 mm±89.5 (p=.02) resulting in a significantly lower DLP: 70.2 mGy×cm±88.4 vs. 45.2 mGy×cm±41.6 (p=.02).

Conclusion: Fully digital-detector may achieve a mild reduction of radiation in pediatric patients. However, the main difference of the DLP was due to reduction of the scan length after exchange of the detector unit.

Cystic masses and pseudomasses in the fetal pelvis:
A differential diagnosis based on fetal MRI and US findings

S. Archontaki, F. Gudinchet, R. Meuli, L. Alamo; Lausanne

Learning Objectives: To familiarize radiologists with the wide spectrum of fetal pelvic cysts and cystic pseudo-masses, with emphasis on prenatal MRI studies.

Background: Pelvic cysts and/or anomalous distension of the whole pelvic organs are often found at pregnancy US screening. The differential diagnosis of these pathologies is wide and requires an appropriate knowledge of the embryology. Complementary prenatal MRI may be used in selected cases to improve the information and limit the differential diagnosis.

Imaging Findings or Procedure Details: All fetal MRI performed in our Institution between 2007 and 2013 were reviewed. Patients with pelvic cystic lesions or anomalous liquid distension of pelvic whole organs were selected. MRI studies were performed in a 1,5 Tesla scanner, with T1-VIBE; T2 tru-FISP and T2 HASTE sequences obtained in all three spatial fetal planes. US and MRI images were compared with autopsies, pathologic exams and/or postnatal imaging studies.

We present a wide spectrum of pathologies. Ovarian cysts are the most often pelvic cysts observed in girls, but they rarely require additional MRI. Obstructions of the lower urinary tract cause megabladder in boys. Hydrometrocolpos can be observed in ano-rectal and genitourinary malformations. Rectal duplication cysts are rarely detected in utero. Lymphangiomas and sacro-coccygeal teratomas may present as cystic or mixed lesions.

Conclusion: The differential diagnosis of prenatal pelvic cystic masses is wide and changes according with the fetal sex. Prenatal MRI provides both high anatomical definition and multiplanar capacity, which can help to limit the differential diagnosis and guide the medical team to take decisions.

Imaging of renovascular hypertension in children

A. C. Da Cunha Afonso, A. Dhouib, A. Kanavaki, L. Merlini, P. Parvex, S. Hanquinet, M. Anooshiravani-Dumont; Genève

Learning Objectives: The purpose of this presentation is to illustrate ultrasound, CTA, MRA and angiography findings in renovascular arterial hypertension (RVHT) in children.

Background: As opposed to adults, arterial hypertension (HT) in children is often of renovascular aetiology. Because RVHT is one of the few causes of hypertension with visible morphologic manifestations and is potentially treatable, it is important to recognize its signs in routine imaging techniques.

Imaging Findings or Procedure Details: Investigation often begins with the non-irradiating technique of renal ultrasound. Direct visualization of an arterial stricture is difficult; colour doppler ultrasound allows an analysis of the flow in the main renal artery and its branches, which are particularly well identified in children.

CTA or MRA are complementary studies needed either when US is inconclusive or incompatible with clinical findings or for pretherapeutic planning.

In positive cases, angiography demonstrates the extent of vascular anomalies, gives quantitative measurements of stenoses and allows interventional treatment when possible.

In our presentation we illustrate the topic through examples of the following pathologies, with pre- and post-therapeutic images: type 1 neurofibromatosis, mid-aortic syndrome in William Beuren's syndrome, Takayasu's arteritis, perirenal haematoma, and renal artery stenosis with no found etiology.

Conclusion: Renovascular hypertension is a potentially curable cause of arterial hypertension, which can be diagnosed using noninvasive imaging modalities. Doppler ultrasound allows for initial investigation. CTA and MRA contribute to the exact description of the lesion and surgical planning. Angiography delineates the vascular anatomy and allows immediate endovascular treatment. CTA, MRA and angiography also allow post-therapeutic follow-up.

Chest MRI in infants and children: A pictorial review

I. M. O. Borzani[1], L. Merlini[2], M. Campoleoni[1], C. Colombo[1];
[1]Milano/IT, [2]Genève

Learning Objectives: Provide an overview of the technology and principles of lung MRI in pediatric patients. Illustrate potential clinical indications and applications of chest MRI through imaging examples. Compare the utility of chest MRI with radiographs, ultrasound and MDCT

Background: Among the modalities for lung imaging, MRI has been the latest to be introduced into clinical practice. MR is increasingly being used for evaluating the chest in pediatric patients given its lack of ionizing radiation, the high contrast resolution and good morphological information

Imaging Findings or Procedure Details:
1. Review acquisition protocols and procedural considerations for chest MR studies in infants and children
2. Present a systematic overview of the indications (cystic fibrosis, follow-up of lung infections, congenital malformations and masses)
3. Compare MRI with other radiological modalities (radiographs, ultrasound and MDCT)

Conclusion: Chest MRI may be considered a useful technique in the follow-up of cystic fibrosis or pneumonia or congenital lung malformation in children as an alternative or adjunct to other modalities with at least similar diagnostic value

The value of diffusion weighted images in breast MRI in the clinical routine at 3 T: A retrospective analysis

M. Daniaux[1], B. Amort[1], W. M. Santner[2]; [1]Innsbruck/AT, [2]Baden-Dättwil

Purpose: Diffusion weighted images (DWI) have shown high diagnostic accuracy for differentiation of benign a malignant breast tumors. It is known that the image quality of DWI and the apparent diffusion coefficient (ADC) can be hampered by several factors. The purpose of this study was to evaluate the value of DWI in a mixed collective of breast patients in the clinical routine and to evaluate the effect of of confounding factors to the determination of dignity.

Methods and Materials: We evaluated 209 Breast Lesions in 195 Breast-MRIs performed in the clinical routine during the last 12 months on a 3.0 Tesla whole-body MR scanner. All lesions were assessed by the Breast Imaging Reporting and Data System (BIRADS). Multi-slice EPI-sequences with SPAIR fat suppression were aquired useing a TIM compatible 4 channel biopsy breast coil and a three direction trace diffusion protocol. The DWI and ADC-maps were evaluated for the ADC threshold level (1,2x10–3 mm²/sec), calculated form b-values of 50 and 800 sec/mm².

Results: The results were divided in woman with different genesis (bioptical proofed invasive cancer/DCIS, high-risk Patients, nonspecific findings in Mammography/Ultrasound, postoperative assessment, response-evaluation during Chemotherapy) and the limited accessibility of lesions due to known problems in Breast-MRI (fat-sat in big breasts, lesions <1 cm, suszeptibility-artefacts due to titanium-marker labeling after biopsy, subacute bleeding after biopsy).

Conclusion: This investigation shows that DWI is a stable and very helpful method for evaluating the dignity of breast lesions in clinical routine. Limitations are only shown to small lesions (<1 cm) and extensive bleedings after biopsy.

Clitoral and bulbar anatomy at MRI in intact women and women with female genital mutilation/cutting

D. Botsikas, L. Luong Trinh, P. Petignat, C. Becker, F. Bianchi-Demicheli, J. Abdulcadir; Genève

Learning Objectives:
1. Learn the anatomy of female sexual organs.
2. Recognize these anatomical structures on MRI.
3. Review the most appropriate MRI sequences.
4. Identify normal anatomical variants and modifications post female genital mutilation/cutting (FGM/C).
5. Show that after FGM/C the majority of the female sexual organs is intact.

Background: Clitoris is an organ, whose function is sexual pleasure.
Female sexual function has only been partially studied. Even if multifactorial, it could also be related to anatomical or functional variants of the clitoris.
FGM/Cs are traditional practices, which can negatively affect sexuality.
Clinically, clitoris and other female erectile organs are only partially visible. Therefore medical imaging is important for studying them.

Imaging Findings or Procedure Details: Clitoris is composed by two cavernous corpora that converge in the median line to form the body, which ends into the glans. Only the glans is accessible to clinical examination.
The MRI sequences best suited for imaging of the clitoris will be discussed. The different size and variants of clitoral components and will be shown.
Some FGM/C types involve removal of the glans. This can be depicted in MRI. Our imaging findings show the bulbs and most of the clitoris intact after those types of FGM/C. This explains why healthy FGM/C women experience orgasm and sexual pleasure. In case of sexual dysfunction, they can be treated surgically and sexologically. Clitoral reconstruction is still scarcely investigated.

Conclusion: Knowledge of radiologic anatomy and variations of female sexual organs is useful for studying female sexual function and planning clitoral reconstruction post FGM/C.

Clinical importance of breast density: Controversies about evaluation means

M. O. Treyvaud, V. Monnard, L. Alamo, V. Dunet, J.-Y. Meuwly; Lausanne

Learning Objectives: To review and illustrate qualitative, semi-quantitative and quantitative assessments of breast density evaluation, their degree of reproductibility and their correlation with breast cancer risk.

Background: Breast density is today a hot topic in the United States as breast density notification laws are being introduced, as in California in April 2013. These laws mandate written notification of their tissue density to women undergoing screening mammography and could have a major impact on the way the patients with high density breast will be screened Increased mammographic density is an independendant factor for breast cancer. Since the 1970s, several breast density assessment methods have been developed.
These include qualitative assessments (Wolfe, Tabar, Boyd, BIRADS), semi-quantitative assessments (planimetry, Cumulus software, Madena software) and quantitative assessments (volumetric measurement [Quantum, Volpara], dual energy measurement).

Imaging Findings or Procedure Details: Illustration of several breast density methods and their reproductibility and breast cancer correlation.

Conclusion: In the context of correlation between breast density and cancer risk, qualitative breast density assessment methods have low reproductibility and new, quantitative three-dimensional, methods should be preferred.

Dual energy contrast enhanced spectral mammography (CESM): Technique, execution, interpretation

M. Daniaux[1], T. de Zordo[1], W. M. Santner[2], B. Amort[1], W. Oberaigner[1], W. R. Jaschke[1]; [1]Innsbruck/AT, [2]Baden-Dättwil

Learning Objectives: Dual energy contrast enhanced mammography (CESM) is one of the latest developments in breast care. In this educational poster we will report our own experience and show how CESM is executed and interpreted. We will discuss the advantages and drawbacks of CESM and we will have an outlook on the future of this innovative modality.

Background: Since the first promising report in 2001, several studies on technical developments and clinical success have been published. Imaging with contrast agents in breast cancer was already known from previous magnetic resonance imaging (MRI) and computed tomography (CT) studies. However, high costs, limited availability or high radiation dose of those techniques led to the development of CESM.

Imaging Findings or Procedure Details: CESM is capable of demonstrating cancers that are not visible at standard mammography. Compared with mammography alone, CESM significantly increased the sensitivity without a loss in specificity. CESM also allowed a gain for the negative predictive value with a significant reduction in the false negatives. These findings highlight the contribution of contrast media injection in the depiction of breast cancers.

Conclusion: Bilateral CESM is feasible, can be easily accomplished, and is well tolerated. CESM is superior to conventional mammography by adding functional assessment of pathologic neo-angiogenesis to morphological findings. In comparison to MRI this new technique offers almost similar diagnostic results, whereas initial results have shown a slightly inferior sensitivity to MRI in particular for the detection of additional foci. Radiation dose is a minor drawback since it is only slightly (20%) elevated in comparison to conventional mammography.

PO79

Digital breast tomosynthesis (DBT)

V. Monnard, M. O. Treyvaud, V. Dunet, L. Alamo, J.-Y. Meuwly; Lausanne

Learning Objectives: To depict advantages and limitations of digital breast tomosynthesis (DBT) compare to 2D digital mammography (FFDM).

Background: FFDM is a 2D projection of a 3D organ using breast compression. The breast compression creates a projection image with tissue superimposition that may hide pathologies (especially for BIRADS C and D breast density categories).or mimic pathologies. It's sensitivity depends on the density of breast tissue with the fat component furnishing a natural contrast for lesion detection, with consequences of false negatives or false positives, requiring additional studies or other imaging modalities explorations.

DBT is a 3D mammographioc exam that minimizes the effects of structure overlap within the breast. The advantages that can be demonstrated with 3D DBT are superior performance with regard to lesion visibility, lesion's margin visibility and reader confidence. It better depicts the border of the mass, the number of masses and eventual associated findings. It also permits 3D localization of the tumor.

Inconvenient are longer data acquisition, longer reading time and potential higher irradiation.

Imaging Findings or Procedure Details: The imaging data are acquired from various angles as the x-ray tube moves in an arc, while the breast is compressed. They are then reconstructed slice by slice. We will show examples of lesion detection, resolution of surprojection images and typical artifacts.

Conclusion: 3D DBT leads to better cancer detection, reduction in recall rate, higher positive predictive value for biopsy recommendation and decrease in unnecessary biopsy. The issue of increased irradiation should be resolved with new possibilities of reconstruction of synthetic 2D image from 3D dataset.

1, 2, 3-triazole containing neurotensin-based radiopeptidomimetics

A. Mascarin, I. E. Valverde, T. Mindt; Basel

Purpose: Neurotensin (NT) is a regulatory peptide with a nanomolar affinity towards NT receptors, which are overexpressed by different types of cancer, for example, colon or breast cancer. Therefore, the binding sequence of Neurotensin, NT (8–13), is a promising vector for the development of peptidic radiotracers for tumour imaging and therapy. The main drawback is the short biological half-life of the peptide. The goal of this project is the stabilization of NT (8–13) by inserting proteolytically stable 1, 2, 3-triazoles as amide bond surrogates.

Methods and Materials: Peptides were synthesized manually on solid phase. The required α-amino alkynes for the Cu (I) catalysed azide-alkyne cycloaddition were synthesized from the corresponding α-amino acids. Introduction of the azido-functionality into the peptide was achieved directly on the resin. The peptides were then conjugated N-terminally to a PEG4-linker and to a DOTA-chelator. After HPLC-purification, the compounds were labeled with ^{177}Lu and evaluated *in vitro* and *in vivo*.

Results: α-Amino alkynes were successfully synthesised and their enantiomeric purity was verified. The triazole containing NT-derivatives were efficiently prepared on solid phase and radiolabelled with [^{177}Lu] LuCl$_3$, in high radiochemical purities and yields. Cell internalizations and receptor binding affinities of the compounds were evaluated with HT-29 cells. Log D and blood serum stabilities were also determined. The biodistributions of the most promising compounds were determined with xenografted mice. The results of the systematic biological evaluation will be presented.

Conclusion: We present here the first "triazole scan" of the binding sequence of Neurotensin (8–13), which led to peptidomimetics with promising properties for the development of new tumour-targeting tracers.

Labeling of a cyclic RGD peptide with two 2-[^{18}F] fluoropyridine prosthetic groups for integrin $\alpha_v\beta_3$ PET imaging

N. Giovinazzo, J. Inkster, S. Germain, D. Colin, Y. Seimbille; Genève

Purpose: Integrins are involved in many diseases such as tumor, thrombosis, cardiovascular and inflammatory diseases, which makes them an appealing target for the development of anti-angiogenic therapies. $\alpha_v\beta_3$, which is the most prominent integrin, can be targeted by monoclonal antibodies or RGD-based peptides, and their radioactive analogs are evaluated to non-invasively visualize angiogenesis *in-vivo*.

Methods and Materials: 2-Fluoropyridine-based prosthetic groups – [^{18}F] FPy5yne and [^{18}F] FPy-PEG$_2$-yne – were prepared by kryptofix-K$_2$CO$_3$-mediated nucleophilic ^{18}F-exchange reaction with two trimethylammonium triflate precursors in CH$_3$CN or DMSO. Then, [^{18}F] FPy5yne or [^{18}F] FPy-PEG$_2$-yne were conjugated to c[RGDfK(N$_3$)] by Huisgen's 1,3-dipolar cycloaddition. The reaction occurred in water/DMSO and was catalyzed by Cu (II) in presence of sodium ascorbate. The radiopeptides were finally purified by HPLC. The radiosynthesis was completely automated by using a TracerLab FxFN.

Results: Introduction of the fluorine-18 into the activated trimethylammonium triflate precursors via no-carrier-added nucleophilic substitution, followed by Sep-Pak purification afforded [^{18}F] FPy5yne and [^{18}F] FPy-PEG$_2$-yne. Conjugation of the two synthons to the azido peptide by copper-catalyzed Huisgen's cycloaddition provided, after semi-preparative HPLC purification, the final radiolabeled peptides in an overall synthesis time of 100 min and radiochemical yields above 15% (decay corrected).

Conclusion: We have successfully synthesized two novel F-18 labeled probes for integrin $\alpha_v\beta_3$ imaging. The radiopeptides were prepared in yields and times which are practical for PET imaging. *In-vitro* binding affinity assays, as well as *in-vivo* biodistribution and microPET/CT studies in tumor bearing mice, are underway to demonstrate how useful they may be in assessing angiogenesis in tumors and monitoring therapy.

Systemic ^{177}Lu-DOTA-RM6 and external beam radiation therapy of human prostate cancer PC-3 grafted in nude mice

F. Buchegger[1], D. Viertl[1], M. Kosinski[1], J. Prior[1], S. Baechler[1], R. Miralbell[2], H. Maecke[3], R. Mansi[3]; [1]Lausanne, [2]Genève, [3]Freiburg/DE

Purpose: Radiolabeled DOTA-RM6, a gastrin releasing peptide receptor (GRPr) antagonist developed by HRM and RM, showed favorable biodistributions in tumor bearing mice. We present first results of fractionated ^{177}Lu-DOTA-RM6 treatment or/and external beam radiotherapy (RT) of prostate cancer PC-3 grafted mice.

Methods and Materials: PC-3 cells were grafted subcutaneously in Fox nude mice and pilot fractionation treatments initiated at 12–13d. ^{177}Lu-DOTA-RM6 was injected daily i.v. over 5 or 8d. Fractionation RT (Philips RT250) was given over 5 or 8d (daily fractions) or over 2 or 3 weeks (3 fractions/week, 10 Gy/week). Pilot combination treatments were performed comparing full-dose, single-agent RT (16 or 24 Gy) or radiopeptide treatments (100 or 160 MBq), 4 to 5 mice/group, with half-dose single-agent treatments and the half-doses combined. Tumor regrowth delay (RD) was calculated as time to reach 1 cm^3.

Results: Fractionation RT of 20 or 30 Gy cured 2/3 and 3/3 mice, respectively. RD increase after individual half-dose treatments (5d treatments) compared with untreated controls (RD=35±9d) was not significant while the increases after full-dose radiopeptide treatment (RD=49±6d) and RT (72±14d) and the half-doses-combination (RD=57±11d) were significant (Student T test). Results from the second combination therapy (8d treatments) are in progress.

Conclusion: PC-3 tumor grafted mice were most cured with 20 to 30 Gy fractionation RT. The biological efficacies of RT and radiopeptide were additive. Changing tumor uptakes in fractionation radiopeptide therapy could be studied with micro-SPECT/micro-PET to rationally choose fractionation treatments while completion of a beta-radiation therapy with targeted alpha- or Auger-radiation emitters might be beneficial aiming to eradicate last small tumor cell clusters in largely apoptotic/necrotic nodules.

Hemispheric dominance in post-lingual unilaterally deaf patients before and after cochlear implant

G. Warnock[1], N. Peter[1], C. Hemsley[1], D. Wong[2], T. Kleinjung[1], R. Probs[1], A. Buck[1]; [1]Zürich, [2]Konstanz/DE

Purpose: Studies of brain activation in response to auditory stimuli in cochlear implant (CI) users have generally focused on the differences to the normally hearing (NH). We hypothesised that the activation pattern in CI users not only differs from NH, but that it evolves after CI and subsequent adaptation. Functional MRI (fMRI) is contraindicated in CI users due to ferromagnetic materials. PET imaging of cerebral blood flow (CBF) using [^{15}O]-water predates fMRI and is a useful alternative when it is contraindicated.

Methods and Materials: Prior to CI surgery, CBF at baseline and during unilateral auditory stimulation of the healthy ear using vowel sounds was measured using [^{15}O]-water PET in an interleaved paradigm. CBF was normalized to the cerebellum for each scan to account for differences in tracer dose and the activation in response to stimulation was visualized using statistical parametric mapping (SPM8). After CI surgery, CBF will be quantified in the same way and the difference in activation patterns studied.

Results: In contrast to pilot studies in NH, left-sided unilateral auditory stimulation in the right unilaterally deaf produced significant (p<0.005) focal activations in auditory regions in both hemispheres. Right-sided stimulation in left-sided deaf also activated regions in both hemispheres. Implant surgery and follow-up PET is planned in these patients and more subjects are being recruited.

Conclusion: Our initial data indicates that CBF activations in the post-lingual unilaterally deaf prior to CI surgery differ from those in non-deaf controls. The activation patterns after surgery will be compared to those pre-surgery.

PO84

A semi-quantitative, semi-automatic software tool for preoperative quantification in lung SPECT-CT scintigraphy

J. Müller, M. P. Putora, F. Schmidt, A. Eberl, J. Fornaro; St. Gallen

Purpose: SPECT-CT data can be used to semi-quantify lung perfusion and ventilation representative of lung function. Preoperative assessment relies on estimates of the function of individual lobes. We present a software tool for semi-automatic and semi-quantitative assessment of lung function of individual lobes.
Methods and Materials: To test the tool we developed and constructed a simple lung phantom which simulates the thorax including different lobes. A plastic box represented the thoracic cage and 3 (or more) plastic bags represented the lung lobes, these were filled with Tc-99m solution. We performed evaluations with various set-up configurations. The testing environment consisted of three combinations of volume and activity. In Test A equal amounts of radioactivity and volume for each bag were used. In Test B same volume bags had varying levels of activity. Test C used bags of equal activity with different volumes
Results: The calculated results of volume and activity were very precise. Repeated test of different settings were constant and could be reliably reproduced. The relative volume and activity estimates were within 1% standard deviation.
Conclusion: With our software tool semiautomatic, semi-quantitative lung perfusion scintigraphy was easily capable of calculating the lung function of different lung lobes.
We have started to use the program on real patient's examinations. The software tool worked as easily as in the phantom. Our next step will be to test its predictive accuracy of postoperative lung functions based on pre- and postoperative data.

PO85

^{18}F-FDG-PET or PET/CT in the differential diagnosis between malignant and benign pleural lesions: Diagnostic performance meta-analyses in patients with or without cancer history

G. Treglia[1], R. Sadeghi[2], S. Annunziata[3], L. Ceriani[1], L. Giovanella[1]; [1]Bellinzona, [2]Mashhad/IR, [3]Rome/IT

Purpose: To meta-analyze published data about the diagnostic performance of ^{18}F-FDG-PET or PET/CT in the differential diagnosis between malignant and benign pleural lesions.
Methods and Materials: A comprehensive literature search was carried out. Pooled sensitivity, specificity, positive and negative likelihood ratio (LR+ and LR-) and diagnostic odd ratio (DOR) of ^{18}F-FDG-PET or PET/CT in the differential diagnosis of pleural lesions on a per patient-based analysis in patients with or without cancer history were calculated. The area under the summary ROC curve (AUC) was evaluated. Sub-analyses considering the device used (PET versus PET/CT) were performed.
Results: The meta-analysis of 11 selected studies including 212 patients without cancer history provided the following results: sensitivity 95% [95% CI: 92–97%], specificity 82% [95% CI: 76–88%], LR+ 5.3 [95% CI: 2.4–11.8], LR- 0.09 [95% CI: 0.05–0.14], DOR 74 [95% CI: 34–161]. The AUC was 0.95. The meta-analysis of 8 selected studies comprising 360 cancer patients (323 with lung cancer) provided the following results: sensitivity 86% [95% CI: 80–91%], specificity 80% [95% CI: 73–85%], LR+ 3.7 [95% CI: 2.8–4.9], LR- 0.18 [95% CI: 0.09–0.34], DOR 27 [95% CI: 13–56]. The AUC was 0.91. No significant improvement of the diagnostic accuracy considering PET/CT studies versus PET only was found.
Conclusion: ^{18}F-FDG-PET and PET/CT demonstrated to be accurate methods in the differential diagnosis between malignant and benign pleural lesions in patients with or without cancer history. Nevertheless possible sources of false-negative and false-positive results should be kept in mind.

PO86

Advantages of cardiac hybrid SPECT/CT in detecting culprit lesion

M. Possner, T. A. Fuchs, O. F. Clerc, S. Dougoud, P. Kaufmann; Zürich

Learning Objectives: Cardiac hybrid imaging by fusion of single-photon emission computed tomography (SPECT) myocardial perfusion imaging (MPI) with coronary computed tomography angiography (CCTA) has been shown to provide complementary information for coronary artery disease (CAD) assessment. Mismatching findings combining both techniques should be accurately reevaluated concerning possible missed findings.
Background: SPECT is a widely used functional imaging technique to detect myocardial ischemia with high sensitivity. On the other side, CCTA as a non invasive morphological study has a high negative predictive value to rule out coronary artery disease. Cardiac hybrid imaging provides important complementary diagnostic information of functional and morphological assessment of CAD. The fusion of both techniques implements fusion of the coronary artery tree and SPECT MPI and therefore perfusion defects can be matched to the coronary vessel lesion.
Imaging Findings or Procedure Details: We illustrate cases with a mismatch between anterolateral ischemia in SPECT MPI without a corresponding vessel in the coronary artery tree of CCTA in patients undergoing cardiac hybrid imaging. After further careful evaluation a proximally occluded intermediate branch was found, which was initially missed due to the lack of contrast medium distally to the occlusion, causing anterolateral ischemia.
Conclusion: As cardiac hybrid imaging integrates functional and anatomical data, mismatching findings should be carefully reevaluated. This helps to detect proximally occluded vessels without contrast enhancement distal to the occlusion, especially small side branches. Cardiac hybrid imaging has shown to provide added diagnostic information for culprit lesion identification and for guiding target vessel revascularization.

PO87

Relativity applied to cardiac PET imaging: Pitfalls in interpretation of perfusion and viability studies

O. F. Clerc, R. R. Buechel, M. Possner, S. Dougoud, T. A. Fuchs, P. Kaufmann; Zürich

Learning Objectives: To recognize pitfalls in cardiac PET and avoid misinterpretations.
Background: Despite advanced technology, cardiac PET can be misinterpreted, particularly because tracer uptake is displayed in a relative scale. Using clinical cases, we will illustrate the interpretation of misleading ^{13}N-NH$_3$ perfusion studies and ^{18}F-FDG viability studies.
Imaging Findings or Procedure Details: A patient with triple aorto-coronary bypass undergoes cardiac PET because of angina pectoris. Myocardial perfusion seems normal and homogenous in all slices and polar maps. However, a global coronary flow reserve (CFR) of 0.82 suggests a diffuse steal effect. On second look, perfusion slices reveal left ventricular transient ischemic dilatation (TID). Diagnosis: balanced, global and severe ischemia. After revascularization of ramus intermedius, follow-up PET demonstrates profound flow heterogeneity with extensive ischemia outside the ramus intermedius territory, a global CFR of 1.4 and no TID. Diagnosis: improved perfusion despite the more pathological aspect of images. Another patient with coronary heart disease and reduced cardiac function undergoes ^{13}N-NH$_3$ and ^{18}F-FDG cardiac PET. ^{18}F-FDG shows high inferior and lateral uptake, but reduced anterior, septal and apical uptake, suggesting a non-viable antero-septo-apical scar. However, ^{13}N-NH$_3$ reveals an inferoseptal ischemia and inferolateral scar. Diagnosis: increased ^{18}F-FDG-uptake in viable inferolateral scar and inferoseptal ischemia, leading to relatively reduced uptake in the otherwise normal myocardium.
Conclusion: Assessment of cardiac perfusion and viability PET is based on relative tracer uptake, which can be misleading. Thus, an integrative approach and comprehensive evaluation taking into account all aspects of the imaging results as well as clinical data is mandatory when assessing cardiac PET studies.

FDG PET/CT a promising tool for the diagnosis of polymyalgia rheumatica

I. C. Mainta, G. Amzalag, C. Tabouret-Viaud, O. Ratib, O. Rager; Genève

Learning Objectives: Limited data are available concerning the metabolic findings of polymyalgia rheumatica-PMR. Here we presented the FDG pattern of distribution as observed in our patients and a review of the literature.

Background: Polymyalgia rheumatica is an inflammatory rheumatic syndrome of unknown origin, closely related to Giant cell arteritis-GCA. The diagnosis is classically based on clinical and serological criteria, nonetheless, in the daily practice, clinicians resort increasingly to imaging modalities in order to strengthen the diagnostic decision and mostly for the evaluation of underlying GCA, amongst which F-18-FDG PET/CT.

Imaging Findings or Procedure Details: In patients with polymyalgia rheumatica, we observed bilateral periarticular hypermetabolism in shoulder and hip joints, the ischial tuberosities, as well as interspinous lumbar increased FDG uptake and around the greater trochanters.

Conclusion: PET/CT offers the advantage of whole body imaging and early detection of metabolic disturbances, making it a promising tool for the evaluation of PMR and useful for the detection of concomitant GCA.

Renal function measurement in potential live kidney donors: Value of the accumulation index (AI) measured during I-123-hippuran (OIH) renography in comparison to glomerular filtration rate (GFR)

S. Durante, M. Nicod Lalonde, J.-P. Venetz, M.-F. Derkenne, J. Prior, M. Pascual, A. Boubaker; Lausanne

Purpose: To correlate AI measured with I-123-OIH to GFR in individuals evaluated for potential live kidney donation.

Methods and Materials: We retrospectively reviewed 88 examinations obtained in 88 potential live kidney donors (52 F, 36 H) aged 27 to 75 y (53±11). GFR was measured with Cr-51-EDTA (3.7 MBq) using the slope intercept method (Bröchner-Mortensen, 2 blood samples at 120 and 240 min). Single kidney function was measured by an AI, defined as the percent of injected activity extracted by each kidney 30 to 90 sec after heartpeak, during a dynamic I-123-OIH renography. Normal GFR lower limit was determined as function of age.

Results: 74 patients (45 F, 29 H) aged 27 to 75 years (53±11) had normal GFR (63–122 ml/min/1.73 m²). Left AI was 9.3±1.9 and right AI was 8.7±2.1 (p=0.07). 14 patients (7 F, 7 H) aged 38 to 69 years (53±10) had abnormal GFR (40–78 ml/min/1.73 m²). Left AI was 7.4±2.0 and right AI was 6.5±1.8 (p=0.21). Age was similar in both groups of patients. Left and right AI were lower in patients with decreased GFR (p<0.005, and p<0.001, respectively). Among patients with normal GFR, left and right AI was 9.8±1.8 and 9.3±1.8 in 26 aged <50 y, 9.6±2.1 and 8.9±2.2 in 28 aged 50–60 y, and 8.4±1.7 and 7.9±2.0 in patients >60 y.

Conclusion: We observed that single kidney function measured by AI during I-123-OIH renography in potential live kidney donors was correlated to GFR, reflecting renal function. In patients with normal GFR, AI was lower in those aged >60 y.

Legend

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

Schweizerischer Radiologiekongress
Congrès Suisse de Radiologie
Swiss Congress of Radiology

Congress Center Basel | 4.–6. Juni 2015

102. Jahreskongress SGR–SSR
102ème Congrès annuel SGR–SSR

15. Jahreskongress SGNM
15ème Congrès annuel SSMN

69. Jahreskongress SVMTRA
69ème Congrès annuel ASTRM

38. Jahreskongress SGPR
38ème Congrès annuel SSRP

17. Generalversammlung SGRRC
17ème Assemblée générale SSRCR

14. Jahresversammlung SSCVIR
14ème Assemblée annuelle SSCVIR

2. Generalversammlung SSER
2ème Assemblée générale SSER

1. Generalversammlung SSSR
1ère Assemblée générale SSSR

www.radiologiekongress.ch

Basel 2015

Picture: Basel Tourismus