

EUROPEAN CONGRESS OF RADIOLOGY

ECR 2022



BUILDING BRIDGES

MARCH 2-6 | VIENNA

Preliminary programme printed on March 23, 2022
subject to change without previous notice

- Impressions of Vienna

Date: March 2, 2022 | 01:00 - 01:00 CET

IND 2 - Aligning enterprise workflows: Redesigning radiology around the patient

Date: March 2, 2022 | 08:00 - 09:00 CET

Moderator:

Sham Sokka

IND 2-1 - Aligning enterprise workflows: Redesigning radiology around the patient (60 min)

Richard G Barr; Youngstown, OH / USA

Edward Steiner; York, PA / USA

Victoria Bedel; USA

RC 103 - Multimodality imaging of cardiovascular inflammation

Categories: Cardiac, Contrast Media, Hybrid Imaging, Imaging Methods, Vascular

ETC Level: LEVEL II+III

Date: March 2, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderator:

Guadrn Maria Feuchtnr; Innsbruck / Austria

RC 103-1 - Chairperson's introduction (2 min)

Guadrn Feuchtnr; Innsbruck / Austria

RC 103-2 - Myocarditis: has COVID-19 changed our perspective? (15 min)

Marco Francone; Milan / Italy

1. To become aware of the pathogenesis and prevalence of myocardial involvement in COVID-19.
2. To review the spectrum of cardiac MRI findings characterising COVID-19 myocarditis and to become aware of the various differential diagnoses of myocardial damage associated with the SARS-CoV2 infection.
3. To discuss possible imaging pathways to follow-up patients with a previous infection and recognise chronic cardiovascular sequelae of COVID-19.

RC 103-3 - Vasculitis: which is the best test? (15 min)

Valentin E. Sinitsyn; Moscow / Russia

1. To learn about the classification of vasculitis based on vessel size and their major clinical manifestations.
2. To become aware of the key imaging findings in vasculitis.
3. To learn about the modern recommendations for imaging of vasculitis and understand the disadvantages and limitations of ultrasound, CTA, MRA, and PET/CT and PET/MRI.

RC 103-4 - Endocarditis: a difficult diagnosis (15 min)

Ricardo P.J. Budde; Rotterdam / Netherlands

1. To discuss the role of imaging in the diagnosis of endocarditis.
2. To become familiar with the CT and PET/CT imaging findings that indicate endocarditis.
3. To discuss the role of the radiologist in the endocarditis team.

RC 103-5 - Panel discussion: Is hybrid imaging the answer? (13 min)



RPS 104 - Lung nodules

Categories: Artificial Intelligence & Machine Learning, Chest, Imaging Methods, Nuclear Medicine

Date: March 2, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderators:

Leyla Musayeva; Baku / Azerbaijan

Lorenzo E. Derchi; Genoa / Italy

RPS 104-2 - Impact of cigarette smoking on metabolic activity of primary tumour on baseline 18F-FDG PET/CT in patients with lung cancer (8 min)

Maoqing Jiang; Ningbo / China

Author Block: M. Jiang, J. Zhang, J. Zheng; Ningbo/CN

Purpose or Learning Objective: Several studies have distinguished lung cancer in never-smokers from tobacco-associated lung cancer by molecular genetics. However, the correlation between cigarette smoking and metabolic activity of primary tumour on baseline 18F-FDG PET/CT in patients with lung cancer is lacking appropriate reporting. In this study, we aimed to explore the difference of 18F-FDG uptake between lung cancer in never-smokers and tobacco-associated lung cancer.

Methods or Background: A total of 338 patients (230 male, 108 female; mean age: 66.3, range 34-86) with pathologically diagnosed lung cancer were enrolled from September 2019 to April 2021, including 185 documented never-smokers and 153 ever-smokers. All patients underwent baseline 18F-FDG PET/CT and SUVmax of primary tumour was calculated. The associations between cigarette smoking, clinicopathological features, and the uptake of 18F-FDG on primary tumour were analysed.

Results or Findings: The proportion of clinical stage I-II on baseline PET-CT for never-smokers was significant higher than that for the ever-smokers (53.0% versus 37.3%; $P=0.004$). The histological subtype of adenocarcinoma favours never-smokers. The mean SUVmax of primary tumour in ever-smokers was significant higher than that in never-smokers (12.40 versus 10.30; $t=3.02$, $P=0.003$). In addition, with the increase cumulative smoking dose, the uptake of 18F-FDG by primary tumours increased significantly, and a close association was observed between cumulative smoking dose and SUVmax ($r=0.18$, $P=0.026$).

Conclusion: This study demonstrated a close association between cigarette smoking status and the metabolic activity of primary tumour, and suggests that smoking may be a potential risk factor of higher SUVmax on 18F-FDG PET/CT of lung cancer.

Limitations: This is a retrospective study and needs to be verified by further more prospective studies.

Ethics committee approval: This study was approved by the medical ethical committee of Hwa Mei Hospital, University of Chinese Academy of Sciences, Ningbo, China.

Funding for this study: No funding was provided for this study.

RPS 104-3 - Deep learning for estimating pulmonary nodule malignancy risk using prior CT examinations in lung cancer screening (8 min)

Kiran Vaidhya Venkadesh; Nijmegen / Netherlands

Author Block: K. V. Venkadesh, T. A. Aleef, A. Schreuder, E. Scholten, B. Van Ginneken, M. Prokop, C. Jacobs; Nijmegen/NL

Purpose or Learning Objective: Nodule size, morphology, and growth are important factors for accurately estimating nodule malignancy risk in lung cancer screening CT examinations. In this work, we aimed to develop a deep learning (DL) algorithm that uses a current and a prior CT examination to estimate the malignancy risk of pulmonary nodules.

Methods or Background: We developed a dual time-point DL algorithm by stacking the nodules from the current and prior CT examinations in the input channels of convolutional neural networks. We used 3,011 nodules (286 malignant) and 994 nodules (73 malignant) as development and hold-out test cohorts from the National Lung Screening Trial, respectively. The reference standard was set by histopathologic confirmation or CT follow-up of more than two years. We compared the performance of the algorithm against PanCan model 2b and a previously published single time-point DL algorithm that only processed a single CT examination. We used the area under the receiver operating characteristic curve (AUC) to measure discrimination performance and a standard permutation test with 10,000 random permutations to compute p-values.

Results or Findings: The dual time-point DL algorithm achieved an AUC of 0.94 (95% CI: 0.91 - 0.97) on the hold-out test cohort. The algorithm outperformed the single time-point DL algorithm and the PanCan model, which had AUCs of 0.92 (95% CI: 0.89 - 0.95; $p = 0.055$) and 0.88 (95% CI: 0.85 - 0.91; $p < 0.001$), respectively.

Conclusion: Deep learning algorithms using current and prior CT examinations have the potential to accurately estimate the malignancy risk of pulmonary nodules.

Limitations: External validation is needed on other screening datasets to generate further evidence.

Ethics committee approval: Institutional review board approval was obtained at each of the 33 centers involved in the NLST.

Funding for this study: Research grant from MeVis Medical Solutions AG.

RPS 104-4 - Radiomics for classifying minimally invasive lung adenocarcinoma and invasive lung adenocarcinoma presenting as ground glass nodules based on contrast-enhanced computed tomography (CECT) (8 min)

Di Tian; Dalian City, Liaoning Province / China

Author Block: D. Tian, Y. He, J. Zhang, Q. Song, A. Liu, Z. Li; Dalian/CN

Purpose or Learning Objective: Radiomics for classifying minimally invasive lung adenocarcinoma and invasive lung adenocarcinoma presenting as ground-glass nodules based on contrast-enhanced computed tomography.

Methods or Background: We retrospectively included 98 ground glass nodules (GGNs) that were surgically confirmed as minimally invasive adenocarcinomas (MIAs) or invasive adenocarcinomas (IAs). Each GGO was segmented manually using 3D-slicer, and texture features were extracted from the enhanced venous phase image. The least absolute shrinkage and selection operator (LASSO) method was applied to select optimal radiomics features whose performance was assessed by the area under the receiver operating characteristic curve (AUC-ROC). The radiomics model was compared to the radiographic model and the radiomics-radiographic CT combined model using univariate and multivariate logistic regression analysis.

Results or Findings: The radiomics model in CT-enhanced venous phase showed better discriminative performance (training AUC, 0.85; test AUC, 0.85) than the radiographic CT model (training AUC, 0.78; test AUC, 0.62). The combined model (training AUC, 0.85; test AUC, 0.85) did not demonstrate improved performance compared with the radiomics model.

Conclusion: A radiomics model based on contrast-enhanced CT imaging have the best diagnostic performance to distinguish MIAs from IAs in GGNs when compare with the radiographic CT model.

Limitations: It was a single-center retrospective study, and there is deviation between collection and inclusion.

Ethics committee approval: The ethics committee of the First Affiliated Hospital of Dalian Medical University.

Funding for this study: No funding support.

RPS 104-5 - Lung nodule volumetry: the effect of deep learning versus iterative reconstruction at different dose levels (8 min)

Caro Franck; Edegem / Belgium



Author Block: C. Franck¹, F. Zanca², K. Carpentier¹, H. El Addouli¹, M. Spinhoven¹, M. C. Niekel¹, A. Van Hoyweghen¹, A. Snoeckx¹;
¹Edegem/BE, ²Heverlee/BE

Purpose or Learning Objective: Deep learning image reconstruction (DLIR) has been shown to reduce radiation dose compared to iterative reconstruction (IR) for chest CT. It is unknown, however, whether the nodule volume measurements with DLIR are comparable with IR at different dose levels.

Methods or Background: An anthropomorphic chest phantom (Lungman, Kyoto Kagaku), containing six spherical, six lobulated, and six spiculated 3D-printed solid nodules (volume range 28-392 mm³), was scanned at six dose levels (0.2, 0.4, 0.8, 1.5, 3, 6 mGy). Images were 1.25 mm reconstructed with ASIR-V 60% and three levels of DLIR (TrueFidelity Low, Medium, High). The volumes of 432 nodules (18 nodules x 6 doses x 4 reconstructions) were measured by five independent observers in a semi-automatic fashion. Mean percentage error in nodule volume measurements was assessed for all reconstructions and dose levels, with respect to the ground truth (high dose scan, 11 mGy). Subsequently, data were stratified per nodule type. A smaller absolute percentage error indicates a higher accuracy.

Results or Findings: In general, mean % errors decreased with increasing dose. On average, errors were significantly lower with TrueFidelity (3.6/3.4/3.0% for Low/Medium/High) than with ASIR-V (4.1%), for all dose levels (p=0.001). With increasing DLIR level, errors decreased for the lower dose range (0.2-0.8 mGy), while for higher doses (1.5-6 mGy) values were comparable. When stratifying per morphology, the largest error was found for lobulated nodules (4.8%), followed by spiculated (3.3%) and spherical (2.8%) nodules.

Conclusion: In chest CT, volume measurements with TrueFidelity showed a significantly higher accuracy compared to ASIR-V, for all dose levels and all nodule types. Lobulated nodules showed the highest absolute error in volume measurements.

Limitations: Only phantom images were used.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 104-6 - The value of virtual monoenergetic images and electron density map derived from dual-layer spectral detector CT in differentiating benign from malignant pulmonary ground glass nodules (8 min)

Jiansheng Qiu; Nan jing / China

Author Block: J. Qiu¹, X. Chen², X. Xin¹, B. Zhang¹; ¹Nanjing/CN, ²Suzhou/CN

Purpose or Learning Objective: To investigate the clinical value of virtual monoenergetic images (VMI) and electron density map (EDM) derived from the dual-layer spectral detector CT (DLCT) in the differential diagnosis of benign and malignant pulmonary ground glass nodules (GGN).

Methods or Background: 27 benign and 38 malignant GGN were retrospectively studied. The 120kVp polyenergetic image (PI), EDM, and 40-80keV VMI were reconstructed, in which the CT value, electron density (ED), and CT features were analysed between benign and malignant lesions. The CT features included lesion size, location, shape, edge, internal structure, adjacent structure, and nodule type. The statistically significant CT signs and quantitative parameters were analysed by logistic regression analysis to obtain the independent risk factors for GGN malignancy, then all the independent risk factors were united to analyse by ROC curve.

Results or Findings: The lesion shape, spiculation, lobulation, location, size, CT value in PI, 40-80 keV VMI, and ED were significant different between two groups (P<0.05), which were enrolled in logistic regression analysis by taking if GGN was malignant as the dependent variable. The EDM had higher efficacy than other VMI with AUC 0.722. Logistic regression analysis results showed that ED (P=0.044), lesion size (P=0.004), and spiculation (P=0.002) were independent risk factors for GGN malignancy. ROC analysis showed that the AUC of ED, size, spiculation, and a combination of the three were 0.722, 0.772, 0.698, and 0.885, respectively. The AUC of combined diagnosis was the largest with sensitivity specificity of 92.1% and 74.1%, respectively.

Conclusion: The diagnostic efficiency of DLCT images in differential diagnosis of pulmonary GGN, EDM has a higher efficiency than other VMI, and the diagnostic efficiency is further improved when EDM combines with lesion size and spiculation is analysed comprehensively.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 104-7 - CT texture analysis of pulmonary neuroendocrine tumours: associations with tumour grading and proliferation (8 min)

Jakob Leonhardi; Leipzig / Germany



Author Block: J. Leonhardi, J. Pappisch, A-K. Höhn, H. Wirtz, T. Denecke, A. Frille, H-J. Meyer; Leipzig/DE

Purpose or Learning Objective: Texture analysis derived from computed tomography (CT) might be able to provide clinically relevant imaging biomarkers and might be associated with histopathology features in tumours. The present study sought to elucidate possible associations between texture features derived from CT images with proliferation index Ki-67 and grading in pulmonary neuroendocrine tumours.

Methods or Background: 38 patients (n= 22 females, 58%) with a mean age of 60.8 ± 15.2 years were included into this retrospective study. Texture analysis was performed using the free available Mazda software. All tumours were histopathologically confirmed. Discrimination and correlation analyses were performed.

Results or Findings: In discrimination analysis, "S(1,1)SumEntrp" was significantly different between typical and atypical carcinoids (mean 1.74 ± 0.11 versus 1.79 ± 0.14 , $p=0.007$). The correlation analysis revealed a moderate positive association between Ki-67 index with the first order parameter kurtosis ($r=0.66$, $p=0.001$). Several other texture features were associated with Ki-67 index, the highest correlation coefficient showed S(4,4)InvDfMom" ($r=0.59$, $p=0.004$).

Conclusion: Several texture features derived from CT were associated with proliferation index Ki-67 and might therefore be a valuable novel biomarker in pulmonary neuroendocrine tumours. "Sumentrp" might be a promising parameter to aid in the discrimination between typical and atypical carcinoids.

Limitations: First, it is a retrospective study with possible known inherent bias. Second, the patient sample is rather small based upon pNET low prevalence among lung tumours. Third, only 60% of patients had a Ki-67 index available, which further reduces the size of the patient sample.

Ethics committee approval: It received ethical approval from the local ethics committee at the Medical Faculty (IRB00001750, AZ: 259/18-ek) on July 31 2018.

Funding for this study: No funding was provided for this study.

RPS 104-8 - Impact of an automatic lung nodule detection algorithm on the evaluation of routine chest x-ray examinations and referral for chest CT: a retrospective observational study (8 min)

Alexander Favril; Antwerp / Belgium

Author Block: A. Favril, L. Vael, A. Snoeckx, C. Franck; Edegem/BE

Purpose or Learning Objective: Chest x-ray is frequently performed in daily clinical practice. The detection of lung nodules on radiographs is an indication for chest CT referral. Since lung nodule detection in chest x-ray has a low accuracy, the sensitivity can be improved by computer aided diagnosis (CAD) systems. However, the risk of large false positive rates can lead to redundant referrals for chest CT and contribute to unnecessary radiation exposure. In this retrospective study, we investigated the impact of an automatic lung nodule detection (ALND) algorithm on the evaluation of chest radiographs and referral for chest CT.

Methods or Background: Between July and September 2020, 1468 consecutive routine PA chest radiographs of adult, non-pregnant patients were retrospectively collected at a tertiary care center. Images were screened for positive ALND annotations in combination with referral for chest CT. In addition, the correlation of the ALND result with a true positive lung nodule was investigated.

Results or Findings: The ALND algorithm detected 591 lung nodules on 524 (36%) chest radiographs. Among these, 12 were indicated as known lesions, 301 were reported as false positive, whereas 220 ALND findings were not reported. On 9% (49/524) of the radiographs, 58 nodules were deemed suspicious and referred for CT. In 55% (27/49) of the cases a CT examination was actually performed of which in 56% (15/27) of the patients a nodular lesion was found.

Conclusion: In approximately 1 out of 10 patients, a positive annotation by an ALND algorithm leads to chest CT referral. When a subsequent chest CT is performed, the suspected nodule correlates with a true lung nodule in more than half of the investigated patients.

Limitations: Not applicable.

Ethics committee approval: Approved.

Funding for this study: Not applicable.

SF 1 - Imaging signs in neuroradiology

Categories: Head and Neck, Neuro, Oncologic Imaging

ETC Level: LEVEL II+III

Date: March 2, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderator:

Charles Anthony Jozef Romanowski; Sheffield / United Kingdom

SF 1-1 - Chairperson's introduction (2 min)

Charles A.J. Romanowski; Sheffield / UK

SF 1-2 - Lesions of the basal ganglia and thalami (15 min)

Joanna Bladowska; Wroclaw / Poland

1. To review the anatomy of the basal ganglia and thalami.
2. To describe the imaging findings of the most common pathologies.
3. To discuss the key findings that may be useful for differential diagnosis.

SF 1-3 - Pseudotumours in neuroradiology and head and neck imaging (15 min)

Bernhard F. Schuknecht; Zurich / Switzerland

1. To identify and categorise pseudotumours based on location and imaging signs.
2. To tailor examination techniques to specific pathologies.
3. To differentiate pseudotumours from alternative/differential diagnoses.

SF 1-4 - White spots of the white matter (15 min)

Joanna M. Wardlaw; Edinburgh / UK

1. To discuss white spots of vascular origin, known as white matter hyperintensities (WMH), or white matter lesions of presumed vascular origin.
2. To review the relevance of the patient's age and the risk of dementia, stroke, and death.
3. To differentiate from other common causes of WMH and review the pros and cons of visual rating scales and computational volume measures.
4. To discuss the available interventions to prevent WMH worsening.

SF 1-5 - Panel discussion: Black spots in the brain: cerebral microhaemorrhages (13 min)



CUBE-1 - Things you should better not do at home - Long odyssey until the correct diagnosis

Categories: Interventional Radiology

Date: March 2, 2022 | 08:00 - 08:45 CET

Moderators:

Christian Loewe; Vienna / Austria

Maximilian de Bucourt; Berlin / Germany

CUBE-1-1 - Introduction

Christian Loewe; Vienna / Austria

Maximilian de Bucourt; Berlin / Germany

CUBE-1-2 - Long odyssey until the correct diagnosis

Maciej Pech; Magdeburg / Germany

CUBE-1-3 - Discussion



OC - Opening Ceremony

Date: March 2, 2022 | 09:00 - 09:30 CET

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

- Opening Ceremony (30 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

**IND 3 - Prostate biopsy: mpMRI-TRUS fusion imaging and second-eye ultrasound & Fusion Ultrasound:
A luxury that is becoming a necessity for modern interventions**

Date: March 2, 2022 | 09:30 - 10:30 CET

Moderators:

Huixiong Xu; shanghai / China

Alexis Kelekis; Athens / Greece

IND 3-1 - (10 min)

EXAMPLE: 1. To learn how to diagnose reversible cerebral vasoconstriction syndrome.

IND 3-2 - (20 min)

IND 3-3 - (20 min)

RT 2 - Adaptations of screening programmes during the COVID pandemic: what is the impact?

Categories: Education, Multidisciplinary, Oncologic Imaging, Professional Issues

ETC Level: LEVEL II+III

Date: March 2, 2022 | 09:30 - 10:30 CET

Moderators:

Michael Fuchsjäger; Graz / Austria

Regina G. H. Beets-Tan; Amsterdam / Netherlands

RT 2-1 - Chairpersons' introduction (2 min)

Michael H. Fuchsjäger; Graz / Austria

Regina G.H. Beets-Tan; Amsterdam / Netherlands

1. To learn about the status of colorectal cancer screening in Europe and know how the screening program was affected by the COVID-19 pandemic.
2. To learn about the effects and lessons learned from changing and adapting cancer screening programmes during Covid-pandemic.

RT 2-2 - Changes and adaptations in breast cancer screening during COVID pandemic (10 min)

Fiona J. Gilbert; Cambridge / UK

RT 2-3 - Changes and adaptations in bowel cancer screening during COVID pandemic (10 min)

Evelien Dekker; Amsterdam / Netherlands

RT 2-4 - Discussion (38 min)

Evelien Dekker; Amsterdam / Netherlands

Fiona J. Gilbert; Cambridge / UK

Geerard L. Beets; Amsterdam / Netherlands

RPS 206 - Advanced prostate cancer imaging

Categories: Genitourinary, Hybrid Imaging, Molecular Imaging, Oncologic Imaging, Translational Imaging

Date: March 2, 2022 | 09:30 - 10:30 CET

CME Credits: 1

Moderators:

Tristan Barrett; Cambridge / United Kingdom

Lorenzo E. Derchi; Genoa / Italy

RPS 206-2 - A pilot study of 68Ga-PSMA11 and 68Ga-RM2 PET/MRI for evaluation of prostate cancer response to high intensity focused ultrasound (HIFU) therapy (8 min)

Heying Duan; Stanford / United States

Author Block: H. Duan, V. Ferri, P. Ghanouni, B. Daniel, G. Davidzon, C. Mari Aparici, G. Sonn, C. Kunder, A. Iagaru; Stanford, CA/US

Purpose or Learning Objective: High intensity focused ultrasound (HIFU) is a non-invasive local treatment procedure that uses thermal energy to ablate prostate cancer (PC) lesions. In this study, we evaluated 68Ga-RM2 and 68Ga-PSMA11 PET/MRI before and after treatment with HIFU to assess the accuracy of localisation and response to treatment.

Methods or Background: Fourteen men with newly diagnosed PC were prospectively enrolled. Pre HIFU, patients underwent prostate biopsy, multiparametric MRI (mpMRI), 68Ga-PSMA11 and 68Ga-RM2 PET/MRI. Response to HIFU treatment was assessed with 68Ga-PSMA11 and 68Ga-RM2 PET/MRI. For localisation, the prostate was divided into 12 segments (apex, mid, and base, medial and lateral respectively, left and right) using PET/MRI data and MIM software. Maximum standardised uptake values (SUVmax) of PC lesions and the background of each segment were collected.

Results or Findings: Pre HIFU biopsy revealed 23 lesions of which 18 were clinically significant with Gleason score (GS) ≥ 7 and mpMRI showed 15 lesions with 13 being \geq PIRADS 4. 68Ga-PSMA11 and 68Ga-RM2 PET/MRI each identified 25 positive lesions including all index lesions. Post-HIFU imaging was available in 9 participants. 68Ga-PSMA11 and 68Ga-RM2 PET/MRI were negative for the respective treated area in all patients. SUVmax of target lesions decreased significantly after HIFU for both radiopharmaceuticals (68Ga-PSMA11: from 12.63 ± 10.63 [3.2736.90] to 3.58 ± 3.37 [1.6512.23], $P=0.03$; 68Ga-RM2: from 8.56 ± 4.96 [1.9217.37] to 2.72 ± 0.95 [1.494.12], $P=0.00$). Pretreatment prostate-specific antigen (PSA) and PSA density were 8.23 ± 3.60 ng/mL and 0.19 ± 0.09 ng/mL², respectively, and decreased significantly after HIFU by 55% to 4.00 ± 2.42 ng/mL ($0.107.97$ ng/mL, $P=0.00$) and 0.10 ± 0.07 ng/mL² ($0.000.24$ ng/mL², $P=0.00$).

Conclusion: Our preliminary results show that both 68Ga-PSMA11 and 68Ga-RM2 PET/MRI identified the dominant lesion for HIFU ablation pretreatment and were able to accurately verify response to treatment in 100%.

Limitations: This study is limited by the small number of participants.

Ethics committee approval: The ethics committee approval was obtained.

Funding for this study: This study is partially funded by GE Healthcare.

RPS 206-3 - A pilot study of 68Ga-PSMA11 and 68Ga-RM2 PET/MRI for biopsy guidance in patients with suspected prostate cancer (8 min)

Heying Duan; Stanford / United States



Author Block: H. Duan, V. Ferri, P. Ghanouni, B. Daniel, G. Davidzon, C. Mari Aparici, G. Sonn, C. Kunder, A. Iagaru; Stanford, CA/US

Purpose or Learning Objective: Targeting of lesions seen on multiparametric MRI (mpMRI) improves prostate cancer (PC) detection at biopsy. However, 20-65% of highly suspicious lesions on MRI prove to be false positives (FP) at biopsy. We evaluated the potential utility of 68Ga-PSMA11 and 68Ga-RM2 PET/MRI for biopsy guidance in patients with suspected PC and prior negative biopsy or equivocal MRI.

Methods or Background: Ten men with suspected PC were prospectively enrolled to undergo 68Ga-PSMA11 and 68Ga-RM2 PET/MRI, including mpMRI. The prostate was divided into 12 segments (apex, mid, and base, lateral and medial, respectively, left and right) using PET/MRI data and MIM software. Maximum standardised uptake values (SUVmax) of suspected PC lesions and background for each segment were collected. Biopsies after PET/MRI included 1 core through each of the 12 segments and targeted sampling of any lesions seen on PET.

Results or Findings: PSA and PSA density were 10.77 ± 6.27 ng/mL and 0.19 ± 0.11 ng/mL², respectively. mpMRI was negative in 5 patients, 4 showed PIRADS 4 and 1 PIRADS 5. 68Ga-PSMA11 identified 25 lesions of which 52% were verified PC and 68Ga-RM2 PET/MRI showed 26 lesions with PC verification in 50%. PET/MRI guided biopsy led to the additional finding of 3 clinically significant tumours and 2 GS 6 cancers. For 68Ga-PSMA11, mean SUVmax for true positives (TP) was slightly higher than FP, however not statistically significant whereas for 68Ga-RM2, SUVmax of TP PC lesions were significantly higher than FP (11.56 ± 9.11 [5.57 40.69] vs 7.93 ± 3.74 [3.73 18.21], $P=0.007$).

Conclusion: Our preliminary results show that 68Ga-PSMA11 and 68Ga-RM2 PET/MRI are feasible for biopsy guidance in suspected PC, and most importantly identified additional clinically significant cancers not seen on mpMRI.

Limitations: This study is limited by the small number of patients.

Ethics committee approval: The ethics committee approval was obtained.

Funding for this study: This study is partially funded by GE Healthcare.

RPS 206-4 - Hyperpolarised [1-13C]lactate production correlates with the percent gleason pattern 4 in human prostate cancer (8 min)

Nikita Sushentsev; Cambridge / UK

Author Block: N. Sushentsev, M. McLean, A. Warren, F. A. Gallagher, T. Barrett; Cambridge/UK

Purpose or Learning Objective: To evaluate the ability of hyperpolarised [1-13C]pyruvate magnetic resonance imaging (HP 13C-MRI) to visualize biopsy-proven areas of prostate cancer (PCa) and correlate tumour [1-13C]lactate production with standard pathologic and imaging biomarkers of tumour aggressiveness.

Methods or Background: Patients with MR-visible biopsy-proven PCa scheduled for radical prostatectomy underwent 3T HP 13C-MRI, with tumour-derived signal-to-noise ratios (SNR) of pyruvate, lactate, and total carbon calculated in addition to [1-13C]pyruvate-to-[1-13C]lactate conversion rate (kPL). Multiparametric MRI (mpMRI) of the prostate was subsequently performed on the same magnet, with apparent diffusion coefficient (ADC) values calculated automatically and extracted from the same tumour regions. Whole-mount surgical sections were stained with haematoxylin and eosin, with tumour grade and per cent Gleason pattern 4 (%GP4) evaluated by an experienced genitourinary pathologist.

Results or Findings: The study included 10 patients with 15 lesions, of which 2, 11, and 2 harboured grade 1, 2, and 3 disease, respectively. 2/15 lesions were not reported prospectively on mpMRI and were detected retrospectively on HP 13C-MRI using whole-mount pathology as reference. Spearman's correlation analysis revealed the presence of strong correlations between lactate SNR and %GP4 ($r_s=0.65$, $P=0.03$), lactate SNR and ADC ($r_s=-0.69$, $P=0.02$), %GP4 and ADC ($r_s=-0.62$, $P=0.03$), as well as total carbon SNR and kPL ($r_s=0.62$, $P=0.04$).

Conclusion: HP 13C-MRI was superior to mpMRI for evaluating the true burden of disease in patients with multifocal PCa, with lesion-derived [1-13C]lactate production acting as a metabolic surrogate of tumour aggressiveness. Non-invasive assessment of %GP4 using HP 13C-MRI may be used clinically to improve the selection of suitable candidates for active surveillance, for which %GP4 is critical.

Limitations: Not applicable.

Ethics committee approval: NREC East of England, 16/EE/0205.

Funding for this study: This study was funded by the Prostate Cancer UK, Cancer Research UK.

RPS 206-5 - Differential hyperpolarised [1-13C]Lactate labelling in benign and malignant prostate is driven by a complex interplay between perfusion, cellularity, and cell metabolism (8 min)

Nikita Sushentsev; Cambridge / UK

Author Block: N. Sushentsev, M. McLean, A. Warren, T. Barrett, F. A. Gallagher; Cambridge/UK

Purpose or Learning Objective: To identify biological mechanisms underpinning differential hyperpolarised [1-13C]lactate labelling in prostate cancer (PCa) and the benign prostate (BP) in patients undergoing radical prostatectomy following hyperpolarised [1-13C]pyruvate magnetic resonance imaging (HP-13C-MRI).

Methods or Background: All patients underwent 3T HP-13C-MRI, with a signal-to-noise ratio (SNR) of lactate derived from areas of PCa and contralateral BP as derived from whole-mount histopathology (WMH). Multiparametric MRI of the prostate was subsequently performed in the same sitting, with apparent diffusion coefficient (ADC) and Ktrans values extracted from identical regions-of-interest. Matching WMH sections were used for immunohistochemical analysis of monocarboxylate transporters (MCT) 1 and 4. RNAscope was used to quantify mRNA expression of lactate dehydrogenase (LDH) subunits A and B, alongside pyruvate dehydrogenase E1 subunit alpha 1 (PDHA1).

Results or Findings: The study included 8 patients with 10 low-to-intermediate risk lesions. Lactate SNR, Ktrans, and WMP-derived cell density were significantly higher in PCa compared to BP (10.76 vs 1.66, 0.39 min⁻¹ vs 0.11 min⁻¹, and 3227.0 cells/mm² vs 1944.0 cells/mm²; P<0.0001, 0.002, and 0.005, respectively), and ADC values were significantly lower in PCa compared to BP (922.4 10⁻⁶ mm²/s vs 1351.0 10⁻⁶ mm²/s; P=0.002). MCT1 and MCT4 did not differ between the two tissue types (P=0.796 and 0.684, respectively). Total LDH density and LDHA/PDHA1 mRNA expression ratio were, however, significantly higher in BP compared to PCa (8483.0 103 copies/mm² vs 5389.0 103 copies/mm² and 1.15 vs 0.68; P=0.004 and 0.03, respectively).

Conclusion: Lactate SNR was significantly higher in areas of low-to-intermediate risk PCa despite significant overexpression of glycolytic enzymes in BP. This may be explained by the increased perfusion/permeability and cellularity of tumour areas, leading to the increased hyperpolarised [1-13C]pyruvate delivery and [1-13C]lactate labelling.

Limitations: Not applicable.

Ethics committee approval: NREC East of England, 16/EE/0205.

Funding for this study: This study was funded by the Prostate Cancer UK, CRUK.

RPS 206-6 - 68Ga PSMA PET/CT initial Egyptian experience in newly diagnosed cancer prostate patients: how we report and stage our patients (8 min)

Noha Taha; Cairo / Egypt

Author Block: N. Taha, M. Shalaby, J. AbdAllah, Y. O. H. Omar; Cairo/EG

Purpose or Learning Objective: To evaluate the role of 68Ga PSMA PET/CT in the staging of patients with pathologically proved prostatic adenocarcinoma.

Methods or Background: Prostate cancer is the 2nd most common male malignancy and is the 4th leading cause of death from malignancies. The key issue for optimal patient management is accurate pretreatment staging. 50 patients with pathologically proven prostate cancer, without any treatment or intervention, were included in this study. The PET/CT findings were correlated with the pathology reports, Gleason score and PSA levels. The patients were evaluated for local staging (T stage), including prostatic lesions extra-prostatic extension and seminal vesicles invasion, the regional nodal staging (N stage), and distant metastatic spread (M stage), including distant nodal, osseous and visceral metastases.

Results or Findings: A significant statistical relationship was found between PSA level, Gleason score and the findings in PET/CT including the pathological grade of the prostatic lesions with their extensions, the regional nodal deposits and the distant metastatic deposits. 68Ga PSMA shows 94% sensitivity in detecting prostatic lesions and its sensitivity increased with the increase of the PSA level of the patient, also it shows a significant P-value in detecting extra-prostatic spread either regional or distant.

Conclusion: 68Ga PSMA PET/CT is a powerful staging tool showing high sensitivity and specificity in the staging of patients with recently diagnosed prostate cancer.

Limitations: Nothing significant.

Ethics committee approval: This study was ethically approved from the ethical committee at the Faculty of Medicine, Ain Shams University.

Funding for this study: No funding was received for this study.

RPS 206-7 - Detection of prostatic cancer lymph nodes metastases using radiomics in 68 Ga-PSMA PET/CT (8 min)

Xavier Alejandro Ballesteros; Monterrey / Mexico



Author Block: X. A. G. Ballesteros, A. E. Mercado Sánchez, H. Solis Lara; Monterrey/MX

Purpose or Learning Objective: Prostate cancer is the third leading cause of death in men who die from malignant neoplasia, so new tools are being sought to objectively predict the probability of malignant infiltration of the lymph nodes for the adequate staging of the disease. Radiomics is the process of converting medical images into data allowing the extraction of quantitative characteristics. The aim of the study was the analysis of radiomic features of lymph nodes, using 68Ga-PSMA PET/CT, as a standard reference.

Methods or Background: The design was a retrospective, cross-sectional, analytical study, which was developed with a total of 41 patients with prostate cancer diagnosis randomly selected from a database of 253 patients. 3DSlicer software was used to obtain radiomic features. Sixteen nodes were segmented per patient (pelvis, retroperitoneum, mediastinal, axillary, and cervical). The nodes segmented were those with the highest SUVmax value in the positive studies and those with the highest short axis in the negative studies.

Results or Findings: Thirty-three variables of shape and textural analysis of radiomic tomographic features were found that allow differentiating between positive and negative lymph nodes for malignancy.

Conclusion: Radiomic analysis of lymph nodes in prostate cancer could detect the nodal metastatic disease even in lymph nodes of normal morphology and size.

Limitations: The limitations of our study were the small sample size and that it had a retrospective design, but it was performed by a blinded observer. Also, the PET/CT images were evaluated and segmented by a single observer, so the reproducibility of the results between different observers was not evaluated.

Ethics committee approval: This study was approved by the ethics in investigation committee with the number RA20-00009.

Funding for this study: This study was funded by the radiology department of "Dr. José Eleuterio González" University Hospital.

RPS 206-8 - Combined use of 68Ga-PSMA-11 PET/CT and multiparametric MR imaging in patients with prostate cancer (8 min)

Muzaffar Maksudov; Tashkent / Uzbekistan

Author Block: M. Maksudov, U. Khaydarov; Tashkent/UZ

Purpose or Learning Objective: To present the results of gallium 68 (68Ga) prostate-specific membrane antigen (PSMA)-11 PET/CT and magnetic resonance (MR) imaging in patients with prostate cancer.

Methods or Background: Forty-five men who were scheduled for radical prostatectomy with pelvic lymph node dissection were recruited for this study. Multiparametric MR imaging (including diffusion-weighted imaging, T2-weighted imaging, and dynamic contrast material-enhanced imaging) and PET/CT data were correlated with results of final pathologic examination and pelvic nodal dissection to yield diagnostic accuracy. PET/CT with 68Ga-PSMA-11 was performed according to the whole-body protocol.

Interpretation of images was carried out visually and quantitatively with the calculation of SUVmax. A mean dose of $3.8 \text{ mCi} \pm 0.6$ ($140.6 \text{ MBq} \pm 22.2$) of 68Ga-PSMA-11 was administered. Whole-body images were acquired starting 60-90 minutes after injection by using a Philips Ingenuity TF PET/CT scanner. Metabolic parameters were compared by using a paired t-test and were correlated with clinical and histopathologic variables.

Results or Findings: High focal (24 cases) or diffuse (21 cases) 68Ga-PSMA-11 uptake was found in the prostate gland in all patients with primary prostate cancer. Whereas multiparametric MR imaging depicted PI-RADS (Prostate Imaging Reporting and Data System) 4 or 5 lesions in 36 patients and PI-RADS 3 lesions in five patients. Pathologic examination confirmed prostate cancer in all patients. In 18 patients, nodal metastases were additionally diagnosed.

Conclusion: 68Ga-PSMA-11 PET/CT has a high potential in the work-up of prostate cancer patients, including primary diagnosis and staging, while MR imaging provides detailed anatomic guidance. The combined use of both imaging methods provides valuable diagnostic information and may inform the need for pelvic node dissection.

Limitations: Limitations are not required.

Ethics committee approval: Approved by Ministry of Health of Uzbekistan

Funding for this study: No funding was received for this study.



SF 2c - The many faces of metastases

Categories: Abdominal Viscera, Chest, Hybrid Imaging, Musculoskeletal, Oncologic Imaging

ETC Level: LEVEL II

Date: March 2, 2022 | 09:30 - 10:30 CET

CME Credits: 1

Moderator:

Andrea Laghi; Roma / Italy

SF 2c-1 - Chairperson's introduction (2 min)

Andrea Laghi; Rome / Italy

SF 2c-2 - Pulmonary metastases: not always just nodules (13 min)

Cornelia M. Schaefer-Prokop; Amersfoort / Netherlands

1. To describe typical and atypical imaging features of pulmonary metastases.
2. To demonstrate the appropriate imaging workflow to improve characterisation.
3. To discuss patient management (follow-up, tissue sampling, and surgery).

SF 2c-3 - Typical and atypical abdominal metastases (13 min)

Alain Luciani; Créteil / France

Co-author: Edouard Reizine; Créteil/FR

1. To describe typical and atypical imaging features of abdominal metastases.
2. To demonstrate the appropriate imaging workflow to improve characterisation.
3. To discuss patient management (follow-up, tissue sampling, and surgery).

SF 2c-4 - Typical and atypical skeletal metastases (13 min)

Frédéric E. Lecouvet; Brussels / Belgium

1. To describe typical and atypical imaging features of skeletal metastases.
2. To demonstrate the appropriate imaging workflow to improve characterisation.
3. To discuss patient management (follow-up, tissue sampling, and surgery).

SF 2c-5 - Pitfalls of metastatic disease on PET/CT (13 min)

Barbara Malene Fischer; London / UK

1. To describe common and uncommon radiotracer uptakes mimicking metastatic disease.
2. To discuss pitfalls occurring with different radiotracers.
3. To learn how to minimise pitfalls on PET/CT.

SF 2c-6 - Panel discussion: What are the lessons learned? (6 min)



RC 212 - Artificial intelligence (AI) applications in paediatrics

Categories: Artificial Intelligence & Machine Learning, Cardiac, Imaging Informatics, Musculoskeletal, Paediatric Imaging

ETC Level: LEVEL III

Date: March 2, 2022 | 09:30 - 10:30 CET

CME Credits: 1

Moderator:

Erich Sorantin; Graz / Austria

RC 212-1 - Chairperson's introduction (5 min)

Erich Sorantin; Graz / Austria

RC 212-2 - Human versus artificial intelligence (15 min)

Loukas G. Astrakas; Ioannina / Greece

1. To understand the basic principles of AI.
2. To learn about the current limitations of AI.
3. To discuss the role of AI in supporting paediatric radiologists.

RC 212-3 - Current and emerging chest applications (15 min)

Steven Schalekamp; Nijmegen / Netherlands

1. To understand the current spectrum of available AI applications for chest radiology.
2. To learn about the emerging AI applications within paediatric chest radiology.
3. To discuss the future directions of AI in paediatric chest radiology.

RC 212-4 - Current and emerging musculoskeletal applications (15 min)

Amaka C. Offiah; Sheffield / UK

1. To understand the current spectrum of available AI applications for paediatric musculoskeletal radiology.
2. To learn about the emerging AI applications within paediatric musculoskeletal radiology.
3. To discuss the future directions of AI in paediatric musculoskeletal radiology.

RC 212-5 - Panel discussion: How can paediatric radiologists acquire the large datasets required to develop robust AI models? (10 min)



IND 4 - Interview with Rob Walton (GE Healthcare): The Future of Healthcare - Accelerated Pace of Change

Date: March 2, 2022 | 10:45 - 11:00 CET

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

IND 4-1 - Accelerating Cancer Care Pathways - 5 Ways to Detect and Diagnose Earlier (15 min)

Rob Walton; United Kingdom

Join us when ESR President Prof. Regina Beets-Tan interviews Rob Walton, President & CEO GE Healthcare EMEA, about GE Healthcare's vision for the "Future of Healthcare".

IND 48 - NAEOTOM Alpha - CT redefined

Date: March 2, 2022 | 10:45 - 11:15 CET

IND 05 - Keeping pace with CT technology and contrast medium usage

Categories: Abdominal, Cardiac, Cardiovascular, Contrast Media, CT, Education, General Radiology, Oncologic Imaging, Tumour

Date: March 2, 2022 | 11:00 - 12:00 CET

Moderator:

Mathias Prokop; Nijmegen / Netherlands



RC 314 - Evolving research and practice in orthopaedics

Categories: Imaging Methods, Musculoskeletal, Radiographers, Research

Date: March 2, 2022 | 11:30 - 12:30 CET

CME Credits: 1

Moderators:

Nicholas Hans Woznitza; London / United Kingdom

Maximilian F. Reiser; Munich / Germany

RC 314-1 - Chairpersons' introduction (5 min)

Nicholas Hans Woznitza; London / UK

Maximilian F. Reiser; Munich / Germany

RC 314-2 - Applications of 3D bioprinting in MSK (15 min)

Stefano Durante; Bologna / Italy

1. To summarise musculoskeletal 3D bioprinting technology.
2. To compare the current achievements of 3D bioprinting in in-vivo applications.
3. To discuss the future potential of 3D cell-printing technology.

RC 314-3 - Medical image analysis to optimise surgical planning (15 min)

Junning Chen; Exeter / UK

1. To describe examples of virtual surgery and computer-aided surgery.
2. To discuss the framework for converting images into models.
3. To identify the challenges in medical imaging for computer-aided techniques.

RC 314-4 - Enhancing paediatric MSK imaging using low dose bi-plane technology (15 min)

Bo R. Mussmann; Odense / Denmark

1. To describe bi-plane scanner technology.
2. To discuss the clinical application of bi-plane technology.
3. To distinguish the benefits and challenges of bi-plane imaging for paediatric patients.

RC 314-5 - Panel discussion: Translating cutting edge MSK imaging innovations into daily practice (10 min)



TS 3 - Acute pancreatitis

Categories: Abdominal Viscera, GI Tract, Imaging Methods

ETC Level: LEVEL I+II

Date: March 2, 2022 | 11:30 - 12:30 CET

CME Credits: 1

Moderator:

Riccardo Manfredi; Roma / Italy

TS 3-2 - Atlanta Classification of acute pancreatitis (30 min)

Thomas Bollen; Nieuwegein / Netherlands

1. To understand grading of acute pancreatitis using the Atlanta classification.
2. To learn about the clinical impact of the Atlanta classification.
3. To understand the follow-up of acute pancreatitis.

TS 3-3 - Role of imaging (30 min)

Charikleia Triantopoulou; Athens / Greece

1. To learn about diagnosing acute pancreatitis.
2. To understand how to apply the Atlanta classification to imaging.
3. To learn about new trends in the diagnosis of acute pancreatitis.

RPS 301a - Upper abdominal imaging: what's new?

Categories: Abdominal Viscera, Imaging Methods, Oncologic Imaging, Research

Date: March 2, 2022 | 11:30 - 12:30 CET

CME Credits: 1

Moderators:

Christoforos Stoupis; Maennedorf / Switzerland

Valérie Vilgrain; Clichy / France

RPS 301a-2 - Quantitative ultrasound assessment of hepatic steatosis with TAI and TSI in NAFLD patients (8 min)

Aladár Rónaszéki; Budapest / Hungary

Author Block: A. D. Rónaszéki, B. K. Budai, R. Stollmayer, B. Csongrády, K. Hagymási, I. Kalina, G. Györi, P. Maurovich-Horvat, P. N. Kaposi-Novák; Budapest/HU

Purpose or Learning Objective: To assess the feasibility of tissue attenuation imaging (TAI) and tissue scatter distribution imaging (TSI) for ultrasound-based quantification of liver steatosis in nonalcoholic fatty liver disease (NAFLD).

Methods or Background: We prospectively enrolled 101 participants with suspected NAFLD. RS85A ultrasound scanner was used with TAI and TSI applications. Patients were divided into $\leq 5\%$, 5%-10%, and $\geq 10\%$ groups based on magnetic resonance imaging proton density fat-fraction (MRI-PDFF). Spearman's correlation, logistic regression and area under the receiver operating characteristic curve (AUROC) were calculated for both TAI and TSI. Interobserver reliability was assessed with the intraclass correlation coefficient (ICC).

Results or Findings: Both TAI ($\rho=0.78$, $P<0.001$) and TSI ($\rho=0.68$, $P<0.001$) showed a significant correlation with MRI-PDFF. TAI overperformed TSI in the detection of both $\geq 5\%$ MRI-PDFF (AUROC=0.89 vs. 0.87) and $\geq 10\%$ (AUROC=0.93 vs. 0.86). In linear regression analysis, MRI-PDFF proved to be an independent predictor of both TAI ($\beta=1.03$; $P<0.001$) and TSI ($\beta=50.9$; $P<0.001$); while liver stiffness ($\beta=-0.86$; $P<0.001$) was negatively associated with TSI. Interobserver analysis showed excellent reproducibility with TAI (ICC=0.95) and moderate reproducibility with TSI (ICC=0.73).

Conclusion: TAI and TSI could be used successfully to measure the severity of hepatic steatosis in clinical practice.

Limitations: Limitations were single-centre study design, a small number of participants, mixed aetiology of NAFLD, selection bias, lack of histological samples.

Ethics committee approval: The present study has been approved by the regional and institutional committee of science and research ethics of our University (SE-RKEB 140/2020).

Funding for this study: The authors received no specific funding.

RPS 301a-3 - Spleen volume-based non-invasive criteria can identify compensated cirrhotic patients at high risk of decompensation: a multi-centre study (8 min)

Qian Yu; Nanjing / China

Author Block: Q. Yu, Y. Wang, S. Ju; Nanjing/CN

Purpose or Learning Objective: Non-invasive criteria to stratify liver decompensation risk remained an unmet need in patients with compensated cirrhosis. We aimed to develop and validate a non-invasive model based on spleen volume and simple serum markers to predict decompensation in compensated cirrhotic patients.

Methods or Background: 239 compensated cirrhotic patients were enrolled from three centres in China from January 2016 to June 2020 in this retrospective study. They were followed up until the occurrence of liver decompensation. Abdominal CT and laboratory workup were collected at baseline. Spleen volume was measured automatically using an in-house AI algorithm with Dice > 0.98 in spleen segmentation. We used these data to develop a spleen volume-based model to determine the risk of decompensation in the first centre comprising 66 patients (Training cohort). We validated it in the other two centres comprising 94 and 79 patients (Test cohorts 1 and 2). And compared with Child-Pugh score, MELD, and FIB-4.

Results or Findings: 58 patients (24%) developed liver decompensation over a median follow-up of 25 months. Using a combination of spleen volume, PLT, GGT, and Hb, we developed a Spleen-Alert model (Model score > 2.14) to identify patients with compensated cirrhosis at risk of liver decompensation. HR for decompensation in patients with high risk was 13.4 in training and 6.1 and 12.2 in test, respectively. The Spleen-Alert model has good performance to predict high-risk compensated patients at risk of liver decompensation (C-indexes of 0.82 in training and 0.82, 0.77 in two test cohorts), outperforming traditional non-invasive tests (C-indexes from 0.51 to 0.74).

Conclusion: Spleen-Alert model, as a simple and non-invasive criterion, showed considerable performance in stratifying the individual risk of liver decompensation in patients with compensated cirrhosis.

Limitations: No limitations were identified.

Ethics committee approval: The ethics committee approved this study.

Funding for this study: Not applicable.

RPS 301a-4 - Differential diagnosis of adrenal adenomas and metastases using spectral parameters in dual-layer detector spectral CT (8 min)

Wu Lei-di; Zhongshan / China

Author Block: W. Lei-di¹, P. Han², H. Meng-ting², Y. Hong-li², W. Lin-xia², X. Yue², X. Zhang³, Y. Ming²; ¹Zhongshan/CN, ²Wuhan/CN, ³Shanghai/CN

Purpose or Learning Objective: To assess the diagnostic value of spectral parameters in differentiating adrenal adenomas from metastases based on dual-layer detector spectral CT (DLCT).

Methods or Background: One hundred patients with 64 adrenal adenomas and 36 metastases were included eventually. Several spectral parameters of tumours such as the CT values of virtual non-contrast images (CTVNC), slopes of spectral HU curves (s-SHC), and iodine-to-CTVNC ratios were measured on spectral based images in each phase. Receiver operating characteristic (ROC) curves were used to compare the diagnostic values of combined or independent spectral parameters between adenomas and metastases.

Results or Findings: In the venous phase, all spectral parameters were significantly different between adenomas and metastases. Combined spectral parameters showed a better diagnostic performance in the venous phase compared with the arterial or delayed phase. In the venous phase, higher AUC was obtained for iodine-to-CTVNC value compared with the other spectral parameters in the differential diagnosis of adenomas and metastases, with diagnostic sensitivity and specificity of 90.5% and 73.8%, respectively. Higher AUC was also obtained for CTVNC value compared with the other spectral parameters in the differential diagnosis of lipid-rich adenomas and metastases, with diagnostic sensitivity and specificity of 90.9% and 81.8%, respectively. In the differential diagnosis of lipid-poor adenomas and metastases, the AUC for s-SHC value was higher than those of other parameters, with diagnostic sensitivity and specificity of 96.6% and 75.0%, respectively.

Conclusion: On DLCT images, spectral parameters in the venous phase such as iodine-to-CTVNC, CTVNC or s-SHC values have great clinical value in differential diagnosis of adrenal adenomas and metastases.

Limitations: This was a single-centre clinical trial with a relatively small sample and the metastasis group was not pathologically confirmed.

Ethics committee approval: This study was approved by IRB.

Funding for this study: There was no funding of this study.

RPS 301a-5 - Extracellular volume value by using dual-layer spectral detector CT in differentiating subtype of adrenal adenomas (8 min)

Guanglei Tang; Guangzhou / China



Author Block: G. Tang, K. Wang, J. Guan; Guangzhou/CN

Purpose or Learning Objective: To explore the feasibility of adrenal extracellular volume value by using dual-layer detector spectral CT to differentiate subtypes of adrenal adenomas.

Methods or Background: From January 2021 to April 2021, 51 patients with unilateral adrenal adenoma and which underwent adrenal gland delayed enhancement CT using dual-layer detector spectral CT were collected. All patients were confirmed by pathology or clinical diagnosis and further divided into three groups, including non-functional adrenal adenoma (group A, n=22), aldosteronoma (group B, n=18), cortisol adenoma (group C, n=11). Thirty cases without positive adrenal gland findings were collected as the control group (group D) in all subjects who received delayed enhancement CT scans at the same period. The ECV values of the adrenal adenoma in group A, B, C and adrenal gland in group D were calculated by using iodine density as derived from spectral data pertaining to delayed enhancement and compared ECV values of each group.

Results or Findings: The ECV value of group D was the highest in all groups. There was a significant difference between group D and A ($23.97 \pm 4.06\%$ vs. $19.00 \pm 5.75\%$, $P=0.001$), group D and B ($23.97 \pm 4.06\%$ vs. $13.74 \pm 4.27\%$, $P<0.001$), and group D and C ($23.97 \pm 4.06\%$ vs. $8.70 \pm 4.09\%$, $P<0.001$). The ECV value of group A was obviously higher than that in group B ($P=0.001$) and group C ($P<0.001$), and ECV value of group B was obviously higher than that of group C ($P=0.015$).

Conclusion: ECV value of normal adrenal gland is relatively high. We can differentiate adrenal nonfunctional adenomas, aldosteronomas, and cortisol adenomas by ECV values.

Limitations: This is a single-centre study with small sample size. There lacks direct evidence that can prove that increased secretion of adrenal cortisol. All ROIs in this study are manually drawn.

Ethics committee approval: This study was approved by the ethics committee.

Funding for this study: Not applicable.

RPS 301a-6 - Adrenal morphology as an indicator for long-term disease control in adults with classic congenital adrenal hyperplasia (8 min)

Hyo Jeong Lee; Seoul / Korea, Republic of

Author Block: H. J. Lee, T. M. KIM, J. H. Kim, H. Chang, M. H. Choi, J. Y. Cho, s. y. kim; Seoul/KR

Purpose or Learning Objective: Monitoring adults with classical congenital adrenal hyperplasia (CAH) is challenging due to variability in clinical and laboratory settings. Moreover, guidelines for adrenal imaging in CAH are not yet available. We evaluated the relationship between adrenal morphology and disease control status in classical CAH.

Methods or Background: This retrospective, cross-sectional study included 90 adult CAH patients and age and sex-matched healthy controls (n=270). Adrenal volume, width, and tumour presence were assessed using abdominal computed tomography. Correlations of adrenal volume and width with hormonal status were evaluated. The diagnostic performance of adrenal volume and width of patients with CAH for identifying disease control was assessed.

Results or Findings: Adrenal morphology of CAH patients showed hypertrophy (45.6%), normal size (42.2%), and hypotrophy (12.2%). Adrenal tumours were detected in 12 patients (13.3%). The adrenal volume and width of CAH patients were significantly larger than that in the control group (18.2 ± 12.2 vs. 7.1 ± 2.0 cc, 4.7 ± 1.9 vs. 3.3 ± 0.5 mm, $P<0.001$ for both). 17α -hydroxyprogesterone (17-OHP) and androstenedione were the highest in patients with adrenal hypertrophy, followed by normal adrenal gland and adrenal hypotrophy ($P<0.05$ for both). The adrenal volume and width correlated positively with adrenocorticotropic hormone, 17-OHP, 11β -hydroxytestosterone, pregnenolone sulfate, and dehydroepiandrosterone sulfate in both male and female patients ($r = 0.330.95$, $P<0.05$ for all). We obtained the optimal cutoff values of 10.7cc and 4mm for classifying well-controlled patients using adrenal volume and width, respectively (AUC 0.820.88, $P<0.001$ for both).

Conclusion: We may use both adrenal volume and width as reliable quantitative parameters for monitoring patients with classical CAH.

Limitations: Measuring the adrenal volume is time-consuming and laborious compared with measuring the width. To apply in clinical practice, automatic or semi-automatic volumetric assessment of the adrenal gland is warranted.

Ethics committee approval: IRB approval.

Funding for this study: Not applicable.

RPS 301a-7 - Peri-cholecystic liver enhancement using dual-layer spectral CT imaging may predict positive bile cultures in the setting of acute cholecystitis (8 min)

Adam Nevo; Omer / Israel



Author Block: A. Nevo, N. Goldberg, G. Dar, M. Daud, S. Levy, J. Sosna, N. Lev Cohain; Jerusalem/IL

Purpose or Learning Objective: To determine the predictive utility of 50keV mono-energetic imaging features for microbial bile culture positivity and the need for cholecystostomy in patients with suspected acute cholecystitis.

Methods or Background: 69 consecutive patients over a four-year period (2/2017/2021) with clinical and radiological signs of cholecystitis on contrast-enhanced dual-layer spectral CT imaging were retrospectively identified. A ranked score Likert scale was created for three imaging criteria: gallbladder mucosal integrity, pericholecystic liver parenchyma enhancement and fat stranding surrounding the gallbladder. 50keV low-monoenergetic images in the portal venous phase were reviewed by six radiologists on a PACS system at standardised windows (60HU width; 350HU centre). Images were ranked, and scores correlated with laboratory data (WBC, CRP), as well as conventional imaging criteria, including gall bladder size and wall thickness. Correlation to cholecystostomy and bile culture positivity was performed via Chi-Square tests, followed by sensitivity, specificity and odds ratios calculations.

Results or Findings: Robust peri-cholecystic liver enhancement was predictive of positive bile cultures in patients undergoing cholecystostomy ($P = 0.006$; sensitivity 88.9%, specificity 66.7%; odds ratio 16.0 [CI 2.2-117.1]). By contrast, both laboratory markers and four imaging findings including mucosal integrity, peri-cholecystic fat stranding, GB length and wall thickness, showed lower sensitivities (79-82%), specificities (16-21%) and odds ratios (0.67-1.25). Higher scores for adjacent liver enhancement and poorer mucosal wall integrity correlated with cholecystostomy as well ($P < 0.021$, $P < 0.025$ respectively), albeit with lower sensitivity 69.2%, 67.9%, specificity 64.7%, 69.2%, and odds ratios 4.1 and 4.8.

Conclusion: The 50keV mono-energetic imaging feature of prominent pericholecystic liver enhancement may potentially predict bacterial infection in patients with cholecystitis. With further validation, this tool might provide a useful clinical biomarker that can help guide patient treatment.

Limitations: No limitations were identified.

Ethics committee approval: Not applicable.

Funding for this study: No funding was received for this study.

RPS 301a-8 - Abdominal ischaemia and haemorrhage in COVID-19 patients: uncommon but potentially life-treating complications (8 min)

Alice Bonanomi; Como / Italy

Author Block: A. Bonanomi, P. A. Bonaffini, P. N. Franco, C. Valle, P. Marra, A. Falanga, S. Sironi; Milan/IT

Purpose or Learning Objective: To report ischaemic and haemorrhagic abdominal complications in COVID-19 patients. To correlate these complications with lung involvement, laboratory tests, comorbidities and eventual anticoagulant treatment.

Methods or Background: Thirty COVID-19 patients underwent an abdomen CECT for not lung-related clinical symptoms (i.e. abdominal pain) between March 10th and April 26th 2020, were retrospectively evaluated. Ischaemic and haemorrhagic complications were recorded. For lung involvement, a parenchymal stage (early, progressive, peak, absorption) was assigned. Blood coagulation values, eventual anticoagulant therapy, comorbidities and eventual presence of PE were assessed.

Results or Findings: Ischaemic complications had been demonstrated in 10 patients: 6/10 small bowel ischaemia (thickened, poorly-enhanced intestinal wall and/or pneumatosis intestinalis) with 1 concomitant small bowel obstruction and 1 perforation; 4/10 ischaemic colitis (layered wall and submucosal oedema). Main mesenteric vessels were patent but 1 case with superior mesenteric vein thrombosis. Two ischaemia cases also presented concurrent splenic infarctions. Bleeding complications were found in 20 patients: spontaneous haematomas in soft tissues in 15, retroperitoneal hematomas in 2 and gastro-intestinal bleeding in 3. Ten presented foci of active bleeding. Platelet and lymphocyte counts were in their normal range. D-Dimer levels demonstrated a significant difference between the two groups ($p = 0.005$), being higher in ischaemic cases. Most of the patients had severe lung disease (45% peak, 29% absorption). Only 2 patients had evidence of PE. 22 patients (hospitalised) were under anticoagulant treatment.

Conclusion: Ischaemic and haemorrhagic abdominal complications may occur in COVID-19 patients, particularly during extended lung disease. CT plays a key role in the diagnosis of these potentially life-treating conditions.

Limitations: Retrospective nature of the study. Small population study.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RC 307 - COVID-19 in the GU-tract: what do we know today?

Categories: Abdominal Viscera, General Radiology, Genitourinary, Imaging Methods

ETC Level: LEVEL II+III

Date: March 2, 2022 | 11:30 - 12:30 CET

CME Credits: 1

Moderator:

Lorenzo E. Derchi; Genoa / Italy

RC 307-1 - Chairperson's introduction (5 min)

Lorenzo E. Derchi; Genoa / Italy

RC 307-2 - Kidneys and COVID-19: what can we do with imaging? (15 min)

Alberto Tagliafico; Genoa / Italy

1. To describe COVID-19-related kidney involvement on imaging.
2. To assess how we can use imaging to screen for potential kidney damage in COVID-19.
3. To describe the contribution of imaging on kidney evaluation in COVID-19.

RC 307-3 - Infection of the urinary tract and COVID-19: is there a relationship? (15 min)

Mathias Prokop; Nijmegen / Netherlands

1. To define the typical findings of renal involvement of COVID-19.
2. To identify the best imaging technique to assess infection of the urinary tract in COVID-19 patients.
3. To be able to identify the differential diagnosis of urinary tract infection.

RC 307-4 - Effects of COVID-19 on the urogenital system in fragile and ultra-fragile patients (15 min)

Marie-France Bellin; Le Kremlin-Bicêtre / France

Co-author: Mohamad Zaidan; Le Kremlin-Bicêtre/FR

1. To list and describe the main effects of COVID-19 reported in the literature on the urogenital system in fragile and ultra-fragile patients.
2. To identify and discuss the main risks associated with COVID-19 in fragile and ultra-fragile patients.
3. To describe the role of radiologists in the multi-disciplinary management of these patients.

RC 307-5 - Panel discussion: When do we need to perform imaging, which technique is best for the primary diagnosis, and when do we need to perform follow-up? (10 min)



IND 47 - Outcomes driven innovation in Mobile Imaging Solutions and Healthcare IT

Categories: Artificial Intelligence & Machine Learning, Chest, CT, Emergency Imaging, General Radiology, Imaging Informatics, Imaging Methods, Interventional Radiology, Lung, Neuro

Date: March 2, 2022 | 12:30 - 13:00 CET

IND 47-1 - Mobile Imaging Solutions - Clinical confidence anywhere (13 min)

Olaf Rieker

The CT City Hopper is a combination of a mobile trailer and an Aquilion Prime SP CT scanner with AiCE technology. In this product presentation, a MyVisit tour is given to present this unique product and Dr. Olaf Rieker will explain how he deployed the CT City Hopper during building constructions in his hospital.

Speakers: Johan Vochteloo - Director Refurbishment & Mobile Solutions Canon Medical Systems Europe
Rose Tijhaar - Business Support Manager Refurbishment & Mobile Solutions Canon Medical Systems Europe
Dr. Olaf Rieker - Head of Department of Radiology and Nuclear Medicine, Marienhospital, Euskirchen, Germany.

IND 47-2 - Healthcare IT - Automation Platform: The right insights, accelerated by AI (17 min)

Anton Meijer; Nijmegen / Netherlands

In healthcare, we see ageing populations globally; workload keeps increasing with limited resources combined with an increased need to make informed decisions in real-time.

There is a transition to a more personalized treatment approach and a desire to optimize resource deployment ensuring clinical teams have the insights they need.

The Automation Platform is an AI-based zero-click solution that uses deep learning technology to streamline your workflow for fast, actionable results every time.

Speakers: Richard Baks, European Clinical Specialist, Canon Medical Systems Europe
Dr. Anton Meijer, Neurologist, Radboud University Medical Center, Nijmegen, the Netherlands

RC 417 - Controversial issues in imaging COVID-19 patients in the emergency setting

Categories: Chest, Contrast Media, Emergency Imaging, Imaging Methods, Professional Issues

ETC Level: LEVEL II+III

Date: March 2, 2022 | 13:00 - 14:00 CET

CME Credits: 1

Moderator:

Marie-Pierre Revel; Paris / France

RC 417-1 - Chairperson's introduction (5 min)

Marie-Pierre Revel; Paris / France

RC 417-2 - Classification and scoring systems of COVID-19 imaging findings (15 min)

Ivana Blazic; Belgrade / Serbia

1. To learn about COVID-19 imaging findings scoring systems defined in the previous studies.
2. To recognise which scoring system is generally accepted by radiology communities.
3. To seek out the correlation between COVID-19 imaging scoring systems and the clinical outcome of patients.

RC 417-3 - Differential diagnosis of lung ground-glass opacities in COVID-19 pandemic (15 min)

Anna Rita Larici; Rome / Italy

1. To learn about the differential diagnosis in patients presenting to the emergency department with ground-glass opacity on CT.
2. To become familiar with the imaging findings of COVID-19 patients in the early phase of the disease.
3. To understand when it is possible to make differential diagnosis.

RC 417-4 - Who would benefit from urgent chest imaging and which imaging strategy is the best? (15 min)

Luis Gorospe Sarasua; Madrid / Spain

1. To learn about the recommendations for selecting patients who require urgent imaging.
2. To become familiar with the adequate indications for performing CT with IV.
3. To describe the CT findings that have an impact on management.

RC 417-5 - Panel discussion: How can we integrate imaging to orient patient management? (10 min)



BS 4b - Musculoskeletal: lower extremities

Categories: Imaging Methods, Musculoskeletal

ETC Level: LEVEL I+II

Date: March 2, 2022 | 13:00 - 14:00 CET

CME Credits: 1

Moderator:

Jean-Luc Drape; Paris / France

BS 4b-2 - The degenerative hip (20 min)

Ustun Aydingoz; Ankara / Turkey

1. To learn about imaging methods in degenerative hip evaluation.
2. To learn about imaging features in the degenerative hip.

BS 4b-3 - The degenerative knee (20 min)

Jan L.M.A. Gielen; Antwerp / Belgium

1. To learn about imaging methods in degenerative knee evaluation.
2. To learn about imaging features in the degenerative knee.

BS 4b-4 - The degenerative ankle (20 min)

Apostolos H. Karantanas; Iraklion / Greece

1. To learn about imaging methods in degenerative ankle evaluation.
2. To learn about imaging features in the degenerative ankle.

RPS 402 - Updates in the evaluation of response to neoadjuvant therapy

Categories: Artificial Intelligence & Machine Learning, Breast, Imaging Methods

Date: March 2, 2022 | 13:00 - 14:00 CET

CME Credits: 1

Moderator:

Heike Preibsch; Tübingen / Germany

RPS 402-2 - Radiomic changes after the first cycle using DISCO DCE-MRI for early predicting tumour response to neoadjuvant chemotherapy for breast cancer (8 min)

Lina Zhang; Shenyang / China

Author Block: L. Guo, S. Du, L. Zhang; Shenyang/CN

Purpose or Learning Objective: To investigate the value of radiomics-based tumour heterogeneity changes after one cycle of neoadjuvant chemotherapy (NAC) using a high spatiotemporal resolution DCE-MRI for early prediction of pathological complete response (pCR) in patients with breast cancer.

Methods or Background: A total of 140 patients (training: test=7:3) with breast cancer underwent Differential Subsampling with Cartesian Ordering (DISCO) DCE-MRI before (t0) and after one cycle (t1) of NAC. Radiomic features were extracted from postcontrast early (CEe), peak (CEp) and delay (CEd) CE-MRI phases, respectively. Feature changes ($t\Delta$) were computed for each phase. For training, the strongest features that associated with pCR were selected. Logistic regression classifiers based on DCE-MRI at t0, t1, $t\Delta$ were constructed for differentiating pCR patients. The performance under different contrast phases was evaluated and compared. Clinicopathological information and the optimal imaging classifier were fused to enhance the predictive performance.

Results or Findings: Imaging classifiers using radiomic feature changes ($t\Delta$) achieved superior performance in both training and test cohort for CEe (AUC=0.840/0.825), CEp (AUC=0.772/0.744) and CEd (AUC=0.757/0.728) compared with DCE-MRI at t0 (CEe: AUC=0.725/0.689; CEp: AUC=0.609/0.572; CEd: AUC=0.678/0.611), with a significant difference of NRI and IDI (all $p<0.05$ in the training cohort). For DCE-MRI at t0 and $t\Delta$, the CEe was the optimal contrast phase for pCR classification. After adding receptor status to CEe at $t\Delta$, the classifier showed the highest AUC of 0.828 in the testing.

Conclusion: Using DISCO DCE-MRI, changes in radiomic features after one cycle of NAC, that reflect tumour heterogeneity changes could provide a non-invasive approach for early prediction of breast cancer response regardless of knowledge of the receptor status.

Limitations: Single-centre research; no voxel-level analysis; no biological explanation.

Ethics committee approval: Approved by the Ethics Committee of First Affiliated Hospital of China Medical University

Funding for this study: Funding was received from the National Scientific Foundation of China (81971695).

RPS 402-3 - Quantitative intratumoural habitats analysis of triple-negative breast cancer treated with combination talimogene laherparepvec (TVEC) neoadjuvant immunotherapy and neoadjuvant chemotherapy (NAI/NAC) (8 min)

Robert Weinfurter; Tampa / United States

Author Block: R. J. Weinfurtner, N. Raghunand, O. Stringfield, M. Abdalah, B. Niell, M. C. Lee, H. Han, B. Czerniecki, H. Soliman; Tampa, FL/US

Purpose or Learning Objective: To quantitatively evaluate perfusion-based intratumoural habitats on dynamic contrast-enhanced (DCE) breast MRI to predict triple-negative breast cancer (TNBC) NAI/NAC response.

Methods or Background: TVEC is a modified oncolytic herpes simplex 1 virus. Subjects with TNBC in this phase II trial underwent ultrasound-guided intratumoural TVEC injections followed by neoadjuvant chemotherapy prior to surgery. Baseline and post-treatment breast MRIs were evaluated for partial vs complete response (mCR). MRI quantitative analysis was performed on dynamic contrast-enhanced T1-weighted images with voxels assigned 8 habitats based on two criteria: high (H) or low (L) maximum contrast enhancement per Otsu algorithm, and the sequentially numbered dynamic sequence of maximum enhancement (H1-4, L1-4). Then, the % habitat makeup (%HM) of tumour and whole breasts (%HM of habitat X=habitat X voxels/total voxels in the segmented volume) were evaluated and correlated with pathologic response (PR). Statistical analyses were performed using paired and unpaired t-tests, with $p < 0.05$ considered statistically significant.

Results or Findings: Twenty patients were included in the study, and 11 achieved pathologic complete response (pCR). Prediction of pCR with mCR yielded accuracy of 65% (sensitivity 66.7%, specificity of 63.6%, PPV 60% and NPV 70%). Pre-NAI/NAC tumour %HM for each habitat differed significantly from whole breasts ($p = 0.001$ or less). The %HM of habitat H1 (early phase, high enhancement) decreased the most after treatment (-18%, $p = 0.0004$) followed by H2 and H3 (-14% and -4%, respectively). Conversely, %HM H4 (late phase, high enhancement) increased (12%, $p = 0.031$). The H1-3 combination decreased 34%, and this was more pronounced in patients with pCR (-44% vs -22%, $p = 0.036$).

Conclusion: In patients undergoing TVEC NAI/NAC treatment for TNBC, a decrease in %HM of early and mid-phase high enhancement habitats correlates with pathologic response.

Limitations: Sample size.

Ethics committee approval: IRB-approved.

Funding for this study: Funding was received from the Moffitt Cancer Center.

RPS 402-4 - Can machine-learning models using baseline breast ultrasound radiomics and clinical features aid in predicting response to neoadjuvant chemotherapy? (8 min)

Panagiotis Kapetas; Vienna / Austria

Author Block: P. Kapetas, P. Clauser, T. H. Helbich, R-I. Milos, P. A. Baltzer; Vienna/AT

Purpose or Learning Objective: To evaluate whether machine-learning (ML) models using selected clinical and radiomic features from pre-therapeutic, B-mode breast ultrasound (US) can predict response to neoadjuvant chemotherapy (NAC).

Methods or Background: 253 patients with invasive breast cancer undergoing NAC were included. One B-mode US image of each tumour from the baseline examination was selected. Tumours were manually segmented (without-ROI1 and with inclusion of surrounding tissue-ROI2) and overall 851 radiomic features were extracted using dedicated software. Two analyses were performed: first, principal component analysis was used for feature reduction and a multilayer perceptron neural network was trained using remaining radiomic and selected clinical features. 1/3 of the cases were used as an external validation set. Second, a decision tree using the exhaustive chi-squared automatic interaction detection method with 10-fold cross-validation was constructed. Postoperative histology was the reference standard. Diagnostic performance was evaluated using the area under the ROC curve (AUC).

Results or Findings: 104 patients (41.1%) achieved pathological complete response. In the first model, the combination of radiomic features, age and molecular subtype showed the highest AUC, both for ROI1 (0.715; 95%CI: 0.606-0.809) and for ROI2 (0.709; 95%CI: 0.599-0.803; $p > 0.05$) in the validation set. The model resulted in 66.3% correct classifications considering ROI1 and 55.4% using ROI2 in the validation set. On the other hand, decision trees based on molecular subtype and 5-6 radiomic features showed AUCs of 0.852 (95%CI: 0.802-0.893) for ROI1 and 0.896 (95%CI: 0.852-0.931) for ROI2 ($p > 0.05$). The corresponding correct classifications were 83.4% and 82.6%.

Conclusion: ML models based on radiomic features from baseline B-mode breast US and simple clinical features have the potential to predict response to NAC.

Limitations: This is a retrospective, monocentric study with a limited patient number.

Ethics committee approval: This was an IRB-approved retrospective study.

Funding for this study: Not applicable.

RPS 402-5 - Correlation between MRI morphological-response patterns and histopathological tumour regression after neoadjuvant endocrine therapy in locally advanced breast cancer: a randomised phase-II trial (8 min)

Joana Roque Dos Reis; Lørenskog / Norway



Author Block: J. R. D. Reis, O. Thomas, M. Lyngra, H. Schandiz, J. Boavida, K-I. Gjesdal, T. Sauer, J. Geisler, J. T. Geitung; Lørenskog/NO

Purpose or Learning Objective: To correlate MRI morphological-response patterns with histopathological tumour regression grading system based on tumour cellularity in locally advanced breast cancer (LABC) treated neoadjuvant with third-generation aromatase inhibitors.

Methods or Background: Fifty postmenopausal patients with ER-positive/HER-2 negative LABC treated with neoadjuvant letrozole and exemestane were given sequentially in an intra-patient cross-over regimen for at least 4 months with MRI response monitoring at baseline as well as after at least 2 and 4 months on treatment. The MRI morphological response pattern was classified into 6 categories: 0/complete imaging response, I/concentric shrinkage, II/fragmentation, III/diffuse, IV/stable and V/progressive. Histopathological tumour regression was assessed based on the recommendations from The Royal College of Pathologists regarding tumour cellularity.

Results or Findings: Following 2 and 4 months with therapy, the most common MRI pattern was pattern II (24/50 and 21/50, respectively). After 4 months of therapy, the most common histopathological tumour regression grade was grade 3 (21/50). After 4 months an increasing correlation is observed between MRI patterns and histopathology. The overall correlation, between the largest tumour diameter obtained from MRI and histopathology, was moderate and positive ($r=0.50$, $P\text{-value}=2e-04$). Among them, the correlation was highest in type IV ($r=0.53$).

Conclusion: The type II MRI pattern "fragmentation" was more frequent in the histopathological responder group; and types I and IV in the non-responder group. Type II pattern showed the best endocrine responsiveness and a relatively moderate correlation between sizes obtained from MRI and histology, whereas type IV pattern indicated endocrine resistance but the strongest correlation between MRI and histology.

Limitations: A single-centre study.

Ethics committee approval: The NEOLETEXE trial was registered on March 23rd, 2015 and approved by the regional ethical committee of the South-Eastern Health Region in Norway (registration number: REK-SØ-84-2015).

Funding for this study: Funding was received from the Bodil and Magne's Cancer Research Fund.

RPS 402-6 - Breast cancer surgical treatment prediction after neoadjuvant chemotherapy: the main role of magnetic resonance and digital mammography (8 min)

Giovanni Cimino; Copertino / Italy

Author Block: G. Cimino, M. Conti, A. Franco, A. De Filippis, C. Esposito, E. Bufi, D. Terribile, P. Belli, R. Manfredi; Rome/IT

Purpose or Learning Objective: To investigate the influence of radiological features measured on magnetic resonance imaging (MRI), digital mammography (DM), in addition to clinical factors on surgeons' choice between breast conservative surgery (BCS), oncoplastic surgery (OPS) or conservative mastectomy (CM), in patients treated with neoadjuvant chemotherapy (NACT).

Methods or Background: Preoperative MRI and DM of 255 women who underwent BCS (118 patients), OPS (50 patients) or CM (87 patients) after NACT in 2016-2021 were retrospectively reviewed. Preoperative radiological features were analysed including the extent of microcalcifications, tumour volume/breast volume ratio (TVBVR) on DM and MRI, multifocality/multicentricity, in addition to histotype, grading and clinical features (menopause, BRCA mutations, ptosis, previous breast surgery). All parameters were correlated with final surgeons' choice.

Results or Findings: On univariate analysis BCS has proved to be the surgeons' choice in patients with a unifocal tumour, the extent of microcalcifications $<54,9$ mm, TVBVR pre-NACT $<0,42$ % on DM and $<3,53$ % on MRI. OPS showed a significant correlation with multifocal tumour, the extent of microcalcifications 55-79,9 mm, TVBVR ratio pre-NACT 0,4-1,38 % on DM and 3,54-10,27 % on MRI. CM was correlated with multicentric tumours, the extent of microcalcifications >80 mm, TVBVR pre-NACT $>1,38$ % on DM and $>10,27$ % on MRI. On multivariate analysis these results were confirmed and were used to create a specific score to define which type of surgery to suggest to patients. ROC curves were produced for each type of surgery (AUC BCS=0,840, OPS=0,751 and MC=0,871).

Conclusion: Radiological features measured on DM and MRI play a fundamental role in the surgeons' choice between BCS, OPS or CM in patients treated with NACT.

Limitations: No limitations were identified.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 402-7 - ADCdiff, ADCmax, ADCmin and ADCmean in breast carcinoma before NACT and in early tumour response assessment on DWI-MRI (8 min)

Mirjan Nadrljanski; Belgrade / Serbia



Author Block: M. Nadrljanski, I. Krusac, V. Urban, M. Mihajlovic; Belgrade/RS

Purpose or Learning Objective: Manually defined ROIs for computation of ADC-values may be technically challenging, prone to sampling errors and operator-dependent. Different ADC parameters (ADCdiff, ADCmax, ADCmin, ADCmean) may provide a more objective approach. ADCdiff corresponding to the level of intratumoral heterogeneity points more objectively to invasive components and may have prognostic significance.

Methods or Background: Retrospective analysis of (N=34) consecutive patients undergoing neoadjuvant chemotherapy (NACT) on 1.5T breast DWI-MRI (b50, b850 [s/mm²]), for: a.) Pre-treatment and b.) Early response assessment (after 2nd cycle of NACT) for morpho-dynamic and DWI parameters: ADCdiff, ADCmax, ADCmin, ADCmean, including the analysis of subgroups of patients with pCR (n1=11) and non-pCR (n2=23) following NACT.

Results or Findings: ADCdiff and ADCmean are significantly different between n1 and n2 on pre-treatment exam [10⁻⁶ x mm²/s]: (403.64+/-122.05 vs. 285.56+/-69.47; p=.008); (808.36+/-60.50 vs. 1015.69+/-78.97; p<.00001) and after the 2nd cycle: (407.36+/-92.00 vs. 261.78+/-60.69; p=.001); (963.27+/-67.51 vs. 1059.65+/-73.63; p=.002). In n1, ADCdiff is not different before and after 2nd cycle of NACT: (403.64+/-122.05 vs. 407.36+/-92.00; p=.096). In n2, ADCdiff is significantly different after 2nd cycle of NACT: (285.56+/-69.47 vs. 261.78+/-60.69; p=.048).

Conclusion: There are complex factors determining the response to NACT. There is no standardised ADC cut-off value determining the response. ADCdiff with indirect interpretation of microvascular changes and the rate of growth may also provide information regarding the response to NACT, as higher ADCdiff values in pCR group on pre-treatment MRI and early response assessment exam may contribute to better response and more adequate assessment.

Limitations: A relatively small number of patients in a single-centre retrospective study.

Ethics committee approval: Referent board approval was obtained for retrospective analysis.

Funding for this study: No funding was provided for this study.

RPS 402-8 - Mammographic density to predict response to neoadjuvant chemotherapy for breast cancer (8 min)

Claudia De Berardinis; Milan / Italy

Author Block: C. Depretto, C. De Berardinis, G. Della Pepa, S. Di Cosimo, R. Miceli, G. Pruneri, S. Folli, G. P. Scaperrotta; Milan/IT

Purpose or Learning Objective: We aimed to investigate the clinical value of mammographic density (MD) in a large consecutive cohort of breast cancer (BC) patients treated with neoadjuvant chemotherapy (NAC).

Methods or Background: We prospectively collected data on all NAC treated BC patients in our Institute from May 2009 to April 2020. We evaluated MD on mammograms as categorised by the Breast Imaging-Reporting and Data System (BI-RADS), according to the following categories: A (almost entirely fat), B (scattered areas of fibroglandular density), C (heterogeneously dense), D (extremely dense). Multivariable logistic regression was used to assess the odds ratios (OR) for pathological complete response (pCR), comparing BI-RADS categories with adjustment for patient age and BMI, and pre-NAC tumour characteristics.

Results or Findings: We analysed 442 patients; 120 (27.1%) attained a pCR following NAC. At multivariable analysis, cases classified as BI-RADS C showed an increased likelihood of pCR as compared to A (OR= 2.79), B (OR= 1.70), and D (OR= 1.47) independently of age, BMI (OR underweight vs normal= 3.76), clinical N and T (OR T1/Tx vs T4= 3.87), molecular subtype (HER2 vs luminal= 10.74; triple-negative vs luminal= 8.19). In subgroup analyses, the strongest association of MD with pCR was observed in triple-negative (ORs of B, C, and D versus A: 1.85, 2.49, and 1.55) and HER2 BC cases (ORs 2.70, 3.23, and 1.16). No significant differential effect of MD with respect to pCR was observed in luminal (ORs of B, C, and D versus A: 0.88, 2.01, and 1.58).

Conclusion: Patients with dense breasts are more likely to attain a pCR after NAC at net of other current clinical and pathological predictive factors.

Limitations: The single centre design study.

Ethics committee approval: The study was approved by the Institutional Review Board. Informed consent was obtained.

Funding for this study: No funding was received for this study.

TS 4 - The role of the radiologist in 2030

Categories: Education, General Radiology, Management/Leadership, Professional Issues

ETC Level: LEVEL II+III

Date: March 2, 2022 | 13:00 - 14:00 CET

CME Credits: 1

Moderators:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

Michael Fuchsjäger; Graz / Austria

TS 4-3 - The new role of the radiologist: report from the ESR survey (10 min)

Andrea G. Rockall; London / UK

TS 4-4 - Panel discussion: Radiology in 2030: how will we need to practice adding value to the patient? (45 min)

Andrea G. Rockall; London / UK

Geerard L. Beets; Amsterdam / Netherlands

Caroline Justich; Vienna / Austria

TS 4-5 - Wrap-up (5 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands



IND 56 - Resona Series Genral Imaging Solution Presentation

Date: March 2, 2022 | 13:05 - 13:35 CET

Moderator:

Willy Luiten; Hoevelaken / Netherlands

IND 7 - Accelerating Cancer Care Pathways - 5 Ways to Detect and Diagnose Earlier

Categories: Artificial Intelligence, Breast, Cancer Assessment, Cancer Diagnostics, CT, General Radiology, Lung, Machine Learning, Multidisciplinary, Oncologic Imaging, PET/CT, Radiomics

Date: March 2, 2022 | 14:00 - 15:00 CET

Moderator:

Ben Newton; Chalfont St Giles / United Kingdom

IND 7-1 - Accelerating Cancer Care Pathways - 5 Ways to Detect and Diagnose Earlier (10 min)

Ben Newton; United Kingdom

Hear from leading cancer care experts on the role AI and technology can play for improved patient outcomes for all.

IND 7-2 - Accelerating Cancer Care Pathways - 5 Ways to Detect and Diagnose Earlier (10 min)

Marie-Pierre Revel; Paris / France

IND 7-3 - Accelerating Cancer Care Pathways - 5 Ways to Detect and Diagnose Earlier (10 min)

Michael Adrian Richards; United Kingdom

IND 7-4 - Accelerating Cancer Care Pathways - 5 Ways to Detect and Diagnose Earlier (10 min)

David Baldwin; United Kingdom

IND 7-5 - Accelerating Cancer Care Pathways - 5 Ways to Detect and Diagnose Earlier (10 min)

Johannes Alberts

IND 7-6 - Accelerating Cancer Care Pathways - 5 Ways to Detect and Diagnose Earlier (10 min)

Steve Powell

IND 49 - Thermal ablation and SBRT - alternatives to eliminate early-stage lung cancer?

Categories: Cancer Assessment, Cancer Diagnostics, Chest, General Radiology, Interventional Oncologic Radiology, Interventional Radiology, Lung, Tumour

Date: March 2, 2022 | 14:05 - 14:55 CET

Moderator:

Maik Bittner ; Erlangen / Germany

IND 49-1 - Chairperson's introduction (2 min)

Maik Bittner ; Erlangen / Germany

Lung cancer is a leading cause of death. Many countries started screening programs to detect lung cancer in an early stage. However, some patients are not eligible for surgery. This opens interesting possibilities for minimally invasive therapies. Find out how thermal ablation and stereotactic body radiation therapy (SBRT) could impact the therapy mix of the future.

IND 49-2 - Role of SBRT in the management of early-stage NSCLC (19 min)

Florence Kean; Massachusetts / United States

IND 49-3 - Thermal ablation for early-stage lung cancer (12 min)

Robert Suh; Los Angeles / United States

IND 49-4 - Questions & answers (17 min)



IND-6 - Interview with David Hale & Sarah Catoen (Guerbet): The Future of Medical Imaging

Date: March 2, 2022 | 14:30 - 14:45 CET



SF 5 - Contemporary issues in ultrasound imaging of the head and neck

Categories: General Radiology, Head and Neck, Oncologic Imaging, Ultrasound

ETC Level: LEVEL II+III

Date: March 2, 2022 | 15:00 - 16:00 CET

CME Credits: 1

Moderator:

Martin G. Mack; Munich / Germany

SF 5-1 - Chairperson's introduction (2 min)

Martin G. Mack; Munich / Germany

SF 5-2 - Primary tumours of the head and neck (15 min)

Timothy Beale; London / UK

1. To understand the role of ultrasound in the assessment of primary tumours in the head and neck.
2. To highlight the advantages and pitfalls of ultrasound in head and neck tumours.
3. To describe a practical ultrasound technique for assessing head and neck tumours.

SF 5-3 - Salivary glands (15 min)

Kunwar S.S. Bhatia; London / UK

1. To explore the current role of ultrasound in the evaluation of the major salivary glands.
2. To illustrate the sonographic features of neoplastic and non-neoplastic salivary pathologies.
3. To highlight several practical tips and potential pitfalls in salivary ultrasound interpretation.

SF 5-4 - Thyroid gland (15 min)

Andrew S. McQueen; Newcastle / UK

1. To review the current status of ultrasound in thyroid nodule risk stratification.
2. To describe the potential uses and technical challenges of multiparametric ultrasound in thyroid imaging.
3. To explore the integration of artificial intelligence into a patient-centric thyroid ultrasound service.

SF 5-5 - Panel discussion: What is important in everyday practice? (13 min)



RPS 501a - New insights in pancreatic imaging

Categories: Abdominal Viscera, Imaging Methods, Oncologic Imaging, Research

Date: March 2, 2022 | 15:00 - 16:00 CET

CME Credits: 1

Moderators:

Celso Matos; Lisbon / Portugal

Valérie Vilgrain; Clichy / France

RPS 501a-2 - Characterising potential radiological errors of missed pancreatic ductal adenocarcinoma on pre-diagnostic cross-sectional imaging (8 min)

Megan Engels; Jacksonville Beach / United States

Author Block: M. M. L. Engels¹, S. Hoogenboom², A. Chuprin¹, J. van Hooft³, J. Legout¹, M. Wallace¹, C. Bolan¹; ¹Jacksonville, FL/US, ²Amsterdam/NL, ³Leiden/NL

Purpose or Learning Objective: To analyse the radiological errors associated with pre-diagnostic pancreatic ductal adenocarcinoma (PDAC).

Methods or Background: This is a single-centre, retrospective, case-control study of 87 pre-diagnostic cross-sectional imaging studies (CT (N=60) and MRI (N=27)) of patients diagnosed with PDAC <3 years later, and 338 matched control studies (CT (N=235), MRI (N=103)). Two board-certified radiologists, blinded to case/control status, independently reassessed each exam. One radiologist was then unblinded and utilised the 2016 revised RADPEER criteria to grade radiological errors and further classify them according to the classification proposed by Kim and Mansfield (AJR, 2014).

Results or Findings: Pancreatic masses were retrospectively suspected in around 57.0% of CT and MRI cases, and 1.6% of controls. Respectively, in comparison to available original CT and MRI reports, the reviewers concurred with the original report in 43.8% and 26.8% (RADPEER 1), with understandable discrepancies in 29.2% and 33.3% (RADPEER 2) and unacceptable discrepancies in 27.0% and 38.1% (RADPEER 3). The 'under-reading' error was by far the most common, occurring in 57.2% of CT and 45.5% of MRI cases. Errors of 'satisfaction of search' occurred in 31.9% of MRI cases and 10.7% of CT cases, and 'faulty reasoning' in 17.9% of CT cases and 4.5% of MRI cases.

Conclusion: Unidentified, early findings of PDAC that should not have been overlooked occur up to 27.0% of CT and 38.1% of MRI cases. Given the detrimental effects of a delayed diagnosis in this deadly disease, radiologists must be aware of these findings and be trained to prevent the most commonly occurring errors.

Limitations: Retrospective design and selection bias.

Ethics committee approval: Mayo Clinic IRB approval #18-002403.

Funding for this study: Funding received by Champions for Hope / Funk-Zitiello foundation.

RPS 501a-3 - Evaluation of hepatic tissue shrinkage after microwave ablation using Jacobian Determinant (JD) (8 min)

Gesa Pöhler; Hannover / Germany

Author Block: G. H. Pöhler, F. Klimes, L. Behrendt, H. Winther, F. Wacker, K. I. Ringe; Hannover/DE

Purpose or Learning Objective: The aim of this study was to evaluate the influence of different clinical preconditions on hepatic tissue shrinkage following computed tomography (CT)-guided microwave ablation (MWA) of malignant liver tumours.

Methods or Background: 25 patients (f=14, median age 61 years) with liver tumours (primary n=15; metastases n=10; mean size 18 mm) referred for CT-guided MWA, were included. Pre- and post-interventional CT images were post-processed using rigid/non-rigid registration and Liver/tumour segmented. Pre- and post-interventional 3D tissue volume analysis was performed voxel-wise using Jacobian Determinant (JD) mapping of the tumour (zone 1), a 5 cm perimeter around the tumour (zone 2) and the whole liver (zone 3) and was compared (tumour subcapsular vs. non-subcapsular; cirrhosis, yes vs. no; primary vs. secondary tumour; history of chemotherapy, yes vs. no. Shapiro-Wilk test, Wilcoxon rank-sum test, $p < 0.05$ deemed significant). Zone 1-3 shrinkage was correlated with local tumour recurrence (Spearman's correlation coefficient (ρ)).

Results or Findings: The median JD tissue volume change in zone 1 was +6%, zone 2 -0.8 % and zone 3 +0.9 %. In non-subcapsular tumours, shrinkage in zone 2 was significantly pronounced as compared to subcapsular (-3.8% (-8.5 - 1.1%) vs. +3.4% (-0.07 8.1%), $p=0.004$). In cirrhotic patients, shrinkage in zone 1 was significantly less compared to non-cirrhotic patients (+20.1% (8.6-67.5%) vs. -0.7% (-8.1-3.2%), $p=0.0027$). The extent of tissue shrinkage in zones 2 and 3 correlated inversely significantly with local tumour recurrence ($\rho=-0.51$, $p=0.017$, $\rho=-0.69$, $p < 0.001$).

Conclusion: Tissue shrinkage after hepatic MWA is more pronounced in patients with a non-subcapsular tumour location and in patients with non-cirrhotic liver parenchyma. Limited tumour and tissue shrinkage may be associated with a higher risk of local tumour recurrence after hepatic MWA.

Limitations: Manageable patients' numbers in subgroups.

Ethics committee approval: IRB-approved study

Funding for this study: Funding was received by the Deutsche Forschungsgesellschaft

RPS 501a-4 - Dual-layer spectral detector CT-derived material decomposition maps: diagnostic performance in grading pancreatic neuroendocrine carcinoma and well-differentiation neuroendocrine tumours (8 min)

Yangdi Wang; Gangzhou / China

Author Block: Y. Wang¹, J. Chen¹, X. Hu¹, C. Song¹, S. Shi¹, Z. Li¹, W. Deng², S-T. Feng¹, Y. Luo¹; ¹Gangzhou/CN, ²Shanghai/CN

Purpose or Learning Objective: To assess whether parameters deriving from dual-layer spectral detector CT (DLCT) allow the grading of pancreatic neuroendocrine neoplasms (pNENs) according to the World Health Organization 2019 classification system.

Methods or Background: This retrospective study included pathologically confirmed pNENs with 116 neuroendocrine tumours (NETs; 26 grade 1, 65 grade 2 and 25 grade 3) and 20 neuroendocrine carcinomas (NECs). Parameters of dual-phase contrast-enhancement DLCT, including iodine concentration (IC), effective atomic number (Zeff), normalised IC and Zeff based on aorta (nIC and nZeff, respectively) and attenuation in conventional images were analysed and compared between NETs and NECs. A receiver operating characteristic curve (ROC) as well as the area under curve (AUC) was generated to evaluate the diagnostic performance, with sensitivity and specificity at optimal thresholds.

Results or Findings: IC and Zeff values in the portal venous phase were independent factors in differentiating NECs from NETs. The AUC of IC/Zeff combination was significantly higher than that of conventional imaging (0.911 [95%CI: 0.850, 0.953] vs 0.864 [95%CI: 0.794, 0.917], $P=0.049$) with a sensitivity of 90% and a specificity of 100%. The optimal thresholds were 1.81 mg/mL for IC and 8.26 for Zeff.

Conclusion: IC and Zeff values in the portal venous phase of DLCT may enable distinguishing pancreatic NECs from NETs.

Limitations: This study was a retrospective design and performed in a single institution. This results in selection bias and small sample size, particularly the NECs group (only 20 patients). Our data was acquired from a single vendor DECT scanner.

Ethics committee approval: The institutional review board approved this retrospective study and waived the requirement for written informed consent.

Funding for this study: This study has received funding from the National Natural Science Foundation of China (82072002, 81971684, 81771908, 81770654, 81801761).

RPS 501a-5 - Analysis of CT findings in patients with different serum pancreatic amylase trends after major pancreatic resections (8 min)

Francesca Mambrin; Verona / Italy



Author Block: F. Mambrin, M. Bariani, G. Zamboni, M. C. Ambrosetti, E. Bannone, G. Marchegiani, G. Mansueto; Verona/IT

Purpose or Learning Objective: The ISGPS has recently defined that a diagnosis of post-pancreatectomy acute pancreatitis (PPAP) requires: sustained postoperative hyperamylasemia, clinically relevant features and radiological alterations consistent with PPAP. Our purpose is to analyse the CT features that correlate with early postoperative serum pancreatic amylase (spAMY) trends after partial pancreatic resections.

Methods or Background: Patients who underwent major pancreatic resections between 2016 and 2021, and had a contrast-enhanced postoperative MDCT between POD3 and POD15 were included. Patients were divided into 3 groups based on their spAMY patterns: spAMY1: values always within/below the reference range or with a single increase in spAMY > upper limit of normal at any POD; spAMY2: sustained increase on POD0+1; spAMY3: sustained increase in spAMY including POD1+2. Two readers in consensus, blinded to spAMY trends, analysed the exams and logged arterial enhancement homogeneity, main pancreatic duct (MPD) diameter, peripancreatic oedema, and fluid collections.

Results or Findings: 473 patients were included (288 males, 185 females, mean age 63 years). Inhomogeneous arterial enhancement was more common in spAMY3 patients (49%) than in spAMY2 or spAMY1 patients (both 40%, $p < 0.001$). MPD was larger in spAMY1 (mean calibre 2.40 ± 1.68 mm; $p < 0.001$). Peripancreatic fat stranding ($p = 0.005$) and fluid collections, especially peripancreatic ($p < 0.001$), were significantly more common in spAMY3.

Conclusion: A clear definition of the CT features of PPAP is fundamental for the radiological description of this entity, which will lead to its accurate and early diagnosis and thus to better treatment.

Limitations: SpAMY evaluation was conducted within a single centre, with homogeneous surgical approaches and postoperative management.

Ethics committee approval: Approved by the Ethics Committee of the Provinces of Verona and Rovigo; approval number: 1101CESC.

Funding for this study: No financial help was obtained for this study.

RPS 501a-6 - Evaluation of dual-layer spectral detector CT for characterisation of pancreatic neuroendocrine neoplasms (8 min)

Yangdi Wang; Gangzhou / China

Author Block: Y. Wang¹, X. Hu¹, C. Song¹, S. Shi¹, Z. Li¹, W. Deng², S-T. Feng¹, Y. Luo¹; ¹Guangzhou/CN, ²Shanghai/CN

Purpose or Learning Objective: To explore the optimal energy level of the dual-layer spectral detector CT (DLCT) images for depicting pancreatic neuroendocrine neoplasms (pNENs) and investigate the value of DLCT images in the detection of pancreatic neuroendocrine tumours.

Methods or Background: 134 pathologically confirmed pNENs patients with 136 lesions were retrospectively studied. All patients underwent dual-phase contrast-enhanced DLCT scanning. The conventional polyenergetic images (PIs), spectral images including virtual monoenergetic images (VMIs) of 40-100keV with interval 10keV, iodine concentration (IC) map and atomic effective number (Zeff) map were generated. The optimal single-energy level was determined by comparing the signal to noise ratio (SNR) and contrast noise ratio (CNR). Besides, the lesion detection rate of spectral images and PIs were also compared. Subject image quality was assessed with a 5-point scale and compared with Wilcoxon rank testing.

Results or Findings: As the energy level decreased, both the SNR and CNR increased. In the arterial phase (AP), SNR of 40-100keV VMIs and CNR of 40-70keV VMIs were significantly higher than those in PIs, while SNR of 40-80keV VMIs and CNR of 40-70keV VMIs in venous phase (VP) were higher than those in PIs. The SNR and CNR on VMIs at 40keV were significantly higher than those on other VMIs levels. Besides, the detection rate on spectral images was significantly higher than that of PIs. The subject scores of spectral images (especially Zeff map) were higher than those of PIs ($P < 0.001$).

Conclusion: VMIs at 40keV was the optimal energy level of DLCT for lesion detection of pancreatic neuroendocrine tumours. Spectral images, especially Zeff could help to increase the diagnosis confidence.

Limitations: High enhancement, equal enhancement and low enhancement lesions were not discussed separately.

Ethics committee approval: The institutional review board approved this retrospective study.

Funding for this study: Funding was received from the National Natural Science Foundation of China.

RPS 501a-7 - Gastroenteropancreatic neuroendocrine neoplasms (GEP-NENs): a radiomic model to predict tumour grade (8 min)

Giuditta Chiti; Gambassi Terme / Italy



Author Block: G. Chiti, F. Flammia, G. Grazzini, P. Tortoli, S. Bettarini, V. Miele; Florence/IT

Purpose or Learning Objective: This single-centre retrospective study aims to assess whether contrast-enhanced computed tomography (CECT) radiomics analysis is predictive of gastroenteropancreatic neuroendocrine neoplasms (GEP-NENs) grade based on the 2019 World Health Organization (WHO) classification and to establish a tumour grade (G) prediction model.

Methods or Background: Preoperative CECT images of 72 patients with GEP-NENs were retrospectively reviewed and divided into two groups (G1-G2 in class 0, G3-NEC in class1). A total of 107 radiomics features were extracted from each neoplasm ROI in CECT arterial phases acquisitions with a 3DSlicer. The Mann-Whitney test and the LASSO regression method were performed in R for feature selection and reduction to build the radiomic-based predictive model. The model was developed for a training cohort (75% of the total) and validated on the independent validation cohort (25%). ROC curves and AUC values were generated on training and validation cohorts.

Results or Findings: 40 features were found to be significant in class distinction. From the LASSO regression, 3 features were identified as suitable for group classification and used to construct the tumour grade radiomic-based prediction model:

MajorAxisLength, Mean and 90Percentile, also individually statistically significant for the group differentiation (p-values respectively 0.001, <0.001 and <0.001). The prediction model resulted in AUC values of 0.84 (95% CI: 0.72-0.97) and 0.82 (95% CI: 0.62-1) for the training and validation cohorts, respectively.

Conclusion: CT-radiomics analysis may aid in differentiating the histological grade for GEP-NENs.

Limitations: Due to the low incidence of the disease, the study population is numerically limited to perform 4 groups (G1, G2, G3, NEC separately) classification statistics.

Ethics committee approval: Approved by the Ethics Committee of our Institution (register number 13261_oss, approved on 02/02/2021).

Funding for this study: No funding was received for this study.

RPS 501a-8 - Intraductal papillary mucinous neoplasm (IPMN): are volumetry and other novel imaging features able to improve malignancy prediction compared to well-established resection criteria? (8 min)

Raffaella Maria Pozzi-Mucelli; Stockholm / Sweden

Author Block: R. M. Pozzi-Mucelli¹, C. F. Moro¹, M. Del Chiaro², R. Valente³, L. K. Blomqvist¹, N. Papanikolaou⁴, J-M. Löhr¹, N. Kartalis¹; ¹Stockholm/SE, ²Aurora, CO/US, ³Umeå/SE, ⁴Lisbon/PT

Purpose or Learning Objective: Current guidelines base the management of IPMN on well-established resection criteria (RC), including cyst size. However, malignancy may occur in small cysts. Since branch-duct (BD) IPMN aren't perfect spheres, the volumetric and morphologic analysis might better correlate with mucin production and grade of dysplasia. Nonetheless, their role in malignancy (high-grade dysplasia/invasive cancer) prediction has been poorly investigated. Previous studies evaluating RC also included patients with IPMN-associated/concomitant pancreatic cancer (PC), which may affect RC's yield. This study aimed to assess the role of volume, morphology, and other well-established RC in malignancy prediction in patients with BD- and mixed-type IPMN after excluding IPMN-associated/concomitant PC.

Methods or Background: Retrospective study of 106 patients (2008-2019) with histopathological diagnosis of BD- and mixed-type IPMN (without associated/concomitant PC) and preoperative MRI available. Standard imaging and clinical features were collected and cyst volume and elongation value [EV=1-(width/length)] calculated on T2-w images. Logistic regression analysis was performed and predicted probabilities (PP) were calculated. Statistical significance set at two-tails, p<0.05.

Results or Findings: Neither volume [Odds ratio (OR)=1.01, 95%CI:0.99-1.02, p=0.12] nor EV (OR=0.38, 95%CI:0.02-5.93, p=0.49) were associated to malignancy. Contrast-enhancing mural nodules (MN), main pancreatic duct (MPD) \geq 5mm and elevated CA19-9 serum levels (>37µmol/L) were associated to malignancy [MN OR:4.32, 95%CI:1.18-15.76, p=0.02; MPD \geq 5mm OR:4.2, 95%CI:1.34-13.1, p=0.01; CA19-9 OR:6.72, 95%CI:1.89-23.89, p=0.003]. The PP for malignancy in a hypothetical male \geq 70-years-old increased from 0.08 (95%CI:0.02-0.27) with no risk-factors, to 0.92 (95%CI:0.63-0.99) with all three risk-factors.

Conclusion: Volume and EV cannot predict malignancy in BD- and/or mixed-type IPMN. MN, MPD \geq 5mm and elevated CA19-9 are associated with higher malignancy risk even after the exclusion of IPMN-associated/concomitant PC.

Limitations: Small sample, only including operated patients with IPMN-diagnosis.

Ethics committee approval: Institutional Review Board approval was obtained (EPN 2015/154431/4).

Funding for this study: This study has received funding from Stockholm Regional Council.



RC 517 - Emergencies in oncologic patients: imaging approach and impact of complication findings

Categories: Abdominal Viscera, Chest, Emergency Imaging, Neuro, Oncologic Imaging

ETC Level: LEVEL II+III

Date: March 2, 2022 | 15:00 - 16:00 CET

CME Credits: 1

Moderator:

Raffaella Basilico; Chieti / Italy

RC 517-1 - Chairperson's introduction (5 min)

Raffaella Basilico; Chieti / Italy

RC 517-2 - Oncology patients in ED with neurological symptoms: the role of imaging (15 min)

Maureen Dumba; London / UK

1. To be able to compare and contrast appropriate imaging techniques available in oncologic emergencies of the CNS.
2. To distinguish the imaging features of common primary and secondary CNS oncological pathologies to formulate a differential diagnosis.
3. To recognise the imaging features of life-threatening conditions in the CNS resulting from neoplastic causes or treatment-related complications.

RC 517-3 - Mass, emboli, toxication, and immune mediated disease: malignancy-related emergencies in the chest (15 min)

Frank Berger; Munich / Germany

1. To learn about imaging features of oncology patients presenting to the emergency department with respiratory symptoms.
2. To differentiate between oncologic and non-oncologic causes of lung emergencies.
3. To become familiar with imaging features of cancer treatment-related changes in the lungs, including effects of cytotoxic and molecular targeted therapies.

RC 517-4 - Abdominal emergencies in oncologic patients: obstruction, perforation, and vascular impairment (10 min)

Alexandra Platon; Geneva / Switzerland

1. To become familiar with the most frequent causes of acute abdomen emergencies in oncologic patients.
2. To learn about the imaging algorithm in oncology patients presenting to the emergency department with acute abdominal pain.
3. To become familiar with vascular impairment findings in abdominal viscera of oncologic patients.

RC 517-5 - Panel discussion: Does the imaging approach differ from other emergency settings in patients with suspected oncologic emergencies? (15 min)



TS 5 - Rectal cancer: a multidisciplinary approach

Categories: Abdominal Viscera, GI Tract, Imaging Methods, Multidisciplinary, Oncologic Imaging

ETC Level: LEVEL II+III

Date: March 2, 2022 | 15:00 - 16:00 CET

CME Credits: 1

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

TS 5-1 - Chairperson's introduction (2 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

1. To understand which questions are clinically relevant.
2. To learn about the relevant MRI findings and their impact on treatment choice.
3. To learn about new treatment strategies, including organ preservation.
4. To understand the role of MRI for selection and follow up.
5. To give an outlook to the highlight Multidisciplinary program at ECR 2022.

TS 5-2 - Lessons from the surgeon (10 min)

Geerard L. Beets; Amsterdam / Netherlands

TS 5-3 - Lessons from the radiation oncologist (10 min)

Vincenzo Valentini; Rome / Italy

TS 5-4 - Lessons from the radiologist: case-based discussion (33 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

TS 5-5 - Wrap-up (5 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

IND 8 - The future of clinical evidence generation

Categories: Education, Education and Training, Evidence-Based Imaging, General Radiology, Interventional Radiology, Management/Leadership, Research

Date: March 2, 2022 | 15:30 - 16:30 CET

Moderator:

Mark Hibberd; Marlborough / United States

IND 8-1 - The future of clinical evidence generation (10 min)

Mark Hibberd; United States

"A roundtable discussion on what clinical evidence may look like in the future. Moderated by Dr Mark Hibberd, CMO, GE Healthcare. The symposia will feature three presentations, followed by a LIVE Q&A discussion. 1. The value and challenges of RWD as a source for evidence generation

2. Use of Premier database for RWD evidence generation and recent results on contrast media

3. MCDA (Multi criteria decision analysis) as a tool to support physicians in their decision making"

Learning Objectives:

Understand why other sources of clinical evidence are now being considered alongside RCTs.

IND 8-2 - The future of clinical evidence generation (10 min)

Hans-Christoph Becker; United States

IND 8-3 - The future of clinical evidence generation (10 min)

Chaan Ng; United States

IND 8-4 - The future of clinical evidence generation (10 min)

Lawrence D. Phillips; United Kingdom

RPS 616 - Imaging for response assessment and prognostication

Categories: Artificial Intelligence & Machine Learning, Hybrid Imaging, Imaging Methods, Oncologic Imaging

Date: March 2, 2022 | 16:30 - 17:30 CET

CME Credits: 1

Moderators:

Caroline Caramella; Le Plessis Robinson / France

Andrea Grace Rockall; Godalming / United Kingdom

RPS 616-2 - Quantitative washout in patients with hepatocellular carcinoma undergoing TACE: an imaging biomarker for predicting prognosis? (8 min)

Lukas Müller; Mainz / Germany

Author Block: L. Müller¹, F. Hahn¹, F. Jungmann¹, F. Stoehr¹, M. C. Halfmann¹, C. Düber¹, R. Kloeckner¹, D. Pinto dos Santos², A. Mähringer-Kunz¹; ¹Mainz/DE, ²Cologne/DE

Purpose or Learning Objective: The delayed percentage attenuation ratio (DPAR) was recently identified as a novel predictor of an early complete response in patients with hepatocellular carcinoma (HCC) undergoing transarterial chemoembolization (TACE). In this study, we aimed to validate the role of DPAR as a predictive biomarker for short-, mid- and long-term outcomes after TACE.

Methods or Background: We retrospectively reviewed laboratory and imaging data for 103 treatment-naïve patients undergoing initial TACE treatment at our tertiary care centre between January 2016 and November 2020. DPAR and other wash-in and washout indices were quantified in the triphasic computed tomography performed before the initial TACE. The influence of the DPAR on the 6-, 12-, 18-, and 24-month survival rates and the median overall survival (OS) was compared to other established washout indices and estimates of tumour burden and remnant liver function.

Results or Findings: The DPAR was significantly higher in patients who survived the first 6 months after TACE (122 vs 115, $p=0.04$). In addition, the number of patients with a DPAR > 120 was significantly higher in this group ($n=38$ vs $n=8$; $p=0.03$). However, no significant differences were observed in the 12-, 18-, and 24-month survival rates after the initial TACE. Regarding the median OS, no significant difference was observed for patients with a high DPAR compared to those with a low DPAR (18.7 months vs 12.7 months, $p=0.260$).

Conclusion: Our results confirm DPAR as the most relevant washout index for predicting the short-term outcome of patients with HCC undergoing TACE. However, DPAR and the other washout indices were not predictive of mid- and long-term outcomes.

Limitations: Single center study and retrospective design.

Ethics committee approval: The ethics committee of the Medical Association of Rhineland Palatinate, Mainz, Germany, approved this study (permit number 2021-16013).

Funding for this study: Not applicable.

RPS 616-3 - Evaluation of treatment response to chemoembolization of hepatocellular carcinoma (HCC) with mRECIST and LI-RADS Treatment Response v2018 (LRTRv2018): correlation with pathology on explanted liver (8 min)

Andrea Agostini; Fermo / Italy



Author Block: S. Capodagli-Colarizi, L. Pierpaoli, A. Borgheresi, A. Agostini, L. Ottaviani, D. Nicolini, C. Floridi, M. Vivarelli, A. Giovagnoni; Ancona/IT

Purpose or Learning Objective: To evaluate the correlation of treatment response to chemoembolization with drug-eluting beads (debTACE) of hepatocellular carcinoma (HCC) assessed with mRECIST and LI-RADS Treatment Response v2018 (LRTRv2018), with pathological necrosis on explanted livers.

Methods or Background: Patients who underwent debTACE for HCC before liver transplantation between June 2018 and December 2019 were retrospectively included. All the patients had a contrast-enhanced CT or MRI examination at baseline and 1 month after treatment; patients lacking radiological data or pathological reports of the explanted liver were excluded. All the lesions were evaluated at baseline according to LI-RADSv2018 criteria, and the treatment response was evaluated according to mRECIST and LRTRv2018 criteria by two expert radiologists (8 and 10 years) in consensus. The pathological necrosis was calculated as a percentage on the nodular section. The statistics were performed with ROC curve analysis.

Results or Findings: Thirty-four nodules (median diameter 19mm, range 12-75mm) in 30 patients (26M:4F; median age 57 y.o., range 51-62) were evaluated. At baseline, 4 nodules were classified as LR-M, 19 nodules as LR-5 and 8 nodules as LR-4. 20 nodules (59%) had a complete response according to mRECIST and 18 (53%) according to LRTRv2018. At pathology 13 nodules (38%) had complete necrosis. mRECIST criteria achieved a sensitivity and specificity respectively of 94% and 53% (AUC 0,732, p=0,0005) for pathological necrosis >90% while LRTRv2018 criteria recorded values of 79% and 60% (AUC 0,693, p=0,0159) respectively, without significant differences (p=0,3432).

Conclusion: mRECIST and LRTRv2018 criteria demonstrated a comparable correlation with pathological necrosis of treated HCC.

Limitations: Retrospective, single centre study.

Ethics committee approval: The study was approved by the local IRB.

Funding for this study: Not applicable.

RPS 616-4 - PET/MRI vs the standard of care imaging in the diagnosis of peritoneal carcinomatosis (8 min)

Onofrio Antonio Catalano; Boston / United States

Author Block: O. Catalano¹, F. S. Furtado¹, M. Wu¹, S. Esfahani¹, M. Anderson¹, B. R. Rosen², A. Mojtahed¹, U. Mahmood¹, C. Ferrone¹; ¹Boston, MA/US, ²Charlestown, MA/US

Purpose or Learning Objective: To compare positron emission tomography (PET)/magnetic resonance imaging (MRI) to the standard of care imaging (SCI) for the diagnosis of peritoneal carcinomatosis (PC) in primary abdominopelvic malignancies.

Methods or Background: Adult subjects were prospectively and consecutively enrolled from 4/2019 to 1/2021. Inclusion criteria were: (a) acquisition of whole-body contrast-enhanced (CE) 18F-fluorodeoxyglucose PET/MRI and (b) pathologically confirmed primary abdominopelvic malignancies. Exclusion criteria were: (a) greater than 4 weeks interval between SCI and PET/MRI and (b) unavailable follow-up. SCI consisted of whole-body contrast-enhanced (CE) PET/computed tomography (CT) with diagnostic quality CT, and/or CE-CT of the abdomen and pelvis, and/or CE-MRI of the abdomen ± pelvis. If available, pathology or surgical findings served as the primary reference standard; otherwise, imaging follow-up was used. When SCI and PET/MRI results disagreed, medical records were checked for management changes. Follow-up data were collected until 8/2021.

Results or Findings: One hundred sixty-four subjects were included, eighty-five (52%) were female, and the median age was 60 years (IQR 50/69). At a subject level, PET/MRI had higher sensitivity (0.97, 95% CI 0.861.00) than SCI (0.54, 95% CI 0.370.71), p<0.001, without a difference in specificity, of 0.95 (95% CI 0.900.98) for PET/MRI and 0.98 (95% CI 0.931.00) for SCI, p=0.25. Fused PET/MRI was more sensitive than stand-alone MRI, p=0.023, and stand-alone PET, p<0.001.

Conclusion: PET/MRI improves detection of PC compared to SCI, which frequently changes management.

Limitations: Study enrollment occurred at the discretion of the subjects' treating oncologist or surgeon, and potential biases in the primary malignancy location and extent of disease are not accounted for in this study.

Ethics committee approval: This study was approved by the institutional review board (protocols 2019P000410/2020P001367), and written informed consent was obtained.

Funding for this study: This study received no specific funding.

RPS 616-5 - Role of MR elastography in preoperatively predicting early and late recurrence of hepatocellular carcinoma after hepatic resection (8 min)

Lina Zhang; Guangzhou / China



Author Block: L. Zhang; Guangzhou/CN

Purpose or Learning Objective: To investigate the diagnostic performance of preoperative magnetic resonance elastography (MRE) for predicting early recurrence (ER) and late recurrence (LR) of hepatocellular carcinoma (HCC) after hepatectomy.

Methods or Background: One hundred and eighty patients (161 men, aged 50.46 ± 10.77 years) with HCC who underwent preoperative MRE and conventional MRI before hepatectomy were included. A preoperative clinic-radiologic model and a combined clinic-pathologic and radiologic model were built using quantitative ADC and MRE-derived parameters and qualitative image features to predict tumour ER and LR after hepatectomy. The Cox proportional hazards model and ROC analyses were used to identify the value of parameters to predict ER and LR.

Results or Findings: Seventy-three (40.5%) and 16 (8.9%) developed ER and LR after hepatectomy, respectively. The combination of tumour stiffness (TS) (hazard ratio [HR], 1.142; $p < 0.001$), AFP ≥ 400 ng/dL (HR, 1.761; $p = 0.022$), multifocal tumours (HR, 3.229; $p < 0.001$) and ADC (HR, 0.998; $p = 0.017$) achieved an AUC of 0.812 for predicting ER in the preoperative model, and the performance was comparable to that of the post-operative model ($p = 0.283$). Liver stiffness (LS) (HR = 1.757; $p < 0.001$) was the only independent predictor for LR in a multivariate analysis in both of pre- and post-operative models, and its AUC with an optimal cut-off of 3.62 kPa were 0.860.

Conclusion: The preoperative model TS combined with clinico-radiological features showed a considerable performance to predict ER after hepatectomy. LS is a predictor for LR of HCC with high specificity.

Limitations: First, it was a retrospective analysis that suffers from selection bias. Second, we only focused on HBV-related HCCs.

Ethics committee approval: The requirement for informed consent was waived.

Funding for this study: National Natural Science Foundation of China grant number 91959118.

RPS 616-6 - 18F-FDG PET/MRI and machine learning for axillary staging in newly diagnosed breast cancer patients (8 min)

Julian Kirchner; Düsseldorf / Germany

Author Block: J. Morawitz¹, N-M. Bruckmann¹, P. Baltzer², B. Sigl², K. Herrmann³, L. Umutlu³, C. Rubbert¹, J. Kirchner¹, J. Caspers¹; ¹Düsseldorf/DE, ²Vienna/AT, ³Essen/DE

Purpose or Learning Objective: 1. To investigate the diagnostic accuracy of machine learning algorithms and experienced radiologists in detecting axillary lymph node metastases of primary breast cancer in MRI and PET/MRI. 2. To assess which morphologic and metabolic lymph node features in MRI and PET/MRI are the most informative to determine lymph node dignity. 3. To determine whether an adjusted threshold can increase the sensitivity of PET/MRI to exclude lymph node involvement with sufficient confidence to spare node-negative patients and invasive procedures such as SLNB.

Methods or Background: 255 patients from two centres were included for the training sample, and 48 patients from a third centre were included for the validation sample. (PET)/MRI datasets were evaluated regarding axillary lymph nodes. Histopathology of axillary lymph nodes served as the reference standard. For the assessment of the diagnostic performance, sensitivity, specificity, positive and negative predictive value and accuracy were calculated. Diagnostic performances were compared by a McNemar test.

Results or Findings: There were no significant differences in the diagnostic performance of radiologists and machine learning algorithms in MRI ($p=0.671$) and PET/MRI ($p=0.683$). The most important lymph node feature was a tracer uptake (ratio of SUVmax of the lymph node/SUVmax of Aorta ascendens, cut-off 1.3-fold of mediastinal blood pool), followed by lymph node size (cut-off 7.5 mm).

Conclusion: The diagnostic performance of a random forest classifier in detecting axillary lymph node metastases is comparable to that of an experienced radiologist. A size of 7.5 mm and a tracer uptake of 1.3-times the mediastinal blood pool are the most important features to determine the dignity of a lymph node. By adjusting the threshold, the sensitivity of the random forest classifier can be increased in a way that 54.5% of patients can be spared an invasive procedure such as an SLNB.

Limitations: No limitations identified.

Ethics committee approval: Institutional Research Committee Votum.

Funding for this study: Deutsche Forschungsgemeinschaft.

RPS 616-7 - Accuracy and precision of diffusion-weighted imaging as quantitative imaging across the variable MRI systems and scan protocols (8 min)

Se Jin Choi; Seoul / Korea, Republic of



Author Block: S. J. Choi, K. W. Kim, D. W. Kim, h. ahn; Seoul/KR

Purpose or Learning Objective: Diffusion-weighted imaging that reflects tumour cellularity is emerging as a preferred method for evaluating the response in oncologic imaging. For the clinical utilization of DWI as a quantitative parameter, the repeatability and accuracy of the ADC value is critical. In this study, we aimed to validate variable MRI systems using Quantitative Imaging Biomarkers Alliance (QIBA)/ National Institute of Standards and Technology (NIST) protocols and to confirm the reliability of currently used clinical DWI protocols.

Methods or Background: In this prospective study, a NIST/QIBA developed phantom with 13 PVP vials of known ADC value was used. The validation of the MRI systems was performed on four 1.5T and 3.0T MRI systems using the QIBA and the clinically used DWI protocols. Acquired DWI images were analyzed by commercially available web-based software (CaliberMRI, Inc., qCal-MR QC Software), and the parameters for quality control according to the QIBA claim were assessed. The linearity and bias of ADC measurement for each DWI protocol were calculated with linear regression. The difference of ADC values between the two protocols was evaluated with a paired T-test and a Bland-Altman plot.

Results or Findings: The regression slope of estimated ADC values on all MRI systems were 1.01 (range, 1.001.02) for the QIBA protocol and 1.02 (0.951.02) for the clinical protocol within the QIBA claim. The estimated ADC values were not statistically different between the two DWI protocols.

Conclusion: ADC estimation from variable MRI systems using QIBA and clinical protocols was accurate, and ADC could be considered as imaging biomarker in the clinical field.

Limitations: This study was performed with a small number of MRI examinations using four MRI systems. Further studies with more examinations and MRI systems are needed to robust DWI's usefulness.

Ethics committee approval: This prospective study included no human participants and was exempt from the institutional board review.

Funding for this study: Nothing to disclosure here.

RPS 616-8 - Computed tomography-based body composition in patients with ovarian cancer: association with chemotoxicity and prognosis (8 min)

Stefania Rizzo; Lugano / Switzerland

Author Block: S. Rizzo¹, M. Del Grande¹, G. M. M. Nicolino², I. Colombo¹, L. Rossi¹, M. Biroli², L. Manganaro³, F. Del Grande¹;
¹Lugano/CH, ²Milan/IT, ³Rome/IT

Purpose or Learning Objective: To assess the association between computed tomography (CT) quantitative measures of body composition profiling and chemotherapy-related complications in patients with ovarian cancer. Secondary purposes were to evaluate association between sarcopenia and survival, and differences in body composition profiling at baseline and after neoadjuvant chemotherapy.

Methods or Background: The study population was retrospectively selected from patients with newly diagnosed ovarian cancer. Clinical data were recorded, and CT images at the level of the 3rd lumbar vertebra were stored. By using specific software, skeletal muscle area (SMA), subcutaneous adipose tissue (SAT), visceral adipose tissue (VAT), and skeletal muscle density (SMD) were extracted. The skeletal muscle index (SMI) was calculated. Statistical analysis was performed to identify body composition features predictive of dose reduction, premature end of chemotherapy and cycle delays. Kaplan-Meier analyses were performed to assess overall survival (OS) and progression-free survival (PFS). Wilcoxon test was performed to compare body composition features before and after neoadjuvant chemotherapy (NACT).

Results or Findings: Sixty-nine patients were included. A significant association was found between VAT and cycle delays (OR=1.01, z=2.01, 95%CI: 1.00-1.02, p< 0.05), between SMA and early discontinuation of chemotherapy (OR=1.03, z=2.10, 95% CI: 1.00-1.05, p< 0.05), and between mean SMD and cycle delays (OR=0.92, z=-2.70, 95%CI: 0.87-0.98, p< 0.01). No significant difference emerged for OS in sarcopenic and non-sarcopenic patients, nor in CT body composition features before and after NACT.

Conclusion: In ovarian cancer patients, CT-derived body composition profiling might predict the risk of chemotoxicity. In particular, VAT and SMD are associated with chemotherapy cycle delays and SMA with early discontinuation of chemotherapy.

Limitations: No limitations identified.

Ethics committee approval: The ethics committee approval was obtained.

Funding for this study: No funding was received for this study.



RC 604 - Eosinophilic lung diseases (ELDs)

Categories: Chest, Education, General Radiology, Imaging Methods, Multidisciplinary

ETC Level: LEVEL III

Date: March 2, 2022 | 16:30 - 17:30 CET

CME Credits: 1

Moderator:

Mark O. Wielpütz; Heidelberg / Germany

RC 604-1 - Chairperson's introduction (5 min)

Mark O. Wielpütz; Heidelberg / Germany

RC 604-2 - Clinico-pathologic classification (15 min)

Paolo Graziano; San Giovanni Rotondo / Italy

1. To identify the pathologic features of eosinophilic lung diseases.
2. To list the causes of eosinophilic lung diseases according to morphologic features.
3. To discuss the main differential diagnosis harmonising clinico-pathologic features.

RC 604-3 - Eosinophilic lung diseases of known cause (15 min)

Arjun Nair; London / UK

1. To list the causes of secondary pulmonary eosinophilic lung diseases.
2. To compare and to contrast the CT findings of the commonest secondary eosinophilic lung diseases, in particular: allergic bronchopulmonary aspergillosis (ABPA), bronchocentric granulomatosis, and eosinophilic granulomatosis with polyangiitis (EGPA).
3. To reflect on the differential radiologic diagnosis for eosinophilic lung diseases.

RC 604-4 - Eosinophilic lung diseases of unknow cause (15 min)

Guillaume Chassagnon; Paris / France

1. To classify eosinophilic lung diseases of unknow cause.
2. To identify situations causing acute eosinophilic pneumonia.
3. To diagnose chronic eosinophilic pneumonia.

RC 604-5 - Panel discussion: The spectrum of eosinophilic lung diseases (10 min)



E³ 623 - Urogenital

Categories: Genitourinary

ETC Level: LEVEL I+II

Date: March 2, 2022 | 16:30 - 17:30 CET

CME Credits: 1

Moderator:

Valeria Panebianco; Roma / Italy

E³ 623-1 - Chairperson's introduction (3 min)

Valeria Panebianco; Rome / Italy

To become familiar with the imaging presentation of common neoplastic and infectious disorders of the kidneys. To describe the typical imaging features of obstructive uropathy and neoplastic disorders of the ureter and bladder. To understand the imaging presentation of benign and malignant disorders of the prostate.

E³ 623-2 - Renal and adrenal imaging (19 min)

Nicolas Grenier; Bordeaux / France

1. To describe the normal imaging anatomy and variants of the kidneys and the adrenal glands.
2. To understand the imaging features of benign and malignant tumours of the kidneys.
3. To describe the imaging features of benign and malignant tumours of the adrenal glands.
4. To explain the imaging features of infectious disorders of the kidneys.

E³ 623-3 - Imaging of the ureter and bladder (19 min)

Hebert Alberto Vargas; New York, NY / United States

1. To explain the imaging anatomy and variants of the ureter and bladder.
2. To understand the diagnostic evaluation and imaging features of obstructive uropathy.
3. To describe the imaging features of benign and malignant tumours of the ureter and bladder.

E³ 623-4 - Prostate imaging (19 min)

Iztok Caglic; Cambridge / UK

1. To describe the MRI anatomy of the prostate.
2. To describe the imaging features of benign prostatic hypertrophy.
3. To understand the imaging features of inflammatory disorders of the prostate.
4. To explain the imaging features of prostate cancer using the prostate imaging reporting and data system (PIRADS).

TS 6 - Pros and Cons

Categories: Breast, Cardiac, Contrast Media, Imaging Methods, Oncologic Imaging, Professional Issues

ETC Level: ALL LEVELS

Date: March 2, 2022 | 16:30 - 17:30 CET

CME Credits: 1

Moderators:

Thomas H. Helbich; Vienna / Austria

Rozemarijn Vliegenthart; Groningen / Netherlands

- Part 1: Intermediate risk screening should be done with breast MRI and not with contrast-enhanced mammography
(30 min)

TS 6-2 - Introduction by the president (1 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

TS 6-3 - Chairperson's introduction (2 min)

Thomas H. Helbich; Vienna / Austria

TS 6-4 - PRO (8 min)

Ritse M. Mann; Nijmegen / Netherlands

This house believes that intermediate risk screening should be done with breast MRI and not with contrast-enhanced mammography.

TS 6-5 - CON (8 min)

Marc B.I. Lobbes; Maastricht / Netherlands

This house believes that intermediate risk screening should NOT be done with breast MRI but with contrast-enhanced mammography.

TS 6-6 - Panel discussion: Will we need to use contrast agents in screening? (10 min)

- Part 2: Evaluating patients with stable cardiac chest pain: non-invasive anatomical coronary artery imaging should be the first-line investigation for all patients (30 min)

TS 6-8 - Chairperson's introduction (2 min)

Rozemarijn Vliegenthart; Groningen / Netherlands

TS 6-9 - PRO (8 min)

Fabian Bamberg; Freiburg / Germany

This house believes that, when evaluating patients with stable cardiac chest pain, non-invasive anatomical coronary artery imaging should be the first-line investigation for all patients.

TS 6-10 - CON (8 min)

Robert Manka; Zurich / Switzerland

This house believes that, when evaluating patients with stable cardiac chest pain, non-invasive anatomical coronary artery imaging should NOT be the first-line investigation for all patients.

TS 6-11 - Panel discussion: Is a single test sufficient in all patients? Are imaging departments ready and prepared to provide these diagnostic services? (10 min)

TS 6-12 - Wrap-up (4 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

OT 1 - Outlook for Tomorrow

Date: March 2, 2022 | 17:45 - 18:15 CET

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

- Outlook for Tomorrow (30 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

E³ 723 - Paediatric

Categories: Abdominal Viscera, Chest, GI Tract, Neuro, Paediatric Imaging

ETC Level: LEVEL I+II

Date: March 3, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderator:

Jean-François Chateil; Bordeaux / France

E³ 723-1 - Chairperson's introduction (3 min)

Jean-François Chateil; Bordeaux / France

To understand the imaging features of the most common congenital and neoplastic disorders of the brain in children and adolescents. To describe the imaging presentations of the most common disorders of the lung and mediastinum in the paediatric age group. To become familiar with the imaging features of important congenital, acute, and neoplastic diseases of the abdomen in children and adolescents.

E³ 723-2 - Paediatric neuroimaging (19 min)

Maria I. Argyropoulou; Ioannina / Greece

1. To become familiar with the normal development of the brain.
2. To learn about the most common congenital disorders of the brain.
3. To learn about the most common brain tumours in children.

E³ 723-3 - Paediatric chest imaging (19 min)

Catherine Owens; London / UK

1. To describe the normal development of the lung and mediastinum.
2. To explain the imaging features of congenital disorders of the lung and mediastinum.
3. To understand the imaging manifestations of respiratory distress and bronchopulmonary dysplasia in infants.
4. To describe the most common tumours of the chest in children.

E³ 723-4 - Paediatric abdominal imaging (19 min)

Joy Barber; London / UK

1. To understand the imaging features of congenital disorders of the abdomen.
2. To describe the diagnostic evaluation and imaging presentation of the most common emergencies in children according to age.
3. To understand the imaging presentation of the most common oncologic disorders of the abdomen in children.



RC 714 - Dose reduction strategies to enhance safety

Categories: EuroSafe Imaging / Radiation Protection, Imaging Methods, Physics in Medical Imaging, Professional Issues, Radiographers

Date: March 3, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderators:

Efthimios M. Agadakos; Athens / Greece

Afshin Gangi; Strasbourg / France

RC 714-1 - Chairpersons' introduction (5 min)

Efthimios Agadakos; Athens / Greece

Afshin Gangi; Strasbourg / France

RC 714-2 - Application of virtual grids (15 min)

Rachel Toomey; Dublin / Ireland

1. To describe the basic concepts of the virtual grid.
2. To consider current, potential, and proposed future clinical applications of virtual grids.
3. To summarise the current research evidence regarding the impact of virtual grids on both image quality and patient radiation dose.

RC 714-3 - CT dose optimisation updates (15 min)

Svea Deppe Mørup; Odense / Denmark

1. To describe the CT optimisation technologies.
2. To reflect on how the different technologies can be combined in optimising radiation dose.
3. To identify how CT optimisation technologies influence image quality.

RC 714-4 - Safety improvements in interventional imaging (15 min)

Roberta Gerasia; Palermo / Italy

1. To describe a practical approach of occupational and patient dose reduction strategies.
2. To analyse how the customisation of the angiographic system improves radiation dose reduction.
3. To examine how real-time patient and staff radiation dose monitoring systems can optimise radiation protection.

RC 714-5 - Panel discussion: How well are we adapting to new technologies? (10 min)



IND 10 - Gadolinium Based Contrast Agents use and environment: current and future trends

Categories: Artificial Intelligence & Machine Learning, Contrast Media, General Radiology, MRI, Research

Date: March 3, 2022 | 08:00 - 09:00 CET

IND 10-1 - The History of GBCA Use (12 min)

Val Runge; Bern / Switzerland

IND 10-2 - (12 min)

IND 10-3 - The Future of GBCA and other contrast media strategies (12 min)

Sarah Catoen; Villepinte / France

RPS 703 - Measuring myocardial extracellular volume (ECV) with CT and MR

Categories: Cardiac, Multidisciplinary, Research

Date: March 3, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderators:

Christian Lücke; Leipzig / Germany

Carlo Catalano; Roma / Italy

RPS 703-2 - Early prediction of cardiac complications in acute myocarditis by means of extracellular volume quantification with the use of dual-energy computed tomography (8 min)

Salim Si-Mohamed; Lyon / France

Author Block: S. A. Si-Mohamed, A. Congi, A. Ziegler, S. Boccalini, D. Tomasevic, T. Bochaton, E. Bonnefoy-Cudraz, L. Bousset, P. Douek; Lyon/FR

Purpose or Learning Objective: To evaluate in acute myocarditis different extracellular volume (ECV) biomarkers of myocardial inflammation burden quantified by dual-energy CT (DECT) in comparison to biological parameters, and to determine the best ECV cut-off for predicting the occurrence of major adverse event (MAE) during the early phase.

Methods or Background: Consecutive patients confirmed with acute myocarditis on CMR from May 2018 to September 2020 who underwent a cardiac DECT were included in this retrospective monocentric study. Global/maximal ECVs of the whole heart and global/maximal ECVs per layer were measured on delayed phase iodine maps. MAE included death, heart failure and serious rhythm disturbance. Pearson correlation between investigated biomarkers, univariate and multivariate analyses for prediction of MAE and log-rank test for survival curve (Kaplan Meier) at one-year follow-up were calculated.

Results or Findings: Sixty-one patients (78.3% male, 30 (25-42) years) were recruited. Delay between symptoms onset and DECT was 1 (0-3) days. Eight MAEs were recorded during the first week of symptoms onset. No patient was lost to follow-up. ECVs were increased in MAE group (P values<0.05). Highest correlation was observed between global ECV and troponin peak ($r=0.79$, $P<0.0001$). A global ECV cut-off $\geq 39.5\%$ was associated with MAE (log-rank <0.0001) in univariate ($P<0.0001$) and multivariate ($P<0.05$) analyses.

Conclusion: ECV should be considered as a good DECT biomarker for inflammation burden assessment and prediction of MAE during the early phase of an acute myocarditis.

Limitations: While we are reporting a limited number of MAE in our study, we were able to demonstrate an association between ECV and MAE using both univariate and multivariate analyses.

Ethics committee approval: Written informed consent was waived by the local IRB (Hospices Civiles de Lyon).

Funding for this study: No funding was provided for this study.

RPS 703-3 - Iodine-based extracellular volume (ECV) to evaluate myocardial status for the patients received PCI using dual-layer spectral detector CT: a comparison study with MR (8 min)

Jing Liang; Nanjing / China

Author Block: J. Liang, Z. Sheng, W. chen, X. Chen, D. Mu; Nanjing/CN

Purpose or Learning Objective: To explore clinical feasibility of using iodine-based extracellular volume (ECV) to assess myocardium for the patients underwent percutaneous coronary intervention (PCI) in comparison with MR results.

Methods or Background: A total of 21 patients who have received PCI were prospectively enrolled for this study. All these patients underwent both cardiac dual-layer spectral detector CT (SDCT) and MR scans for PCI follow-up check. Myocardial ECVCT was calculated from iodine map and ECVMR was calculated from T1 mapping. Image quality (IQ) of both CT and MR images were firstly assessed using 4-point like scale and by two radiologists independently and any patients with a score less than 2 were excluded for final analysis. Pearson test was performed to analyze the correlation between ECVCT and ECVMR and Bland-Altman plot was used for the consistency analysis. Intraclass correlation coefficient (ICC) was performed to evaluate the consistency between the two radiologists.

Results or Findings: A total of 19 patients completed both CT & MR cardiac scans and three patients (two patients with poor IQ of MR, one patient with discontinues coronary artery from CT) were excluded for this study. The mean image quality (IQ) score of CT and MR images were 3.81 ± 0.40 and 3.25 ± 0.58 respectively and interobserver agreement was good (ICC=0.93 for CT and 0.92 for MR). The average of ECVCT and ECVMR was $35.93 \pm 9.73\%$ and $33.89 \pm 7.51\%$ with good correlation ($r=0.79$, $P<0.001$). Bland-Altman analysis showed that the result of ECVCT was 2.04% (95% confidence interval: 9.56%-13.64%) overestimated compared with ECVMR.

Conclusion: Iodine-based ECV derived from SDCT has high correlation with ECV calculated from MR which could be clinical feasible to evaluate myocardium recovery status for the patient underwent PCI.

Limitations: Not applicable.

Ethics committee approval: No.:2018-046-01.

Funding for this study: Not applicable.

RPS 703-4 - Endogenous assessment of myocardial injuries using magnetic resonance T1-rho mapping: comparison to T2 mapping and contrast-enhanced imaging (8 min)

Xavier Pineau; Pessac / France

Author Block: A. Bustin¹, X. Pineau¹, S. Sridi¹, P. Jais¹, M. Stuber², H. Cochet¹; ¹Pessac/FR, ²Lausanne/CH

Purpose or Learning Objective: Magnetic Resonance (MR) myocardial T1-rho mapping has emerged as a promising tool for detecting myocardial injuries without an exogenous contrast agent. Yet, the parameters influencing changes in T1-rho and the applicability of the technique to the broad spectrum of acute and chronic myocardial injury remains unexplored territory. The aims of this study were to identify clinical correlates of myocardial T1-rho and to examine how T1-rho mapping performs against conventional MR sequences under various diseases.

Methods or Background: The 113 subjects comprised 69 patients with known ischemic (N=18) and non-ischemic (N=51) heart disease and 44 healthy controls. MR was performed on a 1.5T System (Aera, Siemens Healthcare, Erlangen). Injured and remote areas were defined by an expert on LGE images. Quantitative analysis was achieved by tracing regions of interest on pre-contrast T1-rho and T2 maps, and on post-contrast T1 and ECV maps within remote and injured areas, on short-axis slices.

Results or Findings: In healthy controls, the mean myocardial T1-rho was 47 ± 2 ms. T1-rho positively related to age ($R=0.4$, $P<0.01$) and showed higher values in females than males (48 vs 46ms, $P<0.01$). T1-rho increased significantly in patients with acute focal myocardial injury (69 vs 48ms in remote, $P<0.01$, N=9), with focal fibrosis (64 vs 47ms in remote, $P<0.01$, N=27), and with diffuse myocardial involvement (52 vs 47ms in controls, $P<0.01$, N=8) with a positive correlation with ECV ($R=0.312$, $P<0.01$).

Conclusion: Myocardial T1-rho values are gender and age-dependent. The technique appears to be sensitive to acute, chronic, focal, and diffuse myocardial injuries, and may thus be a contrast-free adjunct to LGE for gaining new and quantitative insight into acute and chronic myocardial structural disorders.

Limitations: Single center study.

Ethics committee approval: CHU Bordeaux.

Funding for this study: ANR-11-EQPX-0030, ANR-10-IAHU04-LIRYC, ERC-715093, Lefoulon-Delalande Foundation.

RPS 703-5 - Myocardial extracellular volume fraction using late iodine enhancement from dual-energy computed tomography can be used for risk stratification in patients with non-ischemic heart failure (8 min)

Jie Deng; Kunming / China



Author Block: J. Deng, D. Han, Z. Li, W. Gao, W. Chen; Kunming/CN

Purpose or Learning Objective: To assess the potential of myocardial extracellular volume fraction (ECV) from late iodine enhancement (LIE) using dual-energy computed tomography for disease risk stratification in patients with non-ischemic heart failure (NIHF).

Methods or Background: 25 patients with NIHF (52±13 years, 7 female) underwent DECT and were divided into two groups: patients with reduced ejection fraction (HFrEF, LVEF<40%) and patients with non-reduced ejection fraction (non-HFrEF, LVEF≥40%). 41 subjects (43±10 years, 17 female) who underwent DECT who were found to have no abnormalities were served as control groups. LIE was acquired 7 minutes after iodine administration of 0.9ml/kg of iopamidol and CCTA using a spectral CT. LIE images were reconstructed at 8mm slice thickness, 6mm slice gap to the short-axis plane of the left ventricular (LV) myocardium and then the basal, mid and apical slices were extracted. ROIs were manually drawn on LIE images using the AHA's 16-segmentation to calculate ECV. Differences of ECV between groups were compared and correlation between ECV and LVEF and NYHA classification were analyzed.

Results or Findings: The CT-ECV in patients with NIHF was significantly higher than that in HCs (34.63%±3.68 vs 28.03%±2.85, P<0.05). In patients with NIHF, there was an inverse correlation between CT-ECV and LVEF (r=-0.403, P<0.05), and the CT-ECV in HFrEF patients were higher than those in non-HFrEF patients (35.60%±4.15 vs 32.25%±1.68, P<0.05). The significant correlation between CT-ECV and NYHA classification could be observed (r=0.544, P<0.05). The mean radiation dose of LIE is 2.29 mSv±0.55.

Conclusion: ECV derived from Late Iodine enhancement can be used for risk stratification in patients with non-ischemic heart failure.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: National Natural Science Foundation of China (No.82060312). Yunnan Applied Basic Research Projects (No.2018E001(-039)) No.202101AT0702490

RPS 703-6 - T1, T2 and ECV mapping improve sensitivity of CMR and offer pathophysiological insights in patients with acute myocarditis with non infarct-like presentation: results from the MIAMI study (8 min)

Davide Vignale; Milano / Italy

Author Block: D. Vignale¹, A. Palmisano¹, M. Gatti², R. Faletti², N. Galea³, F. De Cobelli¹, A. Esposito¹; ¹Milan/IT, ²Turin/IT, ³Rome/IT

Purpose or Learning Objective: To investigate the sensitivity of cardiac magnetic resonance (CMR) with T1, T2 and ECV mapping for the diagnosis of acute myocarditis (AM) and to investigate the characteristics of mapping alterations according to AM clinical presentation.

Methods or Background: Prospective multicenter study involving 97 consecutive patients with AM confirmed by a multidisciplinary heart team evaluation based on multimodality imaging (comprising CMR performed according to 2018 LLC), laboratory testing, clinical features, and endomyocardial biopsy (performed in 33(34%) patients).

Results or Findings: Male:female ratio was 67:30. Median age was 38 years [IQR=27-44]. All patients had increased troponinT (404[81-887]ng/L). 77(79%) patients had infarct-like (IL) presentation with chest pain. The remaining 20(21%) patients had non-IL presentations with heart failure (HF) in 14(14%) and arrhythmia in 6(6%) patients. Ejection fraction was reduced in 20(21%) patients, with significantly lower values in HF group (27% vs 57% and 63% in IL and arrhythmic presentation, p=0.021). 2018 LLC were positive in 97(100%) patients. 2009 LLC were positive in 77(100%) patients with IL presentation, 10(92%) with HF presentation, and 4(67%) with arrhythmic presentation. 2018 LLC significantly improved CMR sensitivity in non-IL presentation (Fisher's exact test p-value=0.001). Patients with non-IL presentations had lower scar burden (3[1-11]% vs 9[5-13]%, p=0.005) and higher global native-T1 (1103[1059-1197]ms vs 1066[1026-1099]ms, p=0.012), percentage of segments with abnormal native-T1 (94[45-1], p=0.008), global ECV (32.5[27.5-36.8]% vs 28.6[26.3-31.8]%, p=0.014), and percentage of segments with abnormal ECV (100[68.8-100]% vs 68.8[32.5-100]%, p=0.014).

Conclusion: In patients with AM, CMR performed according to 2018 LLC significantly improves sensitivity in non-IL presentation. In this group, despite the smaller volume of scar, parametric mapping shows more intense and diffuse myocardial alterations.

Limitations: Limited number of patients with non-IL presentation.

Ethics committee approval: Approved by the Institutional Review Board (27/INT/2016).

Funding for this study: Partially funded by the Italian Health Ministry.

RPS 703-7 - The feasibility of myocardial extracellular volume fraction derived from late iodine enhancement using dual-energy computed tomography: a comparison with CMR T1 mapping (8 min)

Jie Deng; Kunming / China



Author Block: J. Deng, D. Han, Z. Li, W. Gao, W. Chen; Kunming/CN

Purpose or Learning Objective: To validate the feasibility of myocardial extracellular volume fraction (ECV) derived from late iodine enhancement (LIE) via using dual-energy computed tomography, with the ECV from CMR T1 mapping as reference.

Methods or Background: 45 patients (45±14 years, 15 female) underwent both DECT and CMR. LIE was acquired 7 minutes after iodine administration of 0.9ml/kg of iopamidol and CCTA using the spectral CT. LIE images were reconstructed at 8mm slice thickness, 6mm slice gap to the short-axis plane of the left ventricular (LV) myocardium and then the basal, mid and apical slices were extracted. CMR T1 maps were obtained in short-axis at the basal, mid and apical slices of LV myocardium and consistent with the LIE images before and 10 minutes after intravenous administration of 0.1mmol/kg of gadolinium via using the MOLLI sequence. ROIs were manually drawn on the myocardium using the AHA's 16-segmentation. CT-ECV and CMR-ECV were double blindly calculated, respectively. Correlation, differences and agreement between the two groups and the reproducibility of CT-ECV were tested.

Results or Findings: Among the 45 patients, CT-ECV correlated with CMR-ECV ($r=0.926$, $P<0.001$) and there was no significant difference between the mean values of both (33.09 ± 4.21 vs 32.80 ± 4.89 , $P=0.293$). Bland-Altman analysis showed CT-ECV was comparable to CMR-ECV with a small bias (95%CI: -3.97% to 3.38%, bias=-0.29%). The ICC for the inter- and intra-observer measurements were 0.963 and 0.976. Furthermore, the mean radiation dose of the LIE was 2.42 ± 0.49 mSv.

Conclusion: CT-ECV derived from LIE can serve as an excellent alternative to CMR-ECV in noninvasively quantifying diffused myocardial fibrosis and it has well reproducibility.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: National nature science foundation of China (No.82060312); Yunnan applied basic research projects. (No.2018E001(-039)); No.202101AT0702490

CUBE-2 - Things you should better not do at home - Catastrophy during fEVAR - averted by IR

Categories: Interventional Radiology

Date: March 3, 2022 | 08:00 - 08:45 CET

Moderators:

Christian Loewe; Vienna / Austria

Maximilian de Bucourt; Berlin / Germany

CUBE-2-1 - Introduction

Christian Loewe; Vienna / Austria

Maximilian de Bucourt; Berlin / Germany

CUBE-2-2 - Catastrophy during fEVAR - averted by IR

Martin Funovics; Vienna / Austria

CUBE-2-3 - Discussion



HD 2 - Highlights of the Day

Date: March 3, 2022 | 09:00 - 09:30 CET

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

- Highlights of the Day (30 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

IND 46 - MR in 2022 - When innovation meets expectation

Categories: Abdominal, Artificial Intelligence, Cardiac, Cardiology, Cardiovascular, Deep Learning, General Radiology, Head and Neck, Image Quality, Imaging Methods, Liver, Lung, Machine Learning, MRI, Multidisciplinary, Musculoskeletal, Neuro, Pelvis, Radiographers, Radiologists

Date: March 3, 2022 | 09:15 - 10:00 CET

IND 46-1 - MR in 2022 - When innovation meets expectation (10 min)

Fotis Vlachos; United Kingdom

Discover GE Healthcare MR vision for 2022 and the main innovations that will fit all your needs Stay up to date with the latest GE Healthcare MR innovations. Hear about forthcoming SIGNA™ MR platforms and recent development of clinical applications.

IND 46-2 - Key Enablers of better patient care in a (post-) COVID world (20 min)

Mathias Goyen; Germany

IND 46-3 - MR in 2022 - When innovation meets expectation (10 min)

Icham Gouadjelia; France

IND 46-4 - MR in 2022 - When innovation meets expectation (10 min)

Bastien Perez; France



IND 50 - Artificial intelligence in mammography; leveling the playing field for global disparities

Categories: Artificial Intelligence & Machine Learning, Breast, Cancer Diagnostics, General Radiology

Date: March 3, 2022 | 09:30 - 10:00 CET

IND 50-1 - Artificial intelligence in mammography; leveling the playing field for global disparities (27 min)

Rachel F. Brem; Washington, DC / United States

Globally, over a half a million women die of breast cancer annually. In the US, the death rate has decreased by 40%, due to improved risk-based screening and targeted therapies. There is a need to increase cancer detection with mammography as well as increase interpretation efficiency, especially as tomosynthesis is becoming the standard of care. This presentation will review the impact of Artificial intelligence (AI) in cancer detection as well as compare AI to radiologist interpretation with 2D and 3D mammograms. As we become more aware and sensitive to the disparity of care among underserved populations, both in the US and around the globe, this presentation will discuss the use of AI has a strategy to mitigate the disparate breast cancer care and work toward equalizing care for all.

IND 50-2 - Outlook to upcoming breast care symposia in July (3 min)

Aline Hambüchen; Erlangen / Germany

Mirjam Braun-Brüsehauer; Erlangen / Germany

ESR/EORTC - Imaging and treatment of oligometastatic breast cancer

Categories: Hybrid Imaging, Oncologic Imaging

ETC Level: LEVEL II

Date: March 3, 2022 | 10:30 - 11:30 CET

CME Credits: 1

Moderator:

Nandita Desouza; London / United Kingdom

ESR/EORTC-1 - Chairperson's introduction (5 min)

Nandita M. deSouza; Sutton / UK

ESR/EORTC-2 - Clinical relevance of oligometastatic disease in breast cancer patients (17 min)

David Pasquier; Lille / France

1. To learn about the definition of oligometastatic disease.
2. To appreciate the therapeutic potentials of radiation oncology for oligometastatic disease.
3. To understand the clinical relevance of oligometastatic breast cancer.

ESR/EORTC-3 - Advanced imaging and future perspective in oligometastatic breast cancer (17 min)

Lioe Fee de Geus-Oei; Leiden / Netherlands

1. To learn about the current standards in breast cancer imaging.
2. To appreciate the differences in the diagnostic performance of the available imaging modalities for lesion detection in oligometastatic breast cancer.
3. To understand the future developments in diagnostic imaging for breast cancer detection.

ESR/EORTC-4 - Incorporating advanced imaging into clinical trials: EORTC IG recommendations (17 min)

Frédéric E. Lecouvet; Brussels / Belgium

1. To become aware of the impact of imaging generation on patient stratification and response assessment.
2. To appreciate the role of imaging for end-points evaluation in clinical trials and research.
3. To understand how to design trials evaluating optimal imaging strategies in oligometastatic breast cancer.

ESR/EORTC-5 - Panel discussion: What is the future of imaging in oligometastatic breast cancer? Challenges and opportunities (4 min)



RPS 808 - Temporal bone imaging

Categories: Head and Neck, Imaging Methods, Neuro

Date: March 3, 2022 | 10:30 - 11:30 CET

CME Credits: 1

Moderator:

Bert De Foer; Antwerp / Belgium

RPS 808-2 - Dual-phase contrast-enhanced CT evaluation of dural arteriovenous fistula in patients with pulsatile tinnitus as an initial symptom (8 min)

Xiaoshuai Li; Beijing / China

Author Block: X. Li; Beijing/CN

Purpose or Learning Objective: Intracranial dural arteriovenous fistula (DAVF) can cause pulsatile tinnitus (PT). The purpose of this study was to investigate the diagnostic performance of dual-phase contrast-enhanced CT (DU-CECT) for DAVF in PT patients compared with digital subtraction angiography (DSA).

Methods or Background: From February 2015 to April 2021, PT patients undergoing routine DSA examination were prospectively analyzed. Patients with and without DAVF diagnosed by DSA were included. In DP-CECT, the radiological signs related to DAVF were assessed as follows: asymmetric external carotid artery (EAC) branches, asymmetric enhancement of intracranial or extracranial veins, asymmetric venous collaterals in extracranial space, and shaggy tentorium or venous sinus on CTA; asymmetric enhancement of intracranial or extracranial veins on CTV; numerous transcalvarial channels and asymmetric size of foramen spinosum on high-resolution CT (HRCT).

Results or Findings: 253 PT patients receiving DSA were enrolled, and these patients had previously been screened by DP-CECT. Forty-six patients were diagnosed as DAVF by DSA. Therefore, the prevalence of DAVF was 18% (46/253) in patients with PT as the initial symptom. The sensitivity and specificity of DP-CECT for diagnosis of DAVF were 96% and 100%. The sensitivity of individual CTA signs ranged from 65% to 93%, and specificities ranged from 83% to 100%. The sensitivity of CTV sign was 80%, and specificity was 100%. The sensitivity of individual HRCT signs ranged from 48 to 52% and specificities from 61 to 100%.

Conclusion: DAVF is not rare in patients with PT as the initial symptom. DP-CECT can be used for screening DAVF in patients with PT.

Limitations: One potential limitation of this study was a single-center study.

Ethics committee approval: Yes

Funding for this study: Yes

RPS 808-3 - Pre-intraoperative evaluation in patients affected by cholesteatoma using CT-MR fusion protocol (8 min)

Serena Palizzi; Roma / Italy

Author Block: S. Palizzi, A. Romano, F. Dellepiane, A. Bozzao; Rome/IT

Purpose or Learning Objective: Cholesteatoma is a serious pathological condition that requires surgical excision as definitive treatment, with the least invasive technique. CT is the first level examination for the anatomical evaluation of the middle ear; however, it does not allow the differentiation of cholesteatoma margins from surrounding inflammatory tissue. On the contrary, RM-DWI has high specificity, with a reduced spatial resolution. The purpose of the study is to evaluate whether CT-MRI fusion images can increase the accuracy in the diagnosis and localization of cholesteatoma, with the aim of improving pre-operative planning

Methods or Background: 83 patients with cholesteatoma were included in our study in the time frame between October 2019 and May 2021; 20 underwent CT-MRI examination for pre-surgical planning. MR and CT images were co-registered using a dedicated console (BrainLab, Feldkirchen, Germany). The images with hypersignal in DWI-SE compatible with cholesteatoma were used to construct a three-dimensional "cholesteatoma", to be displayed on multiplanar and 3D co-registered CT images.

Results or Findings: A statistically significant difference was found between the volume of the cholesteatoma tissue and the surrounding inflammatory tissue (mean cholesteatoma volume: 0.03cm³; mean inflammatory tissue volume: 1.8cm³; p <0.05). In 80% of cases, the surgical approach to the patient was modified according to the information obtained from CT-MRI fusion images. No tissue residue was detected in the group of 20 patients surgically treated using the information from CT-MRI fusion. In the control group (63 patients), residual cholesteatoma was present in 6 cases (9.5%).

Conclusion: CT and MRI images are complementary to each other. In selected cases, they should be co-registered in the pre-operative evaluation of cholesteatoma in order to optimize surgical time and aim at radical surgical resection.

Limitations: No limitations identified.

Ethics committee approval: Not applicable.

Funding for this study: No funding was provided for this study.

RPS 808-4 - Altered neurovascular coupling in unilateral pulsatile tinnitus (8 min)

Xiaoshuai Li; Beijing / China

Author Block: X. Li; Beijing/CN

Purpose or Learning Objective: Altered cerebral blood flow (CBF) and regional homogeneity (ReHo) have been reported in pulsatile tinnitus (PT) patients. We aimed to explore regional neurovascular coupling changes in PT patients.

Methods or Background: 24 right PT patients and 25 age- and sex-matched normal controls were included in this study. All subjects received arterial spin labelling imaging to measure CBF and functional MRI to compute ReHo. CBF/ReHo ratio was used to assess the regional neurovascular coupling between the two groups. We analyzed the correlation between CBF/ReHo ratio and clinical data from the PT patients.

Results or Findings: PT patients showed increased CBF/ReHo ratio in the left middle temporal gyrus and right angular gyrus than normal controls, and no decreased CBF/ReHo ratio was found. CBF/ReHo ratio in the left middle temporal gyrus of PT patients were positively correlated with Tinnitus Handicap Inventory score ($r=0.433$, $p=0.035$).

Conclusion: These findings suggested that PT patients show abnormal neurovascular coupling, which provides new information for understanding the neuropathological mechanisms underlying PT.

Limitations: First, we enrolled only the right PT patients. In clinical work, right PT patients are more common than left PT patients[50] and may represent the general state of most patients. As the number of included patients increases, we will further explore the effect of PT side on neurovascular coupling changes. Second, the CBF/ReHo ratio is only an indirect reflection of neurovascular coupling. In the future, we expect that there will be direct neurovascular coupling indicators to describe the neuropathological mechanisms underlying PT.

Ethics committee approval: This study was approved by the local research ethical committee.

Funding for this study: This study was not funded.

RPS 808-5 - Temporal bone imaging using clinical photon-counting CT: image quality, artefact assessment and radiation dose after cochlear implant surgery (8 min)

Amadéa Schönenberger; Zürich / Switzerland

Author Block: A. L. Schönenberger¹, T. Flohr², B. Schmidt², S. Winklhofer¹, H. Alkadhi¹; ¹Zürich/CH, ²Forchheim/DE

Purpose or Learning Objective: Assessing the image quality, artefact severity and radiation dose after cochlear implantation of the temporal bone in clinical photon-counting CT (PCCT) depending on the imaging acquisition and postprocessing.

Methods or Background: PCCT was performed on a human cadaveric temporal bone after surgical cochlear implantation using the QuantumPlus mode at three different CTDIvol levels (15.3, 9.7, 5.8 mGy). Image reconstructions were performed using four different reconstruction kernels (Hr72, 84, 96, 98) and additional four different Quantum Iterative Reconstruction levels (QIR level 1-4) resulting in a total of 60 different imaging data sets. Quantitative (ROI for noise and metal artefacts) and qualitative image evaluation (5-point Likert scale for anatomical and electrode delineation). Image noise quantification using the standard deviation of attenuation in the surrounding fluid.

Results or Findings: The 15.3mGy CTDIvol demonstrated a superior anatomical delineation and reduced quantitative artefacts compared to the two lower radiation levels (mean 3.8 / 2.9 / 1.6; 406 / 471 / 506HU; each $p>0.05$). Image noise showed no significant differences. Image artefacts decreased with higher iterative levels (no QIR = 512HU, QIR level 4 = 379HU, $p>0.05$). Hr72 showed the best anatomical delineation (median 3.8 / 3.2-1.8) and lowest image noise (68 vs. 127-320HU) compared to Hr84, 96, and 98 (each $p>0.05$). Hr72 and 84 demonstrated the lowest artefact levels compared to Hr96 and 98 (388 and 357HU / 515 and 582HU, each $p>0.05$). Electrode delineation showed no significant difference with perfect visibility in all radiation levels.

Conclusion: In clinical PCCT of the temporal bone after cochlear implantation, a sufficiently good electrode delineation was seen in all radiation levels. Optimal anatomical delineation and artefact reduction on higher radiation levels and lower kernels (Hr72) and quantitative artefacts reduction by higher iterative levels.

Limitations: Single subject.

Ethics committee approval: Approved.

Funding for this study: Not applicable.

RPS 808-6 - CT evaluation of labyrinth structures in patients with incomplete partition type II anomaly (8 min)

Ipek Sel; Istanbul / Turkey



Author Block: I. Sel, Y. Karagöz, E. Ateş, D. Ö. Ö. Aksoy, A. S. Mahmutoglu; Istanbul/TR

Purpose or Learning Objective: Incomplete partition type II (IP II) is one of the most frequently encountered congenital inner ear malformations in cochlear implant candidates. It is characterized by modiolar apical defects and mild vestibular enlargement. Anomalous child will develop sensorineural hearing loss (SNHL) worsening progressively with ageing supposedly with minor traumas. Radiological diagnosis of malformation could be difficult with equivocal changes in tiny labyrinthine structures, especially with inexperienced viewers.

Methods or Background: Our study was a retrospective case-control study including 34 SNHL patients with IP type II (66 ears) and 24 patients (48 ears) with normal audiographic findings who underwent temporal CT imaging. A normal group was examined tomographically for inflammatory conditions or trauma not involving labyrinthine structures. Measurements of defined inner ear structures were performed by two observers separately; observer 1 is a senior neuroradiologist and observer 2 is a novice radiologist with 1 year of experience in neuroradiology. The parameters measured in patient and control groups were compared and interobserver reliability was calculated.

Results or Findings: Lateral interscalar notch angle, lateral scalar height, medial interscalar notch depth, medial scalar height, vestibular aqueduct (VA) width at the middle, VA width at operculum level, vestibular height and width were found to be significantly larger while lateral interscalar notch depth and LSSC bone island surface area were significantly smaller in the patient group ($p < 0.05$). These findings especially the lateral cochlear measurements are valuably proving structural changes secondary to apical modiolar deficiency.

Conclusion: CT measurements in SNHL could help to diagnose IP type II anomaly especially in patients with equivocal audiological and radiological findings.

Limitations: No limitations identified.

Ethics committee approval: Yes.

Funding for this study: There was no need for any funding.

RPS 808-7 - Is hearing necessary for cochlear nerve myelination? (8 min)

Mehmet Bilgin Eser; Istanbul / Turkey

Author Block: M. B. Eser, B. Atalay, M. T. Kalcioğlu; Istanbul/TR

Purpose or Learning Objective: This study aimed to investigate whether there is a relationship between cochlear nerve myelination and hearing loss in children with congenital non-syndromic sensorineural profound hearing loss.

Methods or Background: Patients who underwent cochlear implant surgery in our university hospital were retrospectively evaluated, and 33 patients (19 boys, 14 girls) with congenital non-syndromic sensorineural profound hearing loss (>100 db) were included. Current knowledge has shown that the myelinated cochlear nerve can be measured with MRI T2-weighted sequences. So that, the experienced observer measured cochlear nerve circumference (CNC) and surface area (CNSA) from FIESTA-C images taken in the sagittal oblique plane of these patients. Pearson correlation was done to understand the relationship between age and CNC and CNSA, and with t-test was done to compare means of 24 months under-over children of CNC and CNSA.

Results or Findings: The mean age of the individuals is 22.52 (SD: 12.37, Range: 5 - 55) months. CNC in male patients is 3.88 (SD: 0.10) mm and in female patients 3.71 (SD: 0.09) mm, and there was no difference. The mean CNC was 3.81 (SD: 0.41) mm. The mean CNSA we found was 1.08 (SD: 0.23) mm². A moderate positive correlation was found between age and CNC ($r=0.38$, $p=0.03$), CNSA ($r=0.39$, $p=0.03$). Although not significant on the t-test ($p=0.06$), children under 24 months (1.02, SD: 0.15 mm²) had a smaller CNSA than those over 24 months (1.17, SD: 0.32 mm²).

Conclusion: This study provides weak evidence that myelination continues in its normal course in children with a congenital non-syndromic sensorineural profound hearing loss despite the absence of a hearing signal.

Limitations: Retrospective design.

Ethics committee approval: Exist (DN:2018/0177).

Funding for this study: Not applicable.

IND 12 - Connecting the dots - Integrating AI into the Radiology Workflow

Date: March 3, 2022 | 10:30 - 11:30 CET

Moderator:

Dr. Imran Siddiqui; Reading / United Kingdom

IND 12-1 - (15 min)

Declan O'Regan; London / UK

IND 12-2 - (15 min)

Michael Forsting; Essen / Germany

IND 12-3 - (15 min)

Roland Wiest; Bern / Switzerland

IND 12-4 - (15 min)

Amrita Kumar; Maidenhead / UK

RT 8 - Building bridges: interventional oncology, one of the four pillars in cancer care

Categories: Interventional Radiology, Multidisciplinary, Oncologic Imaging, Professional Issues, Radiographers

ETC Level: LEVEL II+III

Date: March 3, 2022 | 10:30 - 11:30 CET

Moderators:

Valérie Vilgrain; Clichy / France

Carlo Catalano; Roma / Italy

RT 8-1 - Chairpersons' introduction (2 min)

Valérie Vilgrain; Clichy / France

Carlo Catalano; Rome / Italy

1. To learn about interventional oncology as one of the four pillars in cancer care.
2. To understand the complementary role of interventional oncology to that of surgical oncology, medical oncology and radiation oncology.
3. To discuss the importance of collaboration between these disciplines for (cost)efficient treatment and better outcome for the patient and to recognise cancer care as a continuum of care.
4. To recognise the synergy when the four disciplines team up together in clinics and in research.

RT 8-2 - Interventional oncology: one of the four pillars in cancer care (8 min)

Thomas K. Helmberger; Munich / Germany

RT 8-3 - Surgical oncology: towards minimally invasive (8 min)

RT 8-4 - Medical oncology: complementary to local treatment (8 min)

Andres Cervantes; Valencia / Spain

RT 8-6 - Discussion (34 min)

Thomas K. Helmberger; Munich / Germany

Afshin Gangi; Strasbourg / France

Adrian Brady; Cork / Ireland

RC 810 - Update in imaging rheumatology

Categories: General Radiology, Imaging Methods, Musculoskeletal, Ultrasound

ETC Level: LEVEL II+III

Date: March 3, 2022 | 10:30 - 11:30 CET

CME Credits: 1

Moderator:

Antoine Feydy; Paris / France

RC 810-1 - Chairperson's introduction (5 min)

Antoine Feydy; Paris / France

RC 810-2 - How to avoid overdiagnosis of SpA on MRI (15 min)

Antoine Feydy; Paris / France

1. To describe the MRI findings of inflammatory diseases of the axial skeleton.
2. To learn about differentials of inflammatory diseases of the axial skeleton.

RC 810-3 - New insights and developments in imaging of spondyloarthropathy (15 min)

Winston Rennie; Leicester / UK

1. To describe how to optimise your protocol.
2. To list the potential role of dual-energy CT for the detection of inflammatory diseases in the axial skeleton.
3. To list the potential role of synthetic CT of inflammatory diseases in the axial skeleton.

RC 810-4 - Advances in ultrasound of juvenile inflammatory arthropathies (15 min)

Iwona Sudol-Szopinska; Warsaw / Poland

1. To explain the role of ultrasound in inflammatory arthropathies in children and adolescents compared to conventional radiography and MRI.
2. To list the ultrasound findings and differentials in inflammatory arthropathies in children and adolescents.

RC 810-5 - Panel discussion: The role of imaging in the diagnosis and characterisation of rheumatologic diseases (10 min)



IND 14 - MRI in abdominal oncology: An interactive discussion of clinical cases from routine practice

Categories: Abdominal, Cancer Assessment, Cancer Diagnostics, Cancer Research, Contrast Media, Education and Training, Evidence-Based Imaging, General Radiology, Hepatic, Liver, MRI, Multimodality Cancer Imaging, Oncologic Imaging, Pelvis, Physics in Medical Imaging, Research, Students, Tumour, Urogenital

Date: March 3, 2022 | 12:00 - 13:00 CET

Moderator:

Luis Marti-Bonmati; Valencia / Spain

IND 14-1 - Detection and characterization of liver cancer: which agent and when? (10 min)

Alain Luciani; Creteil / France

Importance of contrast enhanced MRI in detection for the liver cancer, similarities and differences between Hepatobiliary Contrast agents.

IND 14-2 - MRI in the diagnosis and management of prostate cancer: a practical guide for routine clinical use (20 min)

Heinz-Peter Schlemmer; Heidelberg / Germany

Updating on the role of MRI contrast agents for diagnoses of prostate cancer.

IND 14-3 - A practical review of MRI for the evaluation and management of uterine cancer (20 min)

Riccardo Manfredi; Rome / Italy

Updating on the role of MRI contrast agents for diagnoses of uterine cancer.



IND 51 - Benefits of AI and edge technology in radiology

Categories: Artificial Intelligence & Machine Learning, General Radiology

Date: March 3, 2022 | 12:00 - 12:15 CET

IND 51-1 - Benefits of AI and edge technology in radiology (- min)

Elmar Kotter ; Freiburg / Germany

Prof. Dr. Kotter and his colleagues at the university hospital in Heidelberg benefit of having the AI-Rad Companion Chest CT in their clinical environment. In the institution the data processing is done locally, although the system is running on the teamplay digital health platform. This hybrid and unique setup make it possible that advanced deep-learning algorithms run on their local hardware and no sensitive data leaves the institution. And on the other hand, they benefit from fully managed operations remotely from the cloud with regular software and algorithms updates.

Disclaimer:

AI-Rad Companion consists of several products that are (medical) devices in their own right, and products under development. AI-Rad Companion is not commercially available in all countries. Future availability cannot be ensured.

The edge technology is pending 510(k) clearance, and are not yet commercially available in the United States. Their future availability cannot be guaranteed.

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RPS 909 - Interventional management of malignant liver lesions

Categories: Interventional Oncologic Radiology, Interventional Radiology, Multidisciplinary

Date: March 3, 2022 | 12:30 - 13:30 CET

CME Credits: 1

Moderators:

M.R. Ruben Meijerink; Amsterdam / Netherlands

Valérie Vilgrain; Clichy / France

RPS 909-2 - Prospective study on the immunological effects of conventional transarterial chemoembolization in patients with hepatocellular carcinoma: an interim analysis (8 min)

Robin Schmidt; Berlin / Germany

Author Block: R. Schmidt, B. Gebauer, C. Roderburg, G. Ardila Pardo, E. Can, F. Tacke, L. Hammerich, B. Hamm, L. J. Savic; Berlin/DE

Purpose or Learning Objective: To characterize immune cell profiles in patients with hepatocellular carcinoma (HCC) and alterations induced by conventional transarterial chemoembolization (cTACE).

Methods or Background: This interim report of an ongoing prospective clinical trial included 31 patients with HCC, who received 58 cTACE procedures between 09/2020-08/2021. Peripheral blood was sampled before, 24h, and 8 weeks after cTACE for fluorescence-activated cell sorting (FACS) analysis. A 24-color multiplex staining panel was employed to quantify lymphoid cells and checkpoint-molecule expression including CD3, CD4, CD8, CD45 and PD-1 staining. Baseline MRI and post-cTACE non-contrast CT were registered and Hounsfield units (HU) in a segmented tumour mask were quantified. The mean HU of the entire cohort was defined as a threshold for tumoural Lipiodol uptake. Statistics included normality and paired mixed-effects with post-hoc testing.

Results or Findings: Compared to baseline (CD4+: 69.7% of CD45+CD3+ T cells (TC); CD8+: 23.3% of TC), CD4+ helper TC decreased (64.6%, $p=0.001$), whereas CD8+ effector TC increased (26.9%, $p=0.01$) 24h post-cTACE. A greater increase of CD8+ TC 24h post-cTACE was observed in patients with below threshold tumoural Lipiodol uptake ($p=0.001$) but values returned to baseline levels at 8 weeks ($p<0.001$), as compared to patients with above Lipiodol uptake ($p=0.043$), where levels remained increased 8 weeks post-cTACE ($p>0.999$). However, in patients with below threshold Lipiodol uptake at 24h, CD8+ TC expressing the exhaustion marker PD1 were higher than in patients with above threshold Lipiodol uptake ($p=0.019$), but not 8 weeks post-cTACE ($p=0.293$).

Conclusion: These preliminary results demonstrate possibly favorable cTACE-induced antitumoural T cell response, suggesting Lipiodol as an imaging biomarker for the functional TC status. The findings may help exploit cTACE-induced immune-activation to guide personalized treatments using combinations with immuno-oncological therapies.

Limitations: Single-site.

Ethics committee approval: Obtained.

Funding for this study: Guerbet (project-related funding).

RPS 909-3 - Experimental study on transarterial administration of Bevacizumab combined with transarterial chemoembolization in rats with hepatocellular carcinoma (HCC) (8 min)

Zhang Shen; Wuhan / China

Author Block: Q. Jun¹, Z. Shen², E. Oppermann³, U. Imlau³, H. Korkusuz³, W. Bechstein³, T. J. Vogl³; ¹Hangzhou/CN, ²Wuhan/CN, ³Frankfurt/DE

Purpose or Learning Objective: To evaluate the effects of transarterial administration of Bevacizumab (Avastin), an inhibitor of vascular endothelial growth factor (VEGF), combined with transarterial chemoembolization (TACE) in the treatment of hepatocellular carcinoma in rats.

Methods or Background: Subcapsular implantation of solid Morris hepatoma 3924A (2 mm³) was performed in the livers of 20 male ACI rats. Animal subjects were assigned to the group based on which treatment drugs were injected into the hepatic artery: group A: TACE (mitomycin C + lipiodol + degradable starch microspheres) + Bevacizumab, group B: TACE alone. Post-treatment (V2) and pre-treatment (V1) tumour volumes were assessed by magnetic resonance imaging (MRI) and the mean proportion (V2/V1) was calculated. Immunohistochemical expression of MMP-9 and VEGF in tumours was semi-quantitative in all rats.

Results or Findings: The ratios of the post-treatment to pre-treatment tumour volumes (V2/V1) in groups A and B were 1.6649 ± 0.1255 and 3.0061 ± 0.1910 respectively. A significant difference was observed between group A and group B ($P < 0.0001$). Higher expression of MMP-9 and VEGF in hepatocellular carcinoma was demonstrated in the control group (TACE alone) than group A (TACE + Bevacizumab) (both $P < 0.0020$).

Conclusion: Transarterial administration of Bevacizumab combined with TACE noticeably inhibits the growth of hepatic carcinoma and intrahepatic metastases in rats.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 909-4 - Improved survival after transarterial radioembolisation for hepatocellular carcinoma (HCC) gives the procedure added value (8 min)

Antonio De Cinque; Bologna / Italy

Author Block: A. De Cinque, C. Mosconi, A. Cucchetti, A. Cappelli, G. Vara, C. Pettinato, L. Strigari, R. Golfieri; Bologna/IT

Purpose or Learning Objective: Transarterial Radioembolisation (TARE) requires multidisciplinary experience and skill to be effective. The aim of this study was to identify the determinants of survival in patients with hepatocellular carcinoma (HCC), focusing on the learning curve, technical advancements, patient selection and role of subsequent therapies. Thus, TARE results achieved in the initial period (2005-2012) were compared to those obtained in recent years (2012-2020).

Methods or Background: From 2005 to 2020, 253 patients were treated with TARE. From 2005 to 2012, delivered activity was calculated using body surface area (BSA) formula while, after 2012, partition model was used and, for the most part, selective treatments were performed.

Results or Findings: Of 253 patients, 68 were treated before January 2012 and 185 after 2012. In the second period, patients had an ECOGPS score of 1 ($p = 0.025$) less frequently, less liver involvement ($p = 0.006$) and a less advanced degree of vascular invasion ($p = 0.019$). The median overall survival (OS) of patients treated before 2012 was 11.2 months and that of patients treated beginning in 2012 was 25.7 months. After reweighting to isolate the effect of the treatment period, the median OS of patients before 2012 increased to 16 months. The median OS of patients with an adsorbed dose < 120 Gy was 15.7 months and that of patients with an adsorbed dose ≥ 120 Gy was 26.0 months. Of subsequent therapies, only surgery provided a survival advantage.

Conclusion: Better patient selection, refinement of technique and adoption of personalized dosimetry improved survival after TARE. Conversely, the addition of sorafenib after TARE did not impact life expectancy.

Limitations: Limitations intrinsic to retrospective studies.

Ethics committee approval: The study conformed to the ethical guidelines of the Declaration of Helsinki and was approved by the Institutional Review Board of the centre. All patients provided informed written consent.

Funding for this study: No funding received.

RPS 909-5 - A new biodegradable stent to improve the management of biliary strictures in paediatric split liver transplantation (8 min)

Ludovico Dulcetta; Bergamo / Italy



Author Block: L. Dulcetta, P. Marra, F. S. Carbone, P. A. Bonaffini, R. Muglia, L. D'Antiga, S. Sironi; Bergamo/IT

Purpose or Learning Objective: Cholestasis due to benign biliary strictures is the most common biliary complication after paediatric split liver transplantation (SLT), decreasing graft survival, but consensus about its management is lacking. Percutaneous transhepatic cholangiography (PTC), bilioplasty and internal-external biliary drainage (IEBD) are standard treatments. The aim of this report is to present the preliminary experience with a new biodegradable biliary stent in the management of post SLT biliary strictures.

Methods or Background: In addition to the standard treatment, 6 paediatric patients (4 males; median age 8 years, interquartile range 6.25-9.75) with SLT underwent percutaneous transhepatic implantation of an innovative 10F helical-shaped biodegradable biliary stent, featuring a slow degradation profile. To our knowledge the device is unique and the first to be CE-marked for the use in this indication.

Results or Findings: Percutaneous stent implantation was technically successful in all 6 patients. In the first case, early stent dislodgement and migration in the bowel was demonstrated with X-rays after 72 hours, without sequelae. No complications occurred during a 6-month follow-up.

Conclusion: Preliminary data suggest that implantation of a new biodegradable biliary stent is feasible and safe, to be considered in the management of post SLT cholestasis in paediatric patients. Some technical considerations must be done during implantation. This device may prolong biliary drainage and may relieve the discomfort of long-term IEBD.

Limitations: Small cohort study.

Ethics committee approval: The Human Investigation Committee (IRB) of Bergamo approved this study.

Funding for this study: Not applicable.

RPS 909-6 - The effect of Microwave/Radiofrequency Ablation (MWA/RFA) on liver volume in patients with primary and secondary liver tumours: a single centre retrospective analysis (8 min)

Robrecht Knapen; Maastricht / Netherlands

Author Block: R. Knapen, R. Korenblik, S. James, G. Dams, S. De Boer, C. Van Der Leij, R. Van Dam; Maastricht/NL

Purpose or Learning Objective: Before liver surgery, hypertrophy-inducing procedures, such as Portal Vein Embolization (PVE), can be performed to stimulate future liver remnant (FLR) hypertrophy. This is to reduce the chance of post-hepatectomy liver failure (PHLF). Thermal ablation can induce liver hypertrophy as well, but the exact influence of Radiofrequency or Microwave Ablation (RFA/MWA) on liver hypertrophy remains unclear. Therefore, liver volume changes after RFA/MWA were retrospectively analyzed.

Methods or Background: Consecutive patients, with primary or secondary liver lesions, treated with RFA/MWA between January 2015 and May 2021 were included. Patients with earlier liver treatment or insufficient imaging were excluded. Total Liver Volume (TLV), volume of segment II+III, ablation volume and TLV minus ablation volume (absolute liver volume, ALV) were calculated using OsiriX DICOM viewer and Syngo.via. ALV change after >9 weeks was used as primary outcome variable. Wilcoxon tests were used for analysing volume changes.

Results or Findings: 56 patients were analysed, 36 patients with primary and 20 patients with secondary liver lesions. ALV in patients with secondary liver lesions increased with an average of 74.80mL ($p=0.052$), an average of 104.08% (SD=93.80-114.36%). Segment II+III increased with an average of 10.30mL ($p=0.044$), percentage average of 104.34% (SD=93.37-115.31%). ALV and segment II+III in patients with primary liver lesions remained stable with an average of 100.98% (SD=92.02-110.94%, $p=0.863$) and 101.82% (SD=85.22-118.42%, $p=0.551$), respectively.

Conclusion: Patients with secondary lesions ALV and segment II+III increased after MWA/RFA with 4%, while livers with primary liver lesions remained stable. This suggests that performing an ablation in livers with secondary liver lesions could further increase the FLR, and can be additional to FLR-hypertrophy inducing procedures. This might further help decrease PHLF, but needs to be validated in clinical trials.

Limitations: No limitations identified.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 909-7 - Interventional oncological treatment of hepatocellular carcinoma (HCC): a monocentric long-term evaluation over 27 years (8 min)

Thomas J. Vogl; Frankfurt a. Main / Germany

Author Block: T. J. Vogl, J. Freichel, T. Gruber-Rouh, W. Bechstein, S. Zeuzem; Frankfurt a. Main/DE

Purpose or Learning Objective: To retrospectively evaluate the development and technical progress in local oncological treatments of hepatocellular carcinoma (HCC) regarding survival rates between 1993 and 2020.

Methods or Background: In total, 1.046 HCC patients (824m/222f) were treated in 3.287 sessions with transarterial chemoembolization (TACE) from 1996-2000, laser-induced thermotherapy (LITT) from 1993-2011, microwave ablation (MWA) from 2008-2020, combined LITT+TACE or MWA+TACE. 25 patients (19m/6f, median: 69 years, range: 36-82) received 35 LITTs (1.4 cycles/patient). 67 patients (50m/17f, median: 68 years; range: 42-85) combined LITT+TACE (96 LITTs, 1.4 cycles/patient; 367 TACEs, 5.48 cycles/patient, range: 1-17). 228 patients (179m/49f; median 65 years; range: 32-85) received 385 MWAs (1.7 cycles/patient), 108 patients (90m, 18f; median: 69 years; range: 20-88) MWA+TACE (227 MWAs; 2.1 cycles/patient; 769 TACEs; 7.1 cycles/patient). 618 patients (486m/132f; median: 67 years; range: 15-91) received TACE only (2544 cycles; 4.1 cycles/patient). Results were evaluated regarding overall survival (OS) according to Kaplan-Meier and log-rank test for comparing the groups. A p-value ≤ 0.05 was considered significant.

Results or Findings: Median survival was 593 days for LITT with 1-/3-/5-year survival of 64.0%/24.0%/20.0% and 959 days for combined LITT+TACE with 83.6%/40.3%/14.9%. The total complication rate per LITT treatment was 8.57%; LITT+TACE 6.25%. Complications included pleural effusion, subcapsular haematoma and cutaneous wound infections, but no mortality. Median survival for MWA+TACE was 1,505 days. In the MWA group 1-/3-/5-year survival rates were 91.2%/76.9%/75.0%; for MWA+TACE 83.3%/55.7%/48.3%. The median survival time for TACE only was 474 days with 1-/3-/5-year survival rates of 58.1%/34.7%/30.2%.

Conclusion: Survival rates of MWA and MWA+TACE are significantly higher with less complication rates vs. TACE monotherapy and both LITT groups. However, prospective data remain necessary to further evaluate the superiority of either modality.

Limitations: Retrospective study design.

Ethics committee approval: Approval of the institutional review board was obtained.

Funding for this study: No funding was provided for this study.

RPS 909-8 - Image-guided microwave ablation of liver lesions using a new 150-W generator: preliminary technical evaluation (8 min)

Valentina Cignini; Rome / Italy

Author Block: v. Cignini, G. Risi, M. Calandri, F. Menchini, F. Coi, A. N. A. Serafini, C. Maglia, C. Gazzera, P. Fonio; Turin/IT

Purpose or Learning Objective: To assess the safety and efficacy of a new 150-W generator for microwave ablation of liver lesions. Volume, sphericity of the ablation zone as well as adverse events were evaluated. No available data are present in the literature.

Methods or Background: Prospective collection of data was performed including all the patients who underwent microwave ablation, treated using the 150-W generator since March 2021. Procedures were performed under conscious sedation in the CT room for immediate control of the ablation zone; the microwave ablation antenna (Emprint Medtronic 14G) was inserted under US guidance. Collected data included among the others: ablation mean time, pre- and post-ablation volume, sphericity index, ablation margins, presence of gas artefacts in the veins, THAD. Adverse events were evaluated according to Clavien-Dindo Classification.

Results or Findings: 16 hepatic tumours (32,1 mm +/- 15,1) from 14 patients (M=11; F=3, age 66,4 +/- 5,6) who underwent percutaneous MWA were included in this observational prospective study. Ablation time was 5,8 min. The mean ablation volume was 36,2 +/- 21,3 cm³, larger than pre-ablation volume (18,6 +/- 26,5 cm³) and ablation volumes of previously reported series using the 100 W generator with the same antenna. Mean sphericity index was 0,8125 (range 0,7-1,1), similar to the manufacturer chart and other series using the 100 W generator. Vascular abnormalities at the immediate CT control were observed in 5 patients (3 THAD, 4 gas artefacts in the veins). No adverse events were registered.

Conclusion: The new 150-W generator provides effective and large ablation volume with predictable sphericity index and high safety profile, in absence of severe adverse events.

Limitations: Monocentric study.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.



RT 9 - Building bridges: radiology and radiation therapy, a match made in heaven?

Categories: Management/Leadership, Multidisciplinary, Oncologic Imaging, Professional Issues, Radiographers

ETC Level: LEVEL II+III

Date: March 3, 2022 | 12:30 - 13:30 CET

Moderators:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

Lorenzo E. Derchi; Genoa / Italy

RT 9-1 - Chairpersons' introduction (2 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

Lorenzo E. Derchi; Genoa / Italy

1. To learn about the increasing role of imaging in radiation treatment.
2. To understand how it will impact collaboration in technology innovation.
3. To know how image guidance is used in daily clinical practice of radiation oncology.

RT 9-3 - The use of imaging to guide radiation therapy: an interview with the expert (10 min)

RT 9-4 - Discussion (48 min)

Vincenzo Valentini; Rome / Italy

Bernd Ohnesorge; Erlangen / Germany

Michael H. Fuchsjäger; Graz / Austria

RC 904 - Artificial intelligence (AI) and technological improvements in chest imaging: the transition from research to practice

Categories: Artificial Intelligence & Machine Learning, Chest, Imaging Informatics, Oncologic Imaging

ETC Level: LEVEL III

Date: March 3, 2022 | 12:30 - 13:30 CET

CME Credits: 1

Moderator:

Jürgen Biederer; Heidelberg / Germany

RC 904-1 - Chairperson's introduction (5 min)

Jürgen Biederer; Heidelberg / Germany

RC 904-2 - AI in chronic obstructive pulmonary diseases (COPD) (15 min)

Marleen de Bruijne; Rotterdam / Netherlands

1. To learn about AI techniques used to quantify emphysema and airway properties in chest CT.
2. To learn how AI can help in the diagnosis and prognosis of patients with COPD.
3. To understand the current limitations of AI in COPD.

RC 904-3 - AI in interstitial lung diseases (15 min)

Joseph Jacob; London / UK

1. To understand the processes by which computers learn lung CT patterns.
2. To understand the advantages of computer analysis of CTs over visual CT analysis.
3. To understand the importance of PPFE as a feature in patients with lung fibrosis.

RC 904-4 - AI in lung cancer (15 min)

Joon Beom Seo; Seoul / Korea, Republic of

1. To understand the current status of AI applications in lung cancer imaging.
2. To learn how to improve detection of lung nodules in lung cancer CT screening using AI.
3. To learn how to use AI combined with radiomics in the characterisation of lung nodules and lung cancer staging.

RC 904-5 - Panel discussion: Clinical applications of AI in thoracic imaging (10 min)



OF 9c - Value-based radiology: where to next?

Categories: Education, General Radiology, Management/Leadership, Professional Issues

ETC Level: ALL LEVELS

Date: March 3, 2022 | 12:30 - 13:30 CET

CME Credits: 1

Moderator:

Adrian Brady; Cork / Ireland

OF 9c-1 - Chairperson's introduction (3 min)

Adrian Brady; Cork / Ireland

OF 9c-2 - Value-based radiology (VBR): why now? (10 min)

Adrian Brady; Cork / Ireland

1. To learn the basic concepts of VBR.
2. To appreciate what the ESR has done to date to promote VBR.
3. To understand why VBR is important now and in the future.

OF 9c-3 - What constitutes value for patients? (10 min)

Judy Birch; Poole / UK

1. To learn the patient's perspective on what constitutes value in radiology services.
2. To appreciate any differences between the priorities of radiologists and radiographers and patients.
3. To understand the primacy of patient concerns and needs.

OF 9c-4 - Focus on value: the way forward (10 min)

Jacob Visser; Rotterdam / Netherlands

1. To learn why the assessment of radiology effectiveness must change from a measurement of volume to work done.
2. To appreciate the drivers of such change.
3. To understand what practical steps can be taken to focus on value rather than volume.

OF 9c-5 - Open forum discussion: What practical steps can we take to enhance value in radiology? (27 min)



IND 45 - Key Enablers of Better Patient Care in a (Post)-COVID World

Categories: Artificial Intelligence, COVID-19, General Radiology, Management/Leadership, Radiographers, Radiologists

Date: March 3, 2022 | 13:30 - 14:30 CET

Moderator:

Mathias Goyen; GE Healthcare / Germany

IND 45-1 - Key Enablers of better patient care in a (post-) COVID world (20 min)

Rob Walton; United Kingdom



TS 10 - High-level sports outpatient clinic: a multidisciplinary approach

Categories: Emergency Imaging, Imaging Methods, Multidisciplinary, Musculoskeletal

ETC Level: LEVEL II+III

Date: March 3, 2022 | 14:00 - 15:00 CET

CME Credits: 1

Moderator:

Mario Maas; Amsterdam / Netherlands

TS 10-1 - Introduction by the president (1 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

TS 10-2 - Chairperson's introduction (2 min)

Mario Maas; Amsterdam / Netherlands

1. To become familiar with the needed skills for optimal interaction in high-demand sports.
2. To learn about the needed clinical skills for a team-playing radiologist.
3. To obtain insight in the spectrum of complex sports radiology.
4. To give an outlook to the highlight Multidisciplinary program at ECR 2022.

TS 10-3 - The radiologist is my friend: what is the secret? Lessons from the orthopaedic surgeon (10 min)

Gino M.M.J. Kerkhoffs; Amsterdam / Netherlands

TS 10-4 - The mélange of hard skills and soft skills in sports radiology (10 min)

Mario Maas; Amsterdam / Netherlands

TS 10-5 - Panel discussion: The sports outpatient clinic (32 min)

Gino M.M.J. Kerkhoffs; Amsterdam / Netherlands

Mario Maas; Amsterdam / Netherlands

TS 10-6 - Wrap-up (5 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

E³ 1021 - Imaging evaluation of sarcopenia

Categories: Abdominal Viscera, Imaging Informatics, Imaging Methods, Musculoskeletal, Oncologic Imaging

ETC Level: LEVEL II+III

Date: March 3, 2022 | 14:00 - 15:00 CET

CME Credits: 1

E³ 1021-1 - Multiparametric MRI and CT (30 min)

Iris Rutten; Maastrich / Netherlands

1. To become familiar with the definition of sarcopenia.
2. To learn about the use of CT and MRI for the assessment of sarcopenia.

E³ 1021-2 - Multiparametric US (30 min)

Violeta Vasilevska-Nikodinovska; Skopje / Macedonia

1. To become familiar with the characteristics of the new modes used to evaluate sarcopenia with multiparametric US.
2. To learn about the applications of multiparametric US for the assessment of sarcopenia.

RPS 1013 - Computed tomography (CT)

Categories: Imaging Methods, Musculoskeletal, Oncologic Imaging, Physics in Medical Imaging

Date: March 3, 2022 | 14:00 - 15:00 CET

CME Credits: 1

Moderators:

Konstantinos Perisinakis; Iraklion / Greece

Boris Brkljačić; Zagreb / Croatia

RPS 1013-2 - Commissioning of a whole-body photon counting spectral CT scanner: physico-technical tests (8 min)

Hilde Bosmans; Leuven / Belgium

Author Block: H. Bosmans, L. Dewulf, J. Binst, H. Verhoeven, D. Petrov, K. Merken, N. Marshall, W. Coudyzer, C. Van Ongeval; Leuven/BE

Purpose or Learning Objective: To verify the performance of a newly installed, new generation photon-counting CT scanner for potential applications in high-resolution CT scanning and spectral imaging.

Methods or Background: A quality control program was developed for commissioning a Siemens-Healthineers NAEOTOM Alpha CT including tests for 2 specific applications: virtual non-contrast imaging (VNC) and ultra-high resolution (UHR). Results were compared to Siemens-Healthineers Force (CT_F) and Edge CT (CT_E). Automatic exposure choices were verified for different phantoms/conditions. The measurements used an in-house phantom with different iodine concentrations, the Catphan phantom, and QRM phantom with liver lesion inserts for model observer (MO) detectability. Results for 120kV spectral imaging (4 dose levels/3 matrix sizes) and 120kV UHR scanning are reported.

Results or Findings: Median and range of iodine HUs in the VNC of iodine-filled tubes were respectively -4.7 HU and 9.6 HU for the NAEOTOM, 0.6 HU, and 18.9 for CT_F and -14.7 and 17.7 for CT_E. HU difference showed less variation versus dose for the NAEOTOM. The 50% value of the task transfer function (TTF) for the Catphan air insert was 0.38mm⁻¹ for all three scanners in standard mode, while this value was 1.41 mm⁻¹ for the NAEOTOM UHR. Reconstructed volume size impacted MO results: images with slice 1024x1024 slice voxel matrix had significantly lower threshold diameter of 4.22mm ± 0.08mm, compared to 4.49mm ± 0.07mm for slices reconstructed at 512x512 (p<0.03).

Conclusion: The results confirmed the added value of the new generation scanner. Added value is expected from the UHR scanning and the improved spectral characteristics. Virtual non-contrast images have a minimal fraction of iodine contamination; many choices for the pre-programmed parameters selections were confirmed.

Limitations: More test result will be presented at the conference.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 1013-3 - Verification of tube rotation time in computed tomography systems (8 min)

Benyameen Keelson; Jette / Belgium

Author Block: B. Keelson¹, M. Mazloumi¹, G. Van Gompel¹, J. De Mey¹, J. Vandemeulebroucke², N. Buls¹; ¹Jette/BE, ²Brussels/BE

Purpose or Learning Objective: Temporal resolution is of importance in most modern computed tomography (CT) applications such as cardiac CT and most recently in dynamic musculoskeletal (MSK) applications. Tube rotation time is a dominant contributor to temporal resolution, but is seldomly assessed. This study therefore evaluates a method to verify the tube rotation time in CT systems.

Methods or Background: Tube rotation time (TRT) was measured using a solid-state detector RTI dose probe connected to a Piranha dose meter (RTI Electronics, Mölndal, Sweden). The detector was positioned on the gantry during axial (10 rotations) and helical CT acquisitions in cine mode. TR was estimated as the average difference between successive peak dose times. Measurements were conducted on 4 commercial CT systems available in our institution. Tube voltages ranged between 100-120 kVp and tube current between 100-150 mA. Nominal TRT varied from 280 ms to 1000 ms. Accuracy was computed as the absolute deviation from the nominal TRT and reproducibility by the coefficient of variation (CV).

Results or Findings: A CV of 0.16 % was obtained signifying a high reproducibility of the measurements. Deviations in TRT from nominal values were below 0.005 ms for all 4 CTs across all investigated nominal TRT.

Conclusion: Faster imaging time is an important factor in reducing motion artifacts. This continues to be of significance with the growth in wide beam CTs and innovative applications such as dynamic CT MSK applications. A quick approach with off-center positioned detector allows for routine verification of the TRT. Result showed the approach has high reproducibility.

Limitations: This study was conducted on only 4 commercial CT scanners.

Ethics committee approval: Not applicable.

Funding for this study: This work was supported by an Interdisciplinary Research. Project grant (IRP KARMA-4D) from Vrije Universiteit, Brussel.

RPS 1013-4 - Task-based study of dose reduction using different kernels and model-based iterative reconstruction levels for low-contrast lesion (8 min)

Denise Curto; Milan / Italy

Author Block: G. Muti, D. Curto, S. Riga, F. Rizzetto, M. Felisi, P. E. Colombo, C. De Mattia, A. Vanzulli, A. Torresin; Milan/IT

Purpose or Learning Objective: We aimed to establish the possible dose reduction for Siemens abdomen CT-protocol combining different level of advanced model-based iterative-reconstruction (MBIR, ADMIRE) and three soft-tissue kernels (Br40/Br32/Qr36), keeping the same detectability for low-contrast lesions (HCC, liver metastasis).

Methods or Background: We scanned a phantom at three dose levels: standard dose (13mGy), reduced dose (9mGy), and low dose (4mGy). Raw data was reconstructed using three different soft tissue kernels for FBP and MBIR at three levels. The noise power spectrum (NPS), the normalised one (nNPS), and the task-based transfer function (TTF) for one phantom's insert were computed following the method proposed by AAPM-TaskGroup-233. Detectability of simulated HCC lesion (low-contrast task; $|\Delta HU|=20$) was calculated using non-pre-whitening with eye-filter model observer (NPWE).

Results or Findings: The nNPS, NPS, and TTF changed differently depending on kernels and MBIR levels. The NPS for images reconstructed using the highest level of MBIR showed a reduction of 50% for the noise magnitude, but also a shift of about 30% in peak frequency. The noise magnitude using Qr36 and Br32 kernels was 25% and 40% less than Br40. These variation, combined with the different TTFs, had an effect on detectability, which increased by about 10% and 5%, respectively. For each dose and kernel, the use of MBIR increased the detectability by more than 40% if used at the highest level. However, NPS's alterations, due to different MBIR levels and kernels, turned out in a different image texture, which was not always well accepted in clinical setting.

Conclusion: Starting from the detectability of standard protocol, we could reduce the dose choosing a new kernel-IR combination maintaining the same detectability. Depending on MBIR's level currently used, the dose reduction ranged from 15% up to 55%.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 1013-5 - Evaluation of the impact of ICRP 135 calculation methodology on LDRL deriving from a large cohort of oncology patients undergoing three phases multiregional CT (8 min)

Agnieszka Kuchcinska; Warsaw / Poland



Author Block: A. Kuchcinska, J. Jasieniak, P. Rybarczyk, M. Dedecjus, P. Czuchraniuk, K. Wrzesien, D. Kiprian, A. Cieszanowski; Warsaw/PL

Purpose or Learning Objective: ICRP 135 suggest to calculate typical doses by excluding 5% of lowest and highest values from all dose data distribution. In current dose tracking systems, statistical parameters are calculated based on full distribution of the patients doses. The aim of the study is to check the differences between 75th percentiles of both distributions and evaluate the possible impact for decision whether mean dose exceeds LDRL.

Methods or Background: Dose data collected by DTS was exported to excel files and subsequently statistical parameters were recalculated. Analysed data concern, according to ICRP 135 recommendation, total DLP from whole examination that means 1st phase without contrast agent (chest, abdomen, pelvis), 2nd phase after 35s (chest + abdomen), and 3rd phase after 60s (abdomen + pelvis). Mean, median, and 75th percentile were calculated for 2110 patients divided by 6 relevant group of BMI (total 1567 patients) and one group of 543 patients for which BMI data wasn't available.

Results or Findings: The impact of the ICRP 135 methodology, result in change of the LDRL by the factor $-1,1\% \pm 0,8\%$ which is around $10,3\% \pm 8\%$ of the interval between median and 75th percentile of dose distribution. For the cohort without BMI data, change in LDRL is 0,7%, which is 1,9% of the 36% dose difference between median (825,9 mGy*cm) and 75th percentile 1302,7 mGy*cm (full distribution) and 1293,4 mGy*cm (distribution modified according to ICRP 135).

Conclusion: Calculations provided by DTS, which do not implement the ICRP 135 approach, are connected with small statistical error and therefore should not impact the main purpose of the dose management, which is optimisation and general check if LDRL is exceeded e.g. due to equipment issues or changes in protocols.

Limitations: No limitations identified.

Ethics committee approval: Not applicable as it is a retrospective analysis of dose data.

Funding for this study: Not applicable.

RPS 1013-6 - Task-based study of detectability for dose reduction using different model-based iterative reconstruction for three computed tomography systems (8 min)

Gaia Muti; Milano / Italy

Author Block: G. Muti, S. Riga, D. Curto, F. Rizzetto, M. Felisi, C. De Mattia, P. E. Colombo, A. Vanzulli, A. Torresin; Milan/IT

Purpose or Learning Objective: We aimed to evaluate the dose reduction achievable to obtain same detectability across computed tomography scanners with different model-based iterative-reconstruction (MBIR) algorithm developed by three manufacturers.

Methods or Background: Three CT system with full (IMR, Philips), partial (Asir-V, GE), and advanced (ADMIRE, Siemens) MBIR were used to scan a phantom at three doses: standard dose (13mGy), reduced dose (9mGy), and low dose (4mGy). The study was conducted using a standard kernel across different vendors and raw data were reconstructed using filtered-back projection (FBP) and three IR level (low/medium/high). The noise power spectrum (NPS), the normalised one (nNPS), and the task-based transfer function (TTF) for one phantom's insert were computed following the method proposed by AAPM-TaskGroup-233. Detectability of small lesion for soft tissue (contrast-task $|\Delta HU|=100$, 5mm diameter) was calculated using non-pre-whitening with eye-filter model observer (NPWE).

Results or Findings: NPS, nNPS, and TTF changed differently depending on CT systems. The highest value of detectability was found for advanced-MBIR, followed by full-MBIR, and last partial-MBIR for same dose and iterative strength: detectability of GE and Philips were about 40% and 25% lower than Siemens, respectively. For each system, same detectability of standard dose FBP reconstruction was achieved with lower doses choosing a higher iterative level. For Siemens there was a reduction of 10%, 30%, and 50% using an ADMIRE level 1, 3, and 5; for Philips there was a reduction of 40%, 45%, and 50% using an IMR level 1, 2, and 3; for GE there was a reduction of 15%, 20%, and 30% using an Asir-V level of 30%, 50%, and 70%, respectively.

Conclusion: Different MBIR algorithms were compared and the possible dose reduction using higher iterative levels was evaluated by a task-based metric.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 1013-7 - Empirical scatter correction (ESC): a universal scatter reduction method for cone-beam CT (CBCT) without prior knowledge (8 min)

Philip Trapp; Heidelberg / Germany

Author Block: P. M. Trapp, J. Maier, M. Susenburger, S. Sawall, M. Kachelrieß; Heidelberg/DE

Purpose or Learning Objective: To correct for scatter artifacts in cone-beam CT (CBCT) scans without requiring specific knowledge of the scanning system and without the need for Monte Carlo simulations or trained neural networks.

Methods or Background: The image quality of CBCT scans often suffers from scattered radiation. Scatter corrections can be done using Monte Carlo simulations or the deep scatter estimation [Maier et al., Med. Phys. 46(1):238-249], for example. A drawback of such methods is that they require detailed knowledge about the CT system to be able to model scatter accurately enough. We propose the empirical scatter correction (ESC), which generates scatter-like basis projections from each projection image. A linear combination of these basis projections is subtracted from the measured projections in intensity domain. The log is taken and an FDK reconstruction is performed. The coefficients needed for the linear combination are determined automatically such that the reconstructed images show almost no scatter artifacts. We demonstrate the potential of ESC by correcting simulated and measured data.

Results or Findings: ESC is able to improve the image quality of the simulated data and the CBCT scan significantly. In soft tissue areas with severe scatter artifacts, the CT values closely match those of the ground truth (e.g. for the phantom measurement: difference to slit scan: -13 HU corrected, -289 HU uncorrected).

Conclusion: As the simulation results and the comparison to a slit scan show, ESC is able to reduce artifacts caused by scatter solely based on the projection data. Knowledge about the x-ray spectra or the materials involved is not required.

Limitations: ESC requires many reconstructions to find the optimum linear combination and thus may be suitable for offline use only.

Ethics committee approval: Not applicable.

Funding for this study: BMBF (grant number 13N14804, funding program: Photonics Research Germany (KMU Innovative)).

RPS 1013-8 - Multicentric comparative study of computed tomography dose indicators using an "in vivo" optical fiber detection system (8 min)

Christian Popotte; Strasbourg / France

Author Block: C. Devic¹, M. Munier¹, F. Pilleul², H. Rousseau³, C. Popotte¹; ¹Entzheim/FR, ²Lyon/FR, ³Toulouse/FR

Purpose or Learning Objective: Real-time personalised dosimetry specific of both the equipment and the patient may lead to a paradigm shift in computed tomography dosimetry. The aim of this work is to compare dose index measured by a new real-time in vivo dosimeter under clinical CT conditions and estimated dose index displayed by scanners, and to detect any anomalies during CT procedures. Specific cases are presented.

Methods or Background: A multicentric study was conducted in 4 French medical centers and 5 CT scans from 3 different manufacturers. An innovative detector, based on a scintillating optical fiber (IVIsScan®, FIBERMATRIX, France) has been used routinely to measure CTDI and DLP. The IVIsScan® system was also used to determine the z-axis CTDI mapping and distribution for procedures including those involving several acquisitions.

Results or Findings: Dose indexes were generally consistent with those displayed by the scanners independently of the manufacturer, which validates the use of the IVIsScan® device under clinical conditions. However, large differences have been observed for some examinations and allowed us to detect scanner modulation failures and poor patient positioning leading to overdoses up to +300%. In addition, CTDI mapping allows a better assessment of the dose actually delivered during a CT procedure compared to the average CTDI usually used especially for procedures with several acquisitions.

Conclusion: Thanks to reliable real-time measured dose indexes and an innovative CTDI mapping system, IVIsScan® is an independent dosimetric monitoring tool which allows to detect dose heterogeneities and identify possible malfunctions of the CT device or unusual practices.

Limitations: Headrest head CT could not be integrated in this study.

Ethics committee approval: The data used in this study do not require ethics committee approval.

Funding for this study: This study is part of the development of the material used and did not require specific research funding.



IND 16 - Stroke - Multimodality Insights Into the Patient Pathway

Categories: General Radiology, Neuro

Date: March 3, 2022 | 15:00 - 16:00 CET

Moderator:

Erin Beveridge; Edinburgh / United Kingdom

IND 16-1 - Detection of neovascularization with advanced ultrasound method (SMI) without using contrast materia (- min)

Mahtab Zamani; Oslo / Norway

Understand the diagnostic relevance of detecting neovascularization in unstable plaques by the use of SMI.

IND 16-2 - State-of-the-art brain CT perfusion in acute ischemic stroke (- min)

Anton Meijer; Nijmegen / Netherlands

See benefits of a wide CT detector and Bayesian brain CT perfusion

IND 16-3 - Diffusion tensor imaging as a biomarker for stroke patients (- min)

Josep Puig; Girona / Spain

Understand the relevance of DTI as an early predictor of motor outcome in stroke patients.

IND 16-4 - Higher Definition, Easier Procedure, Better Outcomes (- min)

Adnan Siddiqui; Buffalo New York / USA

Get practical tips on stroke treatment from the clinical examples discussed to increase your diagnostic and treatment possibilities.



IND 52 - Coronary Artery Disease: A glimpse into the future of coronary intervention

Categories: Cardiac, Cardiology, Cardiovascular, CT, General Radiology, Interventional Radiology, Multidisciplinary

Date: March 3, 2022 | 15:15 - 15:55 CET

IND 52-1 - Coronary CTA for comprehensive coronary analysis and optimized planning (- min)

Eric Wyffels; Aalst / Belgium

Management of patients with CAD is currently undergoing fundamental changes, with growing importance of CCTA. CCTA is a great tool for coronary imaging, analysis of coronary physiology and plaque characterization. This helps to optimize patient identification for coronary revascularization, pre-procedural planning and procedural guidance.

IND 52-2 - Robotic assisted PCI in clinical practice (case) and experience sharing (- min)

Konstantinos Bermpeis ; Aalst / Belgium

Robotic-assisted PCI represents another paradigm shift for PCI. Robotic-assisted PCI enhances procedural accuracy while improving radiation safety and ergonomics for the interventional team. The CorPath GRX system, second generation of the Corindus robotic platform, incorporates automated device manipulations that further facilitate robotic PCI especially in complex cases. Advanced stent visualization is also helpful to improve PCI outcomes.

HYPMED 11 - Digital hybrid breast PET/MRI for enhanced diagnosis of breast cancer: achievements of the HYPMED Project

Categories: Breast, Research

ETC Level: LEVEL II+III

Date: March 3, 2022 | 16:00 - 17:00 CET

CME Credits: 1

Moderator:

Christiane K. Kuhl; Aachen / Germany

HYPMED 11-1 - Chairperson's introduction: The HYPMED ambition (15 min)

Christiane K. Kuhl; Aachen / Germany

At the end of the session, participants will be able to:

1. Understand the ambition and structure of HYPMED, a Horizon 2020 European collaborative research and innovation project.
2. Explain how the HYPMED PET-RF device improves breast cancer detection and treatment.
3. Describe how the HYPMED PET-RF device will be evaluated for integration in clinical applications.

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 667211.

HYPMED 11-2 - Introduction of the HYPMED device: a dedicated ultra-low-dose, ultra-high-sensitivity, PET-RF insert for clinical 1.5T MRI with integrated vacuum biopsy capability (15 min)

Volkmar Schulz; Aachen / Germany

HYPMED 11-3 - Comparative whole-body PET/MR data for future clinical comparison study (10 min)

Thomas H. Helbich; Vienna / Austria

HYPMED 11-4 - How to get HYPMED's innovation into the clinic (10 min)

Christiane K. Kuhl; Aachen / Germany

HYPMED 11-5 - Panel discussion (10 min)



E³ 1118 - Paediatric brain tumours: a multidisciplinary approach

Categories: Imaging Methods, Multidisciplinary, Neuro, Oncologic Imaging, Paediatric Imaging

ETC Level: LEVEL II+III

Date: March 3, 2022 | 16:00 - 17:00 CET

CME Credits: 1

Moderator:

Birgit B. Ertl-Wagner; Toronto / Canada

E³ 1118-1 - Chairperson's introduction (5 min)

Birgit Ertl-Wagner; Toronto, ON / Canada

1. To highlight the importance of a multidisciplinary management of paediatric brain tumours.
2. To review the most recent developments in imaging of paediatric brain tumours.
3. To discuss challenging aspects in assessing response to treatment.
4. To give an outlook on the highlight multidisciplinary programme at ECR 2022.

E³ 1118-2 - Neurooncology and neuroradiology: why we need each other - the oncologist's perspective (10 min)

Uri Tabori; Toronto, ON / Canada

E³ 1118-3 - Paediatric brain tumours in the molecular age (10 min)

Birgit Ertl-Wagner; Toronto, ON / Canada

E³ 1118-4 - Challenges with response assessment (10 min)

Zoltán Patay; Memphis, TN / United States

E³ 1118-5 - Multidisciplinary tumour board: case-based panel discussion (25 min)

Birgit Ertl-Wagner; Toronto, ON / Canada

RPS 1117 - Detection and interpretation of notable imaging findings in emergency setting

Categories: Abdominal Viscera, Contrast Media, Emergency Imaging, Neuro, Trauma Imaging

Date: March 3, 2022 | 16:00 - 17:00 CET

CME Credits: 1

Moderators:

Alexandra Platon; Geneva / Switzerland

Lorenzo E. Derchi; Genoa / Italy

RPS 1117-2 - Contrast medium allergy resulting in suboptimal CTs: the experience at a tertiary hospital (8 min)

Michael Morgan; Cambridge / UK

Author Block: M. C. B. Morgan, E. Okonkwo, F. Yarar, E. C. P. M. Serrao, S. Liu, T. Sadler; Cambridge/UK

Purpose or Learning Objective: Iodinated contrast (IC) mediums are vital in various imaging modalities. Reported allergies to IC can lead to suboptimal diagnostic workups and the erroneous denial of indicated procedures. We aimed to determine the number of suboptimal CT studies due to IC allergy in our institution and understand whether referral to the immunology allergy service provided any benefit.

Methods or Background: The electronic medical records (EMR) of all patients who underwent a CT and were documented to be "allergic to IC", in a two-year period at a single tertiary care hospital were retrospectively reviewed. EMRs were evaluated for documented allergies to 'brand' and 'generic' IC, type of allergy and relevant allergy clinic referral. Allergies were coded as mild, moderate, severe, physiological or unknown.

Results or Findings: 141652 CT studies were performed over the period with 1% (545 patients) meeting the study criteria. Suboptimal imaging was acquired in 40.5% of the relevant CTs (221 patients). 75/221 patients had a 'mild' allergy. A total of 26 patients were referred to an allergy clinic, with 54% cleared upon review. Cleared patients had a 'mild' or 'unknown' allergy severity in 79% of the cases.

Conclusion: IC medium is essential for providing accurate diagnoses and is relatively safe. An erroneous allergy to IC can deprive patients of crucial diagnostic imaging. We found that allergies occurred in 1% of our CT volume and patients with a 'mild' or 'unclear' allergy gain the most from allergy testing referral, with 79% being cleared of their allergy.

Limitations: External allergy testing would not be captured by our EMR leading to a potential underestimate in the number of our patients who have undergone testing.

Ethics committee approval: Approval received.

Funding for this study: No funding was received for this study.

RPS 1117-3 - Expert-raters agreement in the assessment of early ischaemic changes in the territory of the middle cerebral artery (MCA) (8 min)

Polina Andropova; St. Peterburg / Russia



Author Block: P. Andropova, D. G. Cheremisin, P. Gavrilov; St. Petersburg/RU

Purpose or Learning Objective: The objective of this study was to describe the agreement in the assessment of early ischaemic changes in the middle cerebral artery (MCA) territory between expert raters of various qualifications.

Methods or Background: We identified patients presenting with hemiparesis or aphasia at the emergency department who underwent CT. Eight raters of different skill levels and various qualifications reviewed and scored the anonymised CT scans of 100 patients. The list of expert raters included: two neuroradiology fellows, two radiologists (with three years of experience in emergency neuroradiology), two radiologists (with three years of experience not in urgent medicine), and two experienced emergency neuroradiologists (more than eight years experience). The expert raters completed a preliminary interpretation form that included their classification of the interpretations as follows: "presence," "absence," of signs of an MCA stroke. And also, the presence or absence of such signs as (1) hyperdense MCA sign, (2) sulcal effacement, (3) parenchymal hypoattenuation, and (4) focal swelling or mass effect were appreciated. Interobserver agreement was measured with the kappa statistic, sensitivity, and specificity.

Results or Findings: The measured interobserver agreement had an interval of 0.2-0.7 for any aforementioned early ischaemic changes. The detection of early signs of ischaemia changes with CT had a mean accuracy of 85%, a sensitivity of 81%, and a mean specificity of 88%.

Conclusion: There's a clear necessity in further elaboration of determination of most reliably detected signs and understanding the role of scoring systems in detection improvement.

Limitations: The experts were not presented with data on the clinical manifestation indicating the ischaemic hemisphere.

Ethics committee approval: Ethical approval for this study was obtained from the Institute of Human Brain of RAS.

Funding for this study: This study did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

RPS 1117-4 - CT value quantitative analysis for diagnosis and differentiation of pseudo-subarachnoid haemorrhage (8 min)

Huang TengFei; China

Author Block: H. TengFei, K. Wang, G. Tang, J. Guan; Guangzhou/CN

Purpose or Learning Objective: To explore the possibility of quantitative analysis of non-enhanced CT for diagnosis of pseudo-subarachnoid haemorrhage (P-SAH) and differential diagnosis with diffuse-subarachnoid haemorrhage (D-SAH).

Methods or Background: There were four groups, including group P-SAH (n=15), group D-SAH (n=25), control group A (n=20, normal haemoglobin), and control group B (n=20, elevated haemoglobin). On non-enhanced CT, CT values of the vascular area (sylvian fissure) and the adjacent white matter were measured and compared among the four groups.

Results or Findings: The density difference between vascular area and white matter was obviously increased on non-enhanced CT in group P-SAH and group D-SAH. There was no significant difference in the CT value of vascular area between group P-SAH (43.62 ± 5.38 HU) and control group B (41.91 ± 1.30 HU) ($P > 0.05$). The CT value of vascular area in group D-SAH (53.31 ± 6.88 HU) was significantly higher than that in other three groups ($P < 0.05$). The CT value of white matter in group P-SAH (26.42 ± 2.10 HU) was significantly lower than that in group D-SAH (29.93 ± 1.25 HU), control group A (29.91 ± 1.25 HU), and control group B (30.37 ± 1.31 HU) ($P < 0.05$). Pair-wise comparison showed that there was statistical difference in the D-value (CT value difference between vascular area and adjacent white matter) in all groups ($P < 0.05$). When comparing the D-value of group P-SAH with control group B, area under curve (AUC) was 0.919 for diagnosis of P-SAH by using 13.35HU as cut-off value. When comparing the D-value of group P-SAH with group D-SAH, AUC was 0.794 for diagnosis of P-SAH by using 18.15HU as cut-off value.

Conclusion: According to CT value of white matter and D-value, it has higher accuracy to diagnose P-SAH and can help differentiate D-SAH.

Limitations: (1) This is a single-center study with small sample size; (2) All ROIs are manually drawn.

Ethics committee approval: Yes

Funding for this study: Not applicable.

RPS 1117-5 - CT after emergency surgery in penetrating trauma: a seven-year experience in a level I Nordic trauma center (8 min)

Seppo Koskinen; Stockholm / Sweden



Author Block: K. H. Halldorsson¹, M. T. Nummela², S. Þórisdóttir³, G. Oladottir³, S. Koskinen¹; ¹Stockholm/SE, ²Helsinki/FI, ³Reykjavik/IS
Purpose or Learning Objective: Patients with severe penetrating trauma may require emergency surgery on arrival, and postoperative CT can reveal additional significant injuries. To determine the utility of postoperative CT performed within 48 hours of emergency surgery after penetrating trauma.

Methods or Background: Trauma registry data was retrieved retrospectively over a seven-year period (2013-2019) at a single level 1 trauma center. All patients, 17-years and older, admitted with penetrating injury, who underwent urgent surgery and postoperative CT imaging within 48 hours, were included. Preoperative and intra-operative medical records were compared to CT findings.

Results or Findings: Patients with gun shot wounds (GSWs) had a longer ICU length of stay and were more severely injured than patients with stab wounds (SWs) (mean ISS, 23.00; range, 1-75; for GSWs, 27.50; for SWs, 20.58, $p = 0.08460$, mean NISS, 31.53; range, 3-75; for GSWs, 38.80; for SWs, 28.19, $p = 0.0422$). 20 out of 38 patients (52.6%) had additional findings at postoperative CT, most of which were minor. Six patients (15.8%) had previously unidentified or underestimated findings at CT that were severe enough to warrant additional surgery or interventional angiography.

Conclusion: CT imaging after emergency surgery in penetrating trauma is an important tool in evaluating the injury as a whole and revealing previously undiagnosed and unexpected injuries. Six out of 38 (15.8%) patients had findings at postoperative CT that warranted additional surgical or angiographic intervention.

Limitations: Our analysis is retrospective and patients were only selected from a single level 1 trauma center. Small cohort size with limited statistical power. No control group.

Ethics committee approval: Approval from the local ethics committee was obtained for this retrospective study (Dnr 2017/1018-31/2, 2020-02164).

Funding for this study: Not applicable.

RPS 1117-6 - Imaging findings of elder abuse on the trauma service: a retrospective case-control study (8 min)

Andrew Wong; Boston / United States

Author Block: A. W. P. Wong, E. Goralnick, E. Sun, A. Salim, B. Khurana; Boston, MA/US

Purpose or Learning Objective: The WHO estimates that one out of six elders has experienced some form of abuse over the past year, with impact ranging from diminished quality of life to physical injury and death. Screening is a recognised strategy for detection, but less effective in elders with a diminished ability to communicate or psychosocial reasons to fear disclosure. This study aimed to identify imaging findings of elder abuse.

Methods or Background: This retrospective case control study identified 12 patients above 60 years of age with keywords "assault" and "abuse" from a multi-institutional trauma registry database from 2015-2020, as well as 12 age and gender matched controls. Demographic information, clinical information, and imaging findings were reviewed.

Results or Findings: Our case series demonstrated excellent agreement with known risk factors for elder abuse. Rib fractures, extra-axial head injuries, and upper extremity injuries were most commonly seen, consistent with prior reports of successfully prosecuted cases of elder abuse. In one case, radiologists identified injuries occult on physical examination but extensive on imaging in a patient who was reported to have fallen.

Conclusion: This study demonstrated that radiologists can be helpful in the assessment of elder abuse, identified head injuries and upper extremity injuries as warning signs of elder abuse, and highlighted the importance of further research to identify imaging findings of elder abuse.

Limitations: This case control study was limited by the small number of patients identified as victims of elder abuse, drawn from the northeastern United States, and limited assessment of patient and abuser risk factors.

Ethics committee approval: IRB approved with informed consent waived.

Funding for this study: Not applicable.

RPS 1117-7 - Abdominal cocoon in tuberculosis: a diagnostic challenge (8 min)

Rajul Rastogi; Moradabad / India



Author Block: R. Rastogi; Moradabad/IN

Purpose or Learning Objective: Abdominal cocoon is an uncommon condition referring to encapsulation of small bowel by a fibro-collagenous membrane leading ultimately to acute or chronic bowel obstruction. Preoperative recognition of the condition is difficult but imperative to institute early management. We did a pilot study, involving 10 cases of abdominal cocoon, all secondary to abdominal tuberculosis and evaluated the most common radiological findings. The aim of the study was to evaluate the most common findings of cocoon secondary to Koch's abdomen.

Methods or Background: All ten patients underwent radiological evaluation in the form of ultrasonography (USG) followed by cross-sectional imaging in the form of computed tomography (CT scan) or magnetic resonance imaging (MRI). All the radiological findings were recorded and compared with clinico-pathological findings.

Results or Findings: In all ten patients, the disease was diagnosed accurately with radiological investigations using clinical and pathological findings as the gold-standard. In eight out of ten cases, follow-up imaging following ATT revealed complete resolution while in rest 2 case; diagnosis was confirmed with biopsy and ATT following laparotomy done for intestinal obstruction.

Conclusion: Prior to imaging era, the correct diagnosis of abdominal cocoon was usual only at surgery where the abdominal cocoon appeared as a dense grey white capsule containing a part or whole of the small bowel. The bowel loops within the cocoon can usually be easily freed in spite of adhesions. Late cases, however, may be associated with necrotic changes in the bowel wall requiring bowel resection. Abdominal cocoon is an uncommon feature of tuberculosis. Thick fibrotic peritoneal membrane wrapping the small bowel is pathognomonic. This condition can be diagnosed with confidence by utilising various radiological investigations. Early recognition results in proper management and prevents the need for bowel resection.

Limitations: The limited sample size.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 1117-8 - CT in acute colitis: is this a valuable tool to reduce overtreatment? (8 min)

Giorgio Piga; Sassari / Italy

Author Block: G. Piga, M. Scaglione, A. Contena, A. Canu, A. Achene, M. Conti, P. Crivelli; Sassari/IT

Purpose or Learning Objective: The goal of this study was to establish how CT influenced subsequent therapeutic choices in patients with suspected acute colitis.

Methods or Background: Between January and June 2021, we retrospectively reviewed the CT scans of 48 patients admitted to our Emergency Department, with a suspected clinical diagnosis of colitis. CT findings were compared to the clinical, surgical, or endoscopic findings. The severity of the CT findings was assessed on the basis of the wall patterns and/or associated complications. The type of treatment each subject underwent in relation to the CT findings was then evaluated.

Results or Findings: All the patients showed transmural wall thickening at CT. Thirty/48 patients (62,5 %) had target and/or halo sign and treated conservatively. Two people (4,1 %), one with pneumatosis and one with reduced wall enhancement, underwent surgical colonic resection. Two/48 patients with an abscess collection (4,1 %) were treated with percutaneous drainage. Three patients (6,2 %), one with perforation secondary to wall ischemia and peritonitis and another two with severe and extensive pneumatosis, rapidly died. Therefore, the CT signs that changed the clinical decision were pneumatosis, ischemic wall changes or abscess. Based on the CT findings, 46/48 (95,8 %) patients were treated conservatively.

Conclusion: High performance of CT allows to direct the patient towards NOM (Non-Operative Management), alternatively to surgery or percutaneous drainage, allowing a timely differential diagnosis, reducing the number of unnecessary laparotomies and the number of intra and extra-hospital mortality.

Limitations: Retrospective study, with limited sample.

Ethics committee approval: Approved by the ethics committee.

Funding for this study: No funding was received for this study.

RC 1115 - Vascular imaging techniques: must-haves and new ones on offer

Categories: Contrast Media, Imaging Methods, Interventional Radiology, Physics in Medical Imaging, Vascular

ETC Level: LEVEL II+III

Date: March 3, 2022 | 16:00 - 17:00 CET

CME Credits: 1

Moderator:

Robert Anthony Morgan; Dorking / United Kingdom

RC 1115-1 - Chairperson's introduction (5 min)

Robert Morgan; London / UK

RC 1115-2 - MRI (10 min)

Jens Vogel-Claussen; Hannover / Germany

1. To understand the prerequisites of a state-of-the art MR angiography.
2. To reflect on the unmet clinical needs of the current MRA techniques.
3. To learn about advanced MRA imaging and new developments.

RC 1115-3 - CT (10 min)

Joachim E. Wildberger; Maastricht / Netherlands

1. To understand the prerequisites of a state-of-the art CT angiography in terms of contrast delivery and radiation.
2. To reflect on the unmet clinical needs of the current CT techniques.
3. To consider advanced imaging (e.g. CT perfusion, CT FFR) in this respect.

RC 1115-4 - US (10 min)

Zoltan Harkanyi; Budapest / Hungary

1. To provide a brief overview of the conventional US vascular exams (B-mode, power, and colour Doppler) and recent development of microvascular imaging.
2. To demonstrate the current applications of contrast-enhanced ultrasound (CEUS) in peripheral and abdominal vessels.
3. To summarise the strength and limitations of the existing vascular ultrasound techniques in adult and paediatric patients.

RC 1115-5 - Angiography (10 min)

Andreas H. Mahnken; Marburg / Germany

1. To learn about recent trends in diagnostic CCA in the age of CTA and MRA.
2. To learn about new technological developments in CCA.
3. To implement new CCA techniques into clinical routine.

RC 1115-6 - Panel discussion: Something for next Black Friday? (15 min)



IND 55 - Critical shift to realizing sustainable and resilient radiology

Date: March 3, 2022 | 16:30 - 17:00 CET

IND 55-1 - Critical shift to realizing sustainable and resilient radiology (30 min)

Reed Omary; Vanderbilt / United States

Stephen Chan; NY / USA

Ariella Shuster; USA

OT 2 - Outlook for Tomorrow

Date: March 3, 2022 | 17:15 - 17:45 CET

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

- Outlook for Tomorrow (30 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

IND-56 - Spotlight on a new generation of patient-centric MRI

Date: March 3, 2022 | 18:30 - 19:15 CET

Moderator:

Mélanie Rouger; Spain

IND 18 - Let's talk about the future of X-ray: Get to know Definium Tempo and AMX Navigate your personal X-ray experts.

Categories: Abdominal, Chest, COVID-19, Emergency Imaging, General Radiology, Head and Neck, Image Quality, Imaging Methods, Lung, Musculoskeletal, Paediatric Imaging, Physics in Medical Imaging, Radiographers, Students

Date: March 4, 2022 | 08:00 - 09:00 CET

IND 18-1 - Let's talk about the future of X-ray: Get to know Definium Tempo and AMX Navigate your personal X-ray experts. (10 min)

Michael Wussow ; United States

Get to know Definium Tempo and AMX Navigate your personal X-ray experts Featuring Indranantha Kumar - X-ray technologist, North Central Bronx Hospital Nadia Dorson, X-ray technologist, Brooklyn, NYC Jeannie Miller, Associate Director, North Central Bronx Hospital Dr. Orlando Ortiz, Department Chair, Jacobi Medical Center Radiology Jordan Flowers, Radiology Technologist, Wayne Memorial Hospital The goal of this session is to introduce the key benefits of two new products. Definium Tempo, fixed OTS X-ray system AMX Navigate*, mobile X-ray

IND 18-2 - Let's talk about the future of X-ray: Get to know Definium Tempo and AMX Navigate your personal X-ray experts. (10 min)

Brien Ott; United States

RPS 1214 - Patient-focused radiography practice

Categories: Imaging Methods, Management/Leadership, Professional Issues, Radiographers

Date: March 4, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderators:

Karen Borg Borg Grima; Naxxar / Malta

Meike W. Vernooij; Rotterdam / Netherlands

RPS 1214-3 - Radiographers' attitudes and opinions towards management and care of patients with dementia (8 min)

Mark F. McEntee; Cork / Ireland

Author Block: C. Devereux, M. F. F. McEntee, R. Young; Cork/IE

Purpose or Learning Objective: Dementia is an umbrella symptom, encompassing a number of different diseases. It results in progressive cognitive decline. Diagnostic imaging plays a major role in the diagnosis of dementia, however patients with dementia attend from imaging for diagnosis of all diseases and injuries. Caring for them in a short visit can be challenging. The aim of this study is to determine Irish radiographers' opinions towards caring for patients with dementia in the radiology department and to examine the protocols that exist.

Methods or Background: This was a qualitative study, which utilised two focus groups to collect study data. A total of eleven radiographers participated in the data collection. The focus groups were transcribed and thematically analysed using NVivo software.

Results or Findings: Participants reported being apprehensive in caring for patients with dementia. No guidelines existed for caring for patients with dementia in Irish radiology departments. The themes that emerged were: (1) practice concerns (patient care, distress, quality of imaging fear, physical violence, safety, consent, justification, compassion), (2) change management of patient care (improving practice, willingness to change), (3) infrastructure and staffing (time, scheduling, carers, support) and (4) knowledge and attitudes (experience, expectations, knowledge, understanding, stigma).

Conclusion: Radiographers have concerns about caring for patients with dementia. There is a lack of knowledge about dementia care amongst the participants. Improvements in knowledge should be addressed. The development and implementation of best practice guidelines to care for patients with dementia would standardise the care of patients.

Limitations: Only one researcher interpreted and analysed the focus group data. Going forward it would be worth assessing radiographers in multiple hospitals, both within the public and private sectors.

Ethics committee approval: The ethical approval for this study was obtained from the Social Research Ethics Committee, UCC, Ireland, (CT-SREC-2020-41).

Funding for this study: No funding was received for this study.

RPS 1214-4 - Implementation of a telemedicine, stroke evaluation service (8 min)

Elin Kjelle; Gjøvik / Norway



Author Block: E. Kjelle, A. M. Myklebust; Drammen/NO

Purpose or Learning Objective: To assess how healthcare managers and personnel experience the quality, organisation and value of a rural telemedicine, remote-controlled CT stroke evaluation service.

Methods or Background: Semi-structured interviews were conducted and covered ten individual and one focus-group interview including managers, paramedics, radiographers, and junior doctors. The interview guide consisted of the following themes: experience of working with the service, task shifting, quality, management and challenges. Interviews were recorded and transcribed before thematic content analysis was used to develop a narrative of the findings.

Results or Findings: Findings were categorised into teamwork, quality, value of the service, organisation of the project, and from project to permanent service. Participants perceived the service as valuable for patients and the local community. The service included task shifting where paramedics positioned the patient in the CT-scanner, while the radiographer ran the scan remotely. This required education, training and changing of routines to facilitate the telemedicine service. The participants experienced the process as both challenging and interesting. The service was considered to improve patient care and health services in the community.

Conclusion: The service was perceived as valuable to the local community and of high quality. Communication, training, flexibility, and cooperation within and between the departments locally, as well as with the external hospitals appears to be a key factor for a successful implementation and long-term sustainability of the service.

Limitations: This study has a combination of one focus group and several individual interviews. This was due to two factors: the ongoing COVID-19 pandemic and the difficulty in recruitment. This combination may lead to a different depth in data obtained from managers in the focus group compared to managers and personnel in the individual interviews.

Ethics committee approval: Yes - NSD 358427.

Funding for this study: Not applicable.

RPS 1214-5 - Meeting the imaging service demand of an increasingly ageing population with cancer care needs (8 min)

Anselm Chukwuani; Birmingham / UK

Author Block: A. Chukwuani¹, D. Omiyi², A. Ginigeme³, A. Umunna⁴; ¹Birmingham/UK, ²Bradford/UK, ³Washington, DC/US, ⁴Manchester/UK

Purpose or Learning Objective: The aim of this paper is to review the current state of imaging service delivery for elderly cancer patients, and examine how to shape the future direction of clinical imaging service delivery to cater for an increasingly ageing population.

Methods or Background: Due to ageing, cancer is majorly a disease of the elderly. It is also clearly established that clinical imaging plays a central role in the diagnosis and management of cancer. Clinical imaging is utilised at all stages of the cancer patient pathway: diagnosis, staging, selecting the appropriate therapy, and follow up. In a nutshell, an increasingly ageing population means more cancer cases, resulting in more demand for imaging service needs.

Results or Findings: The elderly have special needs, and the imaging study of the elderly poses unique challenges. The current heterogenous models of care are majorly adapted to local priorities, needs and available resources. There is an urgent need to draw up models of care specially tailored to address the needs of the elderly in imaging. With the NHS Long Term Plan mapped out, it is hoped that the care for elderly cancer patients should see a significant boost in resource allocation. Some of these resources could be channelled into drawing up plans on how to ensure the provision of dedicated imaging service for elderly cancer patients.

Conclusion: Looking into the future, imaging service will require a lot of investment in imaging equipment, and human resources - skillfully trained to effectively understand and cater for the special needs of an increasingly ageing population.

Limitations: This paper is the result of review of available literature, and focused on the UK experience.

Ethics committee approval: Ethics Committee approval was obtained for this study.

Funding for this study: This study was self-funded by the researchers.

RPS 1214-6 - Autism-friendly MRI: the patients' perspective (8 min)

Nikolaos Stogiannos; Corfu / Greece

Author Block: N. Stogiannos¹, J. Harvey-Lloyd², A. Brammer³, C. Papadopoulos⁴, B. J. Nugent¹, J. McNulty⁵, C. S. d. Reis⁶, K. Cleaver⁷, T. O'Regan¹, C. M. Simcock¹, K. Marais¹, S. Parveen¹, G. Pavlopoulou¹, D. Bowler¹, S. Gaigg¹, C. Malamateniou¹; ¹London/UK, ²Suffolk/UK, ³Manchester/UK, ⁴Luton/UK, ⁵Dublin/IE, ⁶Lausanne/CH, ⁷Greenwich/UK

Purpose or Learning Objective: To map out the perspectives, needs, and preferences of autistic service users who have experienced an MRI examination in the UK. To gain an insight into the main barriers and facilitators to inclusive and safe MRI examinations when scanning autistic adults or children.

Methods or Background: Two online surveys were used, one for autistic individuals over 16 years of age, and the other for parents/carers of autistic individuals, with prior MRI experience. Snowball sampling was employed; the surveys were distributed through the researchers' networks and through the autistic community on Twitter, LinkedIn and Facebook, the National Autistic Society and the London Autism Group. The surveys were open between February 1st and April 30th, 2021. Patient and public involvement was employed during all stages of the project. The SPSS software was used for statistical analyses.

Results or Findings: A total of 128 valid responses were received (112 autistic adults and 16 parents/carers of autistic children). The main barrier to a successful MRI scan was poor communication either between healthcare services or between patients and practitioners. Non-disclosure of autism occurred in more than half of the responses (53.6%). Failure to provide customised MRI examinations or autism-friendly MRI environments with reasonable adjustments (82.9%) were major contributing factors to a poor patient experience.

Conclusion: Current practice in MRI scanning is not taking into account the autistic service user's needs. Optimal communication throughout and provision of reasonable environment adjustments is vital to ensure inclusive MRI scanning practices.

Limitations: Both research design and methodology, and recruitment of participants were impacted by COVID-19 restrictions. Convenience sampling means results should be interpreted with caution.

Ethics committee approval: School of Health Sciences, City, University of London Research Ethics Committee [ETH1920-1988].

Funding for this study: Society and College of Radiographers CORIPS grant scheme [SCoR 155-50011HY].

RPS 1214-7 - Autism-friendly MRI: the radiographers' perspective through a UK-wide survey (8 min)

Nikolaos Stogiannos; Corfu / Greece

Author Block: N. Stogiannos¹, J. Harvey-Lloyd², B. J. Nugent³, A. Brammer⁴, S. Carlier⁵, K. Cleaver⁶, J. McNulty⁷, C. S. d. Reis⁵, C. Malamateniou¹; ¹London/UK, ²Suffolk/UK, ³Edinburgh/UK, ⁴Manchester/UK, ⁵Lausanne/CH, ⁶Greenwich/UK, ⁷Dublin/IE

Purpose or Learning Objective: To explore radiographic practices, training/educational needs, as well as the UK radiographers' perspectives when scanning autistic service users with MRI.

Methods or Background: An online survey was constructed on Qualtrics and pilot-tested by field experts. All UK-based MRI radiographers were invited to participate. The snowball sampling technique was employed. The survey was distributed by three recruitment agencies between December 2020 and February 2021 on social media. Descriptive and inferential statistics were used to analyse the results using the SPSS software.

Results or Findings: This study received 130 valid responses. Effective communication between the patient and the MRI radiographer, adjusted MRI unit environment, and customisation of the MRI examination were found to be beneficial for a successful MRI examination. However, a persistent lack (but also desire) of autism-related training was noted (75.6%). Poor patient-practitioner communication, lack of training (41.5%), lack of Special Educational Needs experts (38.6%), and lack of specific guidelines (37.7%), were the main barriers to a successful MRI examination.

Conclusion: Reasonable adjustments are required when scanning autistic individuals, mainly in the context of communication and the MRI unit environment. Formal training is required for MRI radiographers, and guidelines should also be established to assist them in clinical practice.

Limitations: The number of responses and the use of convenience sampling mean that the results cannot be seen as representative of the UK-based MRI radiographers, but they still offer some useful insights. Also, the COVID-19 pandemic has negatively impacted the recruitment of radiographers as they were working on the frontline during the second national lockdown.

Ethics committee approval: School of Health Sciences, City University of London Research Ethics Committee [ETH1920-1988].

Funding for this study: The Society and College of Radiographers CORIPS grant scheme [SCoR 155-50011HY].

RPS 1214-8 - Evaluating the effect of music on anxiety during mammography cancer screening (8 min)

Francis Zarb; Msida / Malta



Author Block: S. Ellul¹, F. Zarb², K. Borg Grima², D. Mizzi²; ¹Zurrieq/MT, ²Msida/MT

Purpose or Learning Objective: This study aimed to investigate whether the introduction of music medicine (MM) during mammography examinations, has an effect on the anxiety level experienced by clients undergoing breast cancer screening.

Methods or Background: This study followed a quantitative, prospective, and experimental design. Participants were imaged according to the local breast cancer screening protocol, with the experimental group being exposed to MM, selected based on the literature. Anxiety levels were measured before and after each mammogram via the State-Trait Anxiety Inventory for Adults research tool.

Results or Findings: Participants in both experimental and control groups experienced a statistically significant increase in anxiety levels before the mammogram, when compared to their normal anxiety levels ($p < 0.001$). Both groups experienced a statistically significant decrease in anxiety levels after the mammogram when compared to their anxiety levels before the mammogram (experimental group: $p = 0.005$; control group: $p = 0.001$). No significant statistical difference ($p = 0.907$) in the anxiety levels after the mammograms was recorded between the experimental and control groups.

Conclusion: Anxiety levels indicated that mammography screening induces anxiety and that anxiety levels were reduced in both groups after the mammography examination. A variable contributing to this reduction could be MM. Thus, MM could be used in the clinical setting since it is non-invasive and cheap. Nonetheless, in this study MM had no statistical significant effect in decreasing anxiety levels during mammography screening.

Limitations: Due to the cost of the research tool, the study had a small sample size ($n = 50$). Thus, only MM was investigated as a variable and no music choice was given to participants. Further studies with a larger sample size, a choice of music from different genres and investigating other variables which affect anxiety levels are recommended.

Ethics committee approval: Approval was obtained from the University of Malta Research Ethics Committee (code:562601062020).

Funding for this study: Not applicable.

RC 1207 - Imaging of benign female pelvis

Categories: Abdominal Viscera, Education, Genitourinary, Imaging Methods, Paediatric Imaging

ETC Level: LEVEL II

Date: March 4, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderator:

Deniz Akata; Ankara / Turkey

RC 1207-1 - Chairperson's introduction (5 min)

Deniz Akata; Ankara / Turkey

RC 1207-2 - Imaging of endometriosis: ultrasonography and/or pelvic MRI (15 min)

Isabelle Thomassin-Naggara; Paris / France

1. To learn the value of different imaging modalities for diagnosis and pre-operative assessment.
2. To learn the different locations of endometriosis (adnexal, posterior, lateral, and anterior) and their significance in imaging.
3. To understand the key elements for US and MRI reporting.

RC 1207-3 - Myometrial masses (15 min)

Sarah Swift; Leeds / UK

1. To learn the strengths and weaknesses of different imaging modalities for assessing benign myometrial masses.
2. To appreciate the wide variation in appearances of uterine leiomyomata and adenomyosis.
3. To recognise complications that may occur and cause diagnostic challenges.

RC 1207-4 - Congenital anomalies (15 min)

Cristina Maciel; Porto / Portugal

1. To become familiar with how to apply proper patient preparation and dedicated MRI protocol.
2. To identify and categorise the main congenital anomalies of the female genital tract based on the ESRHE/ESGE classification system.
3. To appreciate the value of MRI in treatment planning and the evaluation of post-treatment complications.

RC 1207-5 - Panel discussion: Is there a need for routine MRI for all patients? (10 min)



RC 1208 - Differential diagnosis in head and neck imaging: how I do it

Categories: General Radiology, Head and Neck, Imaging Methods, Oncologic Imaging, Ultrasound

ETC Level: LEVEL I+II

Date: March 4, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderator:

Christian Czerny; Vienna / Austria

RC 1208-1 - Chairperson's introduction (5 min)

Christian Czerny; Vienna / Austria

RC 1208-2 - How I approach the thyroid nodule (15 min)

Sarah LaPorte; Milton Keynes / UK

1. To apply a grading system for classifying thyroid nodules.
2. To advise clinicians on when and how to investigate and follow-up thyroid nodules.
3. To recognise challenging cases and know how to manage them.

RC 1208-3 - How I approach the opacified middle ear (15 min)

Bert De Foer; Antwerp / Belgium

1. To understand the clinical presentation of the most common inflammatory and non-inflammatory disorders of the middle ear.
2. To learn which imaging techniques help in the differentiation of middle ear opacification.
3. To describe the imaging features of the most common disorders causing middle ear opacification.

RC 1208-4 - How I approach the opacified paranasal sinus (15 min)

Heidi Beate Eggesbø; Oslo / Norway

1. To identify dental infection as a common cause of ipsilateral sinusitis.
2. To recognise the specific features of non-invasive and invasive fungal sinusitis.
3. To identify the characteristics of malignant sinonasal disease.

RC 1208-5 - Panel discussion: Common head and neck-related imaging findings: what do I put in the conclusion of my report? (10 min)



CUBE-3 - Things you should better not do at home - Stent migration - Lost in space

Categories: Interventional Radiology

Date: March 4, 2022 | 08:00 - 08:45 CET

Moderators:

Christian Loewe; Vienna / Austria

Maximilian de Bucourt; Berlin / Germany

CUBE-3-1 - Introduction

Christian Loewe; Vienna / Austria

Maximilian de Bucourt; Berlin / Germany

CUBE-3-2 - tba

CUBE-3-3 - Discussion



HD 3 - Highlights of the Day

Date: March 4, 2022 | 09:00 - 09:30 CET

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

- Highlights of the Day (30 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

CTiR 1 - CT for stable chest pain: the DISCHARGE trial

Categories: Cardiac, Chest

Date: March 4, 2022 | 09:20 - 09:45 CET

Moderator:

Carlo Catalano; Roma / Italy

CTiR 1-1 - Chairperson's introduction (2 min)

Carlo Catalano; Rome / Italy

CTiR 1-2 - Introduction to the DISCHARGE trial (4 min)

Marc Dewey; Berlin / Germany

CTiR 1-3 - Main DISCHARGE trial results (6 min)

Pál Maurovich-Horvat; Budapest / Hungary

CTiR 1-4 - Implications and future analyses of the DISCHARGE trial (2 min)

Klaus Kofoed; Copenhagen / Denmark

CTiR 1-5 - Discussion of the DISCHARGE trial (4 min)

Rozemarijn Vliegenthart; Groningen / Netherlands

CTiR 1-6 - Q&A / Wrap-up (6 min)

Marc Dewey; Berlin / Germany

CTiR 1-7 - Closing remarks (1 min)

Carlo Catalano; Rome / Italy



IND 53 - Breaking barriers in MRI with MAGNETOM Free.Max

Categories: General Radiology, Imaging Methods, MRI

Date: March 4, 2022 | 09:30 - 10:18 CET

IND 53-1 - Breaking barriers in MRI with MAGNETOM Free.Max (- min)

Felix Müller-Witt; Erlangen / Germany

When barriers are left behind, new opportunities arise. Hear from our product specialist and directly from your peers how MAGNETOM Free.Max breaks barriers to expand the reach of MRI. Introducing the world's first 80-cm patient bore and High-V MRI, MAGNETOM Free.Max redefines MRI accessibility and opens up new clinical opportunities.

IND 20 - Post Covid-19 recovery: Investments into diagnostic imaging to drive resilience in Europe

Categories: Artificial Intelligence, COVID-19, General Radiology, Management/Leadership

Date: March 4, 2022 | 09:30 - 10:30 CET

Moderator:

Elzbieta Spiewak

IND 20-1 - Post Covid-19 recovery: Investments into diagnostic imaging to drive resilience in Europe (20 min)

Andrea Laghi; Italy

With the NextGenerationEU initiative, the European Union has issued the largest economic stimulus program in a generation. On its basis, EU Member States have created national recovery & resilience plans, which foresee significant investments into the healthcare sector over the period of 2021-2026. The objective of this symposium is to better understand the overarching healthcare investment priorities in national recovery plans and to discuss the importance of investments into diagnostic imaging, to improve the resilience of healthcare systems across the EU. The objectives of this symposium are to highlight the overarching healthcare investment priorities in national recovery and resilience plans.

1. To highlight the role that diagnostic imaging will play to improve the resilience of healthcare systems across the EU.
2. To better understand healthcare investment needs, specifically in the diagnostic imaging sector in order to increase the resilience of healthcare systems in Europe and
3. to achieve the goals of national healthcare systems.

IND 20-2 - Post Covid-19 recovery: Investments into diagnostic imaging to drive resilience in Europe (20 min)

Dirk van den Stehen

IND-19 - Interview with Toshio Takiguchi (Canon Medical)

Date: March 4, 2022 | 09:45 - 10:00 CET

Moderator:

Carlo Catalano; Roma / Italy

NH 13 - Imaging to guide surgical approach: what do radiologists need to know?

Categories: GI Tract, Multidisciplinary, Oncologic Imaging

ETC Level: LEVEL II

Date: March 4, 2022 | 10:30 - 11:30 CET

CME Credits: 1

Moderator:

Lennart K. Blomqvist; Stockholm / Sweden

NH 13-1 - Chairperson's introduction (5 min)

Lennart K. Blomqvist; Stockholm / Sweden

NH 13-2 - Imaging to guide upper GI surgery: questions from the surgeon and contribution of the radiologist (15 min)

Angela M. Riddell; London / UK

1. To understand the contribution of endoluminal and conventional imaging in patient selection for surgery.
2. To understand the added value of functional imaging and other novel imaging techniques in patient selection for surgery.
3. To understand how tumour location helps determine the surgical approach.

NH 13-3 - Imaging to guide lower GI surgery: questions from the surgeon and contribution of the radiologist (15 min)

Ines Santiago; Lisbon / Portugal

1. To introduce the relevant anatomy and anatomic variants for rectal cancer surgery.
2. To discuss the role of MR imaging and EUS for the selection of early rectal cancer patients for local excision (+/-neoadjuvant therapy) versus total mesorectal excision (TME).
3. To address the key imaging features for the selection of rectal cancer patients for neoadjuvant therapy versus upfront surgery.
4. To elaborate on how response assessment after neoadjuvant therapy may shift patients towards less mutilating surgery or organ preservation strategies.

NH 13-4 - Imaging to guide liver surgery: questions from the surgeon and contribution of the radiologist (15 min)

Eduard Jonas; Cape Town / South Africa

1. To discuss the importance of characterisation and detection in the context of modern liver surgery.
2. To introduce the functional segmental anatomy of the liver with an emphasis on surgically relevant variations of segmental anatomy, blood supply, drainage, and biliary anatomy.
3. To address the role of imaging-based liver function assessment in liver surgery.
4. To elaborate on the role of imaging-based treatment response assessment in the multimodality management of liver tumours.

NH 13-5 - Panel discussion: What is needed in the workflow to ensure that imaging information provides accurate surgical guidance? (10 min)



RC 1304 - Thoracic manifestations of COVID-19 pneumonia in 2022: new insights

Categories: Chest, General Radiology, Imaging Methods, Professional Issues

ETC Level: LEVEL II+III

Date: March 4, 2022 | 10:30 - 11:30 CET

CME Credits: 1

Moderator:

Jürgen Biederer; Heidelberg / Germany

RC 1304-1 - Chairperson's introduction (5 min)

Jürgen Biederer; Heidelberg / Germany

RC 1304-2 - What's the current role of imaging? (15 min)

Marie-Pierre Revel; Paris / France

1. To recognise CT features highly suggestive of COVID-19 pneumonia and to learn how to score disease extent.
2. To understand how to appropriately use imaging to diagnose vascular complications.
3. To learn how to distinguish potentially reversible anomalies for irreversible changes on CT.

RC 1304-3 - Imaging modalities: pros and cons (15 min)

Jeffrey Kanne; Madison, WI / United States

1. To define the value of different chest imaging modalities for patients with COVID-19 pneumonia.
2. To identify the limitations in the diagnosis and management of COVID-19 pneumonia.
3. To describe the potential roles of imaging in COVID-19 pneumonia in the context of local transmission, variants of concern, and vaccination levels.

RC 1304-4 - Long-term sequelae (15 min)

Katharina Martini; Zurich / Switzerland

1. To identify and name the typical pulmonary changes encountered in the follow-up of COVID-19 patients.
2. To understand the differences of fibrotic lung changes and prior organising pneumonia after COVID-19 pneumonia.
3. To know which imaging modalities and protocols are appropriate and at which disease stage.

RC 1304-5 - Panel discussion: When and how to image COVID pneumonia (10 min)



RPS 1310 - Knee joint

Categories: EuroSafe Imaging / Radiation Protection, General Radiology, Imaging Methods, Musculoskeletal

Date: March 4, 2022 | 10:30 - 11:30 CET

CME Credits: 1

Moderators:

Maria Tzalonikou; Athens / Greece

Lorenzo E. Derchi; Genoa / Italy

RPS 1310-2 - Colour-coded dual-energy CT collagen imaging for the assessment of the cruciate ligaments after acute trauma: initial results of a multireader diagnostic accuracy study (8 min)

Christian Booz; Frankfurt / Germany

Author Block: C. Booz, V. Koch, L. D. Grünwald, L. S. Alizadeh, K. Eichler, T. Vogl, T. D'Angelo, I. Yel; Frankfurt/DE

Purpose or Learning Objective: To evaluate the diagnostic accuracy of coloured dual-energy CT collagen imaging for the assessment of the cruciate ligaments after acute trauma.

Methods or Background: Data from 141 consecutive patients (70 male) with acute knee trauma who had undergone clinically indicated third-generation dual-source dual-energy CT and additional arthroscopy or MRI between January 2017 and February 2021 were retrospectively analyzed. Five blinded radiologists independently assessed the anterior cruciate ligament (ACL) and posterior cruciate ligament (PCL) using coloured dual-energy CT collagen maps, which are based on collagen material decomposition. Arthroscopy (n = 77) or MRI (n = 64) served as reference standard (maximal time interval 7 days between dual-energy CT and the reference standard). Arthroscopy was performed by three board-certified surgeons (24, 13 and 10 years of experience in arthroscopy), MRI was evaluated by two board-certified radiologists (10 and 34 years of experience in knee MRI) in consensus reading sessions.

Results or Findings: The reference standard revealed a total of 56 complete tears (ACL, 33; PCL, 23) and 93 partial tears (ACL, 52; PCL, 41) of the crucial ligaments. Colour-coded collagen maps showed high overall sensitivity 92% (95%), specificity 90% (94%), and accuracy 91% (94%) for the assessment of complete ACL (PCL) tears. Regarding partial ACL (PCL) tears, sensitivity was 87% (91%), specificity was 92% (94%), and the accuracy was 90% (93%). Intact ACL (PCL) was detected with a sensitivity of 95% (96%), specificity of 96% (97%), and an accuracy of 95% (96%).

Conclusion: Colour-coded dual-energy CT collagen imaging yields excellent diagnostic accuracy for the assessment of the cruciate ligaments by application of collagen material decomposition.

Limitations: Retrospective single-centre study design.

Ethics committee approval: The IRB approved this study.

Funding for this study: There was no funding for this study.

RPS 1310-3 - Sensitivity of DECT in ACL tears: a prospective study with arthroscopy as reference method (8 min)

Ann-Sofi Björkman; Linköping / Sweden

Author Block: A-S. Björkman¹, H. Gauffin¹, S. K. Koskinen², A. Persson¹; ¹Linköping/SE, ²Stockholm/SE

Purpose or Learning Objective: To investigate the diagnostic accuracy of dual-energy CT (DECT) for the detection of ACL tears in the acutely and subacutely injured knee with arthroscopy as reference method.

Methods or Background: Patients with suspected ACL injury were imaged with DECT (Somatom Force, Siemens Healthcare, Germany) and 3.0 T MRI (Ingenia, Philips Medical Systems, Best, The Netherlands). Clinically blinded images were independently read by two radiologists. ACL was classified as normal or abnormal. Arthroscopy served as reference standard. Sensitivity and positive predictive value (PPV) were calculated. Also, sensitivity between DECT and MRI was assessed.

Results or Findings: 48 patients (26 M, 22 F, mean age 23 years, range 15-37 years) were imaged a mean 25 days following trauma. Of these, 21 patients underwent arthroscopy with a mean of 195 days after trauma. Arthroscopy revealed 19 ACL tears and 2 ACLs with no tear. The sensitivity was 76.3% (95% CI 66.8-85.9) and 86.8 (95% CI 71.9-95.6) for DECT and MRI, respectively (p=0.223). The positive predictive value (PPV) was 93.5 (95% CI 84.3-98.2) and 91.7 (95% CI 77.5-98.3) for DECT and MRI, respectively.

Conclusion: DECT has lower sensitivity to detect an ACL rupture than MRI but the difference was not statistically significant. The PPV was high in both methods.

Limitations: The age of the subjects (15-40 years) limits the generalizability of the results to older populations. The low number of true negatives did not allow to calculate specificity.

Ethics committee approval: Ethical approval from the regional ethical review board (2016/44-31 and 2017/221-32) and radiation protection committee was obtained.

Funding for this study: This NACOX-cohort study is supported by the Swedish Medical Research Council, the Swedish Research Council for Sport Science, the Medical Research Council of Southeast Sweden and ALF Grants Region Östergötland

RPS 1310-4 - MRI in patients with verified anterior cruciate ligament tears: evaluation of frequency of ramp lesions and anterolateral ligament injuries and correlation with combined injuries of the knee (8 min)

Nikolaus Stranger; Graz / Austria

Author Block: N. Stranger¹, C. Kaulfersch², G. P. Mattiassich², J. Mandl¹, D. h. m. Szolar¹, P. A. Hausbrandt¹, H. Schöllnast¹; ¹Graz/AT, ²Schladming/AT

Purpose or Learning Objective: To assess the frequency of ramp lesions (RL) and anterolateral ligament (ALL) injuries in MRI of patients with verified anterior cruciate ligament (ACL) tears, and to describe the coexistence of these injuries with further injuries of the knee.

Methods or Background: In this retrospective study, 163 patients with surgical repair of ACL tears were included. MRI scans were reviewed for RL, which were defined according to Greif et al., and ALL injuries. In addition, all coexisting meniscal injuries, injuries of the medial and lateral collateral band and bone marrow oedema were recorded. The correlation of RL and ALL-injuries with coexisting injuries was tested for statistical significance using Pearson's chi-square test. After Bonferroni correction for multiple testing a p<0.003 was defined as statistically significant.

Results or Findings: RL occurred in 52 patients (31.9%). RL were significantly associated with tears of the posterior horn of the medial meniscus (67.3% versus 19.8% of patients with/without RL, respectively) and with subchondral bone marrow oedema in the postero-medial tibia plateau (63.5% versus 0% of patients with/without RL, respectively). ALL-injuries were detected in 52 patients (31.9%). ALL-injuries were significantly associated with a tear of the posterior horn of the lateral meniscus (51.9% versus 16.2% of patients with/without ALL-injury, respectively), tear of the medial collateral ligament (40.4% versus 16.2% of patients with/without ALL-injury, respectively) and tear of the lateral collateral ligament (19.2% versus 0.9% of patients with/without ALL-injury, respectively).

Conclusion: The findings of our study demonstrate that in patients with ACL-tears, the frequency of RL and ALL-injuries is about 32%. Both injuries are frequently associated with further injuries of the knee, which are different between RL and ALL-injuries.

Limitations: Lesions not confirmed with arthroscopy.

Ethics committee approval: Approval of the Ethics Committee of the Medical University of Graz.

Funding for this study: No funding was received for this study.

RPS 1310-5 - Untangling the nature of subchondral bone marrow lesions of the knee with the use of deep learning: a multi-centre cross-sectional study (8 min)

Michail Klontzas; Heraklion / Greece



Author Block: M. Klontzas¹, E. Vassalou¹, G. A. Kakkos¹, K. Spanakis¹, A. Zibis², A. H. Karantanas¹, K. Marias¹; ¹Heraklion/GR, ²Larissa/GR

Purpose or Learning Objective: Bone marrow lesions (BMLs) of the knee are commonly found in the context of subchondral insufficiency fractures (SIF) and advanced osteoarthritis (OA). The purpose of our work was to utilize deep learning in the form of convolutional neural networks to differentiate between the two conditions.

Methods or Background: The study dataset consisted of MRIs of knees with BMLs in the context of SIF (n=212) and OA (n=102), which were retrospectively collected and augmented to create a final dataset of 1174 images. Transfer learning was applied by utilizing an ImageNet-pretrained InceptionV3 convolutional neural network (CNN) which was fine-tuned with the use of the aforementioned MRI dataset. CNN performance was assessed on a validation cohort of 87 images of each group and was compared to that of two MSK radiologists with the use of receiver operating characteristics (ROC) curves and areas under the curve (AUC). Precision, recall and f1-scores were computed for the CNN and expert readers.

Results or Findings: InceptionV3 achieved an AUC of 93.68%, correctly classifying 82/87 OA and 81/87 SIF validation images. The first of the two MSK radiologists performed equally to the CNN, achieving an AUC of 91.95%, whereas the performance of the second expert MSK radiologist was significantly lower compared to both the CNN and the other reader (P<0.001) reaching an AUC of 82.76%.

Conclusion: A CNN model was highly accurate in differentiating between SIF and OA, achieving a higher or equal performance to MSK radiologists.

Limitations: Not applicable.

Ethics committee approval: Approved by the University Hospital of Heraklion (No 360/08/29-04-2020).

Funding for this study: Not applicable.

RPS 1310-6 - On the interchangeability of standard 2D and accelerated 3D knee MRI: is it time to consider a paradigm shift? (8 min)

Céline Smekens; Halle / Belgium

Author Block: C. Smekens¹, E. De Smet², E. Roelant¹, T. Vande Vyvere¹, A. Snoeckx², P. Van Dyck²; ¹Wilrijk/BE, ²Edegem/BE

Purpose or Learning Objective: To evaluate the interchangeability of multi-contrast 3D controlled aliasing in parallel imaging results in higher acceleration (CAIPIRINHA) sampling perfection with application optimized contrast using different flip angle evolutions (SPACE) TSE and standard 2D TSE knee MRI in a large patient population.

Methods or Background: 250 symptomatic subjects prospectively underwent knee MRI on a 3T system with a 15-channel knee coil. The imaging protocol consisted of PD-weighted, T1-weighted and fat-suppressed T2-weighted standard 2D TSE acquisitions (12:14 minutes) and a commercially available multi-contrast 3D CAIPIRINHA SPACE TSE protocol (9:26 minutes). Approximately 13% of the patients (n=33) previously underwent anterior cruciate ligament and/or meniscus surgery. Two experienced musculoskeletal radiologists independently evaluated all datasets for technical image quality and identified pathologies of knee structures using a 4-point Likert scale representing the level of diagnostic confidence. The interchangeability of 2D and 3D protocols was tested under the same-reader scenario using a bootstrap percentile confidence interval. Finally, interreader reliability and intermethod concordance were assessed for all detected pathologies.

Results or Findings: Although 2D acquisitions scored better in terms of image quality and diagnostic confidence, standard 2D and accelerated 3D protocols were found interchangeable for diagnosing structural abnormalities, except for patellar (6.8% difference; 95%-CI: 4.0-9.6) and trochlear (3.6% difference; 95%-CI: 0.8-6.6) cartilage defects. Additionally, interreader reliability was high for both 2D and 3D protocols (range κ , 0.785-1 and κ , 0.725-0.964, respectively) and the intermethod concordance was very good for all diagnoses (range κ , 0.817-0.986).

Conclusion: This study contributes to the growing evidence that accelerated 3D protocols are a valuable time-saving alternative for standard 2D knee MRI. Yet, the radiologists' preference for 2D images needs to be further challenged to achieve a paradigm shift.

Limitations: Not applicable.

Ethics committee approval: The ethics committee approval was obtained.

Funding for this study: CS: B-Q MINDED (EU H2020 MSCA ETN #764513), UAntwerpen SEP #44883.

RPS 1310-7 - Dynamic mediolateral patellar translation is a sex- and size-independent parameter of proximal patellar tracking using dynamic 3 Tesla Magnetic Resonance Imaging (8 min)

Kai-Jonathan Maas; Hamburg / Germany



Author Block: K-J. Maas, M. L. Warncke, T. Dust, M. Krause, K-H. Frosch, G. Adam, G. H. Welsch, F. O. Henes, J. Frings; Hamburg/DE

Purpose or Learning Objective: To assess normal values for physiological patellofemoral tracking and sex differences in a representative group of healthy individuals, using real-time 3T-MRI and to test for the reliability of the presented technique.

Methods or Background: One hundred knees (48 females, 52 males) of 57 healthy individuals with no history of patellofemoral symptoms were scanned with dynamic MRI sequences, during repetitive cycles of flexion (40°) and full extension. Within a 30-seconds-time-frame, three simultaneous, transverse slices were acquired. Dynamic mediolateral patellar translation (dMPT) and dynamic patellar tilt (dPT) were measured on two occasions by two independent examiners. Common radiological parameters were measured using static MRI, and correlations were calculated.

Results or Findings: In 100 knees (53 right, 47 left, 26.7±4.4 years, BMI 22.5±3.1) the mean height was 170.1±7.7cm in women and 181.8±6.4cm in men. The average patella diameter was 37.9±2.7 (95% CI 37.1-38.7) mm in women and 42.4±3.2 (95% CI 41.5-43.3) mm in men. In females, the patellar diameters and intercondylar distances were significantly smaller than in males (p<0.001). Radiological parameters for patellar maltracking were within the normal range. During the range of motion, mean dMPT was 1.7±2.4 (95% CI 0.9-2.5) mm in females and 1.8±2.7 (95% CI 1.1-2.6) mm in males (p=0.766). Mean dPT was 1.3±2.9° in females and -0.2±3.8° in males (p=0.036). Neither dMPT nor dPT was correlated with height, BMI or patellar diameter. Intercondylar distance correlated weakly with dPT (r=-0.241, p=0.041). Intra- and interrater reliability were excellent for dMPT and dPT.

Conclusion: Dynamic mediolateral patellar translation is a size- and sex-independent parameter for proximal patellar tracking. In healthy individuals without patellofemoral abnormalities normal dMPT proximal to the trochlea groove was 1.7±2.5 (1.2-2.2) mm, independent of size or sex. Normal dPT showed a dependency on sex and was 1.3±2.9 (0.4-2.1)° in women and -0.2±3.8 (-1.2-0.9)° in men.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RT 13 - Building bridges: how to be successful in multidisciplinary research?

Categories: Education, Management/Leadership, Multidisciplinary, Professional Issues, Research

ETC Level: LEVEL II+III

Date: March 4, 2022 | 10:30 - 11:30 CET

Moderators:

Valérie Vilgrain; Clichy / France

Boris Brkljačić; Zagreb / Croatia

RT 13-1 - Chairpersons' introduction (2 min)

Valérie Vilgrain; Clichy / France

Boris Brkljačić; Zagreb / Croatia

1. To understand the importance of teaming up with other medical professionals to achieve successful research that will have impact on patient outcome.
2. To learn how to start a clinically oriented research project involving multiple disciplines.
3. To understand the importance of involving the different stakeholders during each stage of the project.
4. To know which skills are required to successfully run a multidisciplinary research.
5. To learn the important role of radiologists in the design and execution of clinical trials.

RT 13-2 - How do I start and successfully run a multidisciplinary clinical research (10 min)

Valérie Vilgrain; Clichy / France

RT 13-3 - Clinical trials in radiology and data sharing: results from a survey of the European Society of Radiology (ESR) research committee (10 min)

Marc Dewey; Berlin / Germany

RT 13-4 - Discussion (38 min)

Luis Martí-Bonmatí; Valencia / Spain

Carlo Catalano; Rome / Italy

Marc Dewey; Berlin / Germany

IND 22 - AI in CT - Make an impact on your exams!

Categories: Artificial Intelligence, Cardiac, Cardiology, CT, Deep Learning, General Radiology, Image Quality, Machine Learning, Radiographers, Radiologists

Date: March 4, 2022 | 11:30 - 12:30 CET

IND 22-1 - AI in CT - Make an impact on your exams! (10 min)

Emilie Rouaud; France

This presentation and panel discussion presents how AI can help you to improve your daily routine in CT. Learn more about clinical outcomes using GE latest innovative products from users' perspective in CT daily routine. 1. Get an update to the latest trends in AI assisted CT imaging. The symposium covers aspects of CT scan workflow optimization, from patient referral, AI assisted protocol, patient positioning and scan parameters selection. 2. How to efficiently incorporate advanced Deep learning reconstruction techniques (true Fidelity images) to your clinical practice with size based automated features. 3. Benefits of automizing time-consuming workflow steps, with intelligent features like Intelligent Protocols, Auto Positioning and Auto Prescription to enhance productivity with more patients as well as better patient care

IND 22-2 - AI in CT - Make an impact on your exams! (10 min)

Joleen Rodrigues

IND 22-3 - AI in CT - Make an impact on your exams! (10 min)

Sri Iyengar; United Kingdom

IND 22-4 - AI in CT - Make an impact on your exams! (10 min)

Gianluca Pontone; Milan / Italy

IND 54 - Liver fat quantification and stiffness assessment: how can UDFF and Auto pSWE improve access to care?

Categories: General Radiology, Liver, Ultrasound

Date: March 4, 2022 | 11:45 - 12:15 CET

IND 54-1 - Liver fat quantification and stiffness assessment: how can UDFF and Auto pSWE improve access to care? (-min)

Christoph F. Dietrich; Bern / Switzerland

Jonathan R. Dillman; Cincinnati / United States

David Bauer; Vienna / Austria

Improving access to care with a non-invasive, widely available, cost-effective method that combines liver stiffness & hepatic steatosis available on the ACUSON Sequoia ultrasound system. Join to hear feedback directly from the first users. • Ultrasound Derived Fat Fraction (UDFF) is the only ultrasound technology to classify hepatic steatosis with a similar clinical utility as MRI-PDFF; both classify hepatic steatosis as an index value greater than 5%. • Auto Point Shear Wave Elastography (Auto pSWE) delivers up to 15 valid point shear wave measurements in seconds, reducing liver elastography exam time by up to 75% compared to conventional elastography techniques.

IND 21 - Interview with Vittorio Puppo (Bracco): Shaping the Future of Healthcare: How Innovations in Diagnostics are driving a healthier, safer World

Date: March 4, 2022 | 12:00 - 12:15 CET

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

IND 21-1 - Shaping the Future of Healthcare: How Innovations in Diagnostics are driving a healthier, safer World (15 min)

Vittorio Puppo; Milan / Italy

Join us when ESR President Prof. Regina Beets-Tan interviews Vittorio Puppo, Chief Marketing Officer, about Bracco's vision for "Shaping the Future of Healthcare". For Bracco, it's all about progress and possibility. We work hard every day to discover and develop diagnostic imaging solutions that improve lives. It's a long legacy of innovation and impact that began 90 years ago—and continues with every breakthrough. To us, caring about people, means caring about our planet. That's why Bracco is also focused on sustainability and forming strategic partnerships that address everything from protecting the environment to social responsibility.

RPS 1402 - Predictive and prognostic models in breast imaging

Categories: Artificial Intelligence & Machine Learning, Breast, Contrast Media

Date: March 4, 2022 | 12:30 - 13:30 CET

CME Credits: 1

Moderators:

Iva Biondić Špoljar; Zagreb / Croatia

Michael Fuchsjäger; Graz / Austria

RPS 1402-2 - Combining DCE-MRI pharmacokinetic parameters at early time points with prognostic factors improves the prediction of pathologic response to neoadjuvant chemotherapy in breast cancer (8 min)

Fiona Gilbert; Cambridge / UK

Author Block: G. C. Baxter, J. C. Carmona-Bozo, R. Manavaki, A. Colarieti, R. Woitek, R. Bedair, J. Abraham, M. J. Graves, F. Gilbert; Cambridge/UK

Purpose or Learning Objective: To explore the additional value of pharmacokinetic parameters from DCE-MRI at early time-points in predicting pathologic complete response (pCR) to neo-adjuvant chemotherapy (NACT) in breast cancer.

Methods or Background: Women >18 years receiving NACT prior to surgery for breast cancer underwent baseline and post cycle 1 DCE-MRI examinations at 3T. DCE-MRI series were analysed using the extended Tofts' model to derive Ktrans, kep, ve and hotspot Ktrans (hs-Ktrans). pCR was defined as no residual invasive cancer in the breast at surgery but allowing for the presence of in situ carcinoma. The area under the curve (AUC) was calculated to evaluate the predictive performance of logistic regression models including standard prognostic factors (histology, grade, molecular subtype) with and without the addition of DCE-MRI parameters.

Results or Findings: Data from 82 patients (86 lesions) were analysed. The majority were invasive ductal carcinomas (ductal: 71/86, 83%; lobular: 3/86, 3%; other: 12/86, 14%), hormone receptor (HR)-positive (57/86, 66%), with 31% HER2-positive. All tumours were either grade 2 or 3. 27/86 (31%) lesions showed pCR. Across all cancers, adding baseline hs-Ktrans increased AUC from 0.77 to 0.80, while the inclusion of Ktrans after 1 treatment cycle yielded the highest increase in AUC (0.72 to 0.76). For the HR+ group, the largest increase in AUC was observed for baseline hs-Ktrans (0.80 to 0.85). The addition of baseline hs-Ktrans and post cycle-1 kep showed the best predictive performance in triple-negative cancers (hs-Ktrans: 0.76 vs 0.59; kep: 0.93 vs 0.70).

Conclusion: The addition of DCE-MRI pharmacokinetic parameters at early time-points to standard prognostic factors can improve pCR prediction in HR+ and triple-negative breast cancer.

Limitations: Relatively small sample size from single site.

Ethics committee approval: NRES Committee South East (13/LO/0411).

Funding for this study: NIHR Cambridge Biomedical Research Centre.

RPS 1402-3 - Intra- and peritumoural radiomics based on dynamic contrast-enhanced MRI for a preoperative prediction of the intraductal component in invasive breast cancer (8 min)

Hao Xu; China

Author Block: H. Xu, L. hongbing, P. Zhou, J. k. Liu, J. Ren; Chengdu/CN

Purpose or Learning Objective: To develop and validate radiomic models for the preoperative prediction of the intraductal component in invasive breast cancer (IBC-IC) using the intra- and peritumoural features derived from dynamic contrast-enhanced MRI.

Methods or Background: The prediction models were developed in a primary cohort of 183 consecutive patients from September 2017 to December 2018. The validation cohort of 111 patients from February 2019 to January 2020 was enrolled to test the prediction models. A total of 208 radiomic features were extracted from the intra- and peritumoural regions of MRI-visible tumours. Then the radiomic features were selected and combined with clinical characteristics to construct predicting models using multivariate logistic regression. The AUC of receiver operating characteristics, sensitivity, and specificity were used to evaluate the performance of the radiomic models.

Results or Findings: Four radiomic models for the prediction of IBC-IC were built, including intratumoural radiomic signature, intratumoural radiomic nomogram, peritumoural radiomic signature, combined intra- and peritumoural radiomic signature. The combined intra- and peritumoural radiomic signature had the optimal diagnostic performance, with the AUC, sensitivity, and specificity of 0.802 (0.737-0.857), 0.733 (0.580-0.854), and 0.746 (0.665-0.817) in the primary cohort and 0.817 (0.732-0.884), 0.741 (0.537-0.889), and 0.750 (0.644-0.838) in the validation cohort.

Conclusion: The radiomic model based on the combined intra- and peritumoural features from DCE-MRI showed good ability to preoperatively predict IBC-IC, which might facilitate the individualized surgical planning for patients with breast cancer before breast-conserving surgery.

Limitations: This was a single-centre study. Hence, the radiomic models in this study need to be verified in a multicentre study with different imaging equipment in the future.

Ethics committee approval: The retrospective analysis was approved by our institutional review board, and the informed consent was waived.

Funding for this study: This study has received funding by the Sichuan Science and Technology Program (grant numbers 2021YFG0125).

RPS 1402-4 - Breast cancer recurrence risk prediction using breast MRI radiomics analysis with nested 10-fold cross-validation (8 min)

Kun Sun; Shanghai / China

Author Block: K. Sun¹, B. Wang², D. Shen¹, F. Yan¹; ¹Shanghai/CN, ²Harbin/CN

Purpose or Learning Objective: To investigate the value of MRI radiomics with nested-10 fold cross-validation based on T1-weighted (T1W) images in predicting recurrence risk in patients with breast cancer.

Methods or Background: This retrospective study enrolled 220 patients with histopathology-confirmed breast cancer and genomic testing. The patients were divided into low-, intermediate- and high-recurrence score (RS) groups based on their genomic testing results. A total of 788 radiomics features and 18 clinicopathological features were extracted to build a radiomics model, a clinicopathological model, and a combined model. Univariate statistical tests and a random forest algorithm were performed via a nested 10-fold cross-validation to select the best features for predicting different RS groups. The predictive performance was validated by both the receiver operating characteristic curve (ROC) and a decision curve analysis (DCA).

Results or Findings: The area under the ROC curve (AUC) of the 3-class problem (i.e., classification of low-, intermediate- and high-RS groups) in the testing cohort ranged between 0.73 (clinico-pathological model) and 0.78 (radiomics model). The prediction performance of the radiomics model was superior to that of the clinico-pathological model and the combined model. For the 2-class problems (i.e., classification between low- and intermediate-RS groups, low- and high-RS groups, intermediate- and high-RS groups, and low- and intermediate-high RS groups), the AUCs ranged from 0.70 (radiomics model, intermediate- vs high-RS groups) to 0.88 (radiomics model, low- vs high-RS groups).

Conclusion: Radiomics features of breast MRI T1WI used in a machine learning classifier provided high discriminatory accuracy in predicting the recurrence risk of breast cancer.

Limitations: Our study is a single-centre retrospective study.

Ethics committee approval: This study was approved by our institutional ethics committee of Ruijin Hospital, Shanghai Jiaotong University School of Medicine.

Funding for this study: This study was funded by the National Natural Science Foundation of China (No. 81801651).

RPS 1402-5 - The value of diffusion-weighted imaging (DWI) in pathological complete response (pCR) prediction in addition to dynamic contrast-enhanced (DCE) MRI in HER2-positive breast cancer patients (8 min)

Anna van der Voort; Amsterdam / Netherlands



Author Block: A. van der Voort¹, K. van der Hoogt¹, R. Wessels², R-J. Schipper³, G. Sonke¹, R. M. Mann⁴; ¹Amsterdam/NL, ²The Hague/NL, ³Eindhoven/NL, ⁴Nijmegen/NL

Purpose or Learning Objective: To investigate the added value of DWI to identify pCR in stage I-III HER2+ breast cancer patients with radiological complete response (rCR) after neoadjuvant chemotherapy (NAC) on DCE-MRI.

Methods or Background: We retrospectively identified patients treated with trastuzumab-containing NAC between January 2015 until September 2019 who had rCR (absence of pathologic enhancement) on post-chemotherapy DCE-MRI-breast in the Netherlands Cancer Institute. Baseline and post-NAC MRI's (Philips 1.5/3.0T) were evaluated by a dedicated breast radiologist blinded for the pathological outcome. We re-evaluated rCR on DCE-MRI and visually evaluated response on high b-value DW-images (b800 and higher). ADC values were measured within the original tumour region. We calculated the negative predictive value (NPV) for pCR (ypT0/is) with a corresponding 95% standard logit confidence interval. Fisher's exact and Mann-Whitney's U test were used for comparison between groups.

Results or Findings: DCE showed rCR in 102 patients of whom 76 had a pCR. A pCR was more common in HR+/HER2+ than HR-/HER2+ patients (40 of 46 vs 36 of 56, p=0.01). Residual DWI signal was visible in 7 patients. NPVs for DCE and for DWI among patients with rCR on DCE, were respectively 74.5% and 77.9% (95%CI: 75.4-80.2%) overall, 64.3% and 70.0% (95%CI: 64.3-75.1%) in HR+ and 86.9% and 86.7% (95%CI: 86.1-87.2%) in HR- patients. Within HR+ patients with visual residual DWI signal only 1 of 6 had a pCR (16.7%, 95%CI: 2.5-61.5%). The relative mean ADC-difference in HR+ patients was 80.1% (IQR 41.1-128.6%) and 114.7%, respectively with and without pCR (IQR 25.1-191.7%; p=0.36).

Conclusion: Standardised DWI evaluation after NAC could potentially help to identify more HR+/HER2+ patients with residual invasive disease.

Limitations: Double reader analysis will be performed before ECR. Multiple DWI-scan protocols were used.

Ethics committee approval: Approved by the IRB.

Funding for this study: No funding was received for this work.

RPS 1402-6 - MRI morphological criteria and ADC value in predicting axillary lymph node (ALN) response after neoadjuvant chemotherapy (NAC): are we nearly there? (8 min)

Maria Clotilde Sciandrello; Torino / Italy

Author Block: M. C. Sciandrello, M. Durando, G. Bartoli, E. Regini, A. Santonocito, A. Pittaro, I. Castellano, P. Fonio; Turin/IT

Purpose or Learning Objective: To identify which MRI criteria can predict residual ALN disease in breast cancer patients undergone NAC.

Methods or Background: From 2014 to 2021, pre-and post-NAC 1,5 T MRIs of 164 patients with locally advanced breast cancer were retrospectively analysed by two dedicated radiologists in consensus, blinded to histological results. We evaluated both quantitative (number, diameter) and qualitative (irregular margins, absence of fatty hilum, cortical thickness>3mm, perifocal oedema, rim enhancement, asymmetry comparing with contralateral side) criteria and ADC value related to ALNs before and after NAC. ALNs status was compared before NAC with ALN biopsy and with sentinel ALN biopsy or axillary dissection after NAC; nodal pathological response is classified according to Pinder's criteria [complete response (pCR) versus no-complete response(no-pCR)]. Statistical analysis (Chi-square or Fisher's exact tests for categorical variables, non-parametric Mann-Whitney test for continuous variables) was performed.

Results or Findings: At pre-therapy MRI, the two parameters that best correlated with positive ALN biopsy were irregular margins and the absence of fatty hilum (p= 0,0003 and p=0,0014 respectively), while, after NAC, relating the different parameters with pCR or no-pCR, the only statistically significant data was the irregularity of margins (p= 0,0003). The other variables, although at the univariate analysis they seemed to demonstrate a statistically significant correlation, did not confirm this data at the multivariate analysis.

Conclusion: Based on our results, irregular ALNs margins seem to be the most reliable parameter associated to pre-therapy ALNs disease and no-pCR after NAC.

Limitations: Retrospective study.

Ethics committee approval: Not required.

Funding for this study: No funding was provided for this study.



RC 1412 - GI and GU imaging in children

Categories: Abdominal Viscera, Genitourinary, GI Tract, Paediatric Imaging, Ultrasound

ETC Level: LEVEL II+III

Date: March 4, 2022 | 12:30 - 13:30 CET

CME Credits: 1

Moderator:

Lil-Sofie Ording Müller; Oslo / Norway

RC 1412-1 - Chairperson's introduction (5 min)

Lil-Sofie Ording Müller; Oslo / Norway

RC 1412-2 - Focal renal lesions (15 min)

Donald Ibe; Abuja / Nigeria

1. To understand the role of imaging in characterising focal renal lesions in children.
2. To learn about the imaging appearances of focal renal lesions in children.
3. To discuss the common pitfalls and how to avoid them.

RC 1412-3 - Unknown sex of a new-born: imaging pearls and pitfalls (15 min)

Marianne Alison; Paris / France

1. To understand the role of imaging in a child with a disorder of sexual development.
2. To learn about the imaging appearances of disorders of sexual development in children.
3. To discuss the common pitfalls and how to avoid them.

RC 1412-4 - Multisystem inflammatory syndrome in children (MIS-C) (15 min)

Tom Watson; London / UK

1. To understand what is meant by MIS-C.
2. To learn about the role of various imaging modalities in diagnosing MIS-C.
3. To discuss the common pitfalls and how to avoid them.

RC 1412-5 - Panel discussion: When to proceed from ultrasound to cross sectional imaging? (10 min)



TS 14 - Open forum for Young ECR

Categories: Education, General Radiology, Management/Leadership, Multidisciplinary, Professional Issues, Students

ETC Level: ALL LEVELS

Date: March 4, 2022 | 12:30 - 13:30 CET

CME Credits: 1

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

- Part 1: Meet the professors (31 min)

TS 14-2 - Chairperson's introduction (3 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

This trailer session will give an outlook to one of the highlights of the Open Forum program at ECR 2022 July. The Young ECR 2022 Open Forum program is dedicated to young radiologists and young clinicians, as part of the ECR 2022 theme Building bridges. In this trailer session distinguished professors of radiology will share their experience, their vision, and give advice and guidance to the younger generation of radiologists. Young members of subspecialty societies in radiology and other medical disciplines will discuss the role of radiologists from the multidisciplinary view of the young generation.

TS 14-3 - Mentoring in radiology: why and how (8 min)

Valérie Vilgrain; Clichy / France

TS 14-4 - Discussion (20 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

Carlo Catalano; Rome / Italy

Valérie Vilgrain; Clichy / France

- Part 2: My involvement in a subspecialty committee: a multidisciplinary perspective (29 min)

TS 14-6 - Chairperson's introduction (1 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

TS 14-7 - Young ESGAR (5 min)

Doenja M. Lambregts; Amsterdam / Netherlands

TS 14-8 - Young UEG (5 min)

Henriette Heinrich; Zurich / Switzerland

TS 14-9 - Discussion (13 min)

TS 14-10 - Wrap-up (5 min)



Regina G.H. Beets-Tan; Amsterdam / Netherlands



RC 1406 - Introduction to functional and molecular imaging and applications in oncology

Categories: Hybrid Imaging, Molecular Imaging, Nuclear Medicine, Oncologic Imaging, Translational Imaging

ETC Level: LEVEL II

Date: March 4, 2022 | 12:30 - 13:30 CET

CME Credits: 1

Moderator:

Michel Eisenblaetter; Freiburg / Germany

RC 1406-1 - Chairperson's introduction (5 min)

Michel Eisenblätter; Freiburg / Germany

RC 1406-2 - Perfusion CT (pCT) (15 min)

Charles A. Cuénod; Paris / France

1. To understand the fundamental processes and technical aspects of pCT.
2. To learn about the current clinical applications of pCT in oncology.
3. To discuss the potential new applications for pCT.

RC 1406-3 - Diffusion and perfusion-weighted MRI (15 min)

Adam Espe Hansen; Copenhagen / Denmark

1. To understand the biophysical basis of diffusion- and perfusion-weighted MRI.
2. To understand the applications of diffusion- and perfusion-weighted MRI at various stages during cancer treatment.
3. To understand the radiological use of diffusion- and perfusion-weighted MRI.

RC 1406-4 - Update on radionuclide theranostics (15 min)

Luigi Aloj; Cambridge / UK

1. To identify the indications and cancers where radionuclide theranostics are approved for clinical use.
2. To list the strategies and conditions where there is likely to be clinical approval in the coming years.
3. To describe and reflect on the challenges and potential of the future development of radionuclide theranostics and the translational approaches currently being explored.

RC 1406-5 - Panel discussion: How to choose the correct modality for the functional imaging of cancer (10 min)



IND 23 - How latest ultrasound innovations can improve patient care by impacting on clinical decisions

Categories: Abdominal, Breast, General Radiology, Head and Neck, Hepatic, Image Quality, Liver, Multidisciplinary, Musculoskeletal, Oncologic Imaging, Radiographers, Radiologists, Thyroid, Ultrasound

Date: March 4, 2022 | 13:30 - 14:30 CET

Moderator:

Kirstin LaConte

IND 23-1 - How latest ultrasound innovations can improve patient care by impacting on clinical decisions (15 min)

Silvia Pérez Rodrigo; Madrid / Spain

Four radiologists, across different care areas, unveil their experience with some of the latest innovations in high end ultrasound. What's new and how this helped in their clinical decisions to improve patient care? Learn from their experience Get to know the latest innovations in ultrasound Acknowledge the potential impact across clinical applications Consider how these solutions and techniques could be applied in routine

IND 23-2 - How latest ultrasound innovations can improve patient care by impacting on clinical decisions (15 min)

Gina Allen; Oxford / United Kingdom

IND 23-3 - How latest ultrasound innovations can improve patient care by impacting on clinical decisions (15 min)

Andrew McQueen; Newcastle upon Tyne / United Kingdom

IND 23-4 - How latest ultrasound innovations can improve patient care by impacting on clinical decisions (15 min)

Tommaso Vincenzo; Palermo / Italy



TS 15 - Hepatocellular carcinoma: a multidisciplinary approach in real life

Categories: Abdominal Viscera, GI Tract, Imaging Methods, Multidisciplinary, Oncologic Imaging

ETC Level: LEVEL II+III

Date: March 4, 2022 | 14:00 - 15:00 CET

CME Credits: 1

Moderator:

Valérie Vilgrain; Clichy / France

TS 15-1 - Chairperson's introduction (2 min)

Valérie Vilgrain; Clichy / France

1. To review the diagnostic imaging findings of hepatocellular carcinoma.
2. To review the management of patients with suspected or confirmed hepatocellular carcinoma.
3. To integrate the pros and cons of different management approaches for hepatocellular carcinoma.
4. To give an outlook to the highlight Multidisciplinary program at ECR 2022.

TS 15-2 - Diagnosis and follow-up of hepatocellular carcinoma (10 min)

Valérie Vilgrain; Clichy / France

1. To learn about the common features of typical hepatocellular carcinoma (HCC) as detailed in the guidelines.
2. To discuss the role of liver biopsy in the diagnosis of HCC.
3. To become familiar with the patient management of atypical lesions in chronic liver diseases.

TS 15-3 - Treatment algorithms in hepatocellular carcinoma: the oncohepatologist's view (10 min)

Mohamed Bouattour; Clichy / France

1. To link staging in hepatocellular carcinoma (HCC) to treatment.
2. To obtain an overview on new systemic treatment options.
3. To discuss the role of systemic therapy in early and intermediate staged HCC.

TS 15-4 - Multidisciplinary tumour board: case-based panel discussion (33 min)

Valérie Vilgrain; Clichy / France

TS 15-5 - Wrap-up (5 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

RPS 1505b - Technical advances and imaging biomarkers

Categories: Artificial Intelligence & Machine Learning, Imaging Informatics, Imaging Methods

Date: March 4, 2022 | 14:00 - 15:00 CET

CME Credits: 1

Moderators:

Wiro J. Niessen; Rotterdam / Netherlands

Carlo Catalano; Roma / Italy

RPS 1505b-2 - Clinical trial: OPERA (orthogonal phase encoding reduction artefact) (8 min)

Andrea Dell'Orso; Siena / Italy

Author Block: A. DELL'ORSO; Empoli/IT

Purpose or Learning Objective: Artefacts in MRI represent a significant problem leading to loss of diagnostic information and substantial costs. A post-processing algorithm, for orthogonal phase encoding reduction of artefact (OPERA) is proposed and tested in the clinical setting.

Methods or Background: The OPERA procedure is based on the key concept that noise-induced signal intensity alterations are randomly distributed, whereas the position of ghosts and aliasing is predictable along with columns or rows of pixels. OPERA combines the intensity values of two images acquired with the same parameters, but with orthogonal phase encoding directions, to correct artefacts. The efficacy of the OPERA procedure on MRI artefacts reduction was tested at a medium-sized general public hospital by using an Espree Siemens 1.5T MR scanner for a total period of 14 months. The procedure was tested on a total of 1003 MR images [55 randomly selected patients (56.4% females; mean age 54.6 ± 16.7 years)]. OPERA corrected images were compared with the corresponding reference-image (Ri) by computing signal-to-noise (SNR) and contrast-noise-ratio (CNR). Images (OPERA vs Ri) were shown in blind at two radiologists with a long-standing MRI expertise by using a better-worse Likert-type scale response, to evaluate artefacts, SNR and CNR.

Results or Findings: OPERA application did not significantly affect SNR (+4.3%; IQR:2.61-5.27%) and CNR (+4.30%; IQR: 2.86-6.04%). The two radiologists observed: artefact reduction (responses 4 and 5 of the Likert-scale) between 82.4% and 83.4% (inter-rater agreement, weighed $K=0.766$); perceived SNR improvement (82.8% to 88.5% $K=0.714$) and contrast improvement (86.9% to 88.9% $K=0.722$).

Conclusion: The testing of OPERA in the daily MRI practice indicates the efficacy of the algorithm in reducing MRI artefacts and improving perceived image quality.

Limitations: Not tested on the heart and superior abdomen. Single-centre study.

Ethics committee approval: OSS_15_145, December 14, 2015.

Funding for this study: No funding has been received for this study.

RPS 1505b-3 - Multi-organ abnormalities in long-COVID (8 min)

Adriana Roca-Fernandez; Oxford / UK

Author Block: A. Dennis, A. Roca-Fernandez, J. Mcgonigle, A. Jandor, G. Ralli, V. Carapella, R. Banerjee; Oxford/UK

Purpose or Learning Objective: In a prospective longitudinal observational study in individuals who had recovered from COVID-19, we set out to assess the degree of organ impairment in the heart, lungs and visceral organs using quantitative MRI and explore potential links with ongoing symptoms.

Methods or Background: Quantitative MRI data were collected with CoverScanMD across two sites in the UK (Siemens 1.5T and 3T). The 30 min scan assesses: inflammation of the heart, kidneys, liver and pancreas with T1-relaxation; lung function with a dynamic structural T2-weighted scan measuring the difference between max inspiration and expiration; fat in the liver and pancreas using PDFF. Impairment for each organ was considered when the metric was outside of pre-defined reference ranges. Associations between organs and symptoms were explored with logistic regression adjusted by time from first symptoms to MRI.

Results or Findings: In N=451 (44yrs, 74% female, 89% white, median 179 days following infection), inflammation was observed in the heart (14%), liver (12%), pancreas (6%) and kidney (4%); fat in liver (22%) and pancreas (30%); estimated lung capacity was reduced in 11%. 21% had evidence of abnormality in 2 or more organs and the number of abnormal metrics negatively correlated with the length of time between initial symptoms and scan ($r = -0.23$, $P < .001$) suggesting some recovery with time. 66% reported ongoing severe breathlessness or fatigue which was significantly associated with increased white cell count (WCC) ($P = .03$) and marginally with myocarditis ($P = 0.06$).

Conclusion: Coronavirus is associated with multi-organ dysfunction 6 months after infection. Organ inflammation was associated with symptoms. Multi-organ MRI may provide a diagnostic tool to stratify patients with long COVID and aid clinical management.

Limitations: Study population was limited by ethnicity.

Ethics committee approval: The study protocol was approved by a UK ethics committee (20/SC/0185).

Funding for this study: Funding was received from Perspectum Ltd.

RPS 1505b-4 - Estimation of bias of deep learning-based chest X-ray classification algorithm (8 min)

David C. Bastos; São Paulo / Brazil

Author Block: D. C. Bastos¹, M. Rosa¹, H. M. H. Lee¹, E. P. Reis¹, G. Szarf¹, A. Gupta², V. K. Venugopal², V. Mahajan²; ¹São Paulo/BR, ²New Delhi/IN

Purpose or Learning Objective: To evaluate the bias in the diagnostic performance of a deep learning-based chest X-ray classification algorithm on previously unseen external data.

Methods or Background: 632 chest X-rays were randomly collected from an academic centre hospital and anonymised selectively, leaving out fields needed for the bias estimation (manufacturer name, age, and gender). They were from six different vendors AGFA (388), Carestream (45), DIPS (21), GE (31), Philips (127), and Siemens (20). The male and female distribution was 376 and 256. The X-rays were read for consolidation ground truth establishment on CARING analytics platform (CARPL). These X-rays were run on open-sourced chest X-ray classification model. Inferencing results were analysed using Aequitas, an open-source python-based package to detect the presence of bias, fairness of algorithms. Algorithms' performance was evaluated on the three metadata classes gender, age group, and brand of equipment. False omission rate (FOR) and false-negative rate (FNR) metrics were used for calculating the inter-class scores of bias.

Results or Findings: AGFA, 60 to 80 age group, and male were the dominant entities and hence considered as baseline for evaluation of bias towards other classes. Significant false omission rate (FOR) and false negative rate (FNR) disparities were observed for all vendor classes except Siemens as compared to AGFA. No gender disparity was seen. All groups show FNR parity whereas all classes showed disparity with respect to false omission rate for age.

Conclusion: We demonstrate that AI algorithms may develop biases, based on the composition of training data. We recommend bias evaluation check to be an integral part of every AI project. Despite this, AI algorithms may still develop certain biases, some of those difficult to evaluate.

Limitations: Limited pathological classes were evaluated.

Ethics committee approval: IRB approved.

Funding for this study: None.

RPS 1505b-5 - Virtual non-contrast image generation from pre-clinical photon-counting spectral CT - a phantom study to evaluate the algorithm performance (8 min)

Varut Vardhanabhuti; Hong Kong / Hong Kong SAR China



Author Block: F. K. YEUNG, W. Y. Ip, V. Vardhanabhuti; Hong Kong/HK

Purpose or Learning Objective: Virtual non-contrast (VNC) as a concept has been used to create non-contrast images from contrast studies. In the context of spectral CT, accurate VNC helps with the accurate material decomposition (MD) properties. The aim of the study is to evaluate the performance of VNC images generated from pre-clinical photon-counting CT in a phantom.

Methods or Background: Commercially available iodine contrast agent (Iopamiro 370) was diluted into various concentrations of iodine solutions (185, 93, 46, 23, 10, 8, 6, 4, 2, 1, 0.5 mg/ml), placed in a phantom and scanned using a pre-clinical photon-counting spectral CT scanner (MARS Bioimaging Ltd., Christchurch, New Zealand) with pre-calibrated MD protocol of multi-energy range. Iodine was decomposed by the scanner's reconstruction algorithm and the measured iodine concentration was compared with the known diluted concentrations as reference. The images were further processed by a custom-made MATLAB (Mathworks, Natick, MA) program to explore the relationship between CT number (in HU) and iodine concentration with subsequent correlation analysis. After iodine removal by VNC post-processing, the corresponding CT number of iodine vials of VNC and original contrast images were compared with the ground truth water vial respectively.

Results or Findings: For iodine images, measured iodine concentration was comparable with calculated ones (mean absolute difference of 9.1%). The HU values and iodine concentration was linearly and highly correlated (adjusted R squared of 0.9974 with p-value of <0.001). At 32-49.9 keV energy range, the mean absolute HU difference between water and VNC image of typical 10 mg/ml iodine solution was 27 ± 13 HU while comparing to contrast image of 605 ± 12 HU.

Conclusion: Virtual non-contrast technique is feasible in spectral CT scanner with good accuracy and correlation with known concentrations in phantom study.

Limitations: No limitations were identified.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 1505b-6 - An online tool for semi-automatic comprehensible characterisation of dynamic contrast-enhanced magnetic resonance imaging studies (8 min)

Stephan Ellmann; Erlangen / Germany

Author Block: S. Ellmann, K. Hellwig, M. Eckstein, A. Hartmann, R. Fietkau, M. Hecht, M. Uder, T. Bäuerle; Erlangen/DE

Purpose or Learning Objective: Dynamic contrast enhancement (DCE) evaluation in MRI is subject to various difficulties, as the signal intensities reflect contrast media concentration non-linearly. Moreover, individual outliers in the time-intensity curves may compromise the semiquantitative values of the enhancement dynamics. In addition, the plethora of analysis methods are hardly comparable with each other. Thus, the aim of this work was the establishment of a web-based tool for the quantitative and semiquantitative evaluation of DCE-MRI.

Methods or Background: An interactive web application was programmed using R to load DCE-MRI studies and semiautomatically fit the raw data to a Brix model using the Levenberg-Marquardt method. Goodness-of-fit was assessed by R2. From the fitted curves, the Brix-equation was extracted, along with (semi-)quantitative parameters: A, kel, kep, time to peak, peak-enhancement, area-under-the-curve. The maximum and minimum of a fitted curve's first derivative were defined as wash-in and wash-out, respectively. In an exemplary case series, 22 neck tumour patients were retrospectively analysed with regard to their response to immunotherapy. For this purpose, pre-therapeutic DCE-MRIs covering the tumour were assessed using the developed online tool. The above parameters were compared between treatment responders and non-responders.

Results or Findings: Fitting the Brix model to the raw DCE-MRI data yielded a mean R2 of 0.939 (95%CI 0.922-0.956). Regarding the case series, treatment responders' tumours featured a significantly higher time to peak ($p=0.048$) and wash-out ($p=0.031$) compared to non-responders.

Conclusion: Raw DCE-MRI data can be fit to pharmacokinetic models semiautomatically with the presented online tool. In a case series, fitting was accurate, and the resulting parameters could be used to identify responders to immunotherapy in neck cancer patients.

Limitations: Proof-of-concept-study with a fully functional web application, but only supported by a small case series.

Ethics committee approval: Approved by the local ethics committee.

Funding for this study: Internal funding.

RPS 1505b-7 - Dual-layer spectral CT fat quantification in the liver and the skeletal muscle: experimental development and first in-patient validation (8 min)

Isabel Molwitz; Hamburg / Germany



Author Block: I. Molwitz¹, G. Campbell¹, J. Yamamura¹, T. Knopp¹, R. Fischer¹, J. Wang², A. Busch¹, M. Grosser¹, P. Szwargulski¹;
¹Hamburg/DE, ²Dallas, TX/US

Purpose or Learning Objective: To develop a material decomposition algorithm for detector-based dual-layer spectral CT (dlsCT) fat quantification, which so far has only been implemented for source-based dual-energy CT techniques, in phantoms and validate it in first patients.

Methods or Background: Phantoms were created with 0, 5, 10, 25, 40, 100% fat and 0, 4.9, 7.0 mg/ml iodine, respectively. Scans were performed with the IQon Spectral CT (Philips, The Netherlands), and 3T MR chemical-shift relaxometry (MRR). Based on maps of the photoelectric effect and Compton scattering, three-material decomposition, including fat and iodine, was done in the image space. After written consent, n=10 patients (mean age 55 years \pm 18; six men) in need of a CT staging were prospectively included, received contrast-enhanced abdominal dlsCT scans at 120kV, and MRI scans for MRR. As reference tissue for the liver and the skeletal muscle, retrospectively available non-contrast-enhanced spectral CT data sets were employed. Agreement between dlsCT and MR was evaluated for the phantoms, three hepatic and two muscular regions of interest per patient by intraclass correlation coefficients (ICC) and Bland-Altman analyses.

Results or Findings: The ICC was excellent in the phantoms (0.978[95%CI 0.937-0.993]) and the skeletal muscle (0.956[95%CI 0.890-0.982]). The ICC was moderate for log-transformed liver fat values (0.75[95%CI 0.48-0.881]). The Bland-Altman analysis yielded a mean difference of -0.714%[95%CI -4.512-3.085] for the liver and 0.501%[95%CI -4.319-5.321] for the skeletal muscle. Interobserver and intraobserver agreements were excellent (>0.9).

Conclusion: DlsCT fat quantification delivers reliable results for the liver and the skeletal muscle, which provide information about steatosis hepatis and muscle quality as parameters of prognostic relevance, in retrospectively available spectral data sets of routine exams.

Limitations: Experimental development and proof of concept study with low patient numbers.

Ethics committee approval: Available.

Funding for this study: Funded by Hamburg Research Center for Medical Technology (04fmthh2020).

RPS 1505b-8 - Reference values for low- and high-attenuation areas and total lung volume from computed tomography (8 min)

Alysson Carvalho; Porto / Portugal

Author Block: A. R. S. Carvalho¹, R. S. Rodrigues², R. Basilio², B. Hochegger³; ¹Porto/PT, ²Rio de Janeiro/BR, ³Porto Alegre/BR

Purpose or Learning Objective: Low-(LAA), high-attenuation areas (HAA) distribution and total lung volume (TLV) derived from computed tomography (CT) have been used in evaluating emphysema and interstitial/alveolar lung diseases. Few studies provided normal reference values of these variables. We aimed to describe reference values of LAA, HAA, and TLV from CT images of healthy subjects.

Methods or Background: Subjects with normal pulmonary function tests and chest CT, under study for lung living donor assessment, were retrospectively analysed. LAA (-1000 to -950 Hounsfield units, HU) and HAA (-700 to -250 HU) volumes were computed and divided by the TLV. The relationship between TLV and demographic variables were evaluated by multiple linear regression. Data are presented as median (0.25 and 0.75 quartiles).

Results or Findings: A total of 198 subjects were analysed. Median TLV was 4,388 (3,888 - 5,112 mL). Reference equations for TLV were generated: TLV (mL) = 689.840*Sex (1 = male, 0 = female) + 5791.096 * Height (m) - 4848.9 including sex, and body height as predictors (R2 = 0.61, adjusted R2 = 0.60, F-statistic = 64.9 and P < 0.0001) or TLV (mL) = 1484.101*Sex (1 = male, 0 = female) 7.672 * Age (y) + 4629.669 including sex, and age as predictors (R2 = 0.4982, adjusted R2 = 0.4923, F-statistic = 84.89 and P < 0.0001). Median LAA% was 0.73 (0.24 - 3.15) and median HAA% was 8.49 (7.24 - 10.05).

Conclusion: This study reported reference values of LAA%, HAA%, and reference equations for TLV derived from CT scan among subjects with normal lung function and CT findings.

Limitations: A higher sample size is still necessary.

Ethics committee approval: Santa Casa de Misericórdia de Porto Alegre (1.731.658), Pontifícia Universidade Católica do Rio Grande do Sul (1.763.960) and ID'Or (44648721.5.0000.5249), Brazil.

Funding for this study: CNPq, CAPES, FAPERJ.



BS 15 - Neuroradiology

Categories: General Radiology, Neuro

ETC Level: LEVEL I+II

Date: March 4, 2022 | 14:00 - 15:00 CET

CME Credits: 1

Moderator:

Alexandre Krainik; Grenoble / France

BS 15-2 - Imaging dementia and neurodegenerative disease (20 min)

Cem Calli; Izmir / Turkey

1. To learn about imaging features in dementia and other neurodegeneration.
2. To demonstrate the most important imaging findings.

BS 15-3 - Imaging posterior fossa malformations (20 min)

Milos A. Lucic; Sremska Kamenica / Serbia

1. To learn about imaging features in posterior fossa malformations.
2. To demonstrate the most important findings.

BS 15-4 - Imaging the sellar region (20 min)

Luc van den Hauwe; Antwerp / Belgium

1. To learn about imaging features in sellar region pathologies.
2. To demonstrate the most important findings.



E³ 1521b - Imaging of the face

Categories: Emergency Imaging, Head and Neck, Imaging Methods, Neuro

ETC Level: LEVEL II

Date: March 4, 2022 | 14:00 - 15:00 CET

CME Credits: 1

E³ 1521b-1 - Facial infections and complications (30 min)

Martin G. Mack; Munich / Germany

1. To become familiar with the key concepts and imaging features of facial infections.
2. To learn how to integrate clinical findings with radiological features.

E³ 1521b-2 - Facial pain (30 min)

Alexandra Borges; Lisbon / Portugal

1. To become familiar with the key concepts and imaging features of facial pain.
2. To learn how to integrate clinical findings with radiological features.

IND 25 - Clinical excellence and operational efficiency - The promise of AI & Analytics

Categories: Artificial Intelligence, General Radiology, Machine Learning, Radiographers, Radiologists

Date: March 4, 2022 | 15:00 - 16:00 CET

Moderator:

Simon Philip Rost; Cologne / Germany

IND 25-1 - Clinical excellence and operational efficiency - The promise of AI & Analytics (25 min)

Evis Sala; Cambridge / United Kingdom

Artificial Intelligence (AI) is getting increasingly sophisticated at doing what humans do, but more efficiently, more quickly and at a lower cost. The potential for AI in healthcare is vast. Just like in our every-day lives, AI is increasingly becoming a part of the healthcare ecosystem and algorithms assist healthcare professionals in their daily clinical routine. The experts will discuss the current and future impact of AI technologies and analytics on diagnostic imaging, and they will evaluate if the promise of clinical excellence and operational efficiency is becoming reality.

Learning Objectives:

1. Identify the current status of AI application in healthcare and discuss strategies to accelerate the mainstream adoption of AI solutions in imaging workflows.
2. Discuss the value AI and evaluate where AI applications create the highest impact (clinical excellence versus operational efficiency).
3. Discover innovative approaches and real-world initiatives that are currently accelerating AI implementations.

IND 25-2 - Clinical excellence and operational efficiency - The promise of AI & Analytics (25 min)

Peter Strouhal; Warwick / United Kingdom

IND 25-3 - Clinical excellence and operational efficiency - The promise of AI & Analytics (25 min)

Felix Nensa; Essen / Germany

IND-24 - Interview with Masaharu Fukumoto (Fujifilm Europe): Taking radiology to the next level: multidisciplinary and integrated technologies for a better clinical value

Date: March 4, 2022 | 15:15 - 15:30 CET

Moderator:

Michael Fuchsjäger; Graz / Austria



RPS 1608 - Orbital and paranasal sinus imaging

Categories: Head and Neck, Imaging Methods, Paediatric Imaging

Date: March 4, 2022 | 16:00 - 17:00 CET

CME Credits: 1

Moderator:

Pim De Graaf; Amsterdam / Netherlands

RPS 1608-2 - Intra voxel incoherent motion (IVIM) 3T MRI for orbital lesion characterisation (8 min)

Augustin Lecler; Paris / France

Author Block: A. Lecler, L. Duron, M. Zmuda, O. Berges, J. Savatovsky, L. Fournier; Paris/FR

Purpose or Learning Objective: To determine the diagnostic accuracy of MRI Intravoxel incoherent motion (IVIM) when characterising orbital lesions, which is challenging due to a wide range of locations and histologic types.

Methods or Background: This IRB-approved prospective single-centre study enrolled participants presenting with an orbital lesion undergoing a 3 Tesla MRI prior to surgery from December 2015 to July 2019. An IVIM sequence with 15 b-values ranging from 0 to 2000 s/mm² was performed. Two neuroradiologists, blinded to clinical data, individually analysed morphological MRIs. They drew one region of interest inside each orbital lesion, providing Apparent Diffusion Coefficient (ADC), true diffusion coefficient (D), perfusion fraction (f) and pseudo diffusion coefficient (D*) values. T-test, Mann-Whitney U test and receiver operating characteristic curve analyses were performed to discriminate between orbital lesions and to determine the diagnostic accuracy of the IVIM parameters.

Results or Findings: 156 participants (84 women and 72 men, mean age 54.4 +/-17.5 years) with 167 orbital lesions (98/167 [59%] benign lesions including 54 orbital inflammations and 69/167 [41%] malignant lesions including 32 lymphomas) were included in the study. ADC and D were significantly lower in malignant than in benign lesions: 0.8x10⁻³mm²/s [0.45] versus 1.04x10⁻³mm²/s [0.33], p<0.001 and 0.75x10⁻³mm²/s [0.40] versus 0.98x10⁻³mm²/s [0.42], p<0.001, respectively. D* was significantly higher in malignant lesions than in benign ones: 12.8x10⁻³mm²/s [20.17] versus 7.52x10⁻³mm²/s [7.57], p=0.005. Area Under Curve were of 0.73, 0.74, 0.72 and 0.81 for ADC, D, D* and a combination of D, f and D*, respectively.

Conclusion: Our study showed that IVIM might help better characterise orbital lesions.

Limitations: - Only participants who underwent surgery - We used 15 b-values for our IVIM acquisition

Ethics committee approval: This study was approved by an IRB (IRB 2015-A00364-45). Signed informed consent was obtained from all subjects.

Funding for this study: No funding was provided for this study.

RPS 1608-3 - The impact of the CT data analysis on treatment tactics in orbital trauma (8 min)

Olga Pavlova; Moscow / Russia

Author Block: O. Pavlova, N. S. Serova, D. Davydov, S. K. Ternovoy; Moscow/RU

Purpose or Learning Objective: To investigate the influence of orbital volume and globe position on the outcome in patients with orbital trauma using CT data postprocessing.

Methods or Background: A total of 107 patients with orbital trauma (100%) were admitted to the Sechenov University hospital. The patients were divided into 3 groups: 50 patients (47%) in the acute period (up to 2 weeks after the trauma), period of developing of posttraumatic deformities (n=30; 28%) (up to 3 months), period of posttraumatic deformities (n=27; 25%) (after 3 months). MSCT was performed using Canon Aquilion One 640, CT data processing was performed using workstation Vitrea Core. Along with the classical bone and soft tissue trauma evaluation on CT, the examined parameters of CT analysis included orbital volume measurement and evaluation of globe position.

Results or Findings: CT revealed the bone and soft tissue structures trauma in 100% of patients, however, the parameters of CT data analysis allowed to additionally reveal increased traumatic orbital volume in 21 patients (19%) and additional enophthalmos in 9 patients (8%), which helped to change the treatment tactic in 12 patients (11%).

Conclusion: The postprocessing of CT data allowed developing new specific criteria such as orbital volume measurement and globe position analysis which increase the efficiency of preoperative planning and help to reduce the possibility of postoperative complications in patients with orbital trauma.

Limitations: No limitations were identified.

Ethics committee approval: Approved by Sechenov University ethics committee.

Funding for this study: No funding was provided for this study.

RPS 1608-4 - Utility of quantitative magnetic resonance imaging of extraocular muscle in the evaluation of disease activity and severity of thyroid-associated ophthalmopathy (8 min)

Cheng Shen; Beijing / China

Author Block: C. Shen; Beijing/CN

Purpose or Learning Objective: Accurate staging of thyroid-associated ophthalmology (TAO) is crucial for the choice of treatment. Conventional MRI has only limited utility on this purpose. We proposed that quantitative imaging methods are superior in proper staging of TAO.

Methods or Background: Twenty patients with TAO were retrospectively enrolled, and clinical activity score (CAS) was used to determine the disease activity and severity. Conventional MRI, fat fraction, T1 ρ imaging and T2 mapping were acquired. Volumes of intra-orbital fat were measured in T1FLAIR sequences. Fat fraction, T1 ρ and T2 relaxation time in each extraocular muscle were measured. Independent sample t-test, and Spearman correlation analysis were used for statistical analysis.

Results or Findings: No significant difference was found in intra-orbital fat volumes between active (CAS \geq 3) and inactive (CAS < 3) TAO patients ($p=0.816$), the fat volumes showed no correlation with CAS scores ($p=0.2$). T2 relaxation time of inferior rectus (IR) was higher in the active group ($p=0.03$). Fat fraction of medial rectus (MR) decreased with CAS, T1 ρ of IR, MR and lateral rectus (LR) increased with CAS, and T2 relaxation time of MR and LR increased with CAS (all $p<0.05$).

Conclusion: Intra-orbital fat volumes might not help to differentiate the activity and severity of TAO. Quantitative magnetic resonance imaging (MRI) might provide accurate parameters delineating the activity and severity of TAO, thus aiding the appropriate choice of treatment.

Limitations: More cases would be involved into the analysis, as well as long-term follow-up in order to assess the role of quantitative MRI in predicting the progression and prognosis of TAO.

Ethics committee approval: This research had been approved by our institutional review board.

Funding for this study: No funding was provided for this study.

RPS 1608-5 - Imaging in unilateral proptosis as a marker of COVID associated mucormycosis (CAM) in post-COVID status (8 min)

Kishan Bhagwat; Davangere / India

Author Block: K. A. Bhagwat¹, K. peethambaram¹, v. k. hancginal²; ¹Davangere/IN, ²Gadag/IN

Purpose or Learning Objective: Unilateral proptosis in post-COVID is one of the clinical signs which needs imaging. The purpose of this study was (1) the early identification of mucormycosis on imaging - that is essential, (2) assessment of the spectrum of ocular involvement of mucormycosis in post-COVID status causing proptosis, and (3) to identify cavernous sinus involvement/thrombosis leading to dilatation of superior ophthalmic vein.

Methods or Background: Retrospective data analysis has been done from three district teaching hospitals, where CT/MRI have been performed for post-COVID patients presenting with unilateral proptosis to evaluate for the rhinooculocerebral mucormycosis. 1.5 T MRI / 16 Slice MDCT scanner have been used for orbital imaging. We have considered all post-COVID patients who underwent imaging for unilateral proptosis for evaluation. Two radiologists, with 16 and 8 years of experience, have read PACS images.

Results or Findings: A total of 119 patients have undergone imaging for mucormycosis among whom 65 patients had presented with unilateral proptosis. Involvement of mucormycosis soft tissue with erosive changes in the medial wall (from ethmoid sinus), floor (maxillary sinus), orbital apex (sphenoid sinus) leading to proptosis was found in 61 patients. Dilated superior ophthalmic vein due to cavernous sinus thrombosis was identified in four patients as the cause of proptosis with coexisting sinus involvement. Preseptal oedema, premaxillary oedema, oedema of soft tissue around the orbit and sinuses were found in 30 patients.

Conclusion: Imaging early in unilateral proptosis helps identify mucormycosis. Assessment of involvement of orbital wall and erosive changes helps as a surgical road map.

Limitations: Since only unilateral proptosis is considered as a criterion. Other early symptoms/signs of facial swelling, preseptal oedema leading to imaging would identify mucor much earlier.

Ethics committee approval: Retrospective study of images on PACS, approval taken.

Funding for this study: No funding was received for this study.

RPS 1608-6 - CT picture of rhino-orbito-cerebral mucormycosis (ROCM), associated in patients with COVID-19 (8 min)

Lolita Yunusova; Tashkent / Uzbekistan



Author Block: L. Yunusova, S. Valiyev; Tashkent/UZ

Purpose or Learning Objective: Report CT manifestations and outcomes of rhino-orbital cerebral mucormycosis (ROCM) in patients with COVID-19.

Methods or Background: We investigated 110 patients of invasive ROCM between July 2020 -September 2021, who were treated for the Maxillofacial Surgery of the TMA. The examined patients were from 46 to 52 years old and were men - 59.5%, women - 40.5%.

Results or Findings: Clinical features of these patients presents: sixty-eight (61,8%) patients had onset of their disease with toothache with one developing submandibular abscess later, one with otitis externa and perichondritis followed by ophthalmoplegia, and one with catarrh. Twenty-eight (25,4%) patients had altered sensorium at presentation, while two others developed it during their hospital stay, one due to internal carotid artery occlusion, and the other due to hydrocephalus. Ophthalmoplegia (89%) was the most frequent presentation followed by proptosis (83%). Visual loss (80%) was observed in 26 (23,6%) patients at presentation and two patients developed it during their hospital stay. One patient had bilateral proptosis, ophthalmoplegia, and visual loss. On CT imaging, all patients had evidence of paranasal sinuses involvement. The ethmoid (86%) and maxillary sinuses (80%) were most commonly involved, followed by sphenoid and frontal sinus in fifty-six (50,9%) each and pansinusitis in seventy-five (68,1%). Forty-eight (43,6%) patients had a gas shadow over the maxilla suggestive of secondary bacterial infection. Intracranial extension with cerebral lobe involvement presenting as a hypodense area with or without rim enhancement was observed in seven (40%) patients. One of these patients had a massive cerebral infarct with marked perilesional oedema resulting in hydrocephalus, which required ventriculoperitoneal shunt placement, and the other had internal carotid artery occlusion.

Conclusion: Computed tomography imaging is a useful modality to assess the extent of the ROCM.

Limitations: No limitations were identified.

Ethics committee approval: This study was approved by the ethics committee.

Funding for this study: No funding was provided for this study.

RPS 1608-7 - Eye-popping in children: what is (literally) behind? A review on paediatric proptosis (8 min)

Larissa Defendi; São Paulo / Brazil

Author Block: L. d. A. Defendi, L. M. R. A. Rodriguez, R. d. O. Tostes, R. Regacini; São Paulo/BR

Purpose or Learning Objective: - Conduct a brief review on paediatric proptosis, emphasising the 6 "Ps" in clinical evaluation; - Present the imaging finding of several conditions leading to proptosis, as well as their clinical presentation and differential diagnosis.

Methods or Background: Proptosis in children can be bilateral or unilateral and encompass a myriad of entities that differs from that in adults, varying from benign conditions to very aggressive neoplasms. Computed tomography provides adequate bony detailing, while MRI is superior in evaluating soft tissue and blood flow.

Results or Findings: The following topics will be discussed: 1. Proptosis in children: the importance of clinical history and examination. The six "Ps". 2. Imaging modalities in orbital disease. Technical aspects and protocols. Advanced techniques are available nowadays. - Computed Tomography (CT) - Magnetic Resonance Imaging (MRI) 3. The imaging findings of several cases will be discussed, followed by a brief review of clinical features, epidemiological data, differential diagnosis and outcomes: - Rhabdomyosarcoma; - Optic nerve gliomas; - Orbital pseudotumor (IgG4 related); - Capillary hemangioma; - Venolymphatic malformations; - Caroticocavernous fistula; - Postseptal orbital cellulitis; - Fibrous dysplasia.

Conclusion: Radiologists play a valuable role in paediatric proptosis. Various underlying orbital conditions can be promptly distinguished from one another in imaging evaluation, as they have unique and diverse imaging appearances.

Limitations: No limitations were identified.

Ethics committee approval: Not applicable.

Funding for this study: No funding was provided for this study.

RPS 1608-8 - Children are not little adults: challenges and nuances in paranasal sinus evaluation (8 min)

Larissa Defendi; São Paulo / Brazil



Author Block: L. d. A. Defendi, L. M. R. A. Rodriguez, S. Monteiro, R. d. O. Tostes, R. Regacini; São Paulo/BR

Purpose or Learning Objective: The purpose of this study was to (1) highlight the changes in paranasal sinus anatomy over time, (2) describe the most common variations not to be confused with pathological conditions, and (3) present the unique features of congenital lesions and some conditions frequently found in the paediatric population.

Methods or Background: Paranasal sinuses are continuously developing during childhood and may pose a challenge to radiologists, especially general and junior professionals. Knowledge of anatomical landmarks is crucial to differentiate normal development from malformed and altered sinuses.

Results or Findings: Teaching cases will be used to illustrate the following topics: (1) paranasal sinus embryology, physiology and anatomy, and (2) evaluating paranasal sinuses: imaging methods, protocols and technical aspects. For number two, the following applies: (a) plain radiographs, (b) computed tomography, (c) magnetic resonance imaging. Illustrated guide: stages of development of each paranasal sinus with respective age correlation; anatomical variants of concern for each paranasal sinus; overview of congenital lesions and conditions mostly affecting the paediatric age group: anterior cephaloceles, nasal dermal sinus, choanal atresia, congenital nasal pyriform aperture stenosis, nasolacrimal duct mucocele, inflammatory conditions: polyps and mucocoeles, sinusitis complications: periorbital cellulitis and proptosis, neoplasms: juvenile angiofibroma and vascular tumours.

Conclusion: Radiologists should be aware of the various paranasal sinus growth stages in infancy, as well as the imaging features of the most common entities in this age group. This knowledge allows prompt diagnosis of pathological conditions and avoids unnecessary procedures in normal anatomical variants.

Limitations: Educational exhibit.

Ethics committee approval: Educational exhibit.

Funding for this study: No fundings available.

RC 1601 - Artificial intelligence (AI) in abdominal radiology

Categories: Abdominal Viscera, Artificial Intelligence & Machine Learning, GI Tract, Imaging Informatics, Research

ETC Level: LEVEL III

Date: March 4, 2022 | 16:00 - 17:00 CET

CME Credits: 1

Moderator:

Luis Curvo-Semedo; Coimbra / Portugal

RC 1601-1 - Chairperson's introduction (5 min)

Luis Curvo-Semedo; Coimbra / Portugal

RC 1601-2 - AI-radiologist at the forefront of innovation in medicine (15 min)

Francesco Sardanelli; San Donato Milanese / Italy

1. To become familiar with the basic concept of artificial intelligence.
2. To learn why this will lead to a paradigm shift in medicine.
3. To understand why radiologists will be at the center of this paradigm shift.

RC 1601-3 - Implementation and design of artificial intelligence in abdominal imaging (15 min)

Nickolas Papanikolaou; Lisbon / Portugal

1. To understand why you should implement AI in abdominal imaging.
2. To learn how to implement AI in abdominal imaging.

RC 1601-4 - AI for abdominal radiologists in routine practice: clinical use cases (15 min)

Joost J.M. van Griethuysen; Amsterdam / Netherlands

1. To learn how to work as a radiologist with AI in abdominal imaging.
2. To become familiar with current AI solutions in abdominal imaging.

RC 1601-5 - Panel discussion: How to implement AI into today's daily clinical routine? (10 min)



BS 16 - Vascular

Categories: Imaging Methods, Vascular

ETC Level: ALL LEVELS

Date: March 4, 2022 | 16:00 - 17:00 CET

CME Credits: 1

Moderator:

Valentin Sinitsyn; Moscow / Russia

BS 16-2 - Imaging the aorta (20 min)

Tim Leiner; Utrecht / Netherlands

1. To present the current imaging techniques to evaluate the aorta.
2. To demonstrate the most important imaging findings.

BS 16-3 - Imaging the upper and lower limb: arterial (20 min)

Christian Loewe; Vienna / Austria

1. To present the current imaging techniques to evaluate the upper and lower limb arteries.
2. To demonstrate the most important findings.

BS 16-4 - Imaging the lower limb: venous (20 min)

Marco Francone; Milan / Italy

1. To present the current imaging techniques to evaluate the lower limb veins.
2. To demonstrate the most important findings.



RT 16 - Building bridges: integrated diagnostics

Categories: Artificial Intelligence & Machine Learning, Multidisciplinary, Oncologic Imaging, Professional Issues, Research

ETC Level: LEVEL II+III

Date: March 4, 2022 | 16:00 - 17:00 CET

Moderators:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

Michael Fuchsjäger; Graz / Austria

RT 16-1 - Chairpersons' introduction (2 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

Michael H. Fuchsjäger; Graz / Austria

1. To learn about the concept of integrated diagnostics for better treatment decision-making process.
2. To understand the value of emerging fluid biomarkers in oncology.
3. To know how digitalisation can enhance the development and implementation of AI powered prediction models.

RT 16-2 - The importance of integrating imaging biomarkers for cancer treatment guidance (8 min)

Luis Martí-Bonmatí; Valencia / Spain

RT 16-3 - Emerging fluid biomarkers in oncology (8 min)

Daan van den Broek; Amsterdam / Netherlands

RT 16-4 - Integrated diagnosis: perspectives from the industry (8 min)

Thomas Schinecker; Basle / Switzerland

RT 16-5 - Discussion (34 min)

Thomas Schinecker; Basle / Switzerland

Luis Martí-Bonmatí; Valencia / Spain

Daan van den Broek; Amsterdam / Netherlands

OT 3 - Outlook for Tomorrow

Date: March 4, 2022 | 17:15 - 17:45 CET

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

- Outlook for Tomorrow (30 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

CUBE-4 - Things you should better not do at home - Do as little as possible to the patient

Categories: Interventional Radiology

Date: March 5, 2022 | 08:00 - 08:45 CET

Moderators:

Christian Loewe; Vienna / Austria

Maximilian de Bucourt; Berlin / Germany

CUBE-4-1 - Introduction

Christian Loewe; Vienna / Austria

Maximilian de Bucourt; Berlin / Germany

CUBE-4-2 - Do as little as possible to the patient

Peter Reimer; Karlsruhe / Germany

CUBE-4-3 - Discussion



RPS 1712 - Imaging in children: realistic benefits of artificial intelligence (AI)

Categories: Artificial Intelligence & Machine Learning, Paediatric Imaging

Date: March 5, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderators:

Charlotte de Lange; Gothenburg / Sweden

Lorenzo E. Derchi; Genoa / Italy

RPS 1712-2 - AI denoising significantly improves image quality in ultra-low-dose paediatric thorax computed tomography scans and improves radiological workflows (8 min)

Andreas Brendlin; Tübingen / Germany

Author Block: A. S. Brendlin, S. Afat, U. Schmid, I. Tsiflikas; Tübingen/DE

Purpose or Learning Objective: To explore the potential impact of an AI-based denoising software solution on image quality and workflows in paediatric thorax ultra-low-dose computed tomography (ULDCT) scans.

Methods or Background: From 01.04.2021-01.10.2021, 60 consecutive paediatric patients with ultra-low-dose CT were included. Images were reconstructed using weighted filtered back projection (wFBP), advanced modelled iterative reconstruction (ADMIRE) strength 2, and wFBP with a novel denoising postprocessing algorithm (PixelShine). Three readers with varying experience levels independently rated subjective image quality on a 5-point Likert scale (1=worst - 5=best). An intraclass correlation coefficient was used to measure inter-rater-agreement. Image noise (standard deviation of Hounsfield Units from regions of interest in homogenous paraspinal muscles) was compared for objective image quality. An additional phantom scan was performed to investigate the dose-reduction capabilities of PixelShine. Statistical analysis ensued using a mixed-effects model. Time to diagnosis was measured for all reconstruction methods.

Results or Findings: Subjective image quality was significantly higher for PixelShine vs ADMIRE 2 vs wFBP (4 IQR [4-5] vs 3 IQR [2-3] vs 2 IQR [2-3]; each $p < 0.001$) with almost perfect agreement ($ICC = 0.94$, $p = 0.001$). The noise was significantly lower for PixelShine vs ADMIRE 2 vs wFBP (33.73 ± 0.85 vs 59.96 ± 1.23 vs 76.89 ± 1.53 HU; each $p = 0.001$). The phantom scan revealed 100% radiation dose PixelShine to have equal noise as 325% ADMIRE 2 and 550% wFBP (each $p = 0.999$). Overall, time to diagnosis was significantly shorter when using PixelShine vs. ADMIRE 2 vs wFBP (2.28 ± 1.56 vs 2.45 ± 1.9 vs 2.66 ± 2.31 min; each $p < 0.001$).

Conclusion: Compared to conventional reconstruction methods, AI postprocessing denoising may positively impact subjective and objective image quality in pediatric ULDCT thorax scans and improve radiological workflows.

Limitations: This is a retrospective study with 60 patients. Dose reduction capabilities were only measurable with a phantom.

Ethics committee approval: IRB approved.

Funding for this study: No funding was received for this study.

RPS 1712-3 - A machine learning assessment using laboratory: US and MR findings to predict long-term outcome in patients with biliary atresia after Kasai portoenterostomy (8 min)

Martina Caruso; Napoli / Italy

Author Block: M. Caruso, C. Ricciardi, G. D. Paoli, F. Di Dato, V. Romeo, M. Petretta, R. Iorio, A. Brunetti, S. Maurea; Naples/IT

Purpose or Learning Objective: Biliary atresia (BA), a rare obliterative cholangiopathy, leads to a progressive biliary cirrhosis and Kasai portoenterostomy (KP) represents its first-line treatment. Our objective was to compare the accuracy of quantitative parameters extracted from the laboratory, ultrasound (US) and magnetic resonance (MR) using machine learning (ML) algorithms in predicting long-term outcome of native liver survivor patients with BA after KP.

Methods or Background: Twenty-four patients were evaluated according to clinical and laboratory data at initial evaluation (median follow-up=9.7 years) after KP as with ideal (n=15) or non-ideal (n=9) medical outcome, successively they were re-evaluated after additional 4 years and classified in Group 1 (n=12) as stable and Group 2 (n=12) as non-stable in the disease course. Laboratory and quantitative US and MR imaging parameters were merged to test ML algorithms.

Results or Findings: The only statistically significant parameters between Group 1 and 2 were total and direct bilirubin (TB and DB) as laboratory parameters, while US stiffness as an imaging parameter. The values of TB and DB were still in the normal range, but tend towards the upper limit. Naïve Bayes was the best algorithm in terms of accuracy, sensitivity, specificity values and AUCROC to predict long-term outcome, selecting only laboratory parameters (TB and DB), while Random Forest and k-Nearest Neighbors algorithms reached the same results using either laboratory or imaging parameters.

Conclusion: The ML evaluation, merging laboratory and quantitative imaging findings, shows the pivotal role of TB and DB values in predicting long-term outcome of BA patients after KP, even though their values may be within normal range. Therefore, clinicians should be alert when the values of these laboratory parameters show subtle changes.

Limitations: The small sample size and the retrospective type of the investigation.

Ethics committee approval: The ethics approval was obtained.

Funding for this study: No funding was received for this study.

RPS 1712-4 - Assessment of an AI aid in detection of paediatric appendicular skeletal fractures by senior and junior radiologists (8 min)

Toan Nguyen; Paris / France

Author Block: R. Maarek, A-L. Hermann, A. Kamoun, R. Khelifi, A. Marchi, M. Collin, A. Jaillard, T. Nguyen, H. Ducou Le Pointe; Paris/FR

Purpose or Learning Objective: The number of conventional X-ray examinations in paediatric emergency departments is constantly increasing, leading to avoidable errors in interpretation by the radiologist. The use of artificial intelligence (AI) could improve the interpretation workflow by prioritising pathological radiographs and providing assistance in fracture detection.

Methods or Background: A cohort of 300 anonymised radiographs performed for peripheral skeletal fracture detection in patients aged 2 to 21 years was retrospectively collected. The gold standard was established for each examination after an independent review by two radiologists experts in musculoskeletal imaging. In case of disagreement, a consensual review with a third expert radiologist was performed. Out of the 300 examinations, 150 presented at least a fracture. All radiographs were then read by 3 senior radiologists and 5 junior radiologists in training between the 2nd and 4th year of residency without and immediately after with the help of an AI. Poor quality radiographs were excluded from the cohort. Sensitivity and specificity for each group of radiologists were calculated without and with the help of AI.

Results or Findings: The standalone sensitivity and specificity of the AI were respectively 91% and 90%. The mean sensitivity for all groups was 73.3% without AI, it increased by almost 10% to 82.8% with the aid of the AI. For the junior radiologists, it increased from 71.9% to 82.2% (+10.3%) and for the seniors from 75.6% to 83.8% (+8.2%). On average, the specificity increased from 89.6% to 90.3% (+0.7%) and from 86.2% to 87.6% (+1.4%) for juniors. For senior radiologists, the average specificity slightly decreased from 95.1% to 94.9% (-0.2%).

Conclusion: The aid of the AI increased sensitivity by an average of 10% without decreasing specificity.

Limitations: No limitations identified.

Ethics committee approval: IRB approval n°20202256.

Funding for this study: No funding was received for this study.

RPS 1712-5 - Computational fluid dynamic modelling of airways after laryngotracheal stenosis (8 min)

Pierluigi Ciet; Rotterdam / Netherlands



Author Block: B. Elders¹, H. Sadafi², J. Costa², J. de Backer², H. A. W. M. Tiddens¹, P. Wielopolski¹, B. Pullens¹, P. Ciet¹; ¹Rotterdam/NL, ²Kontich/BE

Purpose or Learning Objective: The aim of this study was to use Magnetic Resonance Imaging (MRI) based Computational Fluid Dynamic (CFD) modelling of the upper airways after digital surgery to predict the effect of various surgical interventions on airflow patterns and resistance in children post Laryngotracheal Stenosis (LTS) repair.

Methods or Background: After open airway surgery for LTS several complex anatomical changes of the airway can remain, leading to altered upper airway airflow patterns and increased airway resistance for which re-operation might be needed. In this study, CFD analyses were performed on free-breathing (FB) and inspiratory (Insp) MRI scans of a healthy volunteer, and of two patients post LTS repair. Digital surgery was executed to predict the effect of 1) widening of the vocal cords, 2) removal of the tracheal deformation (TD), 3) both widening of the vocal cords and TD removal.

Results or Findings: Patient 1 had severe vocal cord stenosis and mild TD. Patient 2 had severe vocal cord stenosis and severe TD. Compared to the healthy volunteer during FB and Insp, patient 1 showed an increased total airway resistance of 269% and 180%, and patient 2 showed an increase of 735% and 1548%. In patient 1 the best airway resistance was achieved when just the vocal cords were widened (FB:-20.2 Pa.s/L (45.6%), Insp:-17.9 Pa.s/L (68.8%)). In patient 2 the best results were obtained when both the vocal cords were widened and the TD was removed (FB:-71.1 Pa.s/L (71.0%), Insp:-133.9 Pa.s/L (87.3%)).

Conclusion: Our findings suggest that CFD modelling can be used to study the effect of virtual surgical upper airway interventions in patients with complex airway pathology.

Limitations: Proof of concept study in a low number of subjects.

Ethics committee approval: IRB approved.

Funding for this study: Funding was received from Vrienden van het Sophia (SSWO).

RPS 1712-6 - Radiomics signature: a potential biomarker for the prediction of survival and response to treatment in diffuse intrinsic pontine glioma (DIPG) (8 min)

Leonor Cerda Alberich; Valencia / Spain

Author Block: L. Cerda Alberich, M. Fernández Patón, C. Baeza Delgado, B. Martínez de las Heras, A. Cañete Nieto, D. Veiga Canuto, L. Marti-Bonmati; Valencia/ES

Purpose or Learning Objective: To develop, validate and assess the incremental value of radiomics nomograms for the pretreatment predictions of overall survival (OS), response to treatment (RTT) and time to relapse (TTR) in DIPG patients, treated mostly with radiation therapy but also with chemotherapy and surgery.

Methods or Background: A total of 40 DIPG patients were divided into a training set (n=30) and a validation set (n=10). A stratified cross-validation method was employed to assess reproducibility and generalisability of results. Low-variance, high-correlation, Principal Component Analysis (PCA) and unsupervised-learning methods were used to perform dimensionality reduction and pattern discovery on the highly heterogeneous image-based dataset. The predictors identified from the clinical variables (presence of a ring-shaped enhancement at the periphery of the tumour and age at diagnosis), and the radiomics signature constructed from MR images (shape, histogram intensity, texture and deep (with a neural network) features from T1-weighted images, and ADC from diffusion-weighted images), were used to build the clinical-radiomics nomograms for the prediction of OS, RTT and TTR.

Results or Findings: The nomograms were built with the radiomics signature and the presence of a ring-shaped enhancement and demonstrated good prediction accuracy for OS, RTT and TTR in these patients. The combination of a nonlinear PCA method (Kernel PCA) with an unsupervised learning technique (K-Means) was successful in differentiating RTT (progression vs. partial and minor response) and TTR (short vs. medium and long).

Conclusion: The use of the clinical-radiomics nomograms, a noninvasive pretreatment prediction tool, may provide novel insights for precise personalized medicine approaches in the DIPG patients.

Limitations: Future work with a larger sample would be necessary to further validate our model.

Ethics committee approval: Approved by La Fe Hospital's ethics committees.

Funding for this study: PRIMAGE. Horizon 2020 | RIA (Topic SC1-DTH-07-2018) project with grant agreement no: 826494.

RPS 1712-7 - Alteration of effective connectivity in the default mode network of autism after an intervention (8 min)

Wang Wei; Yangzhou / China

Author Block: W. Wei, Y. Han, Q. Hang; Yangzhou/CN

Purpose or Learning Objective: Neuroimaging has revealed numerous atypical functional connectivity of default mode network (DMN) dedicated to social communications (SC) in autism spectrum disorder (ASD), yet their nature and directionality remain unclear. Here, preschoolers with autism received physical intervention from a 12-week mini-basketball training programme (12W-MBTP). Therefore, the directionality and nature of regional interactions within the DMN after the intervention are evaluated while assessing the impact of an intervention on SC.

Methods or Background: Based on the results of independent component analysis (ICA), we applied spectral dynamic causal modelling (DCM) for participants aged 36 years (experimental group, N=17, control group, N=14) to characterise the longitudinal changes following intervention in intrinsic and extrinsic effective connectivity (EC) between core regions of the DMN.

Results or Findings: We found that after the 12W-MBTP intervention, the SRS-2 score of preschoolers with ASD in the experimental group was decreased. Concurrently, the inhibitory directional connections were observed between the core regions of the DMN, including increased self-inhibition in the medial prefrontal cortex (mPFC), and the changes of EC in mPFC were significantly correlated with change in the social responsiveness scale-2 (SRS-2) score.

Conclusion: These new findings shed light on DMN as a potential intervention target, as the inhibitory information transmission between its core regions may play a positive role in improving SC behaviour in preschoolers with ASD, which may be a reliable neuroimaging biomarker for future studies.

Limitations: Our results were limited by the difficulty of completing the entire intervention process and MRI scans in a large sample of preschoolers with autism.

Ethics committee approval: All participants gave written informed consent before their participation, and the study was approved by the Ethics and Human Protection Committee of the Affiliated Hospital of Yangzhou University.

Funding for this study: No funding was received for this study.

RPS 1712-8 - 3D ultrasound kidney volume segmentation in paediatric hydronephrosis: interrater agreement and correlation to hydronephrosis grading (8 min)

Michael Esser; Tübingen / Germany

Author Block: M. Esser¹, I. Tsiflikas¹, J. Jago², L. Rouet³, A. Stebner⁴, J. F. Schäfer¹; ¹Tübingen/DE, ²Bothell, WA/US, ³Suresnes/FR, ⁴Münsterlingen/CH

Purpose or Learning Objective: To evaluate the interrater agreement of kidney volume segmentation by three-dimensional ultrasound (3D-US) in children with hydronephrosis and comparison to hydronephrosis grading.

Methods or Background: 48 kidney volumes were acquired in 45 patients with hydronephrosis by freehand 3D-US (6-1 MHz volumetric sector array, electronic rotation) in prone position (35 male; median age, 4 years; range, one month to 16 years). Semi-automated kidney segmentation (prototype software) was performed afterwards by two readers providing volumes for total kidney volume, dilated collective system and renal parenchyma (total kidney volume minus dilated collective system), as well as hydronephrosis index (renal parenchyma divided by total kidney volume). Interrater agreement was evaluated with a two-way intraclass correlation coefficient (ICC). The maximum anteroposterior diameter of renal pelvis was measured on transverse 2D B-mode images, and hydronephroses were classified grade 1-4.

Results or Findings: Most hydronephroses were grade 2 (n=29), followed by grade 3 (n=15) and grade 1 (n=4). The most frequent patient history included pelvic ureteric junction stenosis (n=21). Interrater agreement for total kidney volume, collective system, hydronephrosis index and renal parenchyma was good to excellent with ICC of 0.94, 0.87, 0.83 and 0.91 respectively (p<0.001 each). There was a positive correlation between hydronephrosis grading and ultrasonic hydronephrosis index and between 2D renal pelvis diameter and volume of the collective system (p<0.001 both).

Conclusion: Novel 3D-US volumetric analysis has a high degree of interrater agreement providing parenchyma volume in hydronephrotic kidneys. Volumes of the collective system and hydronephrosis index correlate with the extent of hydronephrosis.

Limitations: No interrater agreement was assessed.

Ethics committee approval: This prospective study was approved by the local ethics committee.

Funding for this study: The study was supported by a research grant in the framework of a collaboration contract with Philips Ultrasound, Inc.

E³ 1721 - Gynaecological cancer imaging

Categories: Abdominal Viscera, Genitourinary, Imaging Methods, Oncologic Imaging

ETC Level: LEVEL II+III

Date: March 5, 2022 | 08:00 - 09:00 CET

CME Credits: 1

E³ 1721-1 - Cervical cancer (30 min)

Teresa Margarida Cunha; Lisbon / Portugal

1. To describe the imaging findings of cervical cancer.
2. To learn about the new International Federation of Gynecology and Obstetrics (FIGO) classification and its implications.
3. To define the role of radiologic examinations and review the ideal imaging protocols.
4. To recognise imaging pitfalls in cervical cancer.

E³ 1721-2 - Ovarian cancer: new challenges (30 min)

Riccardo Manfredi; Rome / Italy

1. To be familiar with the histological subtype of the epithelial ovarian cancer.
2. To become familiar with the revised FIGO staging system.
3. To learn about the role of imaging in recognising "difficult to resect" disease.

RC 1708 - Advances in petrous bone imaging: how I do it

Categories: Head and Neck, Imaging Methods, Translational Imaging

ETC Level: LEVEL II+III

Date: March 5, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderator:

Stephen Edmund John Connor; London / United Kingdom

RC 1708-1 - Chairperson's introduction (5 min)

Stephen Connor; London / UK

RC 1708-2 - Contemporary imaging of auditory implants (15 min)

Berit M. Verbist; Leiden / Netherlands

1. To demonstrate the current implants for hearing rehabilitation.
2. To describe the imaging appearance of these otological implants.
3. To demonstrate the key imaging features when reporting post implantation.

RC 1708-3 - Can MRI diagnose Meniere's disease and can it be clinically useful? (15 min)

Anja Bernaerts; Antwerp / Belgium

1. To detect and grade endolymphatic hydrops and perilymphatic enhancement.
2. To identify anatomical pitfalls in hydrops imaging.
3. To discuss secondary hydrops.

RC 1708-4 - Contemporary imaging of sudden sensorineural hearing loss and new concepts in imaging pulsatile tinnitus? (15 min)

Giorgio Conte; Milan / Italy

1. To define an optimised MRI scan protocol for assessing sudden sensorineural hearing loss.
2. To describe intra-labyrinthine pathological changes in sudden sensorineural hearing loss using a pattern-based approach.
3. To combine clinical information and imaging findings for identifying the site of origin of pulsatile tinnitus.

RC 1708-5 - Panel discussion: Do new otological imaging applications benefit patient management? (10 min)



HD 4 - Highlights of the Day

Date: March 5, 2022 | 09:00 - 09:30 CET

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

- Highlights of the Day (30 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

IND 29 - AI and predictive decision models: an approach to improve diagnostic confidence, automate workflow and standardize results

Categories: Artificial Intelligence & Machine Learning, Breast, Cancer Assessments Diagnostic and Research, Chest, COVID-19, CT, Deep Learning, Image Quality, Imaging Informatics, Imagings Method, Machine Learning, Multimodality Cancer, Oncologic Imaging, Radiomics

Date: March 5, 2022 | 10:00 - 10:30 CET

IND 29-1 - AI and predictive decision models: an approach to improve diagnostic confidence, automate workflow and standardize results (17 min)

Chiara Romei; Pisa / Italy

Giovanni Ferrando; Genova / Italy

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RT 18 - BEaccepted project

Date: March 5, 2022 | 10:30 - 11:00 CET

Moderators:

Michael Fuchsjäger; Graz / Austria

Boris Brkljačić; Zagreb / Croatia

Caroline Justich; Vienna / Austria

RT 18-1 - Chairpersons' introduction (2 min)

Michael H. Fuchsjäger; Graz / Austria

Boris Brkljačić; Zagreb / Croatia

RT 18-2 - An introduction to imaging (5 min)

RT 18-3 - Perfecting the doctor-patient relationship: the value of BEaccepted to the radiologist (5 min)

Michael H. Fuchsjäger; Graz / Austria

RT 18-4 - BEaccepted: a practical guide for the patient journey (10 min)

Caroline Justich; Vienna / Austria

RT 18-5 - Discussion (8 min)



SA 18 - Acute stroke in the emergency department

Categories: Emergency Imaging, Imaging Methods, Multidisciplinary, Neuro

ETC Level: LEVEL II+III

Date: March 5, 2022 | 10:30 - 11:30 CET

CME Credits: 1

Moderator:

mario muto; Italy

SA 18-1 - Chairperson's introduction (5 min)

Mario Muto; Naples / Italy

SA 18-2 - Acute stroke: MRI first? (10 min)

Catherine Oppenheim; Paris / France

1. To understand the clinical and basic imaging criteria when selecting stroke patients.
2. To analyse the update guidelines in stroke treatment and the role of CT in the Hub and Spoke centre.
3. To describe how CTA and CT-perfusion can select patients.
4. To identify when it is mandatory to perform MRI examinations.

SA 18-3 - Strategies to reduce door-to-needle time: the clinician's point of view (15 min)

Emmanuel Carrera; Geneva / Switzerland

1. To clarify how to organise the pre-hospital setting.
2. To describe the best intra-hospital setting.
3. To discuss going directly to the angio suite: is it realistic?

SA 18-4 - Panel discussion: What radiologists need to know about the clinician's expectations from radiology in acute stroke? (30 min)



RPS 1805a - Artificial intelligence (AI) in abdominal imaging

Categories: Abdominal Viscera, Artificial Intelligence & Machine Learning, Imaging Informatics, Oncologic Imaging

Date: March 5, 2022 | 10:30 - 11:30 CET

CME Credits: 1

Moderators:

Marc Zins; Paris / France

Andrea Grace Rockall; Godalming / United Kingdom

RPS 1805a-2 - Artificial intelligence-based VS standard acquisition in upper abdomen MRI: quantitative and qualitative image analysis (8 min)

Benedetta Masci; Rome / Italy

Author Block: B. Masci, M. Zerunian, F. Pucciarelli, M. Polici, G. Piccinni, D. Polverari, E. Iannicelli, D. Caruso, A. Laghi; Rome/IT

Purpose or Learning Objective: To compare T2 and diffusion-weighted images (DWI) in upper abdomen magnetic resonance imaging (MRI) with AIR Recon Deep Learning (ARDL) algorithm with standard acquisition (non-ARDL), in terms of quantitative and qualitative image analysis and scanning time.

Methods or Background: Thirty consecutive healthy volunteers (23 female, mean age 55 ± 22 years) were included and underwent unenhanced upper abdomen MRI (1.5 Tesla) from May 2021 to October 2021. Exclusion criteria were: contraindications to MRI and severe artefacts on MRI sequences. Examinations included T2 and DWI axial sequences with both standard protocol and ARDL. A radiologist evaluated objective image quality by drawing fixed regions of interest (ROIs) in the liver parenchyma, gallbladder and background to calculate signal-to-noise-ratio (SNR) and contrast to-noise-ratio (CNR). Then, subjective image quality was assessed by two radiologists independently with a five-point Likert scale including parameters as parenchyma edge sharpness, contrast, truncation and motion artefacts and overall image quality. Acquisition timing was also recorded and analysed.

Results or Findings: The objective analysis showed no significant differences between SNR and CNR in ARDL-T2 sequences vs non-ARDL-T2 (SNR=282.23 vs 249.6 and CNR=1122.18 vs 877, $P=0.5038$ and 0.57 respectively) and in DWI sequences with ARDL vs non-ARDL (SNR=677.91 vs 509.35 and CNR=408.75 vs 421.30, $P=0.6884$ and 0.6435 respectively). For subjective analysis, ARDL sequences showed significantly better overall image quality with lower motion and truncation artefacts and higher sharpness and contrast (all $p < 0.0001$) with the good inter-rater agreement ($k=0.83925$). Acquisition timing was significantly lower in both ARDL sequences compared to non-ARDL ones (T2=19.07s vs 24s and DWI=197.93s vs 498.52s, all $p < 0.0001$).

Conclusion: ARDL sequences showed significantly higher overall image quality with reduced acquisition timing, in particular for DWI.

Limitations: Reduced number of sequences tested and small population sample.

Ethics committee approval: This study was approved by our local institutional review board; written informed consent was obtained from all study participants.

Funding for this study: No funding was received for this study.

RPS 1805a-3 - Deep learning training with prior and current CECT scans improves liver lesions detection and segmentation (8 min)

Jacob Sosna; Jerusalem / Israel

Author Block: L. Joskowicz, A. Szeskin, S. Rochman, J. Sosna, R. Lederman; Jerusalem/IL

Purpose or Learning Objective: In clinical practice, radiologists compare the prior current study with improved detection of lesions. We aimed to verify if liver lesions detection and segmentation in a CECT is more accurate with deep learning classification trained on pairs of current and prior scans.

Methods or Background: We developed two deep learning 3D R2U-Net classifiers. The singles classifier is trained with individual CECT liver lesion annotations; the pairs classifier is trained with pairs of registered prior and current CECT liver lesion annotations of the same patient. While the singles classifier discriminates lesion voxels based on absolute appearance, the pairs classifier discriminates based on relative lesion/healthy tissue appearance differences. We evaluated the performance of the singles and pairs classifiers with 174 retrospective clinical CECTs of 59 patients from two centres with metastatic disease with a total of 2,897 liver metastases manually delineated by an expert radiologist. The singles and pairs classifiers were trained/validated/tested with 126/15/33 single CECTs and 350/35/101 pairs of CECTs created from the same 174 CECTs. Their performance was quantified by comparing the test sets results of each to the manual expert annotation with the liver metastasis precision/recall detection and the segmentation Dice coefficient and average symmetric surface distance (ASSD).

Results or Findings: The pairs classifier yields significantly better Dice, ASSD and precision and similar recall results than the singles classifier for liver metastases whose diameter is > 5mm: Dice 0.82 ± 0.16 vs 0.79 ± 0.17 (4% improvement, p-value=0.0015), ASSD 1.08 ± 1.36 mm vs 1.80 ± 1.81 mm (36% improvement, p-value=0.0031, precision 0.64 ± 0.28 vs 0.37 ± 0.28 (73% improvement, p-value=0.00001) and recall 0.87 ± 0.15 vs 0.87 ± 0.16 (same, p-value=0.985).

Conclusion: Deep learning classification of liver lesions trained on pairs of registered current and prior scans increases lesion detection and segmentation accuracy.

Limitations: Single observer annotations, two centres.

Ethics committee approval: IRB waiver informed consent.

Funding for this study: No funding was received for this study.

RPS 1805a-4 - Limited impact of scanner variability on CT radiomic features in predicting outcome for pancreatic cancer patients (8 min)

Martina Mori; Milan / Italy

Author Block: E. Scalco¹, M. M. Mori², D. Palumbo², M. Falconi², M. Reni², F. De Cobelli², G. Rizzo¹, C. Fiorino²; ¹Segrate/IT, ²Milan/IT

Purpose or Learning Objective: To assess the impact of features harmonisation accounting for inter-scanner variability in stratifying patients with pancreatic carcinoma according to the risk of early distant relapse after surgery.

Methods or Background: Pre-surgical CT images of 114 patients who underwent upfront pancreaticoduodenectomy were acquired in a single institute using 3 different scanners. Tumour volumes were delineated by expert radiologists and 181 IBSI-consistent radiomic features were computed. The ComBat harmonisation method was adopted to correct for batch effect related to the acquisition scanner; significant differences among scanners groups were assessed through ANOVA test before and after harmonisation. A previously validated and published 3-variable model including clinical and radiomic features was applied to the original and harmonised dataset. During the original model's training, radiomic features were reduced by removing those with low inter-observer reproducibility and retaining those (3 morphological, 4 texture, 1 statistical) most significantly associated with the endpoint. The prediction performances of the features retained in the first selection were also compared considering original and harmonised values.

Results or Findings: The ComBat method was able to remove differences among the 3 scanners groups (28/181 features with p_value<0.05 before harmonisation; none after harmonisation). Despite this improvement, the model's performances were almost equal before/after harmonisation: the hazard ratios resulting from applying the published score to stratify low-vs-high-risk patients in multivariable logistic regression analysis was 4.33 (95%CI 2.31-8.11) against 4.07 (2.16-7.64) before/after harmonisation. Univariate logistic regression performed on the 8 most relevant radiomic features confirmed that very similar performances (regression coefficients, p-value, odds ratio and 95% CI) were obtained before/after harmonisation.

Conclusion: The performances of predictive radiomic features and of a multi-variate model built on pancreatic CT images were poorly affected by inter-scanner variability.

Limitations: Homogeneous acquisition protocols across the scanners.

Ethics committee approval: Ethics committee approval was obtained. Reference: 28/INT/2015.

Funding for this study: This study was funded - AIRC-grant-IG23015.

RPS 1805a-5 - Pre-treatment computed tomography radiomics for predicting the response to neoadjuvant chemoradiation in locally advanced rectal cancer (8 min)

Xiaoping Yi; Changsha / China



Author Block: X. Yi¹, y. fu¹, b. T. chen²; ¹Changsha/CN, ²Duarte, CA/US

Purpose or Learning Objective: Pretreatment computerised tomography (CT) scans are commonly acquired prior to neoadjuvant chemoradiotherapy (nCRT). This study assessed the usefulness of pretreatment CT-based radiomics for predicting pathological complete response (pCR) of locally advanced rectal cancer (LARC) to nCRT, and to develop a predictive model.

Methods or Background: Patients with LARC who underwent nCRT followed by total mesorectal excision surgery from July 2010 to December 2018 were retrospectively enrolled. A total of 340 radiomics features were extracted from pretreatment contrast-enhanced CT images. The most relevant features to pCR were selected using the least absolute shrinkage and selection operator (LASSO) method and a radiomics signature was generated. Predictive models were built with radiomic features and clinicopathological variables. Model performance was evaluated using discrimination, calibration, and decision curve analysis, and validated in an independent cohort.

Results or Findings: pCR was achieved by 44 of the 216 consecutive patients (20.4%) in this study. The model with the best performance used both radiomics and clinical variables, including radiomic signatures, distance to the anal verge, lymphocyte-to-monocyte ratio, and carcinoembryonic antigen. This combined model discriminated between patients with and without pCR with an area under the curve of 0.926 and 0.872 in the training and the validation cohorts, respectively. The combined model also showed better performance than models built with radiomic or clinical variables alone.

Conclusion: Our combined predictive model was robust in differentiating patients with and without response to nCRT.

Limitations: This was a retrospective study, making case selection bias possible and affecting the performance of our predictive model. Future prospective, multicentre studies are needed to validate our results.

Ethics committee approval: This retrospective study was reviewed and approved by our hospital (IRB No.201910070), and written informed consent was waived.

Funding for this study: Not applicable.

RPS 1805a-6 - Deep-learning-based differentiation of benign and premalignant colorectal polyps in CT colonography (8 min)

Sergio Grosu; Munich / Germany

Author Block: S. Grosu, P. Wesp, A. Graser, S. Maurus, C. C. Cyran, B. Schachtner, J. Ricke, P. M. Kazmierczak, M. Ingrisich; Munich/DE

Purpose or Learning Objective: To evaluate the potential of deep-learning algorithms to differentiate premalignant and benign colorectal polyps detected by CT colonography (CTC).

Methods or Background: In this retrospective analysis polyps of all size categories and morphologies were manually segmented on supine and prone CTC images and classified as benign (hyperplastic polyp or regular mucosa) or premalignant (adenoma) according to histopathology. Two models based on convolutional neural networks were trained to predict the polyp class (benign vs premalignant). Model SEG was trained on 3D CTC image subvolumes covering individual polyps and additionally polyp segmentation masks. Model noSEG was solely trained on the CTC subvolumes. The diagnostic performance of both models for the determination of premalignant from benign was then validated in an external multicenter test sample. The operating point for both models was selected individually to maximize the respective Youden-Index.

Results or Findings: The training set consisted of 107 colorectal polyps in 63 patients (mean age: 63±8 years, 40 men) comprising 169 polyp segmentations. The external test set included 77 polyps in 59 patients comprising 118 polyp segmentations. Model SEG achieved a ROC-AUC of 0.83, the sensitivity of 66%, and specificity of 92% on the external test set for determination of premalignant from benign polyps. Model noSEG yielded a ROC-AUC of 0.75, the sensitivity of 65%, and specificity of 79% on the external test set.

Conclusion: Deep-learning-based image analysis in CTC enabled the differentiation of premalignant and benign colorectal polyps, with the potential to facilitate the identification of high-risk colorectal polyps as an automated second reader.

Limitations: The sample size was small. Results of this study are only applicable to polyps clearly detectable in CT colonography and a selection bias cannot be fully ruled out.

Ethics committee approval: Approved by institutional review board.

Funding for this study: This study was funded by FöFoLe, Faculty of Medicine, Ludwig-Maximilians-University, Munich.

RPS 1805a-7 - Automatic detection and measurement of renal cysts for abdominal ultrasound examination: deep learning approach (8 min)

Yurie Kanauchi; Yokohama Shi Kohoku Ku, Kanagawa Ken / Japan



Author Block: Y. Kanauchi¹, M. Hashimoto², N. Toda², S. Okamoto², H. Haque³, M. Jinzaki², Y. Sakakibara¹; ¹Yokohama/JP, ²Tokyo/JP, ³Hino/JP

Purpose or Learning Objective: The aim of this study was to develop a deep learning model (DLM) that can automatically detect renal cysts in ultrasound images and predict the appropriate position of a pair of measurement markers (MM) to measure their size.

Methods or Background: In total, 2664 ultrasonographic B-mode images with MM of renal cysts obtained from January 2019 to May 2020 were split into 70/30% for training and testing. The DLM adopted a fine-tuned YOLOv5 for detection of renal cysts and a pretrained UNet++ for prediction of heat maps representing the position of MMs. Preprocessed ultrasound images were input to YOLOv5, and images cropped inside the bounding box detected from the input image by YOLOv5 were input to UNet++. Three sonographers manually placed MM on 100 unseen test data. The MM positions annotated by a board-certified radiologist were used as the ground truth. We have evaluated and compared the accuracy of sonographers and the DLM. Their performances were evaluated using precision-recall metrics and measurement errors.

Results or Findings: The evaluation result (precision, recall, position-error, and length-error) for DLM was 0.87, 0.90, 3.73±3.68 mm, and 1.26±1.06 mm respectively. For the first sonographer, the respective metrics were 0.86, 0.87, 2.56±2.76 mm and 1.21±1.36 mm; for the second sonographer, they were 0.83, 0.84, 2.34±2.63 mm, and 0.96±1.07 mm.

Conclusion: Our DLM was able to detect renal cysts with the comparable level of accuracy as sonographers, and the measurement prediction was slightly less accurate. Hence, it might help to automate the process of measurement in ultrasound analysis.

Limitations: No external validation.

Ethics committee approval: Ethics committee approval was obtained; #20170018.

Funding for this study: This study was funded by GEHealthcare.

SF 18 - Emerging MRI for the clinic

Categories: Imaging Methods, Physics in Medical Imaging, Research

ETC Level: LEVEL II+III

Date: March 5, 2022 | 10:30 - 11:30 CET

CME Credits: 1

Moderator:

Konstantin Nikolaou; Tuebingen / Germany

SF 18-1 - Chairperson's introduction (2 min)

Konstantin Nikolaou; Tübingen / Germany

SF 18-2 - Novel MRI hardware and its clinical potential (15 min)

Maxim Zaitsev; Freiburg / Germany

1. To name and recognise the primary hardware parameters of MRI systems.
2. To identify the relationship between the imaging performance of MRI and the nominal system specifications.
3. To appreciate and judge the capability of MRI hardware advances in addressing current and future clinical challenges.

SF 18-3 - The (r)evolution of undersampling techniques (15 min)

Andrew Webb; Leiden / Netherlands

1. To learn about the principle of understanding in image acquisition.
2. To describe the pros and cons of parallel imaging.
3. To relate the concept of compressed sensing to more rapid imaging.

SF 18-4 - Pros and cons of MRI at high-field (15 min)

Michela Tosetti; Pisa / Italy

1. To understand the effects of the magnetic field on MRI parameters.
2. To name the pulse sequences that have the greatest benefits at ultra-high field strengths.
3. To identify the main artefacts that occur at ultra-high field.

SF 18-5 - Panel discussion: Promises and pitfalls of emerging MRI (13 min)



IND 30 - The next step in open whole body MRI, introducing Magnifico Open

Categories: General Radiology and Image Quality, MRI, Musculoskeletal

Date: March 5, 2022 | 11:00 - 11:15 CET

IND 30-1 - The next step in open whole body MRI, introducing Magnifico Open (15 min)

Esaote has over 30 years of experience in developing and producing MRI systems that fully live up to client expectations in terms of image quality and efficiency. Based on this long-term experience Esaote developed Magnifico Open, a whole body open MRI systems featuring the latest in MRI technology like Speed-Up (compressed sensing), MAR, etc, delivering image quality on par with traditional MRI. Magnifico Open also comprises Esaote True-Motion technology, dynamic real-time acquisition of the moving joint.

IND 31 - Value of Artificial Intelligence in Breast Fusion Imaging

Date: March 5, 2022 | 11:30 - 11:45 CET

IND 31-1 - Value of Artificial Intelligence in Breast Fusion Imaging (14 min)

Camilla Fachinetti; Como / Italy

Clara Melchiori; Italy

Esaote is focused on offering the best imaging solutions to its customers and has been innovating for 20 years in Ultrasound Cross-Modality Imaging solutions and particularly in senology.

In this product presentation, our Clinical Specialist Clara Melchiori, will introduce the 2 latest Esaote technologies in Breast Imaging: BreastNavTM and BreastNavTM MRI. With BreastNavTM MRI, Esaote has taken a new step forward in the Cross-modality Imaging by enabling fusion between prone MRI and supine Ultrasound thanks to a 3D adaptative model based on Artificial Intelligence.

The demonstration of the procedure will be followed by a clinical presentation conducted by Dr. Fachinetti, Radiologist Breast Department, Come Hospital, Italy, who will illustrate with the support of clinical cases acquired, the benefits of Cross-Modality Imaging in the Breast application for patient follow-up.

RC 1902 - Artificial intelligence (AI) in breast imaging

Categories: Artificial Intelligence & Machine Learning, Breast, Imaging Methods, Oncologic Imaging, Translational Imaging

ETC Level: LEVEL III

Date: March 5, 2022 | 12:30 - 13:30 CET

CME Credits: 1

Moderator:

Fiona J. Gilbert; Cambridge / United Kingdom

RC 1902-1 - Chairperson's introduction (5 min)

Fiona J. Gilbert; Cambridge / UK

RC 1902-2 - What are the current clinical challenges in breast imaging? (15 min)

Paola Clauser; Vienna / Austria

1. To review the areas of application of AI in breast imaging including image processing, image interpretation, and aid in clinical decision making.
2. To discuss the clinical needs for which AI could be implemented, such as examination time, image evaluation in screening, and personalised medicine.
3. To become familiar with the main factors (technical, organisational, and legal) limiting the development and introduction of AI into clinical practice.

RC 1902-3 - Specific current clinical AI applications in screening (15 min)

Constance Lehman; Boston, MA / United States

1. To summarise the specific case uses of AI in clinical screening mammography programs.
2. To describe the opportunities and challenges in the implementation of AI into clinical practice.

RC 1902-4 - Specific current clinical AI applications in the assessment setting (15 min)

Katja Pinker-Domenig; New York, NY / United States

1. To understand the application of AI to different breast imaging modalities, including mammography, ultrasound, and magnetic resonance imaging, in different clinical scenarios.
2. To identify the clinical value of AI-enhanced breast imaging in the assessment setting.
3. To realise the challenges and current limitations of AI-enhanced breast imaging techniques in the diagnostic setting.

RC 1902-5 - Panel discussion: Translational challenges using AI in clinical breast imaging (10 min)



RC 1916 - Imaging beyond the tumour in oncology patients

Categories: Abdominal Viscera, Cardiac, Musculoskeletal, Oncologic Imaging, Vascular

ETC Level: LEVEL II

Date: March 5, 2022 | 12:30 - 13:30 CET

CME Credits: 1

Moderator:

Laure S. Fournier; Paris / France

RC 1916-1 - Chairperson's introduction (5 min)

Laure S. Fournier; Paris / France

RC 1916-2 - Sarcopenia in cancer patients (15 min)

Tim Leiner; Utrecht / Netherlands

1. To review the definition and pathophysiology of sarcopenia.
2. To understand how different imaging modalities can be used to identify sarcopenia.
3. To describe the prognostic value of imaging markers of sarcopenia in cancer patients.

RC 1916-3 - Cardiovascular disease and cancer (15 min)

Elie Mousseaux; Paris / France

1. To describe the main cardio-toxic effects of chemotherapy and radiotherapy.
2. To understand the interactions of cancer treatment with cardiovascular disease.
3. To understand the possible preventions that are proposed for populations at high cardiovascular risk or at risk of cardiotoxicity.

RC 1916-4 - Treatment complications: the example of immunotherapy (15 min)

Nina Tunariu; London / UK

1. To become familiar with the concepts behind immunotherapy.
2. To identify imaging patterns of immunotherapy-related complications.
3. To become aware of the challenges posed by the patterns of progression encountered with immunotherapy.

RC 1916-5 - Panel discussion: Which is the role of the radiologist in definite factors that impact cancer patient management? (10 min)



RT 19 - Building bridges: opportunities for multidisciplinary training

Categories: Education, General Radiology, Multidisciplinary, Professional Issues, Students

ETC Level: ALL LEVELS

Date: March 5, 2022 | 12:30 - 13:30 CET

Moderators:

Carlo Catalano; Roma / Italy

Regina G. H. Beets-Tan; Amsterdam / Netherlands

RT 19-1 - Chairpersons' introduction (5 min)

Carlo Catalano; Rome / Italy

Regina G.H. Beets-Tan; Amsterdam / Netherlands

1. To understand the new role radiologist and how this may impact training programmes for the new generation radiologists and interventional radiologists.
2. To learn about the ESR survey results and how taking a more clinical role will impact radiologists' training programmes.
3. To learn about opportunities for multidisciplinary training.
4. To discuss whether and how the implementation of AI in radiology will impact radiologists' training programmes.

RT 19-2 - The new role of the radiologist: how will it impact training programmes? (10 min)

Andrea G. Rockall; London / UK

RT 19-3 - AI in radiology: how will it impact training programmes? (10 min)

Adrian Brady; Cork / Ireland

RT 19-4 - Discussion (35 min)

Andrea G. Rockall; London / UK

Boris Brkljač; Zagreb / Croatia

Adrian Brady; Cork / Ireland

RPS 1913 - Magnetic resonance imaging (MRI)

Categories: Abdominal Viscera, Contrast Media, Genitourinary, Physics in Medical Imaging

Date: March 5, 2022 | 12:30 - 13:30 CET

CME Credits: 1

Moderators:

Gisela E Hagberg; Tübingen / Germany

Michael Fuchsjäger; Graz / Austria

RPS 1913-2 - SPIO nanoparticles-based phantom for standardisation of non-invasive MRI methods for iron overload assessment (8 min)

Petr Menshchikov; Moscow / Russia

Author Block: P. A. Bulanov, E. Manzhurtseva, P. Menshchikov, D. Kupriyanov, G. Novichkova, G. Tereshchenko; Moscow/RU

Purpose or Learning Objective: Liver iron overload is a pathological condition in which extra iron increase in tissues and organs, mainly in liver. It can lead to toxic damage and organs dysfunction. A biopsy is a common method for iron concentrations assessment, but it has a number of negative factors, such as risks of infection. The alternative, a non-invasive, method is T2* mapping, because T2* values depend on magnetic susceptibility which changes with an iron present. Earlier we carried out a study on the correlation of T2* values (ms) with LIC (mg/ml) values obtained from a liver biopsy from children with varying degrees of liver iron overload.

However, this formula can be reliably used only with those MRIs on which it was obtained, because T2* values are very sensitive to various scanning parameters. The creation of T2* obtaining standardisation method is the main goal of the current study.

Methods or Background: We used an MR-compatible phantom which consisted of 28 test tubes with different solution concentrations of paramagnetic iron oxide nanoparticles. To check the results for repeatability, the phantom was scanned throughout the year in 1-week increments on our Philips Achiva 3T and Signa GE 1.5T MRI scanners. We further verified reproducibility on other two scanners in other medicine centers.

Results or Findings: The T2* values showed good repeatability on both our scanners. As a result of working with other centres we formulated the standardisation protocol: (1) scanning phantom in another centre, (2) calibration of scanning parameters and T2* mapping or introducing additional calibration coefficients into the recalculation formula, and (3) using our formula to convert T2* into LIC.

Conclusion: Thus, to be able to use formulas, it is enough to check the correspondence of T2* values using the phantom we created.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 1913-3 - Varying MRI-contrast in solid 3D printed structures without adding contrast agents (8 min)

Alejandra Valladares; Vienna / Austria

Author Block: A. Valladares, G. Oberoi, T. Beyer, A. Berg, E. Unger, I. Rausch; Vienna/AT

Purpose or Learning Objective: The development of MRI phantoms presents several challenges in terms of materials and is mainly limited to water-filled compartments and gel-based components. Here, we present a novel design to additively manufacture solid objects with adjustable MRI contrast based on the integration of MRI-visible supporting material.

Methods or Background: Eleven homogeneous cubic probes and one spherical object mimicking a necrotic tumour were designed and printed using additive manufacturing. Each probe comprises a solid internal structure and a specific percentage of commonly-used support material. The models were scanned using standard spin- and gradient-echo pulse sequences on a 3T PET/MRI system. We evaluated MRI visibility and T1 and T2 relaxation rates over time.

Results or Findings: For most probes, measurable signal intensities were obtained. T2 values ranged from 22 ms to 40 ms, comparable to reported values for some body tissues at 3T. T1 values were relatively short compared to similar reports with relaxation times of 109 ms to 131 ms. T1 and T2 relaxation times were stable over three months.

Conclusion: The proposed design allowed the adjustment of imaging contrast in MRI, based mainly on the spin density contribution of the MRI-visible supporting material within a voxel. Furthermore, we demonstrated the possibility of creating a one-compartment object to mimic necrosis in tumours, which is advantageous to create complex models for tumour heterogeneity in MRI and PET/MRI.

Limitations: The current design does not allow mimicking the varying contrast with different T1 and T2-weighing MRI sequences.

Ethics committee approval: Not applicable.

Funding for this study: This work has received funding from the Horizon 2020 programme under the Marie Skłodowska-Curie grant agreement No.764458. AM infrastructure was supported by the Austrian FFG within the M3dRES project (Grant-No.858060).



RPS 1913-4 - Comparisons between simulated and experimental data in quantitative susceptibility maps in a 3.0T MRI-scanner (8 min)

Enrique Cuña; Montevideo / Uruguay

Author Block: E. G. Cuña¹, E. Tuzzi², L. Biagi³, P. Bosco³, M. Garcia¹, J. Mattos¹, K. Scheffler², M. Tosetti³, G. E. Hagberg²;

¹Montevideo/UY, ²Tübingen/DE, ³Pisa/IT

Purpose or Learning Objective: To compare quantitative susceptibility quantification between simulated and experimental phantom containing iron. This would help to adjust processing pipeline parameters to obtain quantitative susceptibility mapping (QSM).

Methods or Background: A phantom was constructed by inserting small vials into a cylindrical container. Vials contained FeCl₂ at four different concentrations (range 0.22-1.79mM) in two forms: clustered and free. The phantom was scanned at 3.0T (Siemens Germany). Multi-echo-GRE-images (TE=6:6:30ms; TR=53ms; nominal FA=18°; voxel=600x600x600µm; GRAPPA=2). For simulations, the same geometry as the real phantom was used. Susceptibility values were assigned to three different regions: background (1ppm), body (0ppm) and iron vials. A molar susceptibility of 1ppm/mM was assigned. For clustered iron vials, random noise (with a uniform probability distribution, from 0 to 1) was generated and multiplied by the corresponding iron concentration. Phase images at TE=6ms were obtained by convolution of the phantom geometry with the macroscopic unit-dipole function. Morphology enabled dipole inversion (MEDI)2 was applied to the earliest echo-time phase images (6ms) to obtain QSM for experimental and simulated data using lambda1=1000 and lambda2=10 for background regularisation.

Results or Findings: For measured QSM images, clustered iron led to highly localised field effects, also captured by simulations. For experimental data, best curve fittings were obtained after applying a Laplacian-based unwrapping pre-processing, with determination coefficients >0.88. In the simulations, QSM-values in both clustered and free iron showed a linear increase with iron (determination coefficient >0.99). In both cases, estimated molar susceptibility was lower with clustered iron.

Conclusion: Our simulation method captures the effect of iron clustering in QSM calculations as seen in experimental phantom acquisitions.

Limitations: QSM processing pipelines need to be refined to achieve higher accuracy for local field effects, as also seen in Alzheimer's beta-amyloid plaques.

Ethics committee approval: Not applicable.

Funding for this study: Validation EU-LACH #16/T01-0118.

RPS 1913-5 - Validation of a novel segmentation tool (segfatMR) for semiautomatic volumetry of adipose tissue in MR images (8 min)

Anna Linder; Leipzig / Germany

Author Block: A. Linder, T. Eggebrecht, N. P. Linder, T. Denecke, H. Busse; Leipzig/DE

Purpose or Learning Objective: Subcutaneous (SAT) and visceral adipose tissue (VAT) are considered as biomarkers for a variety of clinical disciplines and questions. Segmentation and volumetry are generally time-consuming, creating a need for rapid but accurate analysis tools. This work aims to present a new segmentation tool (developed under a custom framework, DicomFlex [RS]) that combines the speed of automatic pre-segmentation with the reliability of a brief interactive revision. Results were validated against a widely used commercial tool (SliceOmatic).

Methods or Background: Validation was performed on MRI datasets (1.5 T Achieva XR, Philips Healthcare) from 20 patients (10 women/men), 25.1-63.1 (mean 48.5) years old, with BMIs between 28.3 and 58.8 (mean 36.8) kg/m². Two independent readers analysed the abdominopelvic datasets (30-40 slices, mean 35.8) with both tools (segfatMR, SliceOmatic). Coefficients of determination (R²) as well as bias and limits of agreement (Bland Altman) were determined.

Results or Findings: Segmentation performance (R² between methods) was excellent for both readers for SAT (> 0.99) and very high for VAT (around 0.90). The novel method was almost twice as fast as the reference 19 (R²) and 25 (R¹) s/slice vs 34 and 40 s/slice. On a subjective level, readers appreciated the intuitive workflow resulting from the standardised interface.

Conclusion: The open-source semiautomatic PC segmentation tool enables a fast and accurate quantification of whole abdominopelvic adipose tissue volume. Development under a standardised software framework (Dicomflex) allows for further extensions or adaptations.

Limitations: Limitations include single-centre-design, limited number of readers (n=2) and specific patient selection based on BMI(>25kg/m²).

Ethics committee approval: MRI study was under IRB approval.

Funding for this study: There was no specific funding for this study.

RPS 1913-6 - Skin temperature changes in pregnant women during foetal MRI (8 min)

Laura Wachholz; Jena / Germany



Author Block: L. Wachholz, H-J. Mentzel, A. Heinrich, H. Proquitte, E. Schleussner, P. Schlattmann, C-H. Cho-Nöth, U. K. M. Teichgräber; Jena/DE

Purpose or Learning Objective: Foetal MRI will be performed as an adjunct to sonography in foetal pathologies. Generally, MRI is related with heat, caused by radiofrequency waves produced during MRI scans. The purpose of this prospective study was to confirm that there is no heating in pregnant women during MRI.

Methods or Background: 20 pregnant women (aged between 19 and 45 years) in a range of 20 to 35 pregnancy week underwent foetal MRI for various indications. Imaging was performed on a 1.5 T MRI (AERA, SIEMENS, GERMANY) without sedation or contrast media. Imaging time was between 30 and 45 minutes. Two probes Tesla M3 (Mammendorfer Institut für Physik und Medizin, GERMANY) were used for measuring the skin temperature: one on the leg outside the field of view (FOV) (TL) and the second one next to the belly button within the FOV (TFOV). Before and after each MRI investigation the body core temperature was estimated by evaluation of the ear temperature (Tc).

Results or Findings: Both probes demonstrated in all 20 pregnant women an increase of the skin temperature of 0.1°C per imaging minute. TFOV increased 3.6°C (mean; min 1.8, max 5.6°C), TL 1.7°C (mean; min 0.1°C, max 2.6°C), Tc 0.3°C (mean; min -0.3°C, max 1.2°C).

Conclusion: We observed a significant increase in temperature in pregnant women during MRI. We don't know if there is any side effect on the foetus. Therefore, possible health consequences, also for the fetus, should be checked.

Limitations: The limitations are the missing online rectal and intrauterine temperature measurements.

Ethics committee approval: The ethics committee approval was obtained.

Funding for this study: Not applicable, institutional study.

RPS 1913-7 - Ultrafast total body EPI-DWIBS with compressed sensing (8 min)

Petr Menshchikov; Moscow / Russia

Author Block: I. Karpov, P. Menshchikov, D. Kupriyanov, E. Patrikeev, A. Morozov; Moscow/RU

Purpose or Learning Objective: Compressed Sensing (CS) is a novel and promising method for the accurate reconstruction from sparsely sampled k space data that allows significant noise reduction compared with parallel imaging methods (SENSE). The study's main aim was to use CS to speed up EPI DWIBS for the whole body.

Methods or Background: Axial EPI-DWIBS images (voxel-2.5x2.5x6 mm, b-factor-1000 s/mm, 30 slices) were acquired both for the phantom and 8 healthy subjects in the abdomen with a 1.5T Philips Ingenia MRI scanner. The phantom contained 8 tubes with pure water, fat and water solution with PVP 10-20-30-40-50-60-70%. Phantom acquisition: Sense/CS factors varied from 1 to 3 with 0.5 increment; NSA=4 and 6. For the in vivo study the combinations of the SENSE/CS and NSA were as follows: SENSE=2, NSA=6; CS=2, NSA=6; CS=1.5, NSA=6; CS=1.5, NSA=4.

Results or Findings: Phantom DWIBS images with CS acceleration show significantly higher SNR than images with appropriate SENSE CS both for NSA=4 and 6. SNR of phantom DWIBS image with SENSE=2, NSA=6 (standard implementation) is equal to the CS=1.5, NSA=4. The same result was obtained for the in vivo studies. Comparing in vivo images with NSA=6, CS=1.5 and CS=2 shows significantly higher SNR (on 14% and 8%, respectively).

Conclusion: CS acceleration shows a higher efficiency than SENSE for EPI-DWIBS based on the SNR analysis. Combination CS=1.5, NSA=4 allows to acquire images with the same quality as for the standard acquisition SENSE=2, NSA=6, reduces the scan time from 1:37 to 1:03 min per one stack resulting in 11 min for full-body DWIBS.

Limitations: The decrease of the accelerating factor is accompanied by increasing the EPI-factor, which may cause additional EPI distortions. For all subjects, no EPI distortions on DWIBS images were found.

Ethics committee approval: The study was approved by NMRCTO N.N.Priorova.

Funding for this study: No funding was received for this study.

RPS 1913-8 - Analysis of slice profile effects for super resolution thin-slice multi-slice MRI (8 min)

Stephen Riederer; Rochester / United States



Author Block: S. Riederer, E. borisch, R. Grimm; Rochester, MN/US

Purpose or Learning Objective: Application of super-resolution methods to the slice select direction attempts to recover through-plane resolution finer than the slice thickness. Critical in this process is the correction for the slice profile. However, conventional "rect" profiles have zeroes in the kZ passband, causing undesirable attenuation of high spatial frequencies in the slice direction. The purpose of this work is to investigate alternative slice profiles which allow improved fidelity.

Methods or Background: First, several alternative RF profiles were identified with no zeroes in the kZ passband. These are a Gaussian and a $(1+\cos)$ (raised cosine, or "rCos"). Second, experimental images using these were compared with a standard "rect" profile using a phantom with resolution patterns varying from 0.15 to 0.50 lp/mm. Third, sagittal images were acquired of the prostate in vivo from several subjects. Axial sampling using 3mm thick slices with the various slice profiles was simulated using several levels of additive noise, super-resolution reconstruction performed, and results compared with the original sagittal image. Finally, results were compared with sagittal reformats made from the actual axial acquisition.

Results or Findings: For 3mm thick slices, both Gaussian and rCos RF pulses allow full restoration of spatial frequencies up to 0.50 1/mm using SR reconstruction, equivalent to 1mm slice thickness. rCos excitation consistently provides improved sharpness vs Gaussian over all noise levels. Sagittal reformats of SR-reconstructed axially acquired data well resemble direct sagittal acquisition.

Conclusion: Alternative (non-rect) RF slice profiles such as Gaussian and rCos allow improved fidelity of high spatial frequencies in the slice direction with resolution finer than that in the acquired slices.

Limitations: The number of subjects studied is limited. Finer (<1mm) slice resolution is desirable.

Ethics committee approval: Approved by Institutional Review Board (IRB).

Funding for this study: Funding for this study was institutional.

IND 32 - Outcomes driven innovation in CT, Healthcare IT, Ultrasound and Mobile Imaging Solutions

Categories: Artificial Intelligence & Machine Learning, Chest, CT, Emergency Imaging, General Radiology, Head and Neck, Image Quality, Imaging Informatics, Imaging Methods, Interventional Radiology, Liver, Lung, Musculoskeletal, Neuro, Ultrasound, Vascular

Date: March 5, 2022 | 12:30 - 13:30 CET

IND 32-1 - Computed Tomography - The value of ultra-high resolution imaging in diagnostic neuroradiology. (15 min)

Marc Brockmann; Germany

Professor Marc Brockmann, the head of the Department of Neuroradiology at the University Medical Center in Mainz Germany, explains about his experiences with the Ultra High resolution Aquilion Precision CT scanner.

Speaker: Prof. Marc Brockmann, Head of Department of Neuroradiology, University Medical Center Mainz, Germany

IND 32-2 - Healthcare IT - Automation Platform: The right insights, accelerated by AI. (16 min)

Anton Meijer; Nijmegen / Netherlands

In healthcare, we see ageing populations globally; workload keeps increasing with limited resources combined with an increased need to make informed decisions in real-time.

There is a transition to a more personalized treatment approach and a desire to optimize resource deployment ensuring clinical teams have the insights they need.

The Automation Platform is an AI-based zero-click solution that uses deep learning technology to streamline your workflow for fast, actionable results every time.

Speakers: Richard Baks, European Clinical Specialist, Canon Medical Systems Europe
Dr. Anton Meijer, Neurologist, Radboud University Medical Center, Nijmegen, the Netherlands

IND 32-3 - Ultrasound - From detection to treatment. (20 min)

Ultrasound is a fundamental imaging technique for clinicians with unique values combining real-time imaging, dynamic exams with various resolutions. Thanks to Doppler techniques, it allows us to analyze vessels and more widely the wall body vascularization. It is easy accessible or even mobile with a very simple setup and on top of that, it is a perfect modality for follow-up of pediatrics. Many improvements and developments have been done during the last years on ultrasound techniques. In this session, the improvements for Resolution, Differentiation, Micro Flows, Fusion Guidance and Elastography are covered.

Speakers: Nadim Kaafarani, Ultrasound.European Clinical & Business Manager, Canon Medical Systems Europe
Enrico Vendraminelli, European Clinical Market Manager, Canon Medical Systems Europe
Luisa Amaral, European Clinical Specialist, Canon Medical Systems Europe

IND 32-4 - Mobile Imaging Solutions - Clinical confidence anywhere. (9 min)

Olaf Rieker

The CT City Hopper is a combination of a mobile trailer and an Aquilion Prime SP CT scanner with AiCE technology. In this product presentation, a MyVisit tour is given to present this unique product and Dr. Olaf Rieker will explain how he deployed the CT City Hopper during building constructions in his hospital.

Speakers: Johan Vochteloo - Director Refurbishment & Mobile Solutions Canon Medical Systems Europe
Rose Tijhaar - Business Support Manager Refurbishment & Mobile Solutions Canon Medical Systems Europe
Dr. Olaf Rieker - Head of Department of Radiology and Nuclear Medicine, Marienhospital, Euskirchen, Germany.

E³ 2023 - Head and neck

Categories: Head and Neck

ETC Level: LEVEL I+II

Date: March 5, 2022 | 14:00 - 15:00 CET

CME Credits: 1

Moderator:

Martin G. Mack; Munich / Germany

E³ 2023-1 - Chairperson's introduction (3 min)

Martin G. Mack; Munich / Germany

To become familiar with the anatomy and imaging presentation of the most common disorders of the temporal bone and skull base. To understand the imaging presentation of common inflammatory and neoplastic disorders of the nose, paranasal sinuses, and nasopharynx. To describe the typical imaging features of the most common neoplastic disorders of the oral cavity, oropharynx, hypopharynx, and larynx.

E³ 2023-2 - Temporal bone and skull base (19 min)

Agnieszka Trojanowska; Lublin / Poland

1. To differentiate between the anatomy, normal variants, and congenital disorders of the temporal bone.
2. To understand the causes and imaging features of hearing and vestibular disorders.
3. To describe the imaging presentation of the most common tumours of the skull base.

E³ 2023-3 - Nose, paranasal sinuses, and nasopharynx (19 min)

Tilak Das; Cambridge / UK

1. To describe the anatomy and normal variants of the nose, paranasal sinuses, and nasopharynx.
2. To differentiate between the imaging features of acute and chronic inflammatory changes of the nose and paranasal sinuses.
3. To understand the imaging features of benign and malignant tumours of the nose, paranasal sinuses, and nasopharynx.

E³ 2023-4 - Oral cavity, oropharynx, hypopharynx and larynx (19 min)

Minerva Becker; Geneva / Switzerland

1. To describe the normal imaging anatomy of the oral cavity, oropharynx, hypopharynx, and larynx.
2. To understand the imaging features of tumours of the oral cavity and oropharynx.
3. To understand the imaging features of tumours of the hypopharynx and larynx.

RC 2017 - Abdominal emergencies after abdominal surgery

Categories: Abdominal Viscera, Emergency Imaging, GI Tract, Interventional Radiology, Trauma Imaging, Vascular

ETC Level: LEVEL I+II

Date: March 5, 2022 | 14:00 - 15:00 CET

CME Credits: 1

Moderator:

Ana Blanco Barrio; Murcia / Spain

RC 2017-1 - Chairperson's introduction (5 min)

Ana Blanco Barrio; Murcia / Spain

RC 2017-2 - Bowel surgery: a puzzle for emergency radiologist (15 min)

Luis Curvo-Semedo; Coimbra / Portugal

1. To learn about the surgical techniques for abdominal approach (laparoscopy, laparotomy, focal incision).
2. To understand the main surgical strategies and anastomosis for oncologic or bariatric surgery.
3. To recognise the different surgical procedures via imaging.

RC 2017-3 - Emergencies after abdominal organ transplantation (15 min)

Trygve Syversveen; Oslo / Norway

1. To learn about the most common abdominal emergencies related to abdominal organ transplantation.
2. To recognise the imaging signs.
3. To learn about the patient management implications.

RC 2017-4 - How to manage post-operative bleeding or ischaemia and abdominal collections (15 min)

Paul Calame; Besançon / France

1. To learn about adequate CT protocols to investigate patients with a suspicion of intra-abdominal bleeding or abdominal collections.
2. To identify the relevant CT findings for management decision-making.
3. To describe the role of interventional radiology when there is intra-abdominal active bleeding or abdominal collection.

RC 2017-5 - Panel discussion: Which imaging findings suggest an operative treatment? (10 min)



RPS 2007 - Ovarian imaging today: what's new?

Categories: Artificial Intelligence & Machine Learning, Evidence-Based Imaging, Genitourinary, Oncologic Imaging, Ultrasound

Date: March 5, 2022 | 14:00 - 15:00 CET

CME Credits: 1

Moderators:

Teresa Margarida Cunha; Lisboa / Portugal

Andrea Grace Rockall; Godalming / United Kingdom

RPS 2007-2 - CT radiomics in differentiating histological subtypes of epithelial ovarian carcinoma (8 min)

Mandi Wang; Hong Kong / China

Author Block: M. Wang¹, J. perucho¹, L. Han², E. M. F. Wong¹, G. Ho¹, E. Y. P. Lee¹, P. Ip¹; ¹Hong Kong/CN, ²Guangzhou/CN

Purpose or Learning Objective: To evaluate the ability of contrast-enhanced CT (ceCT)-based radiomic features in differentiating high-grade serous carcinoma (HGSC) and non-HGSC of epithelial ovarian carcinoma (EOC).

Methods or Background: A total of 341 patients with EOC were enrolled in this multicentre retrospective study. Centre A with 282 patients was designated as the internal cohort and was divided into an internal training set (n = 225) and an internal test set (n = 57). Centre B with 59 patients, was designated as the external cohort and was used for external testing. To address the class imbalance between the distribution of HGSC and non-HGSC, synthetic balanced samples were generated using Random Over-Sampling Examples (ROSE). Tumours were manually delineated on each slice of ceCT images to encompass the entire tumour. Radiomic features with Laplacian of Gaussian (LoG) and wavelet transforms were extracted. Feature selection was performed using Mann-Whitney U tests and least absolute shrinkage and selection operator (LASSO) regression. Selected features were used to build the logistic regression (LR) models for differentiating HGSC and non-HGSC. The performances of the models were assessed by receiver operating characteristic curves (ROC) and the area under the curve (AUC).

Results or Findings: Thirty-four radiomic features were selected for modelling. The AUCs of LR models for differentiating HGSC and non-HGSC were 0.944 for the internal training set, 0.945 for the internal test set and 0.805 for the external test set.

Conclusion: Radiomic features extracted from ceCT were helpful in histological subtyping of EOC. The LR models offered outstanding diagnostic efficiency in the internal cohorts, and excellent in the external cohort.

Limitations: Centre B has a limited sample size. The distribution of HGSC and non-HGSC was different between Centre A and B.

Ethics committee approval: Institutional review board (No. UW 20-251).

Funding for this study: Health and Medical Research Fund (no. 08192106).

RPS 2007-3 - Comparative performance of ORADS MRI score vis-a-vis ADNEX MR score for characterisation of ovarian-adnexal masses, was the transition justified? A comparative evaluation in an Indian cohort (8 min)

Sayantana Patra; New Delhi / India

Author Block: S. Patra¹, S. B. Grover², H. Grover³, P. Mittal¹, G. Khanna¹; ¹New Delhi/IN, ²Greater Noida/IN, ³New York, NY/US

Purpose or Learning Objective: To compare the diagnostic performance of ORADS-MRI score vis-a-vis ADNEX-MR score for characterisation of ovarian-adnexal tumours as benign or malignant using histopathology as a reference standard. The secondary objective was to justify the transition from ADNEX-MR to ORADS-MRI.

Methods or Background: The ORADS-MRI algorithm was recently proposed for characterising ovarian tumours, directing the management of malignant tumours towards specialised oncology teams and benign tumours towards restricted intervention. This study was designed as a cross-sectional, observational study, with the retrospective application of ORADS-MRI and ADNEX-MR scores to a prospectively acquired data set during an IRB approved study on ovarian-adnexal masses conducted during the last 2 years. We recruited patients with ovarian-adnexal tumours, who had undergone 3T MRI with morphological, functional and dynamic contrast-enhanced sequences and who had final histopathology diagnosed. Major exclusion criteria at recruitment were age below 18 years, deranged renal functions, and metallic implants. Two trained radiologists initially blinded to histopathology diagnosis assessed ORADS-MRI and ADNEX-MR scores in each tumour. The final score and the diagnosis were assigned by consensus, ORADS 1-3 and ADNEX 1-3 as benign, ORADS 4/5 and ADNEX 4/5 as malignant, and subsequently correlated with histopathology.

Results or Findings: The cohort comprised 45 patients with 63 tumours, histopathology diagnosis was 36 benign and 27 malignant tumours. ORADS-MRI vis-a-vis ADNEX-MR had sensitivity 96.3% vis-a-vis 96.3%, specificity 72.2% vis-a-vis 63.9%, PPV 72.2% vis-a-vis 66.7%, NPV 96.3% vis-a-vis 95.8% and diagnostic accuracy 82.5% vis-a-vis 77.78%.

Conclusion: Performance of ORADS-MRI was superior in specificity, PPV and diagnostic accuracy and further, since ORADS-MRI is more definitive for risk assignment in tumours with score 5 (ORADS >90%, ADNEX >50%) the transition from ADNEX-MR score towards ORADS-MRI algorithms is adequately justified.

Limitations: Small sample size, single centre study.

Ethics committee approval: Ethics approval was obtained.

Funding for this study: No funding was received for this study.

RPS 2007-4 - Monitoring treatment response in epithelial ovarian carcinoma by PET/CT following neoadjuvant chemotherapy (8 min)

Elaine Lee; Hong Kong / Hong Kong SAR China

Author Block: E. Y. P. Lee, J. A. U. Perucho, G. S. Kwok, K. Y. Tse, P. Ip; Hong Kong/CN

Purpose or Learning Objective: To evaluate the accuracy of PET/CT in monitoring treatment response in epithelial ovarian carcinoma (EOC) after neoadjuvant chemotherapy (NACT).

Methods or Background: Patients with advanced EOC (FIGO III-IV) were prospectively recruited to undergo PET/CT after 3-6 cycles of NACT before interval debulking surgery. PET/CT was evaluated using a 5-point Likert scale. Nineteen regions in the abdominopelvic cavity were evaluated on PET/CT (subdiaphragmatic spaces, perihepatic, liver serosa and hilum, gastric serosa, pancreas and lesser sac, splenic serosa, splenic hilum, paracolic gutters, omentum, bowel mesentery, paraaortic and pelvic lymph nodes, and central pelvis) and correlated with surgical evaluation and histopathological assessment. Histopathological specimens were taken as the gold standard. In the event where resection was not performed and biopsy could not be safely taken (e.g. miliary serosal disease), the intra-operative surgical findings were taken as the standard of reference. A region-based analysis was performed. The diagnostic characteristics of PET/CT were described by accuracy, sensitivity, specificity, positive (PPV) and negative predictive values (NPV).

Results or Findings: The average accuracy of region-based analysis was 0.88 (sensitivity 0.38, specificity 0.96, PPV 0.56 and NPV 0.91) based on 285 regions evaluated in 15 patients with EOC. Sensitivity in disease detection was low in all regions evaluated, but PET/CT showed high specificity and NPV, except for disease in the omentum (specificity 0.71, NPV 0.56) and central pelvis (specificity 0.71, NPV 0.63).

Conclusion: PET/CT was highly specific with a high NPV in evaluating the abdominopelvic cavity of advanced EOC following NACT. These metrics could be useful in surgical planning in stratifying patients for less aggressive and extensive debulking surgery when the disease was deemed to be absent on PET/CT.

Limitations: The study was limited by small a sample size.

Ethics committee approval: Institutional review board (No. UW 18-604).

Funding for this study: Health and Medical Research Fund (No. 06171706).

RPS 2007-5 - T2*-weighted imaging performance in detection of deep endometriosis: a comparison with standard MRI sequences (8 min)

Paolo Niccolò Franco; Rende / Italy

Author Block: P. N. Franco¹, S. Annibaldi², C. Cazzella¹, S. Viganò¹, A. Bonanomi¹, P. A. Bonaffini¹, S. Sironi¹; ¹Milan/IT, ²Bergamo/IT

Purpose or Learning Objective: To evaluate the diagnostic performance of T2*-weighted sequence compared to conventional MRI protocol, used as a reference standard, in the assessment of deep endometriosis.

Methods or Background: Patients who underwent a pelvic MRI on a 3T scan for clinical and/or ultrasound suspicion of deep endometriosis were prospectively enrolled (December 2020 - August 2021). Two radiologists (with 10 and 2 years of experience, respectively) qualitatively evaluated in consensus standard MRI sequences to detect endometriotic lesions. The most experienced radiologist assessed the presence of signal voids on T2*-weighted sequences: in case of discrepancy between standard and T2* sequences, MRI images were re-evaluated in consensus. Equivocal lesions were assessed through second-look ultrasound and clinical evaluation.

Results or Findings: Forty patients (mean age 35.5 years) with a total of 78 endometriosis foci were included in the study. 24,4% (19/78) of endometriotic lesions detected through morphologic standard sequences showed a signal loss in T2*-sequences. At radiologic re-evaluation, 13/19 lesions associated with signal voids (68.4%) have been related to artefacts (including air or previous surgery) or hemorrhagic foci not linked to endometriosis (i.e., hemorrhagic corpus luteum). Among lesions whose nature on T2* sequences was still unclear but not artefact-related (31.6%; 6/19), only 4 resulted consistent with endometriosis at the ultrasound and clinical follow-up and none was an isolated lesion.

Conclusion: T2*-weighted sequences, even if can allow the detection of hemosiderin deposits in endometriotic foci, do not seem to provide an added value in the assessment of deep lesions. Furthermore, artefacts caused by undesirable sources of magnetic signal voids may lead to diagnostic overestimation.

Limitations: The limited sample size. Lack of surgical correlation.

Ethics committee approval: Not applicable.

Funding for this study: No funding was provided for this study.

RPS 2007-6 - Attention to diaphragmatic endometriosis diagnostics: simple extension of pelvic endometriosis MRI protocol (8 min)

Kirsi Härmä; Bern / Switzerland

Author Block: K. H. Härmä, S. Imboden, F. Siegenthaler, M. Mueller, J. T. Heverhagen; Bern/CH

Purpose or Learning Objective: Diaphragmatic endometriosis on MRI.

Methods or Background: In this retrospective single-centre study from 2017 to 2021, nineteen patients with detected diaphragmatic endometriosis (DE) on MRI were consecutively included. Among them (1) patients without DE symptoms referred for pelvic endometriosis MRI (peMRI), including upper abdomen chemical shift sequence (uaCSS) and (2) symptomatic patients suspicious for DE referred for diaphragm endometriosis MRI (diMRI). The image analysis was followed-up by a gynecologic radiologist. Location, number, size, laterality and accuracy of DE findings, as clinical symptoms and correlation with pelvic/bowel deep infiltrating endometriosis (DIE), were investigated. The MR-graphic findings were intra-operative and histopathologically proven. Descriptive statistics, means, medians and ranges were calculated for continuous variables; frequencies for categorical variables. Confusion matrix/PPV/NPV (Excel 2016).

Results or Findings: MRI detected 49 DE suspicious lesions in 19 patients. 47% (9/19) of the patients were referred for diMRI, being suspicious for DE. 53% (10/19) patients were referred for peMRI with uaCSS without any suspicion on DE but pelvic endometriosis. 57% of DE lesions were located posteriorly, 33% laterally, and 10% anteriorly. The mean size of all DE lesions was 13.9 mm (range 3mm-38mm). Until now, nine patients (9/19) underwent a laparoscopic operation resulting in a PPV of 75% for DE detection on MRI. 5/9 operated patients were referred to pelvic MRI. DE was proven in 6/9 patients intra-operatively and histopathologically. False-positive findings in two patients were identified as a diaphragmatic post-operative scar. Both DE and pelvic or bowel DIE was diagnosed in 58%/53% of the women.

Conclusion: The current study demonstrated the importance of incorporating diaphragmatic imaging to pelvic endometriosis MRI. It allows the DE diagnosis in an early stage, offers optimal patient counselling, management of the surgery and anticipating its complexity.

Limitations: Small patient population.

Ethics committee approval: The ethics committee approvals was obtained.

Funding for this study: No funding was received for this study.

RPS 2007-7 - Multiparametric MRI in the differential diagnosis of epithelial ovarian tumours: association between quantitative DCE parameters, ADC and immunohistochemical markers (8 min)

Alina Solopova; Moscow / Russia



Author Block: A. Solopova, Y. Nosova, G. Khabas; Moscow/RU

Purpose or Learning Objective: To explore the correlation between quantitative parameters from DCE-MRI and ADC with Ki-67 proliferation status, p53 and p16 expression in patients with ovarian tumours.

Methods or Background: This prospective study, approved by the local ethical committee, enrolled 102 patients (26 benign (BOT), 24 borderline (BEOT) and 52 malignant epithelial ovarian tumours (MEOT)) from 2018-2020. Preoperative MRI was performed in all patients, DCE-MRI quantitative parameters (Ktrans, Kep, Ve) and ADC (mean) were measured, compared, and correlated with Ki-67, p53, p16 expression between the groups of BOT, BEOT, MEOT (according to the histologic verification). Statistical analyses were performed using the MannWhitney U-test, ROC-curves, and Spearman's correlation by drawing ROIs.

Results or Findings: The Ktrans, Kep and Ve was significantly higher in MEOTs than in BOTs (0,39 (0,36-0,50), 0,25 (0,230-0,270) и 0,22 (0,210-0,240) vs 0,2 (0,16-0,22), 0,016 (0,016-0,051) and 0,1 (0,060-0,130), respectively). ADC values were significantly higher in BOTs than in MEOTs ($1,277 (1,2-1,4) \times 10^{-3}$ vs $0,826 (0,7-0,9) \times 10^{-3}$) ($p < 0,0001$). The Ktrans and ADC (mean) value were the most informative parameters for the differentiation between BOTs and MEOTs, providing the sensitivity, specificity, and accuracy of 88,9%, 94,7% and 90,6% for Ktrans and 85,1%, 87,5%, and 85,7% for ADC (mean), respectively; the combination of Ktrans and ADC mean value provides 91,1%, 94,7% and 92,2%, respectively. Ktrans and Kep were positively correlated with Ki-67 expression ($r=0,6$ and $0,671$, respectively; $p < 0,01$), ADC values were correlated with Ki-67 and p16 expression ($r=0,624$ and $0,6$, respectively; $p < 0,01$).

Conclusion: Preliminary findings demonstrate that DCE MRI and ADC are an effective additional tool for differentiating BOTs from MEOTs, and are correlated with Ki-67 and p16 expression.

Limitations: This is a single-centre study.

Ethics committee approval: All studies were approved by the local ethics committee.

Funding for this study: Grant of the President of Russian Federation (MD-130.2019.7).

IND 35 - Outcomes driven innovation in Ultrasound, MR and CT.

Categories: Artificial Intelligence & Machine Learning, CT, Head and Neck, Image Quality, Liver, MRI, Musculoskeletal, Neuro, Physics in Medical Imaging, Ultrasound, Vascular

Date: March 5, 2022 | 15:00 - 16:00 CET

IND 35-1 - Ultrasound - From detection to treatment. (20 min)

Ultrasound is a fundamental imaging technique for clinicians with unique values combining real-time imaging, dynamic exams with various resolutions. Thanks to Doppler techniques, it allows us to analyze vessels and more widely the wall body vascularization. It is easy accessible or even mobile with a very simple setup and on top of that, it is a perfect modality for follow-up of pediatrics. Many improvements and developments have been the done during the last years on ultrasound techniques. In this session, the improvements for Resolution, Differentiation, Micro Flows, Fusion Guidance and Elastography are covered.

Speakers: Nadim Kaafarani, Ultrasound.European Clinical & Business Manager, Canon Medical Systems Europe
Enrico Vendraminelli, European Clinical Market Manager, Canon Medical Systems Europe
Luisa Amaral, European Clinical Specialist, Canon Medical Systems Europe

IND 35-2 - Magnetic Resonance - Overcome compromises using AI. (19 min)

The need to catch-up with higher backlog of patients requires shorter examination procedures but at the same time nobody wants to compromise on clinical confidence and need to keep high-SNR and high-resolution images. In this session, the methods are presented to overcome the compromise between high-resolution imaging, High SNR and faster scan time. We introduce our artificial intelligence Deep Learning Reconstruction solution AiCE to see through the noise. We explain how to combine AiCE with acceleration techniques like Compressed SPEEDER or Fast3D to create very fast acquisition times and very good image quality.

Speaker: Thierry Munier, European Director MR, Canon Medical Systems Europe

IND 35-3 - Computed Tomography - The value of ultra-high resolution imaging in diagnostic neuroradiology. (17 min)

Marc Brockmann; Germany

Professor Marc Brockmann, the head of the Department of Neuroradiology at the University Medical Center in Mainz Germany, explains about his experiences with the Ultra High resolution Aquilion Precision CT scanner.

Speaker: Prof. Marc Brockmann, Head of Department of Neuroradiology, University Medical Center Mainz, Germany

RPS 2115 - Advances in thoracoabdominal and peripheral vascular MRI

Categories: Chest, Contrast Media, Imaging Methods, Interventional Radiology, Vascular

Date: March 5, 2022 | 16:00 - 17:00 CET

CME Credits: 1

Moderators:

Alban Redheuil; Paris / France

Carlo Catalano; Roma / Italy

RPS 2115-2 - Quantitative normal values of helical flow, flow jets and wall shear stress of healthy volunteers in the ascending aorta (8 min)

Sebastian Ebel; Leipzig / Germany

Author Block: S. Ebel¹, A. Kühn¹, B. Köhler², B. Behrendt², B. Riekens¹, B. Preim², T. Denecke¹, M. Grothoff¹, M. Gutberlet¹; ¹Leipzig/DE, ²Magdeburg/DE

Purpose or Learning Objective: 4D flow MRI enables quantitative assessment of helical flow. We sought to generate normal values and elucidate changes of helical flow (duration, volume, length, velocities and rotational direction) and flow jet (displacement, flow angle) as well as wall shear stress (WSS).

Methods or Background: We assessed the temporal helix existence (THEX), maximum Helical Volume (HVmax), accumulated Helical Volume (HVacc), accumulated Helical Volume Length (HVLacc), maximum forward velocity (maxVfor), maximum circumferential velocity (maxVcirc) and wall shear stress (WSS) as reported elsewhere using the software tool Bloodline in 86 healthy volunteers (46 females, mean age 41±13 years).

Results or Findings: WSS decreased by 42.11% and maxVfor by 44.26% across age (R 0.54 resp.). There was no link between age or gender regarding the other parameters.

Conclusion: This study provides age-dependent normal values regarding WSS and maxVfor and age- and gender-independent normal values regarding THEX, HVmax, HVacc, HVLacc and maxVcirc.

Limitations: We did not differentiate between helices and vortices. A visual, qualitative but also a quantitative differentiation between both is often not possible.

Ethics committee approval: The local ethics board approved this study: Ethik-Kommission an der Medizinischen Fakultät der Universität Leipzig AZ 443/16-ek. The written informed consent was obtained from all participants.

Funding for this study: The study was supported by a DFG-grant (GU 777/4-1 AOBJ 629068 and GR 4617/2-1 AOBJ 629069).

RPS 2115-3 - Preliminary evaluation of a non-contrast-enhanced MRI protocol of the thoracic aorta, including a 4D flow sequence (8 min)

Julien Monsinjon; Toulouse / France

Author Block: R. Moreno¹, J. Monsinjon², T. Puiseux¹, S. Toupin³; ¹Entzheim/FR, ²Toulouse/FR, ³Saint-Denis/FR

Purpose or Learning Objective: Because of their long-term environmental and health risks, the use of gadolinium-based contrast agents in MRI needs to be re-assessed. A new aortic follow-up protocol made of non-contrast-enhanced MR angiography (NCE-MRA) and 4Dflow was validated and implemented in clinical routine, replacing the classical contrast-enhanced MR angiography (CE-MRA) protocol.

Methods or Background: 22 consecutive patients who underwent the aortic follow-up MRI were included in the study (February-August 2021). A new dynamic TrueFISP-3D NCE-MRA sequence was tested as an alternative to the current reference FLASH-3D sequence with contrast injection. Aortic segment diameters and aortic volumes were measured by several radiologists. A qualitative assessment was also performed. The feasibility of integrating a 4Dflow sequence with a compressed sensing acceleration technique in clinical practice was also evaluated. To this aim, the CardioflowQA phantom was used to validate the image quality before clinical use. Wall shear stress (WSS) and pulse wave velocity (PWV) were evaluated and 5 volunteers were included for reproducibility.

Results or Findings: The median acquisition time of the NCE-MRA was 4'30". An excellent correlation was observed between the two sequences for aortic segments ($r=0.99$, $p<0.0001$, $\text{bias}<1\text{mm}$) and volumes ($r=0.98$, $p<0.0001$, $\text{underestimation}=-8.4\text{cm}^3$). The study showed an excellent inter-observer agreement. The average acquisition time of the 4Dflow was 3'54". Good reproducibility was observed for the WSS and PWV for the control group and coherent values for the patient group.

Conclusion: A gadolinium-free aortic follow-up protocol providing quality angiography and new haemodynamic biomarkers has been implemented in the clinical routine.

Limitations: The study is limited by the very short study time and the number of patients.

Ethics committee approval: This study was approved by the Ethics Committee for Research in Medical Imaging (CERIM-France) IRB number: CRM-2107-180.

Funding for this study: No funding was received for this study.

RPS 2115-4 - 4D flow MRI in Marfan patients: association of Z-score and altered aortic haemodynamics (8 min)

Alexander Lenz; Hamburg / Germany

Author Block: A. Lenz, C. Riedel, F. Wright, I. Ristow, S. Zhang, B. Schönagel, G. Adam, Y. von Kodolitsch, P. Bannas; Hamburg/DE

Purpose or Learning Objective: To determine the association of normalised aortic root diameters (Z-score) and 4D flow MRI-derived aortic haemodynamics in Marfan patients.

Methods or Background: We prospectively performed a 4D flow MRI at 3T of the thoracic aorta in 100 Marfan patients (36 ± 14 years). Patients were divided into two groups according to Z-score of the aortic root: i) Z-score <2 ($n=43$), or ii) Z-score >2 ($n=57$). The degree of helical and vortical flow in the ascending aorta was evaluated according to a 3-point scale (0: no, 1: rotation $<360^\circ$, 2: rotation $>360^\circ$). In addition, we assessed wall shear stress (WSS) and flow eccentricity at the level of the sinotubular junction (STJ), mid-ascending aorta (midAAo), and proximal arch (proxAA). Results were statistically compared using unpaired t-tests or Mann-Whitney U tests.

Results or Findings: Flow eccentricity at the level of STJ was significantly higher in Marfan patients with Z-score >2 (0.15 ± 0.07 vs 0.12 ± 0.07 ; $p=0.02$) when compared to Marfan patients with Z-score <2 . WSS at the level of STJ was significantly lower in Z-score >2 patients compared to Z-score <2 patients (0.39 ± 0.11 N/m² vs 0.46 ± 0.12 N/m²; $p=0.002$). Aberrant vortical and helical flow patterns in the ascending aorta were more pronounced in Z-score >2 patients; however, those differences in vortical (0.5 ± 0.7 vs 0.4 ± 0.6 ; $p=0.3$) and helical flow (0.8 ± 0.7 vs 0.7 ± 0.7 ; $p=0.4$) were not statistically significant.

Conclusion: Marfan patients with pathologically increased Z-scores reveal increased flow eccentricity and reduced WSS compared to Marfan patients with physiological Z-scores.

Limitations: Visual assessment of helical and vortical flow as well as manual positioning of 2D analyses planes for assessment of WSS and flow eccentricity may introduce a subjective bias and affect both qualitative and quantitative results.

Ethics committee approval: The study was approved by the local research ethics committee.

Funding for this study: The German Heart Research Foundation funded this study.

RPS 2115-5 - Validation of 4D flow MRI in TIPS stent-grafts using a 3D-printed flow phantom (8 min)

Christoph Riedel; Hamburg / Germany



Author Block: C. Riedel, A. Lenz, I. Ristow, F. Wright, G. Adam, B. Schönagel, P. Bannas; Hamburg/DE

Purpose or Learning Objective: To validate 4D flow MRI-derived flow measurements in transjugular intrahepatic portosystemic shunt (TIPS) stent-grafts using a 3D-printed flow phantom.

Methods or Background: A flow phantom mimicking the portal venous vasculature was 3D-printed using Clear Resin (Formlabs). The model consisted of the superior mesenteric vein (SMV) and the splenic vein (SV) draining into the extrahepatic portal vein (PV), the intrahepatic TIPS-tract, and the liver vein. A Viatorr® stent-graft was positioned within the TIPS tract. SMV and SV served as inlets for blood-mimicking fluid and were connected over a flow regulator and a flow sensor to a pump. TIPS flow rates ranging from 0.8-2.8 L/min were preset and 4D flow MRI acquisitions were performed at 3T using a velocity encoding (venc) of both 100cm/s and 200cm/s. 4D flow MRI-derived datasets were evaluated at predefined levels including SMV, SV, PV, the uncovered part of the stent-graft as well as the covered stent-graft (distal, central, proximal). 4D flow MRI-derived flow rates were compared to preset flow rates as a standard of reference.

Results or Findings: At a venc of 200cm/s, 4D flow MRI-derived flow rates were significantly correlated with the preset flow rates at all vascular levels and within the stent-graft (all $r > 0.98$, $p < 0.001$). At a venc of 100cm/s, aliasing artefacts were present within the stent-graft at flow rates ≥ 2.0 L/min. Lower preset flow rates were also significantly correlated with 4D flow MRI-derived flow rates (all $r > 0.99$, $p < 0.05$). In the uncovered stent-graft, 4D flow MRI underestimated the flow rate at a venc of 100cm/s by 1-6%.

Conclusion: 4D flow MRI enables valid flow evaluation within TIPS stent-grafts and warrants further in vivo validation studies to determine its clinical usefulness for monitoring TIPS function and patency.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 2115-6 - Comparison of image quality of non-contrast MR pulmonary angiography with different voxel sizes (8 min)

Jia Liu; Beijing / China

Author Block: J. Liu, J. Qiu, W. Li, K. Zhao, Z. Bi; Beijing/CN

Purpose or Learning Objective: To compare the image quality of non-contrast MR pulmonary angiography (MRPA) with two different voxel sizes.

Methods or Background: This study consisted of 29 healthy volunteers (13 males, mean age: 44.1 ± 8.0 years) who were given written informed consent. All non-contrast MRPA data were collected on a 1.5T MR scanner (MAGNETOM Aera, Siemens Healthcare, Erlangen, Germany) with an 18-channel body coil and an integrated 32-channel spine matrix coil. A free-breathing 3D turbo spin-echo (TSE) with variable-flip-angle sequence (SPACE) was used to acquire non-contrast MRPA data with the following two sequences of different parameters: 1) voxel size = $1.2 \times 1.2 \times 4$ mm³. 2) voxel size = $2 \times 2 \times 2$ mm³. The subjective image quality assessment of normal pulmonary arteries was evaluated by one experienced radiologist on primary coronal images and constructed axial images separately. The image quality of the two groups was compared by the paired t-test.

Results or Findings: The mean image quality scores of the main, left, and right pulmonary arterial trunks on primary coronal images were 3.0 ± 0.6 , 3.0 ± 0.6 , 3.0 ± 0.6 (group 1) and 2.4 ± 0.6 , 2.5 ± 0.6 , 2.5 ± 0.8 (group 2). The mean image quality scores of the main, left, and right pulmonary arterial trunks on constructed axial images were 2.2 ± 0.5 , 1.4 ± 0.5 , 1.6 ± 0.5 (group 1) and 2.0 ± 0.8 , 2.1 ± 0.7 , 2.1 ± 0.7 (group 2). The branch image quality of group 1 was better than group 2 on primary coronal images ($p < 0.05$). However, the image quality of the left and right pulmonary artery trunk in group 2 was better than group 1 on constructed axial images ($p < 0.05$).

Conclusion: Non-contrast MRPA images with higher resolution within a coronal plane can provide acceptable image quality but images with isotropy can acquire better constructed axial image quality.

Limitations: No limitations.

Ethics committee approval: The ethics approval was obtained.

Funding for this study: No funding was received for this study.

RPS 2115-7 - Quiescent-interval single-shot magnetic resonance angiography outperforms carbon dioxide angiography as a nephroprotective imaging method of chronic lower extremity arterial disease (8 min)

Judit Csőre; Budapest / Hungary

Author Block: J. Csőre, F. I. Suhai, M. Gyánó, A. A. Pataki, G. Juhász, M. Vecsey-Nagy, D. Pál, D. M. Fontanini, C. Csobay-Novák; Budapest/HU

Purpose or Learning Objective: Patients with lower extremity arterial disease (LEAD) often present with chronic kidney disease (CKD), in whom the use of nephroprotective imaging is of utmost importance. We compared the diagnostic performance of two such modalities: the non-contrast quiescent-interval single-shot (QISS) magnetic resonance angiography (MRA) and carbon dioxide digital subtraction angiography (CO2-DSA).

Methods or Background: CO2-DSA and QISS-MRA images of patients with chronic LEAD scheduled for elective diagnostic imaging were compared. A 19-segment lower extremity arterial model was used to assess the degree of stenosis (none, <50%, 50-70%, 70%<) and the image quality (5-point Likert scale: 1-non-diagnostic, 5-excellent) per-segment. Four radiologists evaluated the images. Intra-class correlation coefficient (ICC) was calculated for both inter-rater and intra-rater reliability. Three regions (aorto-iliac, femoro-popliteal, tibio-peroneal) were created by the segments for the final analysis. Diagnostic accuracy and interpretability were also evaluated.

Results or Findings: 523 segments were evaluated in 28 patients (mean age: 71±9 years). Subjective image quality of QISS-MRA was significantly better compared to CO2-DSA for all regions [aorto-iliac: 4(4-5) vs 3(3-4); femoro-popliteal: 4(4-5) vs 4(3-4); tibio-peroneal: 4(3-5) vs 3(2-3), all regions: 4(4-5) vs 3(3-4), p<0.001]. QISS-MRA out-performed CO2-DSA regarding interpretability (98.3% vs 86.2%, p<0.001). Diagnostic accuracy parameters of QISS-MRA for >70% luminal stenosis as compared to CO2-DSA: sensitivity 77.8%, specificity 95.2%, positive predictive value 83.2%, negative predictive value 93.3%. ICC regarding the degree of stenosis: QISS-MRA: 0.97; CO2-DSA: 0.82. Intraobserver variability for each investigator: CO2-DSA: 0.88, 0.93; QISS-MRA: 0.86, 0.91.

Conclusion: QISS-MRA had a better diagnostic value than CO2-DSA in subjective assessment of image quality in all regions studied, proved to be an excellent reproducible method for the assessment of LEAD.

Limitations: Single-centre study with a relatively small number of patients.

Ethics committee approval: Approved by the National Institute of Pharmacy and Nutrition (OGYEI/7984/2020).

Funding for this study: No funding was received for this study.

RPS 2115-8 - Diagnostic value of standardised MR angiography protocol in the evaluation of thoracic outlet syndrome (8 min)

Maria Ragusi; Monza / Italy

Author Block: M. Ragusi¹, C. Talei Franzesi¹, C. Maino¹, D. G. Gandola¹, T. P. Giandola¹, D. Ippolito¹, S. Sironi²; ¹Monza/IT, ²Bergamo/IT

Purpose or Learning Objective: To evaluate the diagnostic performance of a standardised MR angiography (MRA) protocol in the study of thoracic outlet syndrome (TOS).

Methods or Background: A total of 20 patients who underwent MRA study to investigate vascular TOS were retrospectively enrolled. Protocol sequences include Balanced Fast Field Echo M2D, Turbo Spin Echo T1 weighted, high-resolution TSE T1 weighted, HR TSE DIXON T2 weighted, contrast-enhanced MRA (CE- MRA), pre- and post-contrast T1-weighted high-resolution isotropic volume examination. Baseline sequences were performed with the arms in adduction, CE-MRA sequences were performed both with arms in adduction and abduction, with an injection of contrast media repeated for each arms' position.

Results or Findings: Sixteen patients showed unilateral TOS (n=16, 80%), with the left side more frequently involved (n=10, 64.5%) than the right one (n=6, 45.5%). Thirteen patients showed venous compression (vTOS) (65%), 3 patients arterial TOS (aTOS) (15%), only in one case an overlap between vTOS-aTOS (5%) was reported. Eight patients showed compression with the arm in abduction (50%), 8 with the arm both in adduction and abduction (50%). In 5 cases TOS was caused by an osseus abnormalities both post-traumatic or post-surgical. In 6 patients (30%) vTOS was associated with thrombosis. Twenty per cent of TOS were caused by muscle hypertrophy or wrong insertion. Five out of sixteen cases involved the scalene triangle (31%), 8/16 the costoclavicular space (50%) and 3/16 patients the subacromial-pectoralis space (19%). In 4/20 patients vascular TOS was not identified (20%).

Conclusion: A standardised MRI protocol with CE-MRA sequence with arms in adduction and abduction allows identifying the presence of vascular TOS, along with the identification of the intrinsic and extrinsic abnormalities causing pathology.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.



RC 2110 - Joint instability

Categories: General Radiology, Imaging Methods, Musculoskeletal

ETC Level: LEVEL II+III

Date: March 5, 2022 | 16:00 - 17:00 CET

CME Credits: 1

Moderator:

Maryam Shahabpour; Brussel / Belgium

RC 2110-1 - Chairperson's introduction (5 min)

Maryam Shahabpour; Brussels / Belgium

RC 2110-2 - Shoulder instability (15 min)

Simone Waldt; Essen / Germany

1. To describe the morphological and epidemiological aspects of shoulder instability.
2. To explain new trends in the imaging of shoulder instability.

RC 2110-3 - Elbow instability (15 min)

Reto Sutter; Zurich / Switzerland

1. To describe the imaging features of acute elbow dislocations.
2. To explain the imaging hallmarks of chronic elbow instability.

RC 2110-4 - Ankle instability, impingement, and imaging treatment (15 min)

Richard Fawcett; Leeds / UK

1. To explain the risk imaging findings of the unstable ankle.
2. To describe the treatment options for the unstable ankle.

RC 2110-5 - Panel discussion: The use of an imaging algorithm in case of clinical suspicion of joint instability (10 min)



RC 2107 - Imaging in male pelvic trauma

Categories: Abdominal Viscera, Emergency Imaging, General Radiology, Genitourinary, Imaging Methods

ETC Level: LEVEL II

Date: March 5, 2022 | 16:00 - 17:00 CET

CME Credits: 1

Moderator:

Jane Belfield; Liverpool / United Kingdom

RC 2107-1 - Chairperson's introduction (5 min)

Jane Belfield; Liverpool / UK

RC 2107-2 - Bladder trauma (15 min)

Alexandra Platon; Geneva / Switzerland

1. To list the classification and the imaging features of bladder injuries.
2. To describe the imaging signs of extra- and intra-peritoneal bladder rupture.
3. To consider the most appropriate CT technique for the diagnosis of bladder injuries.

RC 2107-3 - Scrotal trauma (15 min)

Subramaniyan Ramanathan; Doha / Qatar

1. To understand the role of various imaging modalities in scrotal trauma.
2. To illustrate the imaging appearances of the spectrum of intratesticular and extra testicular injuries.
3. To review the current guidelines from different societies.
4. To highlight the position statements prepared by ESUR-SPIWG.

RC 2107-4 - Penile trauma (15 min)

Michele Bertolotto; Trieste / Italy

1. To learn how to perform an US and MRI investigation in patients with penile traumas.
2. To identify different penile injuries using US and MRI.
3. To learn how to distinguish between injuries requiring a different approach.

RC 2107-5 - Panel discussion: What is the current role of conventional imaging in GU trauma? (10 min)



TS 21 - Radiologists and radiographers: communicating with patients

Categories: Multidisciplinary, Professional Issues, Radiographers

Date: March 5, 2022 | 16:00 - 17:00 CET

CME Credits: 1

Moderators:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

Michael Fuchsjäger; Graz / Austria

Jonathan McNulty; Dublin / Ireland

- Part 1: The radiologist-patient relationship (30 min)

TS 21-4 - Introduction (2 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

TS 21-5 - The important role of a radiologist in the communication with patients (10 min)

Erik Briers; Hasselt / Belgium

TS 21-6 - Panel discussion: Radiology in 2030: how will we need to practice adding value to the patient? (18 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

Erik Briers; Hasselt / Belgium

Lorenzo E. Derchi; Genoa / Italy

- Part 2: The radiographer-patient relationship (30 min)

TS 21-8 - Introduction (1 min)

Jonathan McNulty; Dublin / Ireland

TS 21-9 - A holistic approach to patient care: the patient's perspective (7 min)

Evelyn Steinhöfer; Vienna / Austria

TS 21-10 - A holistic approach to patient care: the radiographer's perspective (7 min)

Michaela Davis; Dublin / Ireland

TS 21-11 - Panel discussion: Are there sufficient radiographer-focused continuing professional development opportunities related to enhancing communication skills? (10 min)

Erik Briers; Hasselt / Belgium

Michaela Davis; Dublin / Ireland

Lorenzo E. Derchi; Genoa / Italy

TS 21-12 - Wrap-up (5 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

OT 4 - Outlook for Tomorrow

Date: March 5, 2022 | 17:15 - 17:45 CET

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

- Outlook for Tomorrow (30 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

RPS 2210 - Arthritis, inflammation, and sarcopenia

Categories: EuroSafe Imaging / Radiation Protection, General Radiology, Imaging Methods, Musculoskeletal

Date: March 6, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderator:

Lorenzo E. Derchi; Genoa / Italy

RPS 2210-2 - Value of contrast administration in patients with rheumatoid arthritis receiving a 3T MRI scan of the finger joints (8 min)

Miriam Frenken; Düsseldorf / Germany

Author Block: M. Frenken, D. B. B. Abrar, A. Mewes, L. M. Wilms; Düsseldorf/DE

Purpose or Learning Objective: Rheumatoid arthritis (RA) is the most common inflammatory joint disease worldwide and leads to the destruction of bone and cartilage. This prospective study helps to evaluate the value of gadolinium-containing contrast agent application in magnetic resonance imaging (MRI) of the finger joints in patients with RA using the rheumatoid arthritis MRI score (RAMRIS) and its predictive value on treatment response and remission.

Methods or Background: 31 therapy-naïve patients with RA underwent pre-therapeutic MRI (t0) of finger joints and follow-up MRI at 3 (t1) and 6 months (t2) after therapy initiation. CRP was measured to determine treatment response and remission. All MRI examinations were evaluated according to RAMRIS for metacarpophalangeal joints. Synovitis as part of the RAMRIS was evaluated after contrast application as standard and additionally with a STIR sequence instead. The extent to which RAMRIS of finger joints is a predictor of treatment response or remission was investigated for both MRI protocols, with and without contrast administration. Differences were validated by Mann-Whitney-U test.

Results or Findings: As expected, standard RAMRIS with contrast administration was a good predictor for treatment response and remission at t0 and t1 (response/non-response: t0: $p=0.0014$, t1: $p=0.016$, remission/non-remission: t0: $p=0.092$, t1: $p=0.0037$). The pre-therapeutic and the 3 months after therapy STIR-based RAMRIS also showed differences between responders/non-responders and remission and non-remission (response: t0: $p=0.001$, t1: $p=0.01$, remission: t0: $p=0.087$, t1: $p=0.0023$). Neither score showed significant differences between responders/non-responders or remission/non-remission at t2.

Conclusion: In terms of predictive value for treatment response and remission, RAMRIS of finger joints with and without contrast administration showed similar diagnostic accuracy. The results indicate that native STIR sequences may replace contrast administration in RA imaging.

Limitations: Other RA-predilection sites besides the hand could be examined.

Ethics committee approval: The ethics committee approval was obtained by HHU-Düsseldorf.

Funding for this study: Not applicable.

RPS 2210-3 - 50 shades of backfill: new bone formation in axial spondyloarthritis (8 min)

Torsten Diekhoff; Berlin / Germany



Author Block: T. Diekhoff, C. Niedermeyer, D. Poddubnyy, K-G. G. Hermann; Berlin/DE

Purpose or Learning Objective: Several MRI findings of the sacroiliac joint (SIJ) space in axial spondyloarthritis (axSpA) were previously described such as inflammation or fatty metaplasia inside an erosion, i.e. "backfill". This study aims to link the aforementioned changes to CT and to understand, which findings represent new bone formation.

Methods or Background: Out of 178 patients from two prospective studies that included CT and MRI of the SIJs, all patients with the axSpA were selected. MRI was screened by two senior musculoskeletal radiologists in consensus for joint-space related findings and in three categories, Type A: hyperintense in STIR and hypointense in T1 (inflammation inside erosion), Type B: hyperintense in both sequences and Type C: hypointense in STIR and hyperintense in T1 (backfill). By using image fusion techniques and one-by-one comparison, the Hounsfield Units (HU) of those lesions, normal cartilage and spongy and cortical bone were measured in CT.

Results or Findings: Ninety-nine axSpA were identified, and 48 Type A, 88 Type B and 84 Type C lesions were included. The HU values of cartilage were 73.6 ± 15.0 , spongiosa 188.0 ± 69.9 , cartilage 1086.0 ± 100.3 , Type A 341.2 ± 96.7 , Type B 359.3 ± 153.5 and Type C 446.8 ± 123.0 , respectively. The lesion values were significantly higher than cartilage and spongiosa but lower than cortical bone ($p < 0.001$). Type A and B showed similar HU ($p = 0.93$), whereas Type C lesions were less dense ($p < 0.001$).

Conclusion: All joint space lesions (Type A to C) showed a calcified matrix and, thus, resemble new bone formation with gradually higher values in Type C lesions, i.e. typical backfill. Therefore, the nomenclature of those lesions should be critically re-assessed.

Limitations: Image fusion between MRI and CT scans was done manually by landmarks. Up to four lesions per patient were measured.

Ethics committee approval: This study was approved by the ethics committee (EA1/086/16, EA1/073/10), and written informed consent was obtained from patients.

Funding for this study: Not applicable.

RPS 2210-4 - The use of dual-energy CT to quantitatively assess osteomyelitis in patients with diabetic foot ulcers (8 min)

Marieke Mens; Amsterdam / Netherlands

Author Block: M. Mens, A. de Geus, R. Wellenberg, G. Streekstra, T. Busch-Westbroek, S. Bus, M. Nieuwdorp, M. Maas; Amsterdam/NL

Purpose or Learning Objective: The purpose of this study was to evaluate if dual-energy CT (DECT) can be used to quantitatively assess osteomyelitis in patients with diabetic foot ulcers.

Methods or Background: All patients with a diabetic foot ulcer and suspected osteomyelitis that underwent a DECT-scan (dual-source 80kVp and Sn150kVp) between January 2018 and January 2021 were retrospectively included. Two observers independently measured CT-values in Hounsfield Units (HU) of the bone adjacent to the ulcer and of a reference bone, either the same location on the contralateral foot or, if unavailable, the talus in virtual non-calcium images. Subjects were divided into two groups, "osteomyelitis" or "no-osteomyelitis", based on the conventional CT report. CT-values were compared between groups and between affected and reference bone within both groups. Observer agreement was tested using an intraclass correlation coefficient (ICC).

Results or Findings: Fifty-seven foot ulcers were identified of which twenty-four were suspected for osteomyelitis based on the radiology report. The mean CT-value at the suspected location in the osteomyelitis group was -16.55 HU (SD 34.35) and -67.71 HU (SD 51.62) in the no-osteomyelitis group. This difference was statistically significant ($p < 0.001$). In the osteomyelitis group, the difference between affected bone and reference bone was statistically significant ($p < 0.001$); this was not the case in the no-osteomyelitis group ($p = 0.51$). The observer agreement was good for affected bone measurements (ICC=0.840) and moderate for reference bone measurements (ICC=0.584).

Conclusion: Dual-energy CT seems a promising diagnostic tool for the quantitative assessment of osteomyelitis in patients with diabetic foot ulcers.

Limitations: The main limitation is the absence of comparison with MRI since this is considered the gold standard.

Ethics committee approval: Ethical approval was waived by the medical ethical committee of our institute (W21_401#21.446).

Funding for this study: No funding was received for this study.

RPS 2210-5 - Evaluation of bone marrow oedema using spectral photon-counting CT (8 min)

Krishna Chapagain; Christchurch / New Zealand

Author Block: K. M. Chapagain, M. Rajeswari Amma, J. Clarke, C. Lowe, T. E. Kirkbride, S. Dahal, S. Gieseg, P. Butler, A. Butler; Christchurch/NZ

Purpose or Learning Objective: The purpose of this study was to evaluate water and lipid component measurement from spectral photon-counting CT for the detection of bone marrow oedema in acute bone injury.

Methods or Background: Patients with acute bone injury were imaged using high-resolution spectral photon-counting CT in the early phase of injury. Physical phantoms were developed to mimic bone marrow and validate water and lipid measurements. The phantoms contained a two-material mixture (water gel, peanut oil) and a three material mixture (water gel, oil and hydroxyapatite nanopowder). Lipid and water maps were generated by harnessing the spectral information contained in the photon-counting CT images. For both phantoms and human images, regions of interest (ROIs) were drawn in the target areas and reference areas to quantitatively measure the water and lipid concentrations. The estimated values from the photon-counting CT were compared with reference values using linearity plots, and the agreement between reference and estimated values were analysed with Bland-Altman plots.

Results or Findings: Estimated water and lipid mass density values had a linear correlation with reference values (linearity=0.98, 0.99) The measurements were not significantly different from reference values ($p=0.63, 0.91$) with average quantification errors (Bias) (-1.9% and -0.4%), upper limit of agreement (11.5%, 8.7%), and lower limit of agreement (-14.7%, -7.9%) for water and lipid component estimation respectively. Similar to phantom results, the targeted regions in human images showed an increase in water mass density.

Conclusion: Lipid and water components measured from the system are validated using phantom measurements to demonstrate the bone marrow oedema in patients with an acute injury.

Limitations: Comparisons with MRI is not done at this stage, which will be performed in the next phase.

Ethics committee approval: The ethics committee approval was received (18/STH/221).

Funding for this study: This study is funded by MBIE, New Zealand.

RPS 2210-6 - The diagnostic accuracy of AI for ruling out C-spine fractures: are we there yet? (8 min)

Gaby van den Wittenboer; Zwolle / Netherlands

Author Block: G. van den Wittenboer¹, A. de Wit¹, E. Langius-Wiffen¹, B. van der Kolk¹, I. M. Nijholt¹, R. van Dijk¹, M. Podlogar¹, M. Maas², M. F. Boomsma²; ¹Zwolle/NL, ²Amsterdam/NL

Purpose or Learning Objective: To assess the diagnostic accuracy of a cervical spine (C-spine) artificial intelligence (AI) application (Aidoc Medical, Tel Aviv, Israel) for identifying C-spine fractures on CT scans.

Methods or Background: A retrospective diagnostic accuracy study was performed in a level one trauma centre. Consecutive trauma patients (age ≥ 18 years; 2007-2014) were screened with CT for C-spine fractures. To set the reference standard, one radiologist and three neurosurgeons verified scans considered positive by the radiologist on-call and two radiologists verified negative scans that were flagged positively by the AI application. The index test was defined as detection of ≥ 1 fracture(s) per scan by the FDA approved and CE marked AI application. The proportion of patients with missed fractures that received stabilising therapy was determined to highlight therapeutic consequences of missed fractures.

Results or Findings: The AI application analysed 2331 patients. After verification, the on-call radiologist's report was adjusted for 25 patients initially considered negative and flagged positive by the AI (1.2% of all negative scans), increasing the total number of fractures by 13%. The AI application detected 159/211 patients with fractures, resulting in a sensitivity of 75% (95% confidence interval (CI) 69-81%). 16/52 (31%) patients with fractures missed by the AI had received stabilising therapy. Specificity of the AI application was 99% (95% CI 98-99%), overall diagnostic accuracy 97% (95% CI 96-97%), positive predictive value 86% (95% CI 81-90%) and negative predictive value 98% (95% CI 97-98%).

Conclusion: The moderate sensitivity of the AI and the high-miss rate of injuries that received stabilising therapy makes a stand-alone application for screening purposes less expedient, however, as a concurrent reader, AI could aid the radiologist by detecting previously unnoticed fractures, thus increasing the diagnostic yield.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 2211 - Neuroimaging in various diseases

Categories: Imaging Methods, Neuro

Date: March 6, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderator:

Julia Fruehwald-Pallamar; St. Pölten / Austria

RPS 2211-2 - Evidence of nerve hypertrophy in patients with inclusion body myositis on lower limb MRI (8 min)

Mostafa Elmansy; Mansoura / Egypt

Author Block: M. Elmansy¹, J. M. Morrow¹, S. Shah¹, S. Wastling¹, S. Saleh El-Essawy², E. Helmy², M. G Hanna¹, J. S. Thornton¹, T. A. Yousry¹; ¹London/UK, ²Mansoura/EG

Purpose or Learning Objective: To quantify the cross-sectional area (CSA) of the sciatic and tibial nerves in patients with IBM compared with Charcot-Marie-Tooth disease type IA (CMT1A) and healthy controls using MRI and correlate these nerve measurements with the clinical data and disease scores.

Methods or Background: MRI of the sciatic and tibial nerves was performed at 3T using magnetisation-prepared rapid gradient-echo sequence (MPRAGE) and 2D Dixon. The nerve CSA was measured at the mid-thigh and upper-calf regions by an observer blinded to the diagnosis. The measurements were correlated with clinical parameters.

Results or Findings: 20 patients with IBM, 20 CMT1A patients and 29 healthy controls (age and sex-matched) were studied. Sciatic nerve CSA was significantly enlarged in patients with IBM and CMT1A compared to controls (sciatic nerve mean CSA 62.3±22.9mm (IBM) vs 35.5±9.9mm (controls), p=0.001; and 97.6±35.5 (CMT1A) vs 35.5±9.9mm (controls); p=0.001. Similarly, tibial nerve CSA was also enlarged in IBM and CMT1 patients compared to controls. There was no significant correlation between CSA nerve measurements in patients with IBM and clinical disease scores. However, in CMT1A patients, sciatic nerve CSA correlated positively with age r=0.53-0.65 (p≤0.02) as well as the duration of disease r=0.56-0.61 (p≤0.01).

Conclusion: MRI reveals significant hypertrophy of the sciatic and tibial nerves in patients with IBM and CMT1A compared to controls. This study is the first study to demonstrate and quantify nerve hypertrophy in IBM patients using MRI. Further studies are needed to validate this feature, correlate with neurophysiological evaluation, and assess its diagnostic value.

Limitations: No gross limitations.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 2211-3 - Detection of regional white-matter cingulum alterations in breast cancer patients (8 min)

Ana Verde; Lisboa / Portugal

Author Block: A. S. C. Verde, J. Ruivo, B. Sousa, A. Oliveira-Maia, F. Cardoso, N. Papanikolaou; Lisbon/PT

Purpose or Learning Objective: Volumetry studies have shown that breast cancer patients undergoing treatment present reduced volumes in the bilateral thalamus, putamen, frontal and temporal lobes, compared with healthy controls (HC). Since cingulum fibers are interconnecting some of these structures, our aim was to identify local fractional anisotropy (FA) changes in patients which may explain the cancer-related cognitive impairment.

Methods or Background: Brain MRI examinations of 32 non-metastatic breast cancer patients - 17 endocrine-treated (ET) and 15 chemotherapy-treated (CT) - were prospectively acquired on a 3T scanner at two timepoints, namely, before (t0) and 6 months after treatment (t1). Additionally, 19 age-matched female HC, from two OpenNeuro datasets, were included in the analysis. A b-value of 1000 s/mm² and 64 or 128 diffusion encoding directions were used as acquisition parameters for the DTI sequence. For regional-tract analysis, local differences in FA for the bilateral cingulum were quantified between groups by adapting an available MATLAB code.

Results or Findings: Visual analysis of fiber tracking results has depicted local changes in FA, which motivated the cingulum regional analysis. Overall, it was found a bilateral cingulum anisotropy reduction in patients compared with HC, both at t0 and t1. Particularly, there was a point-group interaction, statistically significant after multiple comparisons correction, with patients showing lower FA in the middle of the cingulum compared with HC. No significant differences were found between ET and CT patients.

Conclusion: White-matter integrity loss for the bilateral cingulum in breast cancer patients was shown. This tract belongs to a limbic circuit involved in memory and emotions, which may be associated with symptoms reported by patients.

Limitations: Use of external HC datasets.

Ethics committee approval: MRI acquisitions approved by the local ethics committee.

Funding for this study: BOUNCE project funded by the EU Horizon 2020 research and innovation programme.



RPS 2211-4 - Effects of hypertension on subcortical nucleus morphological alterations in patients with type 2 diabetes
(8 min)

Yi Lu; Kunming / China

Author Block: Y. Lu, L. Shi, Y. Zeng, T. Qi, H. Gu, X. Xiaojie, D. Han; Kunming/CN

Purpose or Learning Objective: As the high comorbidity of Type 2 diabetes mellitus (T2DM), hypertension (HTN) was related with cognitive decline, cerebral atrophy and white matter abnormalities in humans. But the effects of HTN on brain function in T2DM patients are not well understood. Present study was performed to investigate whether HTN might accelerate the subcortical nucleus morphological alterations in T2DM patients.

Methods or Background: We enrolled 36 participants with only T2DM, 28 T2DM patients with HTN (HT2DM) and 30 healthy controls (HCs). The volumetric and shape changes of the subcortical GM structures were assessed for each participant. Then partial correlations between the morphological alterations of subcortical nucleus, neuropsychological scale scores and standard laboratory testing data were also analysed.

Results or Findings: Compared to HCs and T2DM patients, HT2DM patients had significant volume reductions in the right thalamus ($p < 0.05$). Meanwhile, the vertex-based shape analysis showed regionally contracted areas on the anterolateral and ventral aspects of the right thalamus in HT2DM patients (FWE-corrected, $p < 0.05$). Furthermore, the shape decreasing in the anterolateral aspect of right thalamus was negatively correlated with the levels of serum total cholesterol (TC).

Conclusion: The current study revealed that coexistent HTN may accelerate the subcortical nucleus morphological alterations in T2DM patients.

Limitations: Some limitations of our study should be noted. First, this was a cross-sectional clinical study with a relatively small sample size. Second, the current study did not recruit patients with HTN alone. Additionally, this study used the MMSE and DDST, which are simple screening scales used to identify cognition function.

Ethics committee approval: Ethical approval No. NCT03564431

Funding for this study: Yunnan Applied Basic Research Projects-Union Foundation (grant numbers 2018FE001(-209)

RPS 2211-5 - A quantitative imaging study of amide proton transfer weighted in diabetes-associated cognitive dysfunction in type 2 diabetes mellitus rat (8 min)

Wei Shao; Kunming / China

Author Block: W. J. Shao, S. Xiang, J. Fang, W. Su, Y. Yang, Y. Xiong, J. Li; Kunming/CN

Purpose or Learning Objective: To evaluate the feasibility of amide proton transfer weighted (APT_w) in reflecting the pathological changes of brain tissue, cognitive impairment in T2DM rat.

Methods or Background: 48 Sprague-Dawley male rats were divided into control and T2DM groups. Cognitive function was assessed using the Morris water maze experiment. The APT_w signal intensity (SI)(%) was measured by APT_w. Tau expression was determined using immunofluorescence and immunohistochemistry. Pearson and Spearman correlation analysis were used to study the relationship between hippocampal APT_w SI (%), tau protein expression and cognitive function.

Results or Findings: The escape latency time significantly reduced in the T2DM group. The APT_w SI(%) in bilateral hippocampus in T2DM group was significantly higher than that in NC group ($P < 0.05$). Compared with control group, the expression of t-Tau and p-Tau ser199 increased in T2DM group ($P < 0.05$). The expression of t-Tau protein was positively correlated with escape latency time ($\rho = 0.425$, $P = 0.0486$). There was a positive correlation between APT_w SI(%) and t-Tau protein expression. APT_w SI (%) is negatively correlated with platform crossings times.

Conclusion: T2DM may result in increase the expression of t-Tau and p-Tau ser199 protein in hippocampus. The increase of t-Tau protein may be the cause of DACD. MRI APT_w technology can be used as an imaging biomarker for the pathological changes of brain parenchyma and cognitive function in T2DM.

Limitations: This study only focuses on amide proton concentration and does not make an in-depth study on pH

Ethics committee approval: All animal experiments conformed to the internationally accepted principles for the care and use of laboratory animals (Kunming Medical University Institutional Review Board, Approval No. kmmu 2020410).

Funding for this study: The Endocrine Clinical Medical Center of Yunnan Province, No. ZX20190202

RPS 2211-6 - A novel application of neurite orientation dispersion and density imaging (NODDI) to differentiate cognitively recovered vs non-recovered in mild traumatic brain injury (mTBI) (8 min)

Norlisah Mohd Ramli; Kuala Lumpur / Malaysia

Author Block: P. Swaminathan, N. Hamzah, N. Mohd Ramli, V. Narayanan, T. Li Kuo, K. Rahmat; Kuala Lumpur/MY

Purpose or Learning Objective: DTI can detect changes of microstructural brain damage in mTBI, however subtle changes in recovery process remains a challenge. NODDI measures orientation dispersion index (ODI), neurite density index (NDI) and isotropic volume fraction (ISOVF) which may elucidate the process in mTBI recovery.

Methods or Background: 56 mTBI and 19 healthy controls (HC) were recruited. Neuropsychological assessment battery screening module (S-NAB) performance were assessed 2 weeks post-trauma and at 3 months. The mTBI group was then divided into recovered (REC; S-NAB \geq 85) and non-recovered (NREC; S-NAB <85), whereby domains affected were mainly attention and language. DTI and NODDI were done at 3 months. Using tract-based spatial statistics (TBSS), DTI and NODDI parameters were obtained for 50 white matter tracts (WMTs). Data was analysed using SPSS.

Results or Findings: NODDI demonstrated significant changes ($p < 0.050$) in multiple WMTs. Significantly lower NDI was demonstrated in REC (0.4260, 0.4034) vs NREC (0.4540, 0.4389) in both cingulate gyri suggestive of ongoing reparative process in the still-recovering NREC WMTs. Significantly higher ISOVF was seen in REC (0.0716, 0.1349) than NREC (0.0526, 0.0983) in the right external capsule and left fornix/stria terminalis, which may represent increased CSF surrounding healed WMTs. No significant difference between REC and NREC was found in DTI.

Conclusion: NODDI detected more microstructural WMT changes than DTI at 3 months. We postulate that at three months post-mTBI, there is concurrent axonal degeneration and astrogliosis following trauma, which was more abundant in the NREC group. The significantly affected WMTs are comparable to tracts seen in previous studies on mTBI.

Limitations: Significant number of participants whom defaulted.

Ethics committee approval: Medical Research Ethics Committee of the University of Malaya Medical Centre (MREC No. 2018315-6133).

Funding for this study: Malaysian Ministry of Science, Technology and Innovation (MOSTI) Flagship Program Project No. FP0911F001

RPS 2211-7 - Role of hippocampal volumetry and T2 relaxometry in mesial temporal lobe epilepsy (8 min)

Niharika Sharma; Gwalior / India

Author Block: N. Sharma; Gwalior/IN

Purpose or Learning Objective: Aim of our study was to evaluate the role of hippocampal volumetry and T2 Relaxometry in MTLE and compare the relative value of visual assessment, hippocampal volumetry, and T2 relaxometry individually and in combinations.

Methods or Background: This was one-year tertiary care teaching hospital-based case-control study. MRI analysis was done in 40 non-epileptic controls and 40 patients with intractable epilepsy on 1.5T scanner. Visual assessment and hippocampal volumetry were done on oblique coronal IR/T2W and oblique coronal FLAIR images, respectively. T2 relaxation times were measured using 16-echo Carr-Purcell-Meiboom-Gill sequence. All cases were correlated with EEG findings for lateralisation of the epileptic focus.

Results or Findings: The study showed that the highest percentage of MTLE cases were seen in patients with seizures onset in a group of 11-20 years of age and no sex predilection was noted (M:F= 1.5:1). Mean right and left hippocampal volume of 2.19 cm³ and 2.10 cm³ (P-value of <0.001) were found in the cases of study, which was decreased compared to control. T2 relaxation time was increased in MTLE cases (P-value of <0.001). Two other parameters hippocampal volume ratio (HVR) and hippocampal volume difference (HVD) were included in study to detect unilateral cases of mesial temporal sclerosis.

Conclusion: There was an increase in the sensitivity of detection of mesial temporal sclerosis in epilepsy patients on including quantitative methods like T2 relaxometry and hippocampal volumetry with conventional MRI. Use of quantitative methods leads to early diagnosis and helps treatment.

Limitations: Manual error

Ethics committee approval: I have taken approval from Member Secretary, Institutional ethics committee, Assam Medical College, Dibrugarh dated 21/09/2019. (I am unable to attach the same approval as there is no such option available for attachment)

Funding for this study: No funding is given for our study.

RPS 2211-8 - Anatomic study of the medial calcaneal nerve using ultrasonography (8 min)

Cécile Deniel; Plan-De-Cuques / France



Author Block: C. Deniel, T. Le Corroller, D. Guenoun, P. Champsaur; Marseille/FR

Purpose or Learning Objective: To evaluate the possibility and accuracy of the medial calcaneal nerve assessment using ultrasound examination. Secondary objective was to define anatomical landmarks to facilitate the medial calcaneal nerve study for non musculoskeletal specialised radiologists.

Methods or Background: This study was first undertaken in eight cadaveric specimens then followed by high resolution ultrasonographic examination of 20 healthy volunteers (40 legs) by a fellow musculoskeletal radiologist. The location and course of the medial calcaneal nerve was depicted, as well as its relationship to the adjacent anatomic structures.

Results or Findings: High resolution ultrasonography permitted effective study of the medial calcaneal nerve throughout its course. The medial calcaneal nerve mainly branches from the tibial nerve. The level at which it branches is highly variable with a mean distance from the medial malleolus tip of 14.1mm (range -7 75). More distally, at the level of the medial calcaneal side, it ends close to the abductor hallucis muscle with a mean distance of 1.28mm (range 0 2.8).

Conclusion: The medial calcaneal nerve study is achievable using high resolution ultrasonography. The definition of easy to use anatomical landmarks allows physicians to routinely explore the MCN as a differential diagnosis for heel pain.

Limitations: Only a short number of cadavers were included. We did not analyse intra- or inter-observer differences.

Ethics committee approval: All healthy volunteers gave their written consent.

Funding for this study: No funds were received for this study

RPS 2204 - New techniques for pulmonary imaging

Categories: Artificial Intelligence & Machine Learning, Chest, Hybrid Imaging, Imaging Methods, Physics in Medical Imaging

Date: March 6, 2022 | 08:00 - 09:00 CET

CME Credits: 1

Moderator:

Matthias Eberhard; Unterseen / Switzerland

RPS 2204-2 - X-ray dark-field computed tomography allows for the detection of radiation-induced lung damage in early stages (8 min)

Florian Gassert; Munich / Germany

Author Block: F. T. Gassert, R. Burkhardt, T. Gora, D. Pfeiffer, A. Fingerle, A. Sauter, M. Makowski, J. Wilkens, F. Pfeiffer; Munich/DE

Purpose or Learning Objective: The aim of this study was to show the benefit of dark-field CT imaging for the detection of radiation-induced lung damage in early stages.

Methods or Background: We compared attenuation based CT imaging to dark-field (DF) CT imaging in a murine model of radiation-induced lung damage in the right lung (n=6) and a control group (n=6). Animals were scanned before irradiation and 12 weeks, 16 weeks, 20 weeks and 24 weeks thereafter. Three radiologists assessed the images twice for the presence of lung damage and rated their confidence on a scale from 1 to 5. The inter-rater- and intra-rater-reliability was determined and rated with Cohen's κ respectively Fleiss' κ . For the quantitative analysis the ratio of the mean pixel value of the right and left lung ($\kappa = m_{\text{right}}/m_{\text{left}}$) was calculated. Results of the irradiated group were compared with the respective control group by using a t-test.

Results or Findings: The sensitivity of DF CT for radiation-induced lung damage in the reader study was significantly higher at 12 weeks (Att: 36.7%, DF: 53.3%, $p=0.023$) and at 16 weeks (Att: 50.0%, DF: 91.7%, $p<0.001$). The overall confidence of the readers was significantly higher when reading DF images (Att: 3.48, DF: 4.77, $p<0.001$). Both the average intra-rater-reliability (Att: $\kappa=0.82$, DF: $\kappa=0.91$) and the inter-rater-reliability (Att: $\kappa=0.66$, DF: $\kappa=0.75$) were higher for DF imaging. For attenuation based imaging the difference of the ratio (κ) between the control group and the irradiated group became significant after 20 weeks ($p=0.011$), while for DF imaging it was already highly significant after 16 weeks ($p=0.003$).

Conclusion: This small animal study demonstrates that dark-field CT imaging allows for the detection of radiation-induced lung damage in early stages and, in that respect, is superior to conventional CT.

Limitations: This study is limited by its small cohort only.

Ethics committee approval: The ethics committee approval was obtained.

Funding for this study: Not applicable.

RPS 2204-3 - Exploring the effect of matrix size on measurement of pulmonary nodules and chest image quality: a phantom study (8 min)

Xu Wang; Dalian / China

Author Block: J. Y. Liu, X. Wang; Dalian/CN

Purpose or Learning Objective: To evaluate the effect of different matrixes on the accuracy of lung nodule volume measurement and the effect on the image quality of the chest.

Methods or Background: 15 artificial spherical nodules of different sizes (3mm, 5mm, 8mm, 10mm) and different densities (630HU, 800HU, + 100HU) were randomly placed in PH-1 simulative chest phantom. Phantom was scanned by UCT760. Three kinds of matrixes (512,768,1024) were used to reconstruct the original scanned data. A computer-aided diagnosis software (CAD) was used to analyse the spherical nodules placed in the phantom. The absolute error rate (APE) of the length and diameter error sum, roundness and volume measurement were calculated. The CT and SD values of the apex of the lung, the largest slice of thorax, the homogeneous region of lung bottom, the carina of the trachea, the descending aorta and the heart were measured. The different matrixes were evaluated by two observers on a 5-point scale.

Results or Findings: The size of nodules affected APE, and the smaller the nodules, the greater the influence. There were statistically significant differences in the sum of length and diameter errors, roundness and APE between groups A and C, which decreased with the increase of the matrix. There was no significant difference in CT value between groups A and C. SD value increased with the increase of matrix, and the difference was statistically significant ($P < 0.001$). Group C had the highest subjective score (4.78 ± 0.44) and the highest noise score (4.56 ± 0.53), which could meet the diagnosis.

Conclusion: The measurement accuracy of the large matrix for small pulmonary nodules is high, and the fine structure of the lung is better displayed, which is helpful for accurate diagnosis of lung lesions.

Limitations: None.

Ethics committee approval: None.

Funding for this study: No funding was received for this study.

RPS 2204-4 - Feasibility of human lung imaging with a large field-of-view spectral photon-counting CT system (8 min)

Salim Si-Mohamed; Lyon / France

Author Block: S. A. Si-Mohamed¹, S. Boccacini¹, P-A. Rodesch¹, R. A. K. Dessouky², P. Coulon³, E. Lahoud⁴, M. Villien¹, L. Bousset¹, P. Douek¹; ¹Lyon/FR, ²Zagazig/EG, ³Dourdan/FR, ⁴Haifa/IL

Purpose or Learning Objective: To characterise the technical capabilities of a clinical spectral photon-counting CT (SPCCT) and to evaluate its feasibility on a first human volunteer for high-resolution lung imaging.

Methods or Background: Measurement of a modulation transfer function (MTF) and acquisition of a line pairs phantom were performed. An anthropomorphic lung nodules phantom was scanned under standard, low, and ultra-low radiation doses. A human volunteer underwent scans, at 120 kVp standard (62 mAs) and low (11 mAs) dose. High-resolution (HR) images were reconstructed with 1024 matrix, 300mm FOV and 0.25mm slice thickness. Lung structures conspicuity and sharpness, image noise and overall image quality were independently analysed by three radiologists and compared to a previous scan (120kVp, 10mAs).

Results or Findings: 10 % MTF was measured at 22.3lp/cm with a cut-off at 31lp/cm. Up to 28lp/cm were depicted. While mixed and solid nodules were depicted on standard and low dose images with FBP, ultra-low dose imaging necessitated the use of iDose and 1mm slice thickness to allow visualisation of the ground-glass component. In a human volunteer, standard dose SPCCT images were of greater overall image quality and lung structures conspicuity and sharpness than conventional CT images and comparable image noise. Low dose SPCCT images were of greater or similar conspicuity and sharpness of lung structures, of equivalent overall image quality, of lower but acceptable image noise despite a flux reduction of 89%.

Conclusion: An SPCCT prototype demonstrated high-resolution technical capabilities and high image quality on a human volunteer for lung imaging.

Limitations: Exhaustive evaluation of image quality was out of the scope of the present study opening the way for furthermore investigations.

Ethics committee approval: IRB approved the study.

Funding for this study: This study was funded by the European Union Horizon 2020 grant No 668142.

RPS 2204-5 - Virtual non-contrast images in clinical photon-counting detector CT for emphysema quantification: proof of concept (8 min)

Lisa Jungblut; Zürich / Switzerland



Author Block: L. Jungblut, T. D. J. Sartoretti, D. Kronenberg, V. Mergen, A. Euler, H. Alkadhi, T. Frauenfelder, K. Martini; Zurich/CH
Purpose or Learning Objective: The purpose of this study was to evaluate the accuracy of emphysema quantification as performed on post-processed virtual non-contrast images derived from photon-counting detector computed tomography (PCD-CT).
Methods or Background: Sixty-five patients who underwent a three-phase chest CT on a first-generation, clinical dual-source PCD-CT were retrospectively included. Scans were performed in the multi-energy (QuantumPlus) mode at 120kV with a weight-adjusted intravenous contrast agent. Virtual non-contrast images (VNC) were post-processed from the venous as well as from the arterial phase. Images were assessed quantitatively (global noise index (GNI)) and qualitatively by independent readers (overall image quality, emphysema assessment, delineation of small structures). Emphysema quantification (with a threshold of -950 HU) was performed for non-contrast images, contrast-enhanced images (arterial and venous phase) and the post-processed virtual non-contrast images (generated from both; the arterial and the venous phase) by commercially available software. Non-contrast images served as a reference standard for emphysema quantification.
Results or Findings: Virtual non-contrast images post-processed from the arterial phase ($p=0.409$) as well as from the venous phase ($p=0.093$) showed no significant difference in emphysema quantification relative to true non-contrast images while there was a highly significant difference compared for the contrast-enhanced scans (arterial and venous; $p<0.001$). GNI showed no significant difference between the virtual non-contrast image from the arterial and venous phase and the true non-contrast image. The score of subjective assessment was highest for the true non-contrast image ($p<0.001$) while there was no significant difference between both virtual non-contrast reconstructions.
Conclusion: Computer-aided emphysema quantification with PCD-CT is feasible for virtual non-contrast-enhanced images post-processed from the venous as well as the arterial phase.
Limitations: This study has been performed as a single-centre study.
Ethics committee approval: The ethics committee approved this study.
Funding for this study: No funding was received for this study.

RPS 2204-6 - Spectral CT quantification of airway contrast enhancement with virtual monoenergetic reconstructions (8 min)

Arndt Bodenberger; Heidelberg / Germany

Author Block: A. Bodenberger, P. Konietzke, O. Weinheimer, H-U. Kauczor, W. Stiller, T. F. Weber, T. D. Do, M. O. Wielpütz; Heidelberg/DE
Purpose or Learning Objective: Chronic-obstructive airway diseases show progressive remodelling of airway dimensions. Inflammatory activity may be visualised by contrast enhancement in computed tomography (CT) examinations, which has not been systematically studied to date. Spectral CT offers the possibility to study contrast enhancement without the need for multiphase acquisitions.
Methods or Background: 234 lung healthy patients underwent dual-layer spectral CT (Philips iQon) with four retrospective groups: non-enhanced (NE), pulmonary venous (PV), pulmonary arterial (PA) and systemic arterial (SA) standardised contrast phase. Ten virtual monoenergetic series were reconstructed at 40-160 keV. Fully automatic segmentations were carried out using validated in-house software. Attenuation of the airway wall was assessed in Hounsfield Units (HU) for airway generations G2, G3, G4 and combined G5-10. The slope of the spectral attenuation was calculated by $\lambda=(HU_{40keV}-HU_{100keV})/60$.
Results or Findings: Slopes were significantly different for all airway generations between NE ($\lambda_{NE,G5-10}=0.3HU/keV$) vs. contrast-enhanced acquisitions PV ($\lambda_{PV,G5-10}=0.67HU/keV$), PA ($\lambda_{PA,G5-10}=1.83HU/keV$) and SA ($\lambda_{SA,G5-10}=1.97HU/keV$) ($\lambda_{NE,G5-10}-\lambda_{PV,G5-10} p=0.006$; $\lambda_{NE,G5-10}-\lambda_{PA,G5-10} p<0.001$; $\lambda_{NE,G5-10}-\lambda_{SA,G5-10} p<0.001$). Additionally, the slope differs between PV and PA phase ($p_{G5-10}<0.001$) but does not vary between PA and SA phase ($p_{G5-10}>0.999$). Wall thickness (WT) for generation G5-10 did not change significantly between groups at any keV level (40 keV: $WT_{NE}=1.14$ mm, $WT_{PV}=1.22$ mm, $WT_{PA}=1.33$ mm, $WT_{SA}=1.22$ mm, $p=0.054$).
Conclusion: Spectral CT may quantify airway wall attenuation with a single acquisition by determining the slope of spectral enhancement, and may separate arterial and venous enhancement. Further studies are warranted to analyse spectral CT for inflammatory airway diseases.
Limitations: The spectral slope is only assessed in airway-healthy patients.
Ethics committee approval: This retrospective study was approved by the institutional ethics committee (S-924/2019).
Funding for this study: This study was supported by grants from the Bundesministerium für Bildung und Forschung (BMBF) to the German Center for Lung Research (DZL) (82DZL004A, 82DZL004A2).

RPS 2204-7 - Deep learning reconstruction vs hybrid-type and model-based iterative reconstructions: radiation dose reduction of lung density evaluation on ultra-high resolution and area-detector CTs as QIBA study (8 min)

Yoshiharu Ohno; Toyooka / Japan



Author Block: Y. Ohno¹, N. Akino², Y. Ito², H. Kimata², K. Fujii², Y. Fujisawa², K. Murayama¹, Y. Kataoka¹, H. Toyama¹; ¹Toyoake/JIP, ²Otawara/JIP

Purpose or Learning Objective: To compare radiation dose reduction capability of ultra-high resolution CT (UHR-CT) and area-detector CT (ADCT) for lung density evaluation among hybrid-type and model-based iterative reconstruction (IR) and developed deep learning reconstruction (DLR) at Quantitative Imaging Biomarkers Alliance (QIBA) recommended phantom study.

Methods or Background: QIBA recommended phantom was scanned by UHR-CT with normal resolution (NR: 0.5mm×80 rows/896 channels), high resolution (HR: 0.5mm×80 rows/1792 channels) and super-high resolution (SHR: 0.25mm×160 rows/1792 channels) and ADCT (0.5mm×80 rows/896 channels) at 400mA, 230mA, 100mA, 50mA, 20mA and 6mA in five times. Then, all CT data were reconstructed as 0.5mm and 1mm section thicknesses by each reconstruction. Then, CT values of all density forms and CT value within lung density form were determined by ROI measurements five times. Pierson's correlation was analysed between measured CT density and each form density on all CT protocols. To compare the capability for radiation dose reduction on each CT data with ADCT obtained by 400mA and reconstructed with hybrid-type IR (i.e. standard protocol), Δ CT of each protocol was compared with that of the standard protocol by paired t-test.

Results or Findings: There was a significant and excellent correlation with standard reference on each protocol (0.990.05).

Conclusion: For lung density assessment, hybrid-type and model-based IR, as well as DLR on UHR-CT and ADCT, can reduce 95% radiation dose with keeping accuracy as compared with standard CT protocol and QIBA profile.

Limitations: Not applicable.

Ethics committee approval: This study was a phantom study and no need for IRB approval.

Funding for this study: This study was financially and technically supported by Canon Medical Systems Corporation.

RPS 2204-8 - Comparison of conventional and dark-field chest radiography for the diagnosis of pulmonary emphysema (8 min)

Theresa Urban; Garching / Germany

Author Block: T. Urban¹, A. Sauter², M. Frank¹, K. Willer¹, T. Koehler³, F. T. Gassert², M. Makowski², D. Pfeiffer², F. Pfeiffer¹; ¹Garching/DE, ²Munich/DE, ³Hamburg/DE

Purpose or Learning Objective: Dark-field radiography can provide information on the condition of the lungs' alveolar structure. It has recently been translated from the lab to the clinical stage. Here, we evaluate its performance for the detection of emphysema, and compare its diagnostic value with conventional radiography.

Methods or Background: We included 91 patients after a medically indicated CT scan, either without any lung impairment or with varying stages of emphysema. As a reference standard, visual scores based on the Fleischner scale for emphysema severity (absent, trace, mild, moderate, confluent, advanced destructive emphysema) were assigned to all CTs by three radiologists. For dark-field chest radiography, we employed a clinical prototype, which is capable of acquiring dark-field and attenuation-based radiographs simultaneously at a dose in the range of 0.035mSv. Both modalities, displayed individually and simultaneously, were rated for presence and severity of emphysema (no, mild, moderate, severe) by three radiologists. Statistical analysis included receiver-operator-characteristics and comparison of adjacent groups using two-sided Mann-Whitney-U-tests with a significance level of 0.05.

Results or Findings: The dark-field images showed a decrease in signal strength with emphysema severity. Compared to conventional images (AUC=0.73), readers were better able to identify mild emphysema when reading dark-field images (AUC=0.86). While the differentiation between trace and mild emphysema was not possible reading conventional radiographs, readers could differentiate between these stages based on dark-field radiographs.

Conclusion: Dark-field radiography increases the diagnostic value of attenuation-based radiography for the identification and staging of emphysema, especially in the early stages.

Limitations: There is only a limited number of participants. Emphysema was the only lung pathology under investigation.

Ethics committee approval: Approval of the Institutional Review Board was obtained prior to this study (IRB reference number 166/205). All participants gave written informed consent.

Funding for this study: This study was funded by the European Research Council, Philips Medical Systems DMC GmbH, Karlsruhe Nano Micro Facility.



HD 5 - Highlights of the Day

Date: March 6, 2022 | 09:00 - 09:30 CET

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands



RPS 2314 - Optimising patient referral checks and pre-examination communication

Categories: EuroSafe Imaging / Radiation Protection, Evidence-Based Imaging, Professional Issues, Radiographers

Date: March 6, 2022 | 09:30 - 10:30 CET

CME Credits: 1

Moderators:

Louise A. Rainford; Dublin / Ireland

Berit Verbist; Leiden / Netherlands

RPS 2314-3 - Referral justification and the role of the radiographer (8 min)

Liliana Barreira; Dublin / Ireland

Author Block: L. Bowden, L. Barreira, S. Hoare; Dublin/IE

Purpose or Learning Objective: Recently in Ireland, the role of the radiographer has been revised to include a 'practitioner status', as amended into statutory legislation S.I. 256. In effect, this means that radiographers have the qualification and professional judgment to accept, reject or amend a referral according to the clinical information, prior imaging and presentation status of a patient. This ensures that no exam is performed without being justified in advance by the radiographer and documented accordingly. A justification audit was devised in a Tertiary Paediatric Hospital to evaluate at what rate radiographers cancel or modify referrals received, the results of which are presented here.

Methods or Background: Any referrals that had been cancelled or modified by radiographers at the time of examination were collected. The reasons for cancellation/modification were coded according to 13 different categories. The origin of the referrals was also recorded allowing the data to establish trends with relation to the clinics/departments where most modified/cancelled referrals originate from.

Results or Findings: The majority of referrals that were modified or cancelled had originated from the emergency department (ED) (42%) and from the out-patient department (35%). The audits further demonstrated that the majority of the reasons for cancelling/changing an exam are due to, 'incorrect exam selected according to clinical indication', 'unnecessary additional views requested', 'wrong body part', 'wrong side requested', 'exam not justified by the referrer'.

Conclusion: This audit shows that the role of the radiographer as a practitioner is both established and of fundamental importance to positive patient outcomes. Radiographers are not only professionally trained to act as practitioners but also are effective gate-keepers to potential errors in the referral process. Outcomes and learnings from the audit are disseminated among referrers where possible.

Limitations: No limitations were identified.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 2314-4 - Inadequate filling of radiology request form and its impact on patient radiation exposure and waiting time: a preliminary study (8 min)

Bashir Hussain; Kano / Nigeria

Author Block: B. S. Hussain, I. Garba; Kano/NG

Purpose or Learning Objective: The purpose of this study was to evaluate how the failure or inadequacy in filling of radiology request forms leads to an increase in patient radiation exposure resulting from repeat investigations.

Methods or Background: A total of 158 patient request cards for conventional X-ray examination were randomly evaluated. Scoring criteria: filled; inadequately filled, and unfilled were used to score each item based on the following: patient demographic information; patient referral details and referring physician details. Repeat examinations due to inadequate filling or lack of filling of the request card were evaluated. Data was analysed based on descriptive statistics using SPSS statistical software.

Results or Findings: Patient names were adequately filled on all the request cards (100%). Demographic information related to gender and hospital number was provided in 94.9% and 93.7% of the request forms, respectively. Information related to patient referral details such as previous X-ray examination, blood pressure (BP), and last menstrual period (LMP) were inadequately filled with 4.4%, 2.5%, and 19.7% completion, respectively. Of the 158 request forms assessed, 33 (20.9%) led to repeat due to inadequate information provided. Inadequate information related to clinical history and requested examination had the highest and accounted for 45.5% and 24.2% of the causes of repeat, respectively.

Conclusion: Study findings have shown that information related to patient referral details is the most inadequately provided information. Besides, clinical history and the requested examination are the commonest causes of a repeat which is associated with an increase in patient exposure and also in patients' waiting time all of which has medico-legal implications and impact on the overall quality of service rendered.

Limitations: The sample size is small considering the large number of requests received on the daily basis.

Ethics committee approval: Ethics approval was obtained from the institutional research and ethics board.

Funding for this study: No funding was received for this study.

RPS 2314-5 - Assessment of clinical information in examination requests in a radiology department (8 min)

Oksana Lesyuk; São Brás de Alportel / Portugal

Author Block: A. F. L. Abrantes, S. R. Gonçalves, L. P. V. Ribeiro, S. I. Rodrigues, O. Lesyuk, J. Pinheiro, A. d. M. Ribeiro, R. P. P. Almeida; Faro/PT

Purpose or Learning Objective: Clinical information is an important tool to perform correctly imaging studies. Immobilisation devices may difficult the identification of the region of study, therefore, proper communication before an examination to adjust the study to a patient's condition is important. The present study aims to evaluate the existence or absence of clinical information in the examination requests forms in a radiology department.

Methods or Background: A retrospective study was carried out with a total of 600 examination requests from two hospitals (300 from the emergency department and 300 from routine procedures), which were analysed in order to assess the presence or absence of clinical information. The instruments used were a checklist of existence or absence of clinical information in the examination request, and software for examination and visualisation of the exam request forms called RADIO from Global Intelligent Technologies (Glintt). In the second phase, a questionnaire "Relevance of prescription/clinical information in the Orto-traumatology services" by Vasconcelos was applied to a total of 34 radiographers.

Results or Findings: In this study, we verified that only 44.6% of the examination requests in the context of emergency trauma presented clinical information and 55.3% of them do not present any relevant information. 100% of the radiographers affirm that the requests for examination do not contain enough clinical information or correct anatomic region identification to perform the examinations and correct diagnosis. So, questioning the patient or the physicians is necessary to perform the study, decreasing the workflow in radiology departments.

Conclusion: Better communication to ensure a multidisciplinary approach is necessary in order to provide the patient with the best possible care and avoid an inadequate exposure.

Limitations: No limitations.

Ethics committee approval: No ethics conflicts were identified in this study.

Funding for this study: No funding was received for this study.

RPS 2314-6 - The benefits of quality referral information and assessment: the radiographers' perspective (8 min)

Catherine Chilanga; Drammen / Norway



Author Block: C. Chilanga, H. Olerud, K. B. Lysdahl; Drammen/NO

Purpose or Learning Objective: The purpose of this study was to determine the benefits of quality referral information and involve radiographers in assessing referrals for appropriate imaging, as perceived by radiographers.

Methods or Background: An online survey was distributed to radiographers in clinical and non-clinical/academic settings via the International Society of Radiographers and Radiological Technologists (ISRRT) networks. The questionnaire consisted of 5-point Likert scale questions on radiographers' usefulness of referral information (12 reasons listed) and benefits of radiographers assessing referrals (8 benefits suggested).

Results or Findings: A total 279 responses were received. Clinical radiographers reported making use of the referral information frequently for a number of reasons, with the highest rank for 'patient identification', 'ensuring imaging of the correct body region' and 'correct patient positioning' (83%, 79%, 66% very frequently responses). Non-clinical/academic radiographers ranked the same reasons high for usefulness (74%, 63%, 52% strongly agreed as useful responses). Benefits of radiographers' involvement in referral assessment ranked high (strongly agree responses) were the items 'promotes radiographers' professional responsibility' (72%) 'improves radiographers' collaboration with radiologists and referring clinicians' (67%) and 'enables efficient use of radiology services' (57%).

Conclusion: Radiographers perceive referral information as useful for many purposes in their clinical practice, all vital for ensuring patient safety and quality radiology services. Radiology departments can benefit from involving radiographers in assessing referrals, through professional development, inter-professional collaboration, and efficiency of services.

Limitations: The number of responses is low. Larger sample size could also have been of benefit to capture views of a wider range of radiographers. The study is subject to selection bias as only participants who had information from ISRRT organisation networks were able to view and respond to the survey.

Ethics committee approval: The Norwegian Centre for Research Data (NSD) approved this study (reference number 472337).

Funding for this study: No funding was provided for this study.

RPS 2314-7 - Evaluating clinical criteria in patients being referred for a preoperative chest X-ray in a state general hospital in Malta (8 min)

Karen Borg Grima; Msida / Malta

Author Block: E. Vella¹, K. B. Borg Grima², D. Mizzi²; ¹Sliema/MT, ²Msida/MT

Purpose or Learning Objective: Preoperative chest X-rays (CXRs) are frequently performed before surgeries. The aim of this study was to investigate adult clinical referral criteria for a preoperative CXR and to determine if referrals adhered to local protocols, international and European guidelines. The association between clinical indications and the result of the preoperative CXR was investigated.

Methods or Background: The research design was a prospective, cross-sectional study performed in a state general hospital in Malta. 271 adult participants undergoing elective surgery were recruited, using convenience sampling. The research tools comprised of a close-ended questionnaire in which clinical and medical information was obtained. The questionnaire was complimented by a data sheet completed by intermediaries.

Results or Findings: Out of 271 participants, 72 (26.6%) participants were healthy asymptomatic patients, having an American Society of Anaesthesiology (ASA) score I. ASA II was the most common score obtained (45.7%). 44 (16.2%) participants had an abnormal CXR result, with cardiomegaly being the most common abnormality detected. Abnormalities were significantly low in all ASA scores but were seen to increase with an increasing ASA score. Only 11.4% (n=5) of abnormalities were unexpected. A statistically significant association (p=0.007) was found between increasing age and abnormal CXR results. No statistically significant association was found between cardiac or respiratory conditions and CXR abnormalities.

Conclusion: 64.2% of CXRs were not requested in accordance with protocols implemented locally on preoperative testing. Whereas, if the international and European guidelines were applied, 70.1% of CXRs were not requested according to guidelines.

Limitations: Referring physicians may have had cogent reasons for requesting the preoperative CXR but due to time constraints were unable to provide them in detail.

Ethics committee approval: Ethical approval was sought and obtained from the University Research Ethics Committee of the University of Malta.

Funding for this study: No funding was received for this study.

RPS 2314-8 - What makes compassion difficult: a narrative review of the evidence for compassion fatigue in diagnostic radiographers (8 min)

Scott Robertson; London / UK



Author Block: S. Robertson¹, H. McNair¹, S. Cruickshank¹, E. Olanloye¹, A. England²; ¹London/UK, ²Keele/UK

Purpose or Learning Objective: The objective of this study was to investigate the evidence of occupational stressors in diagnostic radiographers, and whether they are at risk of developing compassion fatigue.

Methods or Background: Compassion is an essential concept in healthcare, however, repeated exposure to challenging or traumatic situations can lead to compassion fatigue (CF). A review protocol was developed and registered on PROSPERO. Database and grey literature searches were carried out. No meta-analysis was possible therefore data has been presented as a narrative.

Results or Findings: Fifteen studies were selected for review published between 1982 and 2020. Evidence demonstrates that radiographers suffer from high levels of occupational stress. Stress is perceived rather than defined. Common causes of occupational stress were identified as poor patient interactions, and a lack of time to spend with patients. There is a lack of evidence to show how this stress affects radiographers' health or their ability to provide compassionate care.

Conclusion: Radiographers are prone to suffering from symptoms that can be attributed to CF. This has been present for an extended period of time, and the main changes have been a decrease in job satisfaction and accomplishment. Patient interaction was identified as a cause, but it is unclear if this affects staff ability to be compassionate. Further work is required to find ways to mitigate these effects and prevent the issue from getting worse.

Limitations: It was difficult to find consistency in the range of studies identified in this review, and direct comparisons of the data have not been possible. The wide range of definitions used to cover this topic means that some studies may not have been identified.

Ethics committee approval: Not applicable.

Funding for this study: SR is supported by a pre-doctoral research fellowship grant from the Royal Marsden Hospital Charity.

RPS 2303 - Advanced techniques in cardiac MR

Categories: Cardiac, Imaging Methods

Date: March 6, 2022 | 09:30 - 10:30 CET

CME Credits: 1

Moderator:

Christoph Treutlein; Erlangen / Germany

RPS 2303-2 - Reducing artefacts in cardiac magnetic resonance imaging in patients with cardiac implantable electronic devices (8 min)

Aino-Maija Vuorinen; Helsinki / Finland

Author Block: [A-M. Vuorinen](#), L. Lehmonen, J. Karvonen, M. Holmström, S. Kivistö, T. Kaasalainen; Helsinki/FI

Purpose or Learning Objective: Cardiac implantable electronic devices (CIED) induce artefacts on MRI and may significantly reduce the diagnostic value of cardiac magnetic resonance imaging (CMR). The study aimed to assess the effect of CIED generator location and a raised-arm imaging position on the CIED-induced artefacts on CMR.

Methods or Background: All clinically indicated CMRs performed in our institution for CIED patients with normal cardiac anatomy and permanent CIED with endocardial pacing leads between November 2011 and October 2019 were included (n=171). Cine and late gadolinium enhancement (LGE) images were analysed according to the American Heart Association 17-segment model for artefacts.

Results or Findings: Right-sided generator implantation and raised-arm imaging were associated with a significantly increased number of artefact-free segments. In patients with a right-sided pacemaker, the median percentage of artefact-free segments in short-axis balanced steady-state free precession LGE was 93.8% (IQR 9.4%, n=53) compared to 78.1% (IQR 20.3%, n=58) with a left-sided pacemaker (p<0.001). In patients with a left-sided implantable cardioverter defibrillator, the median percentage of artefact-free segments was 87.5% (IQR 6.3%, n=9) with raised-arm imaging, compared to 62.5% (IQR 34.4%, n=9) with arm down in spoiled gradient-echo short-axis cine (p=0.02).

Conclusion: Raised-arm imaging is a simple, costless method for reducing CMR artefacts in patients with left-sided CIED, and can be used with other image quality improvement methods. Right-sided generator implantation could be considered in patients who are known to require subsequent CMRs to ensure adequate image quality.

Limitations: Assessing artefacts included subjective judgement. Artefacts were not evaluated by specific CIED models.

Ethics committee approval: The study was approved by the Helsinki University Hospital Medical Imaging Center review board.

Funding for this study: This study was supported by HUS Medical Imaging Center research grant and Ida Montin Foundation research grant.

RPS 2303-3 - Free-breathing cine with motion correction: a new generation of real-time compressed sensing cine (8 min)

Benjamin Longere; Lille / France

Author Block: B. Longere¹, N. Abassebay¹, S. Toupin², C. V. Gkizas¹, A. Simeone¹, J. Hennicaux¹, M. Schmidt³, J. Pang⁴, F. Pontana¹;
¹Lille/FR, ²Saint-Denis/FR, ³Erlangen/DE, ⁴Chicago, IL/US

Purpose or Learning Objective: The image quality of cine imaging is highly affected by arrhythmia and shortness of breath. This study aimed to evaluate whether a new compressed sensing free-breathing cine sequence (CS-FB) with motion correction (MOCO) can address such limitations.

Methods or Background: Forty-eight patients referred for cardiac MRI underwent both conventional bSSFP multi-shot multi-breath-hold cine (BH-SSFP, GRAPPA=2) and prototype free-breathing single-shot bSSFP cine (CS-FB, CS acceleration=9.0-24.0, depending on heart rate) with fully automated MOCO. Short-axis stacks were acquired for each patient with matched parameters. Acquisition and reconstruction times, image quality (Likert scale from 1 to 4), left ventricular (LV) and right ventricular (RV) volumes, LV, and RV ejection fractions (EF) and LV mass were assessed for each sequence.

Results or Findings: CS-FB cine's scan time was shorter (2.2 ± 0.6 min vs 4.8 ± 1.2 min for BH-SSFP, $p < 0.0001$), although reconstruction times were longer for CS-FB (4.7 ± 1.5 min vs 0 min for BH-SSFP, $p < 0.0001$). CS-FB achieved higher image quality (3.9 ± 0.3) than BH-SSFP (3.6 ± 0.6 , respectively, $p = 0.0001$), especially for patients with arrhythmia or difficulties holding breath ($n = 19$; 3.9 ± 0.2 vs 3.3 ± 0.7 , $p = 0.002$). Regardless of cardiac rhythm, LVEF, LV stroke volumes and mass were similar between both sequences. There was difference in RVEF (CS-FB: $49.9 \pm 11.2\%$; BH-SSFP: $51.5 \pm 11.4\%$; $p = 0.0007$) and RV stroke volume (CS-FB: 73.9 ± 24.4 mL; BH-SSFP: 76.8 ± 26.3 mL; $p = 0.005$) but not for the RV end-systolic and end-diastolic volumes.

Conclusion: Free-breathing CS acquisition with MOCO can be reliably performed in a clinical setting to evaluate LV parameters, with better image quality and shorter scan time than conventional cine, especially for patients with arrhythmia or shortness of breath.

Limitations: CS-FB sequence required longer reconstruction times than the reference BH-SSFP cine. However, the robustness of the CS-FB sequence against arrhythmia and respiratory motion avoid the repetition of cine acquisitions.

Ethics committee approval: The ethics committee approval was obtained, IRB number: CRM-21103-163.

Funding for this study: No funding was received for this study.

RPS 2303-4 - Free-breathing quantitative assessment of left ventricular volume and function using compressed sensing: a preliminary study in elder patients (8 min)

Jing-Wen Dai; Beijing / China

Author Block: J-w. Dai, M. Zhang, J. An, M. Chen; Beijing/CN

Purpose or Learning Objective: The aim of this study was to evaluate the accuracy of compressed sensing (CS) cine image with free-breathing in comparison to standard breath-hold cine for the assessment of left ventricular volume and function in elder patients.

Methods or Background: 29 consecutive patients (18 male and 11 female) over 60 years old (70.4 ± 7.5 years old) were enrolled in this study. All subjects underwent standard breath-hold cine and CS real-time free-breathing cine examinations using a 3.0T MR (Prisma; Siemens, Erlangen, Germany). The image quality of each cine image was evaluated based on the clearness of the myocardial border and artefact using a five-point scale from 1 which is nondiagnostic quality to 5 equals excellent quality. Qualitative image scoring, LV volumes, function and mass were compared using a paired t-test, and the agreement was evaluated using Bland Altman analysis.

Results or Findings: The free-breathing CS image quality was slightly lower than standard cine (4.7 ± 0.5 for standard vs 4.1 ± 0.7 for CS; $p < 0.01$). There was a small but statistically significant ($p < 0.05$) overestimation of LVEF ($1.0 \pm 1.9\%$), LV EDV (3.9 ± 6.6 ml) and LV SV (3.9 ± 4.8 ml) using the free-breathing CS technique. No significant differences existed in LV ESV and LV mass. The mean differences with 95 % CI, based on BlandAltman analysis, were 3.9 mL (-9.0 to 16.8) for LVEDV, 0.1 mL (-7.3 to 7.4) for LVESV, 0.3 g (-10.9 to 11.5) for LV mass, and 1.0 % (-2.6 to 4.7) for LVEF.

Conclusion: Compressed sensing cine cardiac imaging with free-breathing showed good agreement for quantification of LV metrics and provided an alternative with shorter acquisition time in elder patients who have difficulties in breath-holding.

Limitations: This study is limited by the small sample size and quantitative image quality assessment.

Ethics committee approval: The local research ethics committee approved the study.

Funding for this study: No funding was received for this study.

RPS 2303-5 - Acute impact of an endurance race on biventricular and biatrial myocardial strain in competitive male and female triathletes evaluated by feature-tracking CMR (8 min)

Hang Chen; Hamburg / Germany



Author Block: H. Chen, A. Kisters, M. K. Świdarska, E. Cavus, D. Säring, K. Müllerleile, G. K. Lund, G. Adam, E. Tahir; Hamburg/DE
Purpose or Learning Objective: Cardiac adaptation in endurance athletes is a well-known phenomenon, but the acute impact of strenuous exercise is fairly unknown. The purpose of this study was to analyse the alterations in biventricular and biatrial function in triathletes after an endurance race using novel feature-tracking cardiac magnetic resonance (FT-CMR).
Methods or Background: Fifty consecutive triathletes (45±10 years; 80% men) and twenty-eight controls were prospectively recruited. All underwent 1.5T CMR examination. The time interval between race completion and CMR was 2.3±1.1 hours (range 1-5 hours). Biventricular and biatrial volumes, left ventricular ejection fraction (LVEF), FT-CMR analysis and late gadolinium enhancement (LGE) imaging were performed. Global systolic longitudinal strain (GLS), circumferential strain (GCS) and radial strain (GRS) were assessed. CMR was performed at baseline and following an endurance race. High-sensitive Troponin T and NT-proBNP were determined.
Results or Findings: Post-race Troponin T (P<0.0001) and NT-proBNP (P<0.0001) were elevated. LVEF remained constant (62±6 vs 63±7%, P=0.607). Post-race LV GLS decreased by tendency (-18±2 vs -17±2%, P=0.054), whereas GCS (-16±4 vs -18±4%, P<0.05) and GRS increased (39±11 vs 44±11%, P<0.01). Post-race right ventricular GLS (-19±3 vs -19±3%, P=0.668) remained constant and GCS increased (-7±2 vs -8±3%, P<0.001). Post-race left atrial GLS (30±8 vs 24±6%, P<0.0001) decreased while right atrial GLS remained constant (25±6 vs 24±6%, P=0.519).
Conclusion: The different alterations of post-race biventricular and biatrial strain might constitute an intrinsic compensatory mechanism following an acute bout of endurance exercise. The combined use of strain parameters may allow a better characterisation and understanding of ventricular and atrial function in endurance athletes.
Limitations: This study had a relatively small sample size and ruled out triathletes with pre-existing cardiovascular disease and systemic diseases, limiting its generalisability.
Ethics committee approval: The ethics committee approved the study (PV4764).
Funding for this study: No funding was received for this study.

RPS 2303-6 - Cardiac remodeling and subclinical left ventricular dysfunction in uncomplicated obese adults: a cardiovascular magnetic resonance study with tissue tracking (8 min)

Jing Liu; Chengdu / China

Author Block: J. Liu¹, J. Li¹, H. Pu¹, W. He¹, N. Tong¹, X. Zhou², I. PENG¹; ¹Chengdu/CN, ²Shanghai/CN
Purpose or Learning Objective: Obesity increases the risk of heart failure and cardiovascular mortality. However, the specific effects of obesity on cardiac structure and function have not been clarified. This study aimed to evaluate the left ventricular (LV) geometric and functional changes using cardiovascular magnetic resonance (CMR) in uncomplicated obese adults.
Methods or Background: A total of 48 obese participants and 25 healthy controls were prospectively enrolled. The LV geometry, global systolic functions, and strains were assessed using CMR. Body composition was measured using dual X-ray absorptiometry.
Results or Findings: Compared with healthy controls, the obese patients had greater LV size, mass, myocardial thickness, and impaired myocardial contractility with lower LV global radial, circumferential, and longitudinal peak strains (PS) and LV global circumferential and longitudinal peak diastolic strain rates (PDSR) (all p<0.05). Multivariable linear regression showed that the body mass index (BMI) was independently associated with LV average myocardial thickness (LVAMT), LV maximum myocardial thickness (LVMMT), and concentricity in the obese group (LVAMT: β=0.098, p=0.02; LVMMT: β=0.16, p=0.044; concentricity: β=0.013, p=0.037). In addition, the visceral adipose tissue (VAT) was associated with LV global longitudinal PS and LV longitudinal and circumferential PDSR (longitudinal PS: β =-2.784, p<0.001; longitudinal PDSR: β=-0.202, p=0.001; circumferential PDSR: β=-0.193, p=0.005).
Conclusion: LV geometric remodelling and subclinical dysfunction are observed in obese adults with preserved LV ejection fraction. Instead of BMI, VAT is found to be a sensitive predictor for subclinical LV dysfunction.
Limitations: A cross-sectional study.
Ethics committee approval: The study was approved by the Institutional Review Board of West China Hospital.
Funding for this study: This work was supported by the National Natural Science Foundation of China [Grant number.81601462].

RPS 2303-7 - Spin-echo diffusion weighted imaging of in-vivo human heart at 3T (8 min)

Li-Fei Ma; Shanghai / China



Author Block: X-m. WU, X-y. WU, h. tan, L-f. MA, Q. JIANG, H-p. DONG; Shanghai/CN

Purpose or Learning Objective: The objective of this study was to investigate the possibility of cardiac DWI using conventional spin-echo (SE) EPI.

Methods or Background: Seven female and five healthy male subjects (mean age, 39.2 ± 13.0 years; heart rate, 69.8 ± 7.8 bpm) without any contraindication to MR scanning underwent cardiac DWI, which was performed on a 3 Tesla MR scanner (Elition X, Philips Healthcare, Best, the Netherlands, Max G 45 mT/m, Max SR 200 T/m/s) with a 16-channel anterior coil and a 12-channel posterior coil. Diffusion-weighted SE-EPI with respiratory navigation, volume shim, and fat suppression (both SPIR and gradient reversal) was then performed with the following parameters: voxel size = $2.5 \times 2.5 \times 8$ mm³, FOV 320×320 mm², slice number 1, half scan factor 0.6, SENSE factor 2.0, NSA 10, TR 1 heartbeat, 5 b values (200, 300, 500, 800, 1000 s/mm²) were acquired separately with b₀, corresponding TEs are 35, 38, 42, 47, 50 ms. Scan time ~1min6s for each b value scan considering navigation efficiency of 60%.

Results or Findings: Image quality degraded, and distortion became more severe, with higher b values. When b value > 500 s/mm², the overall mean image quality score was lower than 2.5. A significant difference was also found between segments (SNR: F=4.59, P=0.001; CNR: F=4.60, P=0.001). The signal was lower in the interventricular septum, especially in the infero-septal part, compared with other segments.

Conclusion: Using a clinical 3T scanner, SE-EPI DWI could be successfully performed with careful choice of navigator placement and cardiac trigger delay. Medium b values are recommended to obtain good image quality.

Limitations: Only healthy volunteers were involved in this study. Patients should be included to investigate the diagnostic value of cardiac DWI in future studies.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 2303-8 - Evaluation of novel rapid post-processing vs conventional strain parameters in highly accelerated cardiac magnetic resonance (8 min)

Moritz Halfmann; Mainz / Germany

Author Block: M. C. Halfmann¹, T. S. Emrich², K-F. Kreitner¹; ¹Mainz/DE, ²Charleston, SC/US

Purpose or Learning Objective: Development of compressed sensing (CS) cardiac magnetic resonance (CMR) sequences rapidly accelerated cardiac imaging while showing good reproducibility for volumetric analyses. However, for imaging biomarkers such as strain, CS-derived measurements are significantly altered. Novel prototype rapid strain parameters (junction strain (JS) and long axis strain (RS)) are evaluated for their potential to overcome that bias.

Methods or Background: 15 prospectively enrolled healthy volunteers (HV) underwent CMR including a stack of short-axis slices and two orthogonal left ventricular long-axis slices. Acquisitions were based on balanced steady-state free precession Cine (bSSFP) and CS-sequences. Exclusion criteria were any history of cardiac disease and abnormal volumes as characterised by CMR. Dedicated post-processing software (cvi42 Circle) was used to compute JS, RS and global longitudinal strain (GLS).

Results or Findings: GLS correlated moderately between bSSFP and CS ($r=0.58$). JS and RS correlated strongly between acquisitions ($r=0.70/0.69$, respectively). Correlation between novel parameters and GLS was moderate in bSSFP (JS/GLS $r=0.56$; RS/GLS $r=0.53$) and weak in CS (JS/GLS $r=0.34$; RS/GLS $r=0.31$). Bland-Altman analysis showed a significant bias for CS-derived GLS with a mean difference of -3.9% and limits of agreement (LoA) from -6.9 to -1.0%. There was no significant bias for both JS and RS (mean differences -1.1/-1.0%; LoA -3.8 to 1.7/-3.8 to 1.8%).

Conclusion: Novel rapid strain parameters correlate strongly between bSSFP and CS acquisitions and with established GLS. However, they differ from GLS as there is no significant systematic bias between acquisition types.

Limitations: Rapid post-processing strains are still under evaluation, larger studies including patient populations are needed to evaluate the clinical significance of these preliminary results.

Ethics committee approval: The study protocol was approved by the local ethics committee with a waiver for informed consent.

Funding for this study: No outside funding was acquired for this study.



RPS 2305a - Artificial intelligence (AI) in liver imaging

Categories: Abdominal Viscera, Artificial Intelligence & Machine Learning, Imaging Informatics, Oncologic Imaging

Date: March 6, 2022 | 09:30 - 10:30 CET

CME Credits: 1

Moderator:

Mathilde Wagner; Paris / France

RPS 2305a-2 - Doing more with less: combining manually annotated and automated liver segmentations to train deep neural network segmentation algorithms (8 min)

Moritz Gross; Berlin / Germany

Author Block: M. Gross¹, M. Spektor², A. Jaffe², A. S. Kücükaya¹, S. Iseke³, S. Haider⁴, M. Strazzabosco², J. A. Onofrey², J. Chapiro²;
¹Berlin/DE, ²New Haven, CT/US, ³Rostock/DE, ⁴Munich/DE

Purpose or Learning Objective: Manual liver segmentation is time-consuming and expensive. In this study, a DCNN was trained using a novel framework that incorporates a small set of manually annotated imaging with a large set of automated segmentations to supplement segmentation performance.

Methods or Background: This study included 617 arterial-phase T1-weighted MR images of which 219 had corresponding manual liver segmentations. The 219 annotated images were split into 50/15/35% (n=109/33/77) training/validation/testing subsets, respectively. First, ten proportions (10-100%, increments of 10%) of manual liver segmentations from the training pool were used to train ten baseline (BL) DCNN models with identical 3D U-net architectures. The BL models were used to generate automated liver segmentations on the unlabeled dataset (n=398) and on the remaining portion of the training pool that was not in their respective training set. Second, these automated segmentations were combined with the manually annotated images into new training sets and used to train ten enhanced-training (ET) DCNNs. The dice similarity coefficient (DSC) was used to quantify segmentation performance and a Wilcoxon signed-rank test was used for comparisons.

Results or Findings: BL models trained with more manual segmentations substantially outperformed BL models trained with fewer segmentation data. ET models significantly outperformed their respective BL models (for all training sets including 10-50% of available manual segmentations: $p < 0.05$). Some ET models significantly outperformed BL models trained with more manual segmentations (ET 30% vs BL 40%, ET 70% vs BL 90%, $p < 0.05$).

Conclusion: This new training approach reduced the overfitting of models trained on smaller training sets and achieved satisfactory liver segmentation performance even with fewer expert annotations, outperforming models that were trained with more manual segmentations.

Limitations: One network architecture was used and a single contrast phase.

Ethics committee approval: This study was approved by the local IRB.

Funding for this study: This study was funded, NIH grant P30 KD034989.

RPS 2305a-3 - Deep-learning based hepatic tumour load analysis of neuroendocrine liver metastases in Gd-EOB MRI (8 min)

Uli Fehrenbach; Berlin / Germany

Author Block: U. Fehrenbach¹, S. Xin¹, T. A. Auer¹, H. Jann¹, H. Amthauer¹, D. Geisel¹, T. Denecke², B. Wiedenmann¹, T. Penzkofer¹;
¹Berlin/DE, ²Leipzig/DE

Purpose or Learning Objective: Fast and exact quantification of hepatic metastasis is an unmet medical need in patients with secondary liver malignancies. We therefore present a deep-learning 3D-quantification model of neuroendocrine liver metastases (NELM) using gadoteric-acid (Gd-EOB)-enhanced MRI.

Methods or Background: In 149 patients, manual segmentations of NELM and livers were used to train a neural network (278 Gd-EOB MRI scans). Clinical utility was evaluated in another 33 patients which were discussed in our multidisciplinary cancer conference (MCC) and received a Gd-EOB MRI both at baseline and as follow-up examination (n = 66). The model's measurements (NELM volume; hepatic tumour load (HTL)) with corresponding absolute (Δ absNELM; Δ absHTL) and relative changes (Δ relNELM; Δ relHTL) between baseline and follow-up were compared to MCC decisions of therapy response.

Results or Findings: Internal and external validation of the model's accuracy showed a high overlap for NELM and livers (Matthew's correlation coefficient (phi): 0.76/0.95 (internal), 0.86/0.96 (external)) with higher phi in larger NELM volume (phi= 0.80 vs. 0.71; p = 0.003). MCC decisions were significantly differentiated by all response variables (Δ absNELM; Δ absHTL; Δ relNELM; Δ relHTL) (p < 0.001). Δ relNELM and Δ relHTL showed optimal discrimination between therapy success or failure (AUC:1.000; p < 0.001).

Conclusion: The deep-learning based model shows high accuracy in 3D-quantification of NELM and HTL in Gd-EOB-MRI. The model's measurements correlated well with the evaluation of therapeutic response of an expert MCC.

Limitations: The 3D assessment approach needs to be further evaluated in direct comparison to 2D measurements and its impact on clinical endpoints in larger cohorts. The ground truth of accuracy is based on manual segmentation of liver metastasis. Due to the sometimes pronounced, even small foci of liver metastases, manual segmentation is not perfect.

Ethics committee approval: Approved by the Institutional Review Board of Charité Berlin.

Funding for this study: No funding was received for this study.

RPS 2305a-4 - Accuracy and efficiency of right-lobe graft volume estimation with deep learning-based CT volumetry in a large cohort of living right liver donors (8 min)

Rohee Park; Seoul / Korea, Republic of

Author Block: R. Park, S. S. Lee, Y. S. Sung, J. S. Yoon, H-I. Suk, H. J. Kim, S. H. Choi; Seoul/KR

Purpose or Learning Objective: To devise construct graft volume-to-weight conversion formula and to evaluate efficiency and accuracy of DLA-assisted CT volumetry in right lobe (RL) graft in a large cohort of LDLT.

Methods or Background: We retrospectively enrolled 581 RL donors and divided them into development and validation groups. The CT was analysed using DLA-assisted software. The graft volume-to-weight conversion formula was derived from the development group by linear regression. The agreement between estimated and measured graft weights and inter-reader agreement were assessed using CCC and 95% Bland-Altman LOA in the validation group. To assess factors influencing estimation error, multivariable linear regression was performed in the validation group.

Results or Findings: Segmentation correction was required in 28.6% cases with short correction time (mean, 12.8±33.6 seconds) and small change in volume (95% LOA, -3.0% to 3.0%). The total process time ranged from 1.3 to 8.0 minutes (mean, 1.8±0.6 minutes). The conversion formula was as follows: estimated graft weight (g)=206.3+0.653 x CT-measured graft volume (ml) (r=0.878, p<.001). Between estimated and measured graft weights, CCC was 0.834 and 95% LOA was -1.7%±17.1% (P=.002). Of the inter-reader agreement of RL volume, CCC was 0.998 and 95% LOA was 0.2%±1.8% (P=.069). The sex (coefficient;-3.47) and BMI (coefficient;-0.58) have a significant independent association with estimation error, while age, hepatosteatosis, CT interval and graft type did not.

Conclusion: We proposed a graft volume-to-weight conversion formula that would be useful in preoperative graft weight estimation. The DLA-assisted CT volumetry is a highly efficient method for preoperative graft weight estimation. The error margin of RL graft weight is within approximately 17% of graft weight.

Limitations: First, it was retrospective. Second, we evaluated only RL graft donors. Third, development and validation groups were enrolled in the same institution.

Ethics committee approval: IRB waived the requirement for informed consent.

Funding for this study: This research was supported by a National Research Foundation of Korea (NRF) grant, funded by the Korean government (MSIT) (2020R1F1A1048826).

RPS 2305a-5 - Fully automatic calculation hepato-renal index in ultrasound images using deep learning (8 min)

Mostafa Ghelichoghli; Karaj / Iran



Author Block: M. Ghelichoghli¹, s. m. bagheri², A. Akhavan¹, V. Ashkani Chenarlogh¹, N. Sirjani¹, I. Shiri³, A. Shabanzadeh¹; ¹Karaj/IR, ²tehran/IR, ³Geneva/CH

Purpose or Learning Objective: In this study, we have proposed and validated a fully automatic approach for the quantification of fatty liver disease using ultrasound images based on hepato-renal-index (HRI) calculation. The procedure includes segmentation of kidneys and liver, detection of an ROI in the renal parenchyma region and liver at the same depth, and HRI calculation.

Methods or Background: We proposed a highly accurate and fast convolutional neural network, named Fast-Unet, for the segmentation of kidneys and liver. The main superiority of Fast-Unet model is low response time, which is appropriate in ultrasound image analysis that needs on-site measurement by radiologists. We used a superpixel algorithm to find the lowest variance region in parenchyma as the renal ROI. At the next step, all pixels with the same depth as renal ROI centrum were found using the intersection of two borders of the convex probe sector. This step is conducted because if the renal and liver ROIs were not in the same depth resulting HRI is not accurate due to the ultrasound depth attenuation effect. Finally, an ROI in the liver with the same depth was found and HRI was calculated.

Results or Findings: The train-test dataset contained 752 ultrasound images. The Dice and Jaccard coefficients were used to evaluate the segmentation step, and 94% and 89% for the kidney and 97% and 91% for the liver were achieved respectively. The predicted HRI values were also validated with a radiologist's report using the root-mean-square-error (RMSE) metric and 0.04 was achieved.

Conclusion: Automation of HRI calculation speeds up the fatty liver diagnosis and helps novice radiologists to interpret ultrasound images more accurately.

Limitations: There is no limitation in this study.

Ethics committee approval: Med Fanavaran Plus co. ethics committee approved this study.

Funding for this study: Med Fanavaran Plus Co. funded this study.

RPS 2305a-6 - Deep learning-based automated assessment of hepatic fibrosis on magnetic resonance images and non-image data (8 min)

Weixia Li; Shanghai / China

Author Block: W. Li¹, Y. Zhu¹, G. Zhao¹, X. Chen¹, X. Zhao², Q. Xie¹, F. Yan¹; ¹Shanghai/CN, ²Guangdong/CN

Purpose or Learning Objective: To evaluate the performance of fully automated deep learning (DL) algorithm for staging hepatic fibrosis and distinguishing fibrosis from normal people based on MR images with or without non-image information.

Methods or Background: 500 patients were retrospectively enrolled from two hospitals. Model DL were built using delay phase MR images to assess fibrosis stages. In addition, different models of model DL combined with non-image information including biomarkers (APRI and FIB-4), virus status (hepatitis B and C virus tests), and MR information (manufactures and static magnetic field). The AUROCs were compared between different models using Delong test, the sensitivity and specificity of both model DL and model Full (model DL combined with all non-image information) were compared with experienced radiologists and biomarkers using McNemar's test.

Results or Findings: In the test set, the AUROC (with 95% confidence intervals) values of model Full for diagnosing fibrosis stages F0-4, F1-4, F2-4, F3-4 and F4 were 0.99 (0.94-1.00), 0.98 (0.93-0.99), 0.90 (0.83-0.95), 0.81 (0.73-0.88) and 0.84 (0.76-0.90), respectively, which outperformed model DL on diagnosing F0-4 and F1-4. Compared with the radiologists, model Full showed better specificity for fibrosis stage F0-4, better sensitivity for the other four classification tasks. While compared with biomarkers, both model DL and model Full showed significantly higher specificity in staging F3-4 and F4.

Conclusion: DL using MR images with or without non-image data provides a promising non-invasive assessment tool for the staging liver fibrosis, and for distinguishing liver fibrosis patients from normal people, with a performance superior to experienced radiologists and biomarkers.

Limitations: The sample among fibrosis stage was unbalanced.

Ethics committee approval: Ruijin Hospital affiliated to Shanghai JiaoTong University School of Medicine

Funding for this study: National Natural Science Foundation of China (grant numbers 81401406) and Innovative research team of high-level local universities in Shanghai.

RPS 2305a-7 - CNN-based tumour progression prediction after thermal ablation with CT imaging (8 min)

Sean Benson; Amsterdam / Netherlands

Author Block: m. Taghavi, F. Staal, M. Maas, S. H. Benson, R. G. H. Beets-Tan; Amsterdam/NL

Purpose or Learning Objective: For solitary small (< 3 cm) tumors, ablation of liver metastases is now part of international guidelines. However, a significant number of patients experience regrowth due to insufficient treatment or inadequate ablation of tumour margins. Local tumour progression (LTP): defined as regrowth /recurrent disease after ablation is a threat to overall survival. The aim of this study was to create a deep learning model using CT images obtained at baseline and directly after treatment in order to predict which patients would later experience regrowth.

Methods or Background: For this study, we retrospectively included 79 patients (120 lesions) with colorectal liver metastasis (CRLM) who were treated by thermal ablation consisting of either radiofrequency ablation (RFA), or microwave ablation (MWA) for liver metastases (LM). Exclusion criteria were based on the ESMO guidelines. The pre- and post-treatment scans were used as input to a multi-channel Convolutional Neural Network (CNN). The manual lesion delineation was used to identify a 3D region of interest (RoI) around each lesion. We employed transfer learning in order to train a deep learning model for the dataset in question. A 19-layer CNN from the Visual Geometry Group (VGG-19) was found to perform best.

Results or Findings: The area under the receiver operating characteristic curve (AUC) was found to be 0.72, 95% confidence interval: (0.64, 0.79).

Conclusion: We have demonstrated that it is possible to use transfer learning together with CNN models in order to predict tumour progression and also demonstrated that it is possible to employ state-of-the-art methods to avoid overfitting.

Limitations: Small cohort size of 79 patients, therefore impacting the size of the AUC confidence interval.

Ethics committee approval: The informed consent requirement was waived by the Institutional Review Board due to the retrospective nature of the study.

Funding for this study: Not applicable.

RPS 2305a-8 - Hepatic CT-based radiomics phenotypes associate with response to anti-angiogenics in neuroendocrine tumours (8 min)

Marta Ligeró; Barcelona / Spain

Author Block: M. Ligeró, E. Delgado, J. Hernando, A. Garcia-Alvarez, X. Merino Casabiel, M. Escobar, J. Capdevila, R. Perez Lopez; Barcelona/ES

Purpose or Learning Objective: To define and validate CT-based radiomics phenotypes associating with response to anti-angiogenic treatment in patients with gastroenteropancreatic neuroendocrine tumors(GEP-NET). To investigate if multi-phase radiomics model or the combination of radiomics with clinical data improves response prediction.

Methods or Background: A predictive CT-based radiomics signature was developed in 57 patients included in the TALENT phase II prospective trial of lenvatinib in advanced GEP-NET from October 2015 to August 2020. Radiomics features were extracted from all liver lesions at pre-treatment CT. Features were selected using minimum redundancy maximum relevance(mRMR) and combined in a logistic regression for predicting clinical benefit (progression free survival[PFS]>15 months). A multiphase model including arterial and portal acquisitions was developed. Models were validated internally and tested in an external cohort of 26 patients treated with the VEGFR1-3 inhibitor sunitinib. A regression model was used to combine radiomics and clinical variables. Model interpretability plots were also developed.

Results or Findings: In the training and validation set, the model associated with response (area under the curve [AUC] 0.76 and 0.69, respectively). In the test set the model associated with response (AUC = 0.68). The multi-phase didn't improve the prediction capacity (AUC = 0.59). The model combining radiomics and clinical variables slightly improved the capacity for predicting response in the three cohorts (AUC = 0.78, 0.75 and 0.67, respectively). Interpretability plots showed that patients with high radiomics-score presented more spherical and hypervascularised lesions.

Conclusion: Single-phase radiomics associates with response to anti-angiogenics based on the quantification of hypervascularisation and tumour shape.

Limitations: Further testing populations are needed to validate the prediction capacity of the model.

Ethics committee approval: The institutional review board approved this retrospective study. Need for informed consent for the computational analysis of the images was waived.

Funding for this study: The TALENT clinical trial was funded by Eisai.



RPS 2411 - Brain tumour: other than glioma

Categories: Artificial Intelligence & Machine Learning, Imaging Methods, Neuro, Oncologic Imaging

Date: March 6, 2022 | 11:30 - 12:30 CET

CME Credits: 1

Moderator:

Asif Mazumder; London / United Kingdom

RPS 2411-2 - Texture analysis applied in Ktrans maps using DCE-MRI in the diagnosis of idiopathic GH deficiency compared with normal control (8 min)

Shiyun Tian; Dalian / China

Author Block: S. Tian, L. Na, B. Gao; Dalian/CN

Purpose or Learning Objective: This study aimed to assess the potential of texture analysis applied in Ktrans maps of pituitary gland obtained from DCE-MRI in the diagnosis of idiopathic GH deficiency compared with normal controls. Meanwhile, we evaluate the efficiency of textural features of Ktrans maps.

Methods or Background: This study included 120 patients (9.1 years \pm 3.1) with clinical growth retardation, proved IGHD. 26 children (12.6 years \pm 2.1) were included as control subjects. All children underwent conventional plain and enhanced DCE-MR scanning of the pituitary. No space-occupying lesions or abnormal signals in the pituitary gland were found. Omni Kinetics software was used to perform DCE-MRI data processing, Ktrans was obtained. The Mann-Whitney rank sum test was used to compare the differences in Ktrans maps between IGHD and normal. ROC curves were used to evaluate the efficiency of textural features of Ktrans maps in differentiating IGHD from controls. The Spearson correlation coefficient was used to correlate the Ktrans mean value with serum growth hormone levels in the IGHD group.

Results or Findings: Based on the texture analysis of Ktrans, seven features were significantly decreased, including VolumeCount, VoxelValueSum, GlcmTotalFrequency, RunLengthNonuniformity, VolumeMM, VolumeCC and SurfaceArea, while Energy and SurfaceVolumeRatio were increased in the IGHD group compared to HC (all $P < 0.05$). According to the ROC analysis, the VoxelValueSum (AUC=0.896) was considered the best feature for differentiating GHID from HC, with a sensitivity of 100 % and specificity of 85 %, respectively. The levels of GH showed a negative correlation with the Quantile 95 of the Ktrans in the anterior pituitary gland ($r = 0.306$, $P = .002$).

Conclusion: Texture analysis of Ktrans maps in the pituitary gland based on DCE-MRI is feasible. Compared to normal controls, IGHD were characterized by lower texture features.

Limitations: The trial is a retrospective study.

Ethics committee approval: Ethics committee approval passed.

Funding for this study: No funding was received for this study.

RPS 2411-3 - MRI based radiomics and spatial distribution joint model in the differentiation of autoimmune encephalitis from low-grade diffuse astrocytoma (8 min)

Sirong Piao; Shanghai / China

Author Block: S. Piao, X. Luo, Y. Bao, B. Hu, X. Liu, Y. Zhu, L. Yang, D. Geng, Y. Li; Shanghai/CN

Purpose or Learning Objective: Preoperative differentiation of autoimmune encephalitis from low grade diffuse astrocytoma is important to guide clinical decision-making. We aim to develop quantitative models integrating both radiomics and spatial distribution features of brain lesions from non-contrast MRI for discrimination of autoimmune encephalitis from low grade diffuse astrocytoma.

Methods or Background: The study included patients with autoimmune encephalitis (AE, n=59) and WHO grade II diffuse astrocytoma (AS, n=89) into training and test sets with a ratio of 3:1. Another 22 AE patients and 28 AS patients were allocated as the external set. Hyperintensity T2-FLAIR lesions were segmented manually. 42 radiomics and 11 spatial distribution features were extracted via LASSO, and joint models were constructed using logistic regression algorithms for two diseases differentiations. The discrimination performance of the joint model was compared with neuroradiologists.

Results or Findings: The radiomics and spatial distribution feature joint model achieved AUC=0.998/0.974 (training/test set) and prominently outperformed the radiomics model (AUC=0.993/0.971) and the spatial distribution model (AUC=0.989/0.965). The senior and junior neuroradiologists achieved the AUC of 0.951/0.870 and 0.689/0.641, respectively. The diagnostic ability of the joint model suppressed the junior neuroradiologist.

Conclusion: The radiomics and spatial distribution joint model could effectively differentiate AE from AS and achieved the diagnostic performance as senior neuroradiologist in the discrimination between the two diseases, with a clear path that is easy to follow in further practice.

Limitations: AE mediated by different auto-antibodies was not strictly distinct due to the retrospective nature of the study. Additionally, the results need to be further validated via a multi-centre study with more participants.

Ethics committee approval: This study was approved by the Institutional Research Review Board of the Huashan Hospital.

Funding for this study: This work was supported by the Science and Technology Commission of the Shanghai Municipality (19ZR1407900, 20S31904300) and Shanghai Hospital Development Center (SHDC2020CR3020A).

RPS 2411-4 - Differentiation of medulloblastoma molecular subtypes with multiparametric MRI findings, including MRI based texture analysis (8 min)

Bülent Aslan; Istanbul / Turkey

Author Block: N. C. CIMSIT, B. Aslan, E. Bıyıklı, T. Aybal; Istanbul/TR

Purpose or Learning Objective: The aim of our study was to differentiate medulloblastoma molecular subtypes with multiparametric MRI findings, including magnetic resonance imaging-based texture analysis.

Methods or Background: Fifty-eight patients with preoperative MRI and histopathological diagnosis of medulloblastoma after surgery were included in our study. The patients were divided into two groups as SHH pathway active and group 3/group 4 medulloblastoma. Morphological findings in brain MRI, ADC measurements and texture analysis features of the lesions in both groups were compared.

Results or Findings: Thirty-two (55.2%) of 58 medulloblastoma patients included in the study were SHH pathway, while the others were group 3-4 molecular subtype. Among the morphological findings, being out of midline or in the cerebellar hemisphere ($p<0.001$), peri-tumoural oedema ($p=0.041$), macrocyst ($p=0.001$) and nodular involvement/lobulation ($p=0.002$), as well as heterogeneous contrast enhancement ($p=0.002$) 0.011) were statistically more common in SHH active tumours. The ratio of the solid part of the tumour to the thalamus in ADC measurements was statistically significantly lower in SHH tumours ($p<0.001$). When the threshold value for this ratio was determined as 0.855, the sensitivity was 82.1%, and the specificity was 92.3%. As for texture analysis parameters, kurtosis ($p=0.023$), SumOfSqs ($p=0.022$) and 01-10-50-90% percentile (respectively $p=0.011$; $p=0.001$; $p=0.006$; $p=0.013$) values obtained from ADC images and kurtosis ($p=0.041$), SumOfSqs ($p=0.005$), SumVarnrc ($p=0.014$), SumEntrp ($p=0.032$) values obtained from T1W images were statistically significant in differentiating SHH and group 3/ group 4 medulloblastoma.

Conclusion: The use of morphological MRI findings, ADC measurement, and texture analysis parameters provide useful diagnostic information in identifying medulloblastoma molecular subtypes.

Limitations: Retrospective study.

Ethics committee approval: Ethics committee approval was obtained

Funding for this study: No funding was received for this study.

RPS 2411-5 - Myeline changes caused by neurotoxicity after the first chemotherapy course: a pilot study (8 min)

Nataliia Kriventsova; Moscow / Russia



Author Block: N. Kriventsova, P. Menshchikov, N. Kosirnikova, D. Kupriyanov, G. Tereshchenko; Moscow/RU

Purpose or Learning Objective: Neurotoxicity of the central and peripheral nervous system is a frequent complication of chemotherapy and is characterized by different neurological symptoms. Some previous DTI/DWI studies indirectly indicate the demyelination processes caused by neurotoxicity. Thus, the study's main aim was to directly measure myeline content after the first chemotherapy course.

Methods or Background: 6 paediatric patients (mean age 13.7 ± 2.4) with leukaemia and osteosarcoma were enrolled in the study. MRI examination included 2 scanning sessions: 1 week before and after chemotherapy. Each scanning includes the acquisition of the following pulse sequences: (1) macromolecular proton fraction (MPF) gradient echo (GE) with $FA=3^\circ$ and 20° as well as additional MT-weighted GE with Gaussian saturated prepulse, and (2) water myeline fraction (WMF) Turbo Spin Echo with TE from 10 to 210ms. MPF, WMF and T2 values were measured in white matter (WM) of parietal, temporal, occipital, frontal lobes, cerebellum and thalamus.

Results or Findings: Both MPF and T2 simultaneously increase in WM occipital lobes and thalamus. WMF shows increased values for the cerebellum as well as decreased values in WM parietal lobes.

Conclusion: Previously, both MPF and WMF have been shown to reflect myeline concentration. Moreover, some previous studies revealed the influence of region oedema associated with the T2 increase on the MPF. In our study, we have the same effect. Therefore, MPF seems to be ineffective in this case. Reduced WMF indicates a demyelination process in white matter of the parietal lobe. The increase in WMF in the cerebellum may indicate the accumulation of "myelin refuse". Myelin residues are located at the site of degeneration until the complete cleansing by macrophages.

Limitations: The main limitation of the study is the small patient cohort.

Ethics committee approval: Not applicable.

Funding for this study: No funding was received for this study.

RPS 2411-6 - Clinical outcomes post stereotactic radiosurgery (SRS) treatment for metastases: can pseudocontinuous arterial spin labelling (pCASL) contribute? (8 min)

Meghavi Mashar; Preston / UK

Author Block: M. Mashar, M. Sokolska, J. Markus, M. Kosmin, H. Hyare; London/UK

Purpose or Learning Objective: We investigated the utility of pseudocontinuous arterial spin labelling (pCASL), a perfusion-weighted MR technique, in clinically stratifying patients post stereotactic radiosurgery (SRS) for cerebral metastases.

Methods or Background: 45 patients (25 female, mean age: 60.2 years) with metastases treated with first SRS treatment (03/17 to 10/19) and pCASL sequence at the first follow-up (mean: 6.35 weeks). pCASL perfusion weighted image (PWI) was visually classified: positive (n=16) or negative (n=29) (ASL+/-). Signal intensity (SI) from the lesion and perilesional area were manually defined on PACS. Ratios of SI were calculated (mean \pm standard error); radiological progression as per RANO criteria and 6-month mortality were documented.

Results or Findings: The ratio of mean SI in the lesion to perilesional area (contrast to noise ratio) was higher in ASL+ (1.94 ± 0.15) vs ASL- (0.77 ± 0.05) ($P < 0.05$) and similarly in ratios of maximum SI [ASL+ (1.81 ± 0.22), ASL- (0.95 ± 0.04)]. Treatment response at first follow-up was similar ASL+, non-progression n=15, 94%; ASL, non-progression n=27, 93%, and 6-month mortality: ASL+, n=2, 13%; ASL-, n=4, 13%. Whilst there was limited follow-up available at 6 months (n=29), a higher proportion in the ASL- group had progressive disease at 6 months: n=10, (50%) vs ASL+, n=2 (22%).

Conclusion: Our results indicate that post-SRS for metastases, pCASL can stratify patients at 6 months. Visual assessment of pCASL PWI allows accurate classification of perfusion in metastases indicating the feasibility of use clinically. The association between ASL signal post-treatment and disease non-progression may be due to treatment-related increased vascularity, or that vascular metastases are more radio-sensitive.

Limitations: As a preliminary retrospective, small sample study, findings are limited. Assessment of interobserver variability would add robustness to our conclusions and better evaluate utility in clinical practice.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.



RPS 2401b - Diagnosis and preoperative planning of colon pathology: advances in knowledge

Categories: Contrast Media, GI Tract, Imaging Methods, Oncologic Imaging, Research

Date: March 6, 2022 | 11:30 - 12:30 CET

CME Credits: 1

Moderator:

Emanuele Neri; Pisa / Italy

RPS 2401b-2 - Low volume reduced bowel preparation regimen for CT colonography: a randomised non-inferiority trial (8 min)

Simone Vicini; Sora / Italy

Author Block: S. Vicini¹, D. M. Bellini¹, N. Panvini¹, M. Rengo², I. Carbone²; ¹Latina/IT, ²Rome/IT

Purpose or Learning Objective: To determine whether the quality of low-volume reduced bowel preparation (LV-RBP) for CT colonography (CTC) is non-inferior to full-volume reduced bowel preparation (FV-RBP) regimen.

Methods or Background: In this randomised controlled trial, consecutive participants referred for CTC were randomly assigned to receive LV-RBP (52.5 g of PMF104 in 500 mL of water) or FV-RBP (105 g of PMF104 in 1000 mL of water). Images were independently reviewed by five readers who rated the quality of bowel preparation from 0 (best score) to 3 (worst score). The primary outcome was the non-inferiority of LV-RBP to FV-RBP in the proportion of colonic segments scored 0 for cleansing quality, with a non-inferiority margin of 10%. The volume of residual fluids, colonic distension, lesions and polyps detection rates and patient tolerability were secondary outcomes.

Results or Findings: 110 participants (mean age 65 years±14 SD) were allocated to LV-RBP (n=55) or FV-RBP (n=55) arms. There was 92% segment scored 0 in colon cleansing quality in LV-RBP and 94% in FV-RBP for prone scans, and 94% vs 92% for supine scans. The risk difference was -2.1 (95% CI -5.9 to 1.7) and 1.5 (95%CI -2.4 to 5.4) for prone and supine positions, respectively. Residual fluids and colonic distension were also non-inferior in LV-RBP. LV-RBP was associated with a lower number of evacuations during preparation (7±5 vs 10±6, p=0.002).

Conclusion: The LV-RBP demonstrated the non-inferior quality of colon cleansing with improved gastrointestinal tolerability compared to the FV-RBP regimen.

Limitations: The number of participants enrolled was relatively small. Second, we were not able to evaluate CTC diagnostic accuracy for polyps detection. Third, the quality of colon cleansing was assessed exclusively by subjective analysis.

Ethics committee approval: Approval was obtained from the ethics committee of the Sapienza University of Rome.

Funding for this study: No funding was received for this study.

RPS 2401b-3 - Examining outcomes of CT abdominal tomography to diagnose constipation in an emergency setting (8 min)

Sook Cheng Chin; Toronto / Canada

Author Block: S. C. Chin¹, C. O'Brien², A. Kielar¹; ¹Toronto, ON/CA, ²Dublin/IE

Purpose or Learning Objective: The purpose of this quality initiative project was to examine if CT abdominal tomograms (CTAT), which are ultra-low dose unenhanced CT examinations, are performed for constipation changes in patient management.

Methods or Background: A retrospective observational study of two emergency departments (ED) where 200 randomly selected adults who had a CTAT examination performed from January 2019 to December 2019 presenting with constipation were included. Management and final diagnosis were collected from available ED notes. Stool location, volume and other significant CT findings were extracted from the radiology reports.

Results or Findings: The median age was 72 years with a 86 to 114 female to male ratio. Constipation was present in 107 patients (48.2%). 7 patients (3.2%) had a bowel obstruction and 10 patients (4.5%) had other GI-related acute pathology diagnosed on CTAT. Patients who received a CTAT diagnosis of constipation were more likely to receive treatment for constipation (57.0% vs 26.9%) and receive a final discharge diagnosis of constipation vs another diagnosis. However, the stool volume or location did not impact management ($p=0.4$; $p=0.21$).

Conclusion: In conclusion, we have demonstrated that ultra-low-dose CT quantification of constipation does alter management slightly but the perceived added benefit of more accurately quantifying and localising stool within the colon does not influence management.

Limitations: We acknowledge several limitations of this study as a retrospective observational study. We did not perform an inter-observer assessment for grading the quantity of stool volume. We also did not explore the reasons for not treating patients with a CT diagnosis of constipation as we were limited to the electronic records available within our own institution.

Ethics committee approval: Waived as part of a quality improvement project.

Funding for this study: No funding was received for this study.

RPS 2401b-4 - Enterocoele, a problem for the patient, the surgeon, the radiologist: ten years and more of experience of oral contrast agent in defecography (8 min)

Francesco Testa; Bra / Italy

Author Block: F. Testa, G. Di Guardia, M. Lo Bello, V. Verna, P. Lasciarrea; Verduno/IT

Purpose or Learning Objective: The oral contrast medium does not seem mandatory in defecography procedures; however, to demonstrate an enterocoele (critical information for the surgeon), it is necessary to opacify the small bowel. A decade of case studies to illustrate the opportunity of oral contrast in all patients who undergo the procedure.

Methods or Background: Our series of 353 defecographies conducted on patients with various degrees of evacuation disorders were reviewed in detail. For each procedure, we considered the enterocoele and its extension. In all of our procedures, contrast medium (barium sulphate or iodate) was administered orally between 40 and 60 minutes before the examination.

Results or Findings: 353 defecographs in 333 females and 20 males (mean age 60.3, median age 62) showed a total of 132 cases of enterocoele (37.4%), classified in 75 cases of mild enterocoele (56.8%, non-interfering with the evacuation dynamics) and 57 of severe enterocoele (43.2%), interfering with the evacuation dynamics. No significant differences were recognised in the use of barium sulphate or iodate oral contrast medium.

Conclusion: The prevalence of enterocoele suggests the use of oral contrast medium in all patients undergoing defecography, with an advantageous cost-benefit balance. The choice between barium and iodate contrast can be made on the basis of the constipation tendency, which tends to be aggravated by barium-based compounds.

Limitations: No limitations were identified.

Ethics committee approval: No ethics committee approval was needed.

Funding for this study: No funding was received for this study.

RPS 2401b-5 - Magnetic resonance imaging (MRI) and colonoscopy in evaluation of colorectal diseases (8 min)

Rajul Rastogi; Moradabad / India

Author Block: R. Rastogi, V. Khare, A. Mishra; Moradabad/IN

Purpose or Learning Objective: Colorectal disease, especially carcinoma, are an important cause of morbidity and mortality in the modern era. With the rising incidence of colorectal diseases and due to limitations of conventional flexible fiberoptic colonoscopy (gold standard tool), imaging plays a significant role in the evaluation of these patients. Recent developments in magnetic resonance imaging (MRI) coupled with its advantages of noninvasive and radiation-free nature, it has recently become a screening tool in colorectal diseases.

Methods or Background: Forty-four patients with signs and symptoms of the colorectal disease were evaluated by 1.5T MRI followed by conventional, flexible, fiberoptic colonoscopy on the same day. Bowel preparation was done using polyethylene glycol. Data from MRI and colonoscopy were recorded and compared with the final diagnosis.

Results or Findings: The majority of patients in the study were in the 21-40yrs age group with male predominance. Altered bowel habits followed by bleeding per rectum were the commonest presentations. Both MRI and colonoscopy overdiagnosed the lesions as malignant with higher errors by MRI. MRI was very effective in the detection of growth, strictures, diverticulosis, mucosal thickening/oedema and extracolonic manifestation but failed in detecting small polyps and ulcers. MRI had high sensitivity and negative predictive value of 100% with an accuracy of more than 70%.

Conclusion: MRI with its noninvasive and radiation-free nature along with its high sensitivity and negative predictive value for malignant lesions should be considered over colonoscopy as well as computed tomography in the evaluation of colorectal diseases.

Limitations: The study was performed on 1.5T MR scanner.

Ethics committee approval: The ethics committee approval was obtained.

Funding for this study: No funding was provided for this study.

RPS 2401b-6 - Magnetic resonance imaging in the local staging of colon cancer: a prospective, blinded study (8 min)

Sören R. Rafaelsen; Vejle / Denmark

Author Block: S. R. Rafaelsen, C. Dam, C. Vagn-Hansen, J. Møller, H. Rahr, M. Sjöström, J. Lindebjerg, T. F. Hansen, M. R. V. Pedersen; Vejle/DK

Purpose or Learning Objective: The purpose of this study was to investigate the sensitivity and specificity of magnetic resonance imaging (MRI) compared to CT scan.

Methods or Background: Patients underwent a standard CT scan. For the MRI scan, a 3 Tesla unit was used, including diffusion-weighted imaging (DWI), with an average scan time of 25 minutes. No intravenous, oral or rectal contrast medium was administered. Prior to the study both the CT and MRI radiologist had received feedback from the pathologist at a weekly colorectal MDT meeting five years prior to inclusion of the first patient. McNemar's test was used to compare the two modalities.

Results or Findings: From 2018 to 2021, 134 patients had CT and MRI scans. CT failed to detect 16/134 (12%) colon tumours, half of which were pT3 tumours, whereas MRI detected all tumours. For discriminating between stage T3ab and T3cd the sensitivity of CT was 51.1% and of MRI 80.0% ($p = 0.02$). CT and MRI had a sensitivity of 21.4% and 46.4% in detecting pT4 tumours and a specificity of 79.0% and 85.0%, respectively. For the evaluation of extravascular involvement, the sensitivity and specificity of CT was 35.0% and 82.0%, whereas MRI had higher values of 50.0% and 81.8%, respectively.

Conclusion: MRI detected colonic tumours more often than CT. Compared to CT the sensitivity of MRI was statistically significantly higher in detecting advanced T3cd and T4 tumours. MRI has the potential to be used in the treatment planning of colon cancer.

Limitations: Inter-observer variation was not evaluated.

Ethics committee approval: The study was approved by the local Science Ethical Committee, and all patients signed the informed consent.

Funding for this study: This study was funded by the Danish Cancer Society, MRP grant nr. R231-A14077, and the Region of Southern Denmark, E-fond 152.

RPS 2401b-7 - Dose optimisation of iodinated contrast media in the preoperative evaluation of the venous system before CME for right colon cancer (8 min)

Luigi Asmundo; Milan / Italy



Author Block: L. Asmundo, M. Marongiu, F. Rizzetto, L. A. Carbonaro, A. Vanzulli; Milan/IT

Purpose or Learning Objective: The objective of this study was to optimise the dose of iodinated contrast media for CT imaging of venous colic vessels for preoperative evaluation before a complete mesocolic excision (CME) technique to treat right colon cancer.

Methods or Background: 150 patients with an abdominal venous phase CT scan performed February-April 2021 were retrospectively selected: 50 with i.v. administration of lobitridol (350mg/ml), 50 with Iohexol (370mg/ml), 50 with administration of Iohexol (350mg/ml). Enhancement values of the superior mesenteric vein, of the right colic vein, and of the ileocolic vein were evaluated with ROIs.

Results or Findings: We did not find any significant difference between the groups, in terms of weight of the patients ($p=0.504$), administered contrast dose ($p=0.504$), dose of iodine per kilogram ($p=0.228$), a dose of contrast medium per kilogram ($p=0.786$). The upper quartile enhancement thresholds ($>75\%$) for each vein were: superior mesenteric vein (170 HU), ileocolic vein (134 HU), right colic vein (102 HU). The average dose (iodium/kg) for upper quartile enhancement thresholds ($>75\%$) of the three veins (564, 557 and 549 mg/kg for superior mesenteric, ileocolic and right colic veins, respectively) proved to be higher than the average dose for the lower percentile ($<25\%$) enhancement thresholds ($p<0.001$).

Conclusion: In order to get the highest enhancement values, a contrast media dose of 1.48 cc/kg of Iohexol 370, and 1.57 cc/kg of lobitridol 350 and Iohexol 350, should be administered to enable us to outline a protocol of CT image acquisition in order to improve the visualisation of the right colic vein vascular map, before CME.

Limitations: This is a retrospective study and no other technical parameters such as the injection flow, nor patients' parameters such as body mass index were evaluated.

Ethics committee approval: This study was approved by the local ethical committee.

Funding for this study: No funding was received for this study.

RPS 2405a - Artificial intelligence (AI) in cardiovascular imaging

Categories: Artificial Intelligence & Machine Learning, Cardiac, Imaging Informatics, Vascular

Date: March 6, 2022 | 11:30 - 12:30 CET

CME Credits: 1

Moderators:

Maximilian Russe; Freiburg / Germany

Carlo Catalano; Roma / Italy

RPS 2405a-2 - Deep convolutional neural networks improve the long term prediction of major cardiovascular events after coronary computed tomography angiography (8 min)

Alessa Chami; München / Germany

Author Block: A. Chami, C. v. Schack, R. Adolf, N. Nano, E. Hendrich, A. Will, S. Martinoff, M. Hadamitzky; Munich/DE

Purpose or Learning Objective: Coronary Computed Tomography Angiography (CCTA) is an established modality for assessing coronary artery disease (CAD). Its role for prognosis assessment is still limited. Deep convolutional neural networks (CNNs) might improve this process by using plaque characteristics that are currently not used.

Methods or Background: The Consecutive CCTAs from patients with suspected CAD examined between October 2004 and January 2018 were analyzed. The primary endpoint was a composite of all-cause mortality, myocardial infarction and late revascularization. The training endpoint additionally included early revascularization. The clinical risk was assessed by Morise score; for conventional CCTA assessment, extent of CAD (eoCAD) and segment involvement score (SIS) were used. Semiautomatic post-processing was performed for vessel delineation and annotation of calcified and non-calcified plaque areas. Two-step training of a densenet-121 CNN was done: The full network was trained using the training endpoint, then the feature layer was trained using the primary endpoint. Five times cross-validation was performed to ensure that each CNN was evaluated on an unseen set of data.

Results or Findings: The study population comprised 5468 patients. During the follow-up of 7.2 years, 334 patients reached the primary endpoint; in addition, 405 early revascularizations occurred. The outcome correlation of CNN showed an AUC of 0.720 ± 0.010 and 0.631 ± 0.015 for training endpoint and primary endpoint resp. Combining CNN with conventional CT parameters showed an improvement of AUC from 0.791 to 0.821 ($p < 0.0001$) and from 0.766 to 0.773 ($p < 0.0001$) for eoCAD and SIS resp. In a stepwise model including clinical risk, conventional CT parameters and CNN, the latter improved the prediction from 0.813 to 0.819 ($p = 0.0022$) and from 0.772 to 0.775 ($p < 0.0013$) for eoCAD and SIS resp.

Conclusion: CNNs are a promising tool to further improve the prediction of major cardiovascular events after CCTA.

Limitations: No limitations identified.

Ethics committee approval: Ethics committee approval was received.

Funding for this study: No funding was received for this study.

RPS 2405a-3 - Improving the degree of enhancement in coronary computed tomography angiography with a patient-specific trigger delay bolus tracking in a third-generation dual-source scanner (8 min)

Yiran Wang; Zhengzhou / China

Author Block: y. Wang; Zhengzhou/CN

Purpose or Learning Objective: To compare coronary CT angiography (CCTA) contrast opacification between a fixed trigger delay and patient-specific trigger delay bolus tracking in a third-generation dual-source scanner.

Methods or Background: 100 consecutive patients were randomly divided into two groups to perform CCTA scans in the bolus tracking method; group A with a fixed trigger delay time of 5 seconds and group B with an automatic patient-specific trigger delay time estimated from monitored CT values. All CT scanning and contrast media injection protocol parameters were kept identical. CT value of aorta root (AO), coronary segments and superior vena cava (SVC) were measured for the objective image quality evaluation. Subjective evaluation of the image quality was performed by two independent blinded reviewers using a 5-point scale (5 = excellent, 1 = poor). Independent sample t-test and the Wilcoxon-Mann-Whitney test were used to compare quantitative and qualitative data, respectively.

Results or Findings: The trigger delay time in group B ranged from 4-8 seconds (mean, 6.6 ± 1.4 seconds). Group B had higher mean enhancement in AO and coronary (407 ± 61 Hu vs 360 ± 48 Hu for pRCA, 423 ± 58 Hu vs 367 ± 57 Hu for pLAD, and 408 ± 55 Hu vs 351 ± 56 Hu for pLCX, all $p < 0.05$) than group A. The opacification of the SVC was significantly lower in group B than in group A (147 Hu vs 261 Hu; $p < 0.05$). Subjective image quality was higher in group B than in group A (4.5 vs 4.1 ; $p < 0.05$).

Conclusion: Compared with a fixed delay time, a patient-specific trigger delay bolus tracking estimation provided significantly higher attenuation and improved the image quality for coronary CT angiography.

Limitations: The diagnostic accuracy of our study needs to be further validated against invasive angiography.

Ethics committee approval: This study protocol was approved by the local ethics committee.

Funding for this study: No funding was received for this study.

RPS 2405a-4 - The use of a graph convolutional neural network model based on fundus photograph derived vascular biomarkers to predict coronary artery disease based on the CT CAD-RADS scores (8 min)

Varut Vardhanabhuti; Hong Kong / Hong Kong SAR China

Author Block: F. Huang, J. LIAN, K. S. NG, V. Vardhanabhuti; Hong Kong/HK

Purpose or Learning Objective: The purpose of this study is to utilize a graph convolutional neural network (GCN) to predict the coronary artery disease reporting and data system (CAD-RADS) based on coronary CT angiography (CCTA) using the quantitative vascular biomarkers derived from fundus images of the same subjects.

Methods or Background: This prospective single-centre study included 145 subjects who had received both CCTA and funduscopy examinations on the same day in our local imaging centre in 2019. The CCTA scans were stratified by CAD-RADS scores by expert readers, which were then binarized into two classes (i.e. 0 (normal), 1 (minimal) and 2 (mild) were in class 0, and 3 (moderate), 4 (severe) and 5 (occluded) were in class 1). The vascular biomarkers were extracted from their eye images using a retinal health information and notification system. A graph was constructed, where each graph nodes represented a fundus image, and the node features were the vascular biomarkers relevant to blood vessel width and curvature. The graph edges were determined by the similarity of age and gender of paired subjects. A GCN model was employed on the graph to predict the binarized CAD-RADS score for each node. The image data of 115 subjects (80%) were used for training and 30 subjects (20%) for testing. We also trained multiple traditional machine learning models for comparison.

Results or Findings: The GCN model showed a sensitivity, specificity, accuracy and area under the curve of 75%, 81.03%, 79.27% and 0.864, respectively. The performance outperforms the same evaluation metrics obtained from the traditional machine learning models ($p < 0.01$).

Conclusion: The changes in fundus vasculature had potential predictive value for CAD-RADS scores and significant coronary artery diseases.

Limitations: Small sample size. Proof of concept study.

Ethics committee approval: Approved by the local institution.

Funding for this study: No funding was received for this study.

RPS 2405a-5 - Image preprocessing and filtering effect on the estimate of myocardial radiomic features from T1 and T2 mapping in hypertrophic cardiomyopathy (8 min)

Daniela Marfisi; Pisa / Italy



Author Block: D. Marfisi¹, C. Tessa², C. Marzi³, J. Del Meglio⁴, S. Linsalata¹, C. Vignali⁴, G. Casolo⁴, A. C. Traino¹, M. Giannelli¹; ¹Pisa/IT, ²Massa/IT, ³Sesto Fiorentino/IT, ⁴Lido di Camaiore/IT

Purpose or Learning Objective: Radiomics, often combined with artificial intelligence techniques, is emerging as a promising and useful tool for unveiling myocardial tissue characteristics in cardiac magnetic resonance (CMR) imaging. Nonetheless, its proper application deserves some caution and a preliminary assessment of possible radiomic feature dependence on various factors, since each step of the radiomic workflow could influence feature estimation. Accordingly, the purpose of this study was to investigate, for the first time, the effect of image preprocessing and filtering on radiomic feature estimation from quantitative CMR T1 and T2 mapping.

Methods or Background: Specifically, T1/T2 maps of 26 patients with hypertrophic cardiomyopathy (HCM) were used to estimate 98 myocardial radiomic features for 7 different resampling voxel sizes (at fixed bin width), 9 different bin widths (at fixed resampling voxel size), and 7 different spatial filters (at fixed resampling voxel size/bin width).

Results or Findings: While we found a remarkable dependence of myocardial radiomic features from T1/T2 mapping on image filters, many radiomic features showed a limited sensitivity to resampling voxel size/bin width in terms of intraclass correlation coefficient (>0.75) and coefficient of variation ($<30\%$). The estimate of several textural radiomic features showed a linear significant ($p<0.05$) correlation with resampling voxel size/bin width.

Conclusion: Overall, radiomic features from T2 maps have proven to be less sensitive to image preprocessing than those from T1 maps, especially when varying bin width. Our results might corroborate the potential of radiomics from T1/T2 mapping in HCM and hopefully in other myocardial diseases.

Limitations: This was a single-centre study of a relatively small cohort of HCM patients.

Ethics committee approval: The study was approved by the local ethics committee of the Azienda USL Toscana Nord Ovest (Pisa, Italy).

Funding for this study: This study received no external funding.

RPS 2405a-6 - Fully automated left ventricular late gadolinium enhancement detection by a convolutional neuronal network in chronic myocardial infarction (8 min)

Mathias Josef Pamminger; Innsbruck / Austria

Author Block: M. J. Pamminger, D. Obmann, C. Kremser, P. Poskaite, F. Troger, S. Reinstadler, B. Metzler, M. Haltmeier, A. Mayr; Innsbruck/AT

Purpose or Learning Objective: To compare fully automated segmentation of left ventricular late gadolinium enhancement (LGE) as evaluated by a convolutional neuronal network (CNN) with manual segmentation in chronic myocardial infarction.

Methods or Background: Cardiac magnetic resonance imaging, including two-dimensional LGE imaging, was performed in 191 patients on a 1.5 T clinical scanner 12 months after ST-elevation myocardial infarction. LGE images were presented to a trained CNN for automated determination of left ventricular myocardium and consequently LGE volume. Manual LGE segmentation according to the +5-SD method was used as the reference standard. Image quality was assessed according to a 3-point Likert scale (2 = perfect image quality, 1 = some artefacts without impaired LGE delineation, 0 = strong artefacts with impaired LGE delineation). Regression and Bland-Altman analyses were performed.

Results or Findings: In 191 included patients (182 male, mean age 57 years), the LGE volume was 9.7 [IQR 3.6 to 16.2] cm³ according to manual segmentation and 8.3 [3.2 to 17.6] cm³ according to CNN segmentation. The Bland-Altman analysis showed little average difference (-0.5 cm³, $p=0.257$), however, the limits of agreement ranged from -18.4 cm³ to 17.5 cm³. The linear correlation was fair (0.57, $p<0.001$). The subgroup analysis according to the image quality showed comparable performance of CNN segmentation in all three groups.

Conclusion: Our fully automated LGE segmentation based on a CNN in two-dimensional data sets provides measurements with little average difference compared to very time-consuming manual segmentations. However, dispersion is substantially and limits the current application of this approach on a per-patient basis. Image quality does not affect CNN performance.

Limitations: Manual segmentation according to the +5-SD method is dependent on investigator experience and is limited in circumferential myocardial LGE.

Ethics committee approval: Local ethics committee approval was provided.

Funding for this study: No funding was received for this study.

RPS 2405a-7 - Prediction of low-keV monoenergetic images from dual-energy spectral CT to improve the automatic detection of pulmonary embolism in single-energy CT scans (8 min)

Matthias Alexander Fink; Heidelberg / Germany



Author Block: M. A. Fink¹, C. Seibold², H-U. Kauczor¹, R. Stiefelhagen², J. Kleesiek³; ¹Heidelberg/DE, ²Karlsruhe/DE, ³Essen/DE

Purpose or Learning Objective: We aimed to develop a deep learning (DL) model based on detector-based spectral dual-energy angiography CT (DE-CTPA) data, yielding predictions of low-keV acquisitions to improve automatic pulmonary embolism (PE) detection in conventional single-energy CT scans.

Methods or Background: We used two data sets: our institutional DE-CTPA data set D1 comprising standard arterial series and the corresponding virtual monoenergetic images (VMI) at low-energy levels (40 keV) with 7,892 image pairs, and a 10% subset of the RSNA Pulmonary Embolism Detection Challenge (2020) data set D2, which consists of 161,253 polyenergetic images with dichotomous slice-wise annotations (PE/no PE). We trained a fully convolutional 9-block ResNet encoder-decoder network to generate VMI predictions from D1, which are then fed into a ResNet50 network for the PE classification task on single-energy CT scans from D2. We evaluated our VMI reconstruction results in terms of Peak-Signal-to-Noise-Ratio (PSNR) and Structural Similarity Index Measure (SSIM). For PE identification, we performed a binary classification on slice level and reported the area under the curve (AUC).

Results or Findings: The quantitative results on the reconstruction ability of the DL model revealed high-quality visual VMI predictions with reconstruction results of 0.984 ± 0.002 (SSIM) and 41.706 ± 0.547 (PSNR). The PE classification yielded an AUC of 0.84 for our framework, which improves PE classification compared to other naïve PE classification approaches with AUCs up to 0.81.

Conclusion: Our results demonstrate that the prediction of synthetic VMI from polyenergetic CT scans can improve the automated detection of PE. This could help rescue CTPA studies with suboptimal opacification of the pulmonary arteries from single-energy CT scanners.

Limitations: Class imbalance per subset could bias the results.

Ethics committee approval: The study was approved by our IRB (S-236/2020).

Funding for this study: No funding was received for this study.

RPS 2405a-8 - Vessel segmentation on non-contrast liver MRI (8 min)

Daniel Sobotka; Vienna / Austria

Author Block: D. Sobotka, A. Herold, M. Perkonigg, L. Beer, N. Bastati-Huber, A. Sablatnig, A. Ba-Ssalamah, G. Langs; Vienna/AT

Purpose or Learning Objective: Liver vessel segmentation in MR imaging is crucial for the computational analysis of vascular remodelling. Existing techniques rely on contrast-enhanced MR (MRce), which are not uniformly acquired. Non-contrast images are acquired more frequently, but vessels are hard to distinguish from other structures due to lack of opacification. Here, we propose a convolutional neural network to segment liver vessels on non-contrast images with the help of auxiliary contrast-enhanced data available only during training. The approach improves segmentation accuracy on non-contrast images and reduces the need for annotated examples.

Methods or Background: A multi-task learning approach trains a Y-net style convolutional neural network for liver vessel segmentation on MR imaging data. During training, MR with and without contrast together with vessel annotations on a sub-set of the data are available. The auxiliary MRce provides variability to the encoder training of the model. This improves the vessel segmentation accuracy, even if no MRce is available during application. We investigate overall- and vessel thickness specific segmentation accuracy.

Results or Findings: Using auxiliary contrast-enhanced sequences improves the Dice score for vessel segmentation on non-contrast MR by 0.10 from 0.45 to 0.55. For small vessels (0-10 mm), the score increases by 0.03, for bigger vessels (>10mm) by 0.13.

Conclusion: Highly-informative contrast-enhanced sequences improve vessel segmentation models for non-contrast imaging data. It allows for a reduction of the number of annotated examples necessary for vessel segmentation model training.

Limitations: Number of vessel annotations used in evaluating the proposed framework.

Ethics committee approval: The local ethics committee approved this study protocol (EK 2027/2017), which was performed in accordance with the Helsinki Declaration.

Funding for this study: This study was partially funded by Austrian Science Fund (FWF): P 35189, Vienna Science and Technology Fund (WWTF): LS20-065, Novartis Pharmaceuticals Corporation.



RT 24 - The green radiology department

Categories: General Radiology, Management/Leadership, Professional Issues, Radiographers

ETC Level: ALL LEVELS

Date: March 6, 2022 | 11:30 - 12:30 CET

Moderators:

Boris Brkljačić; Zagreb / Croatia

Adrian Brady; Cork / Ireland

RT 24-1 - Chairpersons' introduction (2 min)

Boris Brkljačić; Zagreb / Croatia

Adrian Brady; Cork / Ireland

1. To learn ways to achieve a sustainable and long-term energy saving radiology department.
2. To understand how minor changes to the settings of the reporting stations in a radiology department can result in significant energy savings and promote energy-wise habits.

RT 24-2 - The "Green Fingerprint" Project (10 min)

Joachim Hohmann; Winterthur / Switzerland

RT 24-3 - The "GREENWATER" Project (10 min)

Francesco Sardanelli; San Donato Milanese / Italy

RT 24-4 - Discussion (38 min)

Lorenzo E. Derchi; Genoa / Italy

Joachim Hohmann; Winterthur / Switzerland

Luis Martí-Bonmatí; Valencia / Spain

RPS 2511 - Artificial intelligence (AI) meets the brain

Categories: Artificial Intelligence & Machine Learning, Imaging Methods, Neuro

Date: March 6, 2022 | 13:00 - 14:00 CET

CME Credits: 1

Moderator:

Teresa Santos Nunes; Lisboa / Portugal

RPS 2511-2 - AI-enhanced multi-shot multi-contrast EPI protocol: a preliminary clinical experience (8 min)

Silvia Pistocchi; Lausanne / Switzerland

Author Block: S. Pistocchi¹, T. Hilbert¹, D. Rodriguez¹, B. Clifford², T. Feiweier³, Z. Hosseini⁴, V. Dunet¹, S. Cauley², T. Kober¹;

¹Lausanne/CH, ²Boston, MA/US, ³Erlangen/DE, ⁴Atlanta, GA/US

Purpose or Learning Objective: The duration of MRI acquisitions is a major limitation of this imaging modality, but especially for time-sensitive applications such as stroke or when imaging non-compliant or very young patients. Here we aim to evaluate the image quality of a new fast AI-enhanced protocol utilising a prototype multi-shot, multi-contrast EPI sequence and compare it to the standard imaging protocol at our institution.

Methods or Background: Between the 1st and 31st of June 2021, the AI-enhanced multi-shot multi-contrast EPI prototype sequence was added to our standard protocol in 30 brain MRI examinations with mixed clinical indications. The prototype sequence provided five contrasts (2D sagittal T1, axial FLAIR, T2GE, DWI) in a total of two minutes of scan time. Images were prospectively reviewed and independently compared to the standard 7:30 min: sec protocol by two experienced neuroradiologists. Six items (overall image quality, grey-white matter interface, basal ganglia delineation, sulci, motion, and susceptibility artefacts) were assessed on each generated contrast using a 4-point Likert scale. Inter-observer concordance was assessed using the Gwet AC1 coefficient.

Results or Findings: The AI-enhanced multi-shot multi-contrast EPI protocol allowed a 73% reduction of acquisition time and showed good to excellent overall image quality (mean score ≥ 3). Inter-observer concordance was good to excellent (Gwet AC1: 0.52 to 1.0). Motion and susceptibility artefacts were mostly rated as absent or minor with no adverse effect on diagnostic use, but with more heterogeneous inter-observer concordance (Gwet AC1: 0.27 to 0.83).

Conclusion: The AI-enhanced multi-shot multi-contrast EPI protocol demonstrated good image quality with a 73% reduction in acquisition time. Further studies evaluating diagnostic performance in time-sensitive clinical applications should be planned.

Limitations: This study is monocentric and has a small sample size.

Ethics committee approval: Not applicable.

Funding for this study: No funding has been used for this study.

RPS 2511-3 - Comparison of image quality improvements among deep learning reconstruction, hybrid-type and model-based iterative reconstruction on brain contrast-enhanced CT angiography for ultra-high-resolution CT (8 min)

Kazuhiro Murayama; Toyooka / Japan



Author Block: K. Murayama¹, Y. Ohno¹, H. Ikeda¹, H. Kimata², N. Akino², K. Fujii², Y. Kataoka¹, A. Katagata¹, H. Toyama¹; ¹Toyoake/JP, ²Otawara/JP

Purpose or Learning Objective: To directly compare the capability for image quality improvements on brain contrast-enhanced CT angiography (CE-CTA) for ultra-high-resolution CT (UHR-CT) in intracranial aneurysms patients among deep learning reconstruction (DLR) and hybrid-type iterative reconstruction (IR) and model-based IR.

Methods or Background: 21 intracranial aneurysm patients underwent brain CE-CTA and reconstructed by DLR, hybrid-type IR and model-based IR using a UHR-CT system with super-high resolution mode (SHR: 0.25mm×160 rows/1792 channels). CT values at MCA were assessed by ROI measurements. Image J software was used to generate the profile curves. To assess the capability for improvement of spatial resolution with UHR-CT and DLR, full width at half maximum (FWHM), the width of the edge rise distance (ERD) and the edge rise slope (ERS) were measured at each vessel. For qualitative assessment, overall image quality, artefact, aneurysm, and vascular depiction levels were assessed by 5-point scales by two board-certified radiologists. CT values, ERS and all qualitative indexes were compared by Tukey's HSD test. Inter-observer agreements of each method were evaluated by kappa statistics with χ^2 test.

Results or Findings: CT values and ERS of model-based IR and DLR were significantly higher than those of hybrid-type IR at MCA ($p<0.05$). Inter-observer agreement of each index by all methods was determined as moderate, substantial or excellent ($0.51\leq\kappa\leq 0.92$, $p<0.001$). In addition, overall image quality and artefact of DLR were significantly improved as compared with others ($p<0.05$). Aneurysm and vascular depiction levels had no significant difference among all methods ($p>0.05$).

Conclusion: DLR has a potential for image quality improvements than hybrid-type and model-based IR on brain CE-CTA for UHR-CT.

Limitations: Not applicable.

Ethics committee approval: This retrospective study was approved by the Institutional Review Board of Fujita Health University.

Funding for this study: This study was financially supported by Canon Medical Systems Corporation.

RPS 2511-4 - Multi-modal brain MRI affine registration using deep learning (8 min)

Srivathsa Pasumarthi Venkata; Menlo Park / United States

Author Block: S. Pasumarthi Venkata; Menlo Park, CA/US

Purpose or Learning Objective: Inter- and intra-patient image registration is a key step in brain MRI processing and analysis. Current open-source libraries provide good solutions but have slower run-time and do not run on GPUs. In this work, we propose deep learning (DL) based affine registration solution for intra-patient multi-modal brain MRI registration.

Methods or Background: The core idea of our work was inspired by Voxelmorph which is a DL-based registration algorithm for non-rigid registration. We adopted this work for rigid/affine registration using a multi-path residual network. The 3D DL model had two separate paths for the fixed and the moving images with similar DenseBlock layers and shared weights. The feature maps learned by the individual paths were concatenated and fed through a series of fully connected layers and finally, the 12 affine parameters were predicted. These parameters along with the moving image were fed to the spatial transformer layer. The network returned the registered image from the output of the spatial transformer layer. The network is trained with a weighted combination of NMI (normalised mutual information) and NCC (normalised cross-correlation) losses. We used the BRATS 2021 dataset with pre-registered T1, T1ce, T2, FLAIR images with T1 as a fixed image. We induced simulated affine motion on the moving images for training. We trained separate models for T1/T1ce, T1/T2 and T1/FLAIR image pairs. The models were evaluated using PSNR, SSIM between the DL registered and pre-registered images; Dice scores of tumours before/after registration were computed.

Results or Findings: The average validation PSNR/SSIM/Dice scores were 37.65dB/0.96/0.85 respectively.

Conclusion: We proposed a DL-based affine brain MRI registration that is accurate and orders of magnitude faster than the existing non-GPU implementations.

Limitations: Detailed clinical evaluation required; can be extended to PET/MRI, CT/MRI registration.

Ethics committee approval: Not applicable since the Public dataset was used.

Funding for this study: This study was funded - grant reference NIH R44EB027560.

RPS 2511-5 - Development and validation of a deep learning-based automatic brain volumetry for parkinsonian syndromes using 3D T1-weighted images (8 min)

Seongken Kim; Seoul / Korea, Republic of



Author Block: S. Kim, C. Suh, H. Oh, E. P. Hong, S. Park, J. K. SUNG, W. H. SHIM, S. J. Kim; Seoul/KR

Purpose or Learning Objective: To develop and validate a deep learning-based automatic brain volumetry (DLABV) for the differentiation of parkinsonian syndromes using 3D T1-weighted brain MR images.

Methods or Background: A DLABV was trained using a dataset of 3D T1-weighted brain MR images. 2D U-Net model was used for model architecture. The training dataset which contains 300 cognitively normal subjects (CN, 129 men) was labelled with FreeSurfer 6.0 brainstem substructure module. The test dataset consists of 207 CN, 52 progressive supranuclear palsy (PSP) patients, 65 multiple system atrophy (MSA) patients, and 189 Parkinson disease (PD) patients. The volume of the midbrain, pons, medulla, SCP, the midbrain-pons area ratio (MP) and the midbrain-pons volume ratio (MP_vol) were measured for differentiation of parkinsonian syndromes. Normalised volume using intracranial volume (ICV) was also used. To distinguish between each group, the receiver operating characteristic curve and area under the curve (AUC) was calculated and classification accuracy was measured by support vector machine (SVM).

Results or Findings: Compared with simple volumetry, volumetry using ICV normalisation showed more accurate performance in the differentiation of parkinsonian syndromes. The AUC in PSP vs PD using normalised midbrain volume was 0.89. In addition, the AUC in MSA vs PD using normalised pons volume was 0.97. MP_vol in MSA patients were significantly larger than in PSP patients and AUC was 0.98. Using normalised volume and MP showed highest classification accuracy.

Conclusion: The DLABV using ICV normalisation allowed an accurate differentiation of parkinsonian syndromes using 3D T1-weighted brain MR images.

Limitations: It is unclear whether the early parkinsonian syndromes can be differentiated using brain volumetry since our study did not target early parkinsonian syndrome patients.

Ethics committee approval: Our institutional review board approved this study.

Funding for this study: This study has received funding by the National Research Foundation of Korea.

RPS 2511-6 - Consistency of stroke and haemorrhage diagnosis on native brain CT scans in emergency medicine by clinicians using AI compared to radiologists (8 min)

Anna Khoruzhaya; Moscow / Russia

Author Block: A. N. Khoruzhaya, A. Smorchkova, E. I. Kremneva, N. Kudryavtsev, A. Vladzimirskyy, S. Morozov; Moscow/RU

Purpose or Learning Objective: To compare the accuracy of diagnosis of stroke and intracranial haemorrhage (ICH) between clinicians using AI services and radiologists in emergency medical service.

Methods or Background: A dataset was created containing 104 anonymised native brain CT scans with a distribution: 52 with the norm and 52 with the target pathology (stroke and ICH, ratio 1/1). The dataset was verified and processed by an AI algorithm with known accuracy characteristics (ROC AUC 0.9). AI performed visual marking of pathological areas of ischaemia and haemorrhage in each study and calculated the probability of absence or presence of the target pathology. The original dataset was assessed by 5 radiologists for the absence or presence of the target pathology. 5 emergency room clinicians evaluated the result of the AI on the collected dataset and agreed or disagreed with its findings. The responses were collected using a questionnaire.

Results or Findings: The first results of the study show that the sensitivity and specificity of diagnosing stroke and ICH in the group of radiologists was 89% (95% CI: 87-91%) and 92% (95% CI: 90-94%), respectively. The sensitivity and specificity of diagnostics of stroke and ICH in the group of clinicians using AI was 85% and 89%, respectively. When comparing the sensitivity and specificity between the groups of radiologists and clinicians, a significant difference was not shown ($p > 0.05$).

Conclusion: A clinical scenario of the use of AI algorithms by clinicians to assess the brain CT scan for the presence of stroke or ICH was carried out in order to make an accelerated decision on treatment tactics.

Limitations: The results of sensitivity and specificity in a group of clinicians using an AI service may vary depending on the accuracy of the service.

Ethics committee approval: No ethics committee approval was obtained.

Funding for this study: No funding was received for this study.

RPS 2511-7 - Patient-specific vs normative brain connectivity: a symptom-specific artificial intelligence-based comparison (8 min)

Quirin Strotzer; Regensburg / Germany

Author Block: Q. D. Strotzer, J. Schlaier, A. Beer; Regensburg/DE

Purpose or Learning Objective: Structural connectivity based on diffusion-weighted magnetic resonance imaging (DWI) is gaining importance in research and clinical use in fields like deep brain stimulation. Individual DWI is often unavailable. Therefore, normative connectomes based on averaged whole-brain tractography are a practical alternative. Comparisons of these concepts are sparse. Here, we compared patient-specific and normative approaches by their ability to predict the effects of deep brain stimulation using a symptom-specific, machine learning-based approach.

Methods or Background: Twenty-one patients who received bilateral subthalamic deep brain stimulation for Parkinson's disease were included. For every electrode contact (168 in total), we computed tractography patterns based on individual DWI and two normative connectomes (32 healthy individuals, 90 Parkinson's patients). Connectivity strength to 36 brain structures was calculated for every electrode contact, resulting in a dataset of 168 observations (electrode contacts) with 36 attributes (connectivity strength) for each connectome. Stimulation-associated symptom mitigation and side effects were assessed for every contact. We tested the prediction of stimulation outcomes based on connectivity strength using several supervised learning algorithms.

Results or Findings: Support vector machines yielded overall the best results. Averaged across all clinical classes (symptoms, side effects), the individual connectome achieved the highest area under the receiver operating characteristic curve (AUC-ROC; .81) compared to the normative healthy (.76) and disease-matched connectomes (.74). By clinical class, there were significant differences for paresthesia and autonomous side effects in favour of the individual connectome. Results differed considerably between clinical classes, from a mean AUC-ROC of 0.68 for paraesthesia to 0.91 for hyperkinesia.

Conclusion: Clinical effects may be mediated by different networks, as revealed by tractography methods based on DWI. Individual connectomes may be superior in predicting stimulation effectiveness.

Limitations: This study is done with single-centre data and has a limited sample size.

Ethics committee approval: Approval by the local ethics committee.

Funding for this study: No funding was received for this study.

RPS 2511-8 - Real-world evaluation of artificial intelligence software for cerebral large vessel occlusion detection in CT angiography (8 min)

Kicky van Leeuwen; de Bilt / Netherlands

Author Block: K. G. van Leeuwen¹, R. Becks¹, S. Schalekamp¹, B. Van Ginneken¹, M. J. Rutten², M. De Rooij¹, F. J. A. Meijer¹;
¹Nijmegen/NL, ²S-Hertogenbosch/NL

Purpose or Learning Objective: The commercially available AI tool (StrokeViewer v2, Nicolab) supports the diagnostic process of stroke by detecting large vessel occlusions (LVO) on CTA. We prospectively evaluated this tool in our department to monitor safety and impact.

Methods or Background: We implemented the software with the goal to improve the diagnosis of LVO and elevate the diagnostic confidence of the radiologist (resident). We used quantitative measures (data from clinical systems, vendor log files) and qualitative measures (user survey) to analyse diagnostic performance, number of users, login attempts, radiologists' diagnostic confidence, and user experience.

Results or Findings: In total, 226 CTAs with a clinical indication of stroke between January-June 2021 were prospectively evaluated. Thirteen cases of posterior circulation and distal vessel occlusions were excluded as they were outside the intended use of the AI tool. The AI tool missed 12 of the 36 occlusions in the middle cerebral or intracranial internal carotid artery (M1=1, M2=10, ICA=1) resulting in an accuracy of 86.4%. Irrespective of location, the sensitivity was 77.8% and specificity 90.4%. The number of monthly unique users varied between 8 and 24 radiologists/residents. Log in attempts dropped after the initial month (which included training) to a monthly average of 44 attempts. The diagnostic confidence did not increase during the use of the tool. The likelihood that users would recommend StrokeViewer to colleagues was rated 4.5/10.

Conclusion: Over six months, the use of StrokeViewer dropped and users did not sense improvement of diagnostic confidence. Measures have been taken to stimulate adoption for the latter six months of the trial period.

Limitations: Because of the prospective character, no comparison could be made between radiologists supported by AI vs radiologists without AI.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.



RPS 2504 - Pleural disorders

Categories: Artificial Intelligence & Machine Learning, Chest, Imaging Methods

Date: March 6, 2022 | 13:00 - 14:00 CET

CME Credits: 1

Moderator:

Ivan Vollmer Torrubiano; Barcelona / Spain

RPS 2504-2 - Ultrasound-guided percutaneous needle biopsy of pleural and peripheral lung lesion: comparison with computed tomography guided biopsy (8 min)

Binoy Choudhury; Guwahati / India

Author Block: [B. K. Choudhury](#); Guwahati/IN

Purpose or Learning Objective: Ultrasound (US) guided needle biopsy is a very useful, easily available, less expensive and safer diagnostic technique with real-time monitoring. The purpose of this study was to determine the efficacy, safety and advantages of US-guided biopsy of pleural and peripheral lung lesions abutting pleura and to compare it with CT guidance.

Methods or Background: Among 1960 image-guided thoracic biopsies obtained at our hospital between January 2001 and December 2020, 363 were US-guided biopsies for pleural and peripheral lung lesions (278-male, 85-female). Out of these, 343 were performed using US only; the other 20 had initial CT localization. There were 27 pleural lesions and 336 pulmonary lesions with pleural contact. After reviewing the patient, CT scan and coagulation profile, a biopsy was performed using the freehand US technique under real-time visualization. Lesion size, pleural lesion contact, biopsy type, number of passes, procedure time, sample adequacy and complications were recorded.

Results or Findings: Among 1960 biopsies, 363 (18.5%) were US-guided and 1597 (81.5%) were CT-guided procedures. The procedure time was significantly less in the US-guided than under the CT-guided procedures. The post-procedure pneumothorax was significantly less in the US-guided group as observed on 2 out of 363 US-guided procedures (0.55%) and 43 out of 1597 CT-guided procedures (2.7%). Intraparenchymal haemorrhage occurred in 2 out of 363 US-guided biopsies (0.55%) and 17 out of 1597 under CT guidance (1.1%).

Conclusion: US guidance allows significantly less procedure time and post-procedural complications without the use of ionizing radiation. US guidance can be used as an alternative to CT guidance for the biopsy of thoracic lesions abutting pleura.

Limitations: Single-centre retrospective study. The patients were not randomized between the US and CT guidance which may result in selection bias.

Ethics committee approval: The ethics committee approval was obtained.

Funding for this study: Not applicable.

RPS 2504-3 - Artificial intelligence-driven pleural plaque segmentation and volume correlation to lung function (8 min)

Kevin Groot Lipman; Amsterdam / Netherlands

Author Block: K. Groot Lipman, T. N. Boellaard, N. Bogveradze, E. K. Hong, F. Castagnoli, F. Landolfi, R. G. H. Beets-Tan, S. Burgers, S. Trebeschi; Amsterdam/NL

Purpose or Learning Objective: Pleural plaques (PP) are morphological manifestations of long-term asbestos exposure. The relationship between PP and lung function is not well-understood. The time-consuming nature of PP delineation to obtain volume impedes research. To automate this, we aimed to develop automatic Artificial Intelligence (AI)-driven segmentation of PP. Moreover, we want to explore the relationship between the pleural plaque volume in CT scans and pulmonary function tests (PFT).

Methods or Background: Radiologists manually delineated pleural plaques in n=422 thoracic CT scans (n=61 363 images) of patients with occupational exposure to asbestos, which were used to develop the AI model. The Pearson correlation coefficient (r) was used for the correlation between PP volume and PFT metrics. When recorded, these were VC, FVC, DLCO, and KCO.

Results or Findings: We trained the AI system on subjects in the training set (n=322). On the independent test set (n=100), the correlation between the predicted volume and the ground truth was r=0.89, the median overlap was 0.70 Dice Similarity Coefficient. We found weak to no correlations for VC (n=138, r=-0.41), FVC (n=152, r=-0.44), DLCO (n=137, r=-0.16), and KCO (n=119, r=0.15). For DLCO and KCO, no significant differences were found (p>0.05). Significant differences were found for VC (p=0.02) and FVC (p=0.006).

Conclusion: We successfully developed an AI algorithm to automatically segment PP in CT images to enable fast volume extraction. The PP volume is associated with loss in VC and FVC. We envision that the AI model could be used to non-invasively gain insight into lung morphology and lung function, which could make PP volume investigation more accessible to other researchers.

Limitations: We could not correct for confounders in the correlation between the lung function parameters and the volume, like smoking.

Ethics committee approval: Approved by the institutional board.

Funding for this study: No funding was received for this study.

RPS 2504-4 - Development and validation of CT-based radiomics nomogram for prognostic prediction in patients with malignant pleural mesothelioma (8 min)

Xie Xiaojie; Kunming / China

Author Block: X. Xie¹, D. Han¹, J. Chen¹, H. Luo², J. Jie¹, S. Shen¹, W. ZHAO¹, X. Zhang², W. Jin¹; ¹Kunming/CN, ²Chuxiong/CN

Purpose or Learning Objective: To develop and validate a prognostic model combining the clinical factors and unenhanced CT-based radiomic signature for malignant pleural mesothelioma (MPM).

Methods or Background: A total of 164 patients with MPM were enrolled in this multi-centre study from 2007 to 2020 and divided into training (n = 82) and test (n = 82) sets according to the admission time. A clinical model was constructed based on the clinicopathological and CT morphological features. The correlation of the overall survival (OS) with radiomic features, which were extracted from the region of interest (ROI) manually segmented on the three-dimensional CT images were analyzed. The Cox proportional risk model was conducted by combining the radiomic signature with clinical factors to establish a nomogram for prognostic prediction and risk stratification. Harrell's Concordance Index (C-Index) and calibration curve were used to evaluate the model's discrimination and consistency, respectively.

Results or Findings: Based on the clinical factors, Cox multivariate analysis showed that albumin reduction (hazard ratio[HR]=1.584), clinical stage IV (HR=3.075) and chemotherapy (HR=0.477) were independent factors for OS prediction. The predictive performance of the clinic-radiomic combined nomogram was superior to the clinical model alone in training (C-index: 0.709 & 0.662) and test (C-index: 0.664 & 0.613) sets. The patients in the training (P<0.001) and test (P=0.007) sets can be successfully stratified into low and high-risk groups with the combined nomogram.

Conclusion: The nomogram combined with clinical and CT-based radiomic signature is a new and favourable tool to predict the prognosis for MPM patients, which may provide valuable information for clinical decision making.

Limitations: The multi-centre study cannot guarantee the uniformity of clinical and imaging data.

Ethics committee approval: Ethical approval No. 2020-L-27.

Funding for this study: Joint Program of Yunnan Science and Technology and KMMU (202001AY070001-201).

RPS 2504-5 - Training and validation of DL algorithms for the detection of pneumothorax based on data from a competition in diagnostic imaging (8 min)

Maurice Henkel; Basel / Switzerland



Author Block: M. J. Henkel, B. Stieltjes, A. W. Sauter; Basel/CH

Purpose or Learning Objective: Competitions are a potential approach in data science to solve real-world problems. It offers organizers the opportunity to get external expertise and participants a great learning opportunity. In this study, we show how this approach can be used to create labelled data for the training of deep learning (DL) algorithms.

Methods or Background: A platform to create competitions in diagnostic imaging has been developed. Ten radiology residents competed on the platform in detecting pneumothorax on 1161 chest x-rays. Using this data, multiple DL algorithms for detecting pneumothorax were developed. Classification and localization performance of the models were tested on an internal and NIH ChestX-ray14 dataset.

Results or Findings: The AI models F1 scores on the internal and the NIH dataset were 0.87 and 0.44, respectively. Sensitivity was 0.85 and 0.80 for classification and specificity 0.96 and 0.48 for classification. F1 scores were 0.72 and 0.66, sensitivity 0.72 and 0.72.

Conclusion: Our results demonstrated that competition derived annotations are a valuable data source for DL algorithm development. Further work is needed to include additional parameters such as user performance, consensus of diagnosis, and quality control in the development pipeline.

Limitations: The training data is based on data from a single institution. The "ground truth" in this study is based on the consensus opinion of the residents performing the annotation of the images; no expert review other than the approved report has taken place to confirm the diagnoses. Finally, this is a retrospective study; the model's performance has not yet been prospectively evaluated in a clinical environment.

Ethics committee approval: All patient data used in this study were completely anonymized and therefore it does not require ethics committee approval.

Funding for this study: This study was funded by Innosuisse - Schweizerische Agentur für Innovationsförderung, Einsteinstrasse 2, 3003 Bern.

RPS 2504-6 - A comparative study of quantitative lung function analysis software and MDCT tissue segmentation software for pneumothorax lung compression ratio measurement (8 min)

Huayang Du; Beijing / China

Author Block: H. Du, X. Sui, X. Lu, L. Song, W. Song, R. Zhao; Beijing/CN

Purpose or Learning Objective: To compare the application of quantitative lung function analysis software and MDCT tissue segmentation software in measuring the lung compression ratio (R,%) and investigate the feasibility of applying quantitative lung function analysis software in measuring the lung compression ratio in pneumothorax patients.

Methods or Background: Two software types were used to process the CT images of 31 pneumothorax patients and to measure the pneumothorax gas volume (V1), compressed lung volume (V2), total volume of the affected thorax Vthorax, and R. Subjective assessment (5-point value) on the accuracy of pneumothorax segmentation was performed by two radiologists with more than 4 years experience in a double-blind method. Intra-group correlation coefficients (ICC) were calculated for V1, V2, Vthorax, and R. Bland-Altman scatter plots were plotted for quantitative and qualitative observation of the consistency of the measures.

Results or Findings: The quantitative lung function analysis software V1, V2, V thorax, R was (1577.71+690.54) ml, (1175.49+602.37) ml, (2753.20+774.06) ml, (56.90+17.96) % in 31 patients and that in the tissue segmentation software were (1732.67+689.61) mL, (715.53+456.17) mL, (2448.20+628.24) mL, (69.81+17.14)%, ICC were 0.731, 0.703, 0.636, 0.763, respectively. The difference between the 2 measurements compared to the mean, pneumothorax volume and compression lung volume of 29 cases (93.55%), and the total chest volume and lung compression of 28 patients (90.32%) were within a 95% confidence interval. The subjective mean scores for the lung function software segmentation of pneumothorax gas and compression lung [(4.85±0.40), (4.27±0.83)] were significantly higher than those of the tissue segmentation software [(4.60±0.61), (3.16±1.10)], (all P < 0.05).

Conclusion: The quantitative lung function analysis software can quickly measure gas volume and lung compression rate in pneumothorax patients, which is more accurate, convenient and faster than tissue segmentation software.

Limitations: The sample size is relatively small.

Ethics committee approval: This study has been ethically approved by PUMCH.

Funding for this study: Not applicable.

RPS 2504-7 - Imaging IRAE-pericardial effusion on chest CT: clinical and radiologic manifestations and implications for management (8 min)

Kathleen Capaccione; New York / United States

Author Block: K. M. Capaccione¹, S. Huang¹, Z. Toor¹, A. Deng², B. May¹, M. M. Salvatore¹; ¹New York/US, ²Charolette, NC/US

Purpose or Learning Objective: IRAE pericardial effusion has been reported but is not well characterized clinically or radiographically. Here, we described the largest cohort of patients to date who developed IRAE pericardial effusion and analyzed their clinical course and radiologic correlates.

Methods or Background: We identified patients treated with checkpoint inhibitor immunotherapy and who developed pericardial effusion during the same time period. We analyzed chronicity to assess if pericardial effusions developed after initiation of therapy; cardiac function on echocardiogram was also assessed to rule out cardiac dysfunction as a cause of pericardial effusion. We analyzed clinical information and serial CT exams for concomitant findings. We performed statistical analysis to evaluate which features were characteristic of or associated with IRAE pericardial effusion.

Results or Findings: The majority of IRAE-pericardial effusions were small and not clinically significant, and most commonly followed anti-PD-1 inhibitor therapy; a significant number were seen in patients previously treated with carboplatin. Approximately half were treated with steroids or resolved spontaneously. Approximately half of the patients with IRAE-pericardial effusion had mediastinal adenopathy and/or pleural effusions, however these were not significantly different in the control patients.

Conclusion: Contrary to prior case reports and series, our data suggest that IRAE-pericardial effusions are rarely clinically significant and analysis of the risk/benefit ratio does not warrant discontinuation of checkpoint inhibitor therapy.

Limitations: Limitations of this study were the relatively small sample size and the retrospective design of the study given that patients may have gone on to have significant developments in their clinical course after the end of the study period.

Ethics committee approval: Columbia University IRB AAAS7350 approved 10/29/2020.

Funding for this study: No funding was received for this study.

RPS 2504-8 - Pre-treatment CT-based radiomics nomogram for discriminating between simple parapneumonic effusions and complicated parapneumonic effusions/empyema (8 min)

Yangfan Zhang; Ningbo / China

Author Block: Y. Zhang, R. Liu, L. Yang, J. Yu, D. Dong, K. Yan, J. Zhang, J. Zheng; Ningbo/CN

Purpose or Learning Objective: We aimed to develop and validate a CT-based radiomics nomogram for discriminating pneumonic effusion (PPE) types and assisting in identifying which may benefit from drainage.

Methods or Background: A retrospective review of 128 patients (training cohort: n = 73; internal validation cohort: n = 30; external validation cohort: n = 25) with PPE was enrolled between July 2017 and July 2021. In the training cohort, the optimal CT radiomics features were selected by the maximum relevance minimum redundancy (mRMR) algorithm and the least absolute shrinkage and selection operator (LASSO) regression model and combined to calculate the radiomics score (Rad-score). Incorporating Rad-score and clinical risk factors, the radiomics-based nomogram was established by multivariable logistic regression analysis. The performance of the nomogram was determined in terms of its discrimination, calibration, and clinical utility.

Results or Findings: The radiomics score, fever and neutrophil count were found to be independent predictors to discriminate between simple PPE and complicated PPE/empyema. The combined nomogram showed a good prediction efficacy with areas under the curve of 0.959 (95% confidence interval [CI], 0.885-0.991), 0.833 (95% CI, 0.653-0.944), and 0.877 (95% CI, 0.688-0.975) in the training, internal validation, and external validation cohorts, respectively. Decision curve analysis indicated that the radiomics-based nomogram is of clinical usefulness.

Conclusion: A CT-based radiomics nomogram for patients with PPE adds accuracy to the prediction of PPE types and contributes to clinicians to predict the need for chest tube drainage.

Limitations: This is a retrospective study, causing a case selection bias that may affect the study results.

Ethics committee approval: This study was approved by the Ethics Committee of the HwaMei Hospital, University of Chinese Academy of Sciences (approval NO. YJ-KYSB-NBEY-2021-086-01).

Funding for this study: This study was funded by the Science and Technology Project of Ningbo (Grant No. 202002N7034).

RPS 2509 - Interventional neuroradiological management

Categories: Interventional Oncologic Radiology, Interventional Radiology, Multidisciplinary, Neuro

Date: March 6, 2022 | 13:00 - 14:00 CET

CME Credits: 1

Moderator:

Inês Gil; Lisboa / Portugal

RPS 2509-2 - Approach and technical aspects with treatment outcome in superselective intraarterial chemotherapy for intraocular retinoblastoma (8 min)

Mohammad Zuber Mohammad Zakir; Nagpur / India

Author Block: M. Z. Mohammad Zakir¹, P. Chatterjee², R. Radhakrishnan³; ¹Nagpur/IN, ²Guwahati/IN, ³Chennai/IN

Purpose or Learning Objective: To study the various approach, technical aspects with treatment outcome in superselective intraarterial chemotherapy for intraocular retinoblastoma.

Methods or Background: Our study was a prospective study over a period of three years which included 165 subjects suffering from various stages of retinoblastoma. We used superselective ostium catheterisation for intraarterial chemotherapy. The most commonly used approach was the ophthalmic artery; however, in some cases, the middle meningeal artery approach was used.

Results or Findings: Among 165 patients there was complete regression of the tumour in 32 patients. The total radiation dose was 3-8 mGy, average procedural time was < 10 min, total contrast usage < 10ml. Intraarterial chemotherapy forms a main stay in the treatment of retinoblastoma and helps in globe salvage further decreasing the morbidity. Post intraarterial chemotherapy there was a decrease in tumour counts, vitrea seeding etc. No major local/vascular complications were seen. Transient pancytopenia was seen in a few of the cases.

Conclusion: Intraarterial chemotherapy is a useful and safe technique for salvaging the eye in retinoblastoma. Intraarterial chemotherapy forms the mainstay in the treatment of ocular retinoblastoma.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 2509-3 - Surpass evolve flow diverter in the treatment of intracranial aneurysms: a single centre initial experience study with angiography and clinical results (8 min)

Jagadeesan Dhanasekaran; Chennai / India

Author Block: J. Dhanasekaran, S. Joseph, N. N. N. Ray, S. Sekar, L. Jella, V. Pothula; Chennai/IN

Purpose or Learning Objective: Flow diverters (FD) have become a safe treatment option for intracranial aneurysms (IA), especially in fusiform and blister-like aneurysms which remained challenging. Newer generation surpass evolve (SE) is an FD that was approved for usage in 2019 in India. The aim of this study is to describe the initial experience and analyse the angiographic and clinical outcomes using SE in treatment of IA.

Methods or Background: Between December 2019 to July 2021, thirty-one IA in 26 patients 73% women, mean age 50 years were treated with SE in our institute. Baseline patient, aneurysm demographics and treatments were prospectively collected and results were reviewed retrospectively.

Results or Findings: IA was noted as an incidental finding in 73% of patients, the majority 62% were saccular, and 60% wide neck. Single FD was used in 85% of patients. Apart from re-sheathing of FD, three patients required angioplasty of deployed FD. Adjuvant coiling was performed in five aneurysms and two aneurysms required an extra FD to achieve proper wall apposition. The mean aneurysm-flow-amplitude ratio obtained in two patients showed a superior flow diversion effect of SE device. There was no thromboembolic complication, however, we had a few early reversible neurological complications and one mortality. Favourable aneurysm occlusion O'Kelly-Marotta (OKM) grading scale D was achieved in 17/19 (90%) follow-up patients. No FD deployment failure, intra-procedural mortality, increase in the mRS was observed.

Conclusion: SE worked technically well in terms of its excellent navigability, re-sheathing, the accuracy of placement and maximal flow diversion. Our initial clinical and angiographic results show good efficacy comparable to other FD.

Limitations: The limitations of this study are that it is a single-institutional study and its small sample size.

Ethics committee approval: No ethics approval was obtained.

Funding for this study: No funding was received for this study.

RPS 2509-4 - Clinical consequence of vessel perforations during endovascular treatment for acute ischaemic stroke (8 min)

Matthijs van der Sluijs; Rotterdam / Netherlands

Author Block: M. van der Sluijs¹, R. Su¹, J. Hofmeijer², T. van Walsum¹, G. Lycklama³, A. van Es⁴, S. Cornelissen¹, A. Van Der Lugt¹; ¹Rotterdam/NL, ²Arnhem/NL, ³The Hague/NL, ⁴Leiden/NL

Purpose or Learning Objective: Endovascular treatment of acute ischaemic stroke can be complicated by vessel perforation. In this work we study the incidence of this specific complication in clinical practice and its effects on functional outcome, including the relation with the location of a vessel perforation.

Methods or Background: All patients in the MR CLEAN Registry who underwent EVT were analysed for the presence of vessel perforation. DSA imaging of cases mentioned by interventionalist or corelab were studied. Additionally, DSAs of SAH cases were reassessed for potential vessel perforations. In cases where an interventionalist mentioned a perforation, but corelab did not find any, perforation was assumed. Functional outcome was measured using the modified Rankin Scale (mRS) at 90 days. The association between vessel perforation and outcome was analysed with ordinal logistic regression models adjusted for confounding parameters, such as NIHSS at baseline, reperfusion and collaterals. Results were described as unadjusted common (cOR) and adjusted common odds ratio (acOR).

Results or Findings: Vessel perforation occurred in 74 (2,7%) of 2794 patients who underwent EVT. The proportion of vessel perforations in females was higher compared to non-perforation cases. (63.5% vs 47.5% p=0.009). Anatomical location of perforations was located respectively in ICA-M1 (35%), M2-M3 (45%), posterior (6.3%) and missing in 14.9% of cases. Functional outcome (mRS) was worse in patients with vessel perforations (cOR 0.31, 95%CI 0.20-0.49, acOR 0.50, 95%CI 0.29-0.85) compared to patients without a vessel perforation. No association was observed with anatomical location proximal vs distal (cOR 2.36, 95%CI 0.83-6,73, acOR 1.10, 95%CI 0.29-4.17).

Conclusion: Incidence of vessel perforation during EVT is low, but has severe clinical consequences, regardless of the anatomical location of the vessel perforation.

Limitations: Potential bias by reviewing SAH patients, therefore, a higher chance of poor outcome.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 2509-5 - Analysis of the clinical results of the endovascular treatment of indirect carotid-cavernous fistulae (8 min)

José Rodríguez Castro; Oviedo / Spain

Author Block: J. Rodríguez Castro, L. Martínez Cambolor, M. Martínez-Cachero García, S. Budiño Torres, E. Murias Quintana, J. M. Jiménez Pérez, J. Chaviano Grajera, F. García Arias, P. Vega Valdés; Oviedo/ES

Purpose or Learning Objective: The purpose of this study was to (1) demonstrate that endovascular treatment of indirect carotid-cavernous fistulae is effective and stable in the long term, (2) describe the techniques and materials most used in our centre, (3) evidence that this treatment reduces patient's symptomatology, and (4) display the safety of this treatment.

Methods or Background: A retrospective observational study was carried out. A database was made with 39 interventions in 32 patients with indirect carotid-cavernous fistulae treated in our centre from 2006 to 2020. A collection of epidemiological, clinical, intervention-related, and postoperative variables was made for subsequent statistical analysis.

Results or Findings: In 28 (72%) of the interventions, complete closure of the fistula was achieved, with 26 patients (81.3%) being achieved in the initial intervention. The fistula was closed with stable treatment in 92% of the cases at 6 months. The access route was also analysed, the most frequent being the venous route through the inferior petrosal sinus (71.9%). Coils were the preferably used material (84.6%). Regarding the improvement of symptoms at 6 months after the intervention, 29 patients (74.3%) had a complete remission of symptoms. Complications were associated barely to 7.7% of the interventions.

Conclusion: Endovascular treatment of indirect carotid-cavernous fistulae is effective and stable in the long term. The most used and effective access route in our centre is the venous one through the inferior petrosal sinus. The most widely used and effective material for closing indirect carotid-cavernous fistulae are coils. Most of the patients had symptomatic improvement immediately after the intervention and nearly all had no symptoms 6 months after the procedure. Endovascular treatment is a technique that has few perioperative complications and does not usually require reoperation.

Limitations: This study has a small sample size.

Ethics committee approval: The ethics committee approval was obtained.

Funding for this study: No funding was needed.

RPS 2509-6 - Patients' perception and satisfaction of Vim MRgFUS thalamotomy: comparative evaluation of the influence of interactive video-assisted vs standard informed consent (8 min)

Leonardo Pertici; Empoli / Italy



Author Block: L. Pertici, F. Sgalambro, V. Pagliei, F. Bruno, A. Gagliardi, C. Fagotti, A. Barile, A. Splendiani, C. Masciocchi; L'Aquila/IT
Purpose or Learning Objective: MRgFUS thalamotomy for the treatment of tremor in ET and PD is usually perceived as a simple procedure by patients, who fail to consider it as an ablative procedure with some risks, that, therefore, requires strong compliance from patients. We evaluated the influence of interactive video-assisted vs standard informed consent on patients' treatment perception, understanding and satisfaction.

Methods or Background: We prospectively evaluated 58 patients eligible for MRgFUS thalamotomy. Before treatment, patients were randomly assigned to two groups: group A (28 patients, 15 males, mean age 65 y/o, ET/PD 18/10) received the standard written informed consent and group B (30 patients, 16 males, mean age 64 y/o, ET/PD 19/11) the video-assisted consent. Two questionnaires were then given to all study participants: the first one at the end of the consent process (5 items, score 0-4, total score 20), assessing patients' understanding of the procedure, the second one at the end of the treatment (2 items, score 0-4, total score 8), assessing patients' perception and satisfaction based on the expectations they had after the consent information received.

Results or Findings: In ET patients, mean total understanding and satisfaction scores were 25.2 and 27.6 in groups B and A respectively ($p=.234$). In PD patients, scores were 23 and 28 in groups B and A. In younger patients (28-75 y/o) scores were 21 (A) and 28 (B), while in the older patients' group (>75 y/o) 25 and 22.

Conclusion: Video-assisted integrated informed consent increases understanding of the procedure and its risks, as well as satisfaction regarding the treatment, especially in younger patients. In older patients and individuals with mild cognitive impairment, the computer interaction may represent a limitation compared to direct communication.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 2509-7 - A novel thrombectomy device: an in vitro evaluation of a prototype catheter (8 min)

Yasemin Tanyildizi; Mainz / Germany

Author Block: Y. Tanyildizi, S. Krost-Reuhl, A. Heimann, O. Kempfski, R. Kloeckner, F. Hahn, M. A. Brockmann; Mainz/DE

Purpose or Learning Objective: This prototype catheter is a newly-developed distal access catheter featuring a self-expanding, flexible, funnel-shaped tip. The purpose of its design is to reduce the risk of thrombus fragmentation during mechanical thrombectomy and improve first pass recanalisation (TICI 3). In this experimental setup, we preclinically evaluated the effectiveness and navigability of the new catheter.

Methods or Background: A vessel model was filled with a blood-like-viscous medium, and the image was projected with the corresponding vessel area by camera transmission to corresponding to the conditions in an angiography. Thrombi from porcine blood were placed into the arteria carotis interna of the vascular model and subsequently mechanically thrombectomised with a stent retriever. In the first part, the prototype was compared to a standard distal-access-catheter without using an external catheter. (N=20 for each catheter). In the second part, the prototype was inserted through a guiding catheter (n=11) to determine the navigability performance.

Results or Findings: In the first experimental series, mechanical thrombectomy was successful 19 out of 20 times (95% success rate) for the prototype catheter versus 15 out of 20 times (75% success rate) for the standard distal-access catheter. In the second experimental series, the prototype catheter achieved first-pass recanalisation 10 out of 11 times (91% success rate) and 1 out of 11 times at second pass (9%).

Conclusion: This series of experiments demonstrated higher first-pass recanalisation rates for the newly-developed funnel-shaped prototype featuring a self-expanding tip in comparison to a cylindrical standard distal-access-catheter.

Limitations: This study is limited by (1) no in vivo testing and (2) the limited number of thrombectomies.

Ethics committee approval: The ethics committee approved this study (AZ G 14-1-093 and AZ 23177 07 A16 -1-001 AFW).

Funding for this study: This study was funded by the WIPANO (Wissens- und Technologietransfer durch Patente und Normen) and Bundesministerium für Wirtschaft und Energie.



RPS 2611 - Vascular: other than acute stroke

Categories: Imaging Methods, Neuro, Vascular

Date: March 6, 2022 | 15:00 - 16:00 CET

CME Credits: 1

Moderator:

Agata Majos; Lodz / Poland

RPS 2611-2 - Development and validation of CT-based nomogram for identifying symptomatic carotid plaque (8 min)

Wenbin Ji; Linhai, Taizhou, Zhejiang / China

Author Block: W. Ji, B. Zhang; Linhai/CN

Purpose or Learning Objective: To develop a computed tomography (CT)-based model using CT angiography (CTA) markers and radiomics features to differentiate symptomatic from asymptomatic carotid plaques.

Methods or Background: Eighty-nine patients (178 arteries) with carotid plaques diagnosed by CTA between January 2015 to March 2021 in the Taizhou Hospital of Zhejiang province were retrospectively analysed. The patients were randomly divided into training and test sets. Ten CTA markers were recorded and calculated to build a traditional model. Radiomics features were extracted from the CT images, and their repeatability was evaluated. Then, the features were selected by the maximum relevanceminimum redundancy and the least absolute shrinkage and selection operator algorithm to build a radiomics model in the training set, and the performance of the model was evaluated in the test set. A nomogram model combining traditional and radiomics features was also constructed. The performance of all the models in identifying symptomatic plaques was compared.

Results or Findings: The degree of carotid stenosis based on the European Carotid Surgery Trial, maximal total-plaque thickness, and maximal soft-plaque thickness were used to build a traditional model. The area under the receiver operating characteristic curves (AUCs) of the traditional model and radiomics model were 0.65 versus 0.60 and 0.75 versus 0.76 in the training and test sets. The performance of the nomogram model in identifying symptomatic plaques was superior to those of the other models in the training set, with an AUC of 0.82.

Conclusion: Our CT-based nomogram model effectively distinguished symptomatic from asymptomatic carotid plaques.

Limitations: The sample size was relatively small. This study only preliminarily carried out the internal verification.

Ethics committee approval: The study was approved by the Ethics Committee of the Hospital.

Funding for this study: No funding was received for this study.

RPS 2611-3 - Preliminary study on subclinical brain alterations in patients with asymptomatic carotid vulnerable plaques using DTI (8 min)

Shuai Yang; Changsha / China

Author Block: S. Yang; Changsha/CN

Purpose or Learning Objective: To assess the alterations in the topological properties of the white matter brain network in carotid vulnerable plaque group and carotid hard plaque group based on magnetic resonance diffusion tensor imaging (DTI).

Methods or Background: One hundred and nineteen volunteers were included and performed DTI examination, among who, 58 volunteers had carotid vulnerable plaques, 23 volunteers had carotid hard plaques. The differences in the topological properties among the three groups were explored at both the global and local levels using one-way ANOVA and Bonferroni t-test ($p < 0.05$). Then network-based statistic (NBS) method was employed to assess the alterations of the interregional connections among three groups (NBS corrected, $p < 0.001$ at voxel level, $p < 0.05$ at cluster level, permuted for 5000 times).

Results or Findings: Compared with the control group and vulnerable plaque group, the hard plaque group demonstrated significantly increased betweenness centrality in the left supramarginal gyrus region. Compared with the control group and hard plaque group, the vulnerable plaque group demonstrated significantly decreased nodal clustering coefficient in the left putamen region. The vulnerable-plaque group presented a significantly decreased subnetwork component and two significantly increased subnetwork components in the NBS analysis results.

Conclusion: The topological organisation of white matter networks in carotid hard plaque group is different from vulnerable plaque group, which tends to increase the local efficiency of network communication to compensate. Furthermore, the carotid vulnerable plaque group showed more disorder of topological properties.

Limitations: First, we were limited by the cross-sectional design and small sample size of this study. Second, we only analysed the anatomical connectivity of white matter. The combination of structural and functional network analysis might provide a more comprehensive perspective for the disorder of topological properties in patients with carotid vulnerable plaques.

Ethics committee approval: Approved by the institutional review boards of Xiangya Hospital.

Funding for this study: No funding was received for this study.

RPS 2611-4 - Application in carotid CTA combined with low-tube voltage and low-rate injection of contrast medium based on Iterative Model Reconstruction (IMR) (8 min)

Yang Ming; Wuhan / China

Author Block: Y. Ming¹, X. Zhang², K. Luo¹; ¹Wuhan/CN, ²Shanghai/CN

Purpose or Learning Objective: To investigate the clinical use of dual-layer spiral CT in the diagnosis of carotid artery disease in CTA combined with low-tube-voltage and low-rate injection of contrast medium with Iterative Model Reconstruction (IMR) reconstruction.

Methods or Background: Eighty patients who would perform carotid CTA were enrolled and divided into two groups randomly. CTA was performed in group A using normal tube voltage (120 kV) and normal injection rate of contrast medium (5mL/s, 50ml, 320mg/ml) by iDose4 reconstruction. Group B received CTA by low-tube-voltage (80kV) and low injection rate of contrast medium (2.5mL/s, 25ml, 320mg/ml) with IMR reconstruction. Quantitative measurements of CT value, image noise and contrast-to-noise ratio (CNR) were measured in either group. The t-test was used to compare objective evaluation indices (noise, CNR) and radiation dosage between the two groups. X2-test was used to compare subjective evaluation of image quality (contrast, sharpness and subjective noise) between the two groups. A level of $P < 0.05$ was considered statistically significant.

Results or Findings: There were significant differences in objective noise and CNR between the two groups ($P < 0.01$). Group B showed better subjective image quality. Compared to group A, group B showed better subjective scores of contrast, noise and a slightly worse score of sharpness with no significance ($P > 0.05$). The volume of contrast agents in group B (25ml) is only half of that in group A (50ml). The effective dose (ED) of group B (0.61 ± 0.05 mSv) was 57.9% lower compared to group A (1.45 ± 0.09 mSv).

Conclusion: Compared with iDose4, the IMR technique can provide 57.9% ED reduction and 50% contrast agent reduction in carotid CTA by dual-layer MSCT with satisfactory image quality.

Limitations: The condition of obese patients receiving low-dose carotid CTA needs further study.

Ethics committee approval: This study was approved by the hospital ethics committee.

Funding for this study: No funding for this study.

RPS 2611-5 - The impact of acceleration factors of compressed sensing on the image quality of 3D-TOF-MRA for cervical vessels (8 min)

Qingwei Song; Dalian / China

Author Block: Q. Song; Dalian/CN

Purpose or Learning Objective: Explore the impact of acceleration factors of CS on the image quality of 3D-TOF-MRA for cervical vessels.

Methods or Background: 22 healthy volunteers were recruited and underwent the 3D-TOF MRA scan of neck vessels on a 3.0 T MR scanner. Four groups with different acceleration schemes were set up in our study, group A with a routine clinical setup of SENSE acceleration factor 3, and groups B, C, and D with CS factors of 4, 6, and 8. Regions of interest were placed manually at both sides of the carotid artery and nearby sternocleidomastoid muscle by experienced radiologists for the measurement of SNR and CNR. The two observers used a four-point scoring method to evaluate the quality of the four groups of images. The Kappa statistics were calculated for determining the interobserver agreement. The assessment of intermethod agreement was based on the evaluation of the senior physicians. Kruskal-Wallis test was employed to assess the difference of SNR, CNR and image scores between the 4 groups. Mann-Whitney U test was used to make a pairwise comparison.

Results or Findings: There were no statistically significant differences in SNR, CNR between the four groups. However, if CS acceleration factor of 8 was used, the subjective scores decreased obviously ($p < 0.05$, Table. 3). And no significant differences in image quality were detected between conventional SENSE acceleration with a factor of 3 and CS acceleration with factors of 4 and 6.

Conclusion: CS acceleration factor of 6 is recommended for clinical 3D-TOF carotid MRA to achieve an optimal balance between imaging time and image quality.

Limitations: This study was limited by the few amount of volunteers.

Ethics committee approval: This study has been approved by the local IRB.

Funding for this study: Not applicable.

RPS 2611-6 - Effect of MRI acquisition parameters on accuracy and precision of phase-contrast measurements in a small lumen vessel phantom (8 min)

Maria Correia de Verdier; Uppsala / Sweden

Author Block: M. Correia de Verdier, J. Wikström; Uppsala/SE

Purpose or Learning Objective: To assess the effects of spatial resolution, number of excitations (NEX) and velocity encoding (VENC) on accuracy and precision of phase-contrast (PC) MRI measurements in a vessel phantom with a small lumen diameter.

Methods or Background: A 3 T scanner and a 32-channel head coil were used for all the PC-MRI measurements. An in vitro flow model consisting of a plastic tube (2.3 mm inner diameter) passing through an agar gel was constructed to provide a continuous flow. The flow rate was controlled using a reservoir with a scale and timer and used as the standard reference. A PC-MRI sequence was performed with varying voxel size (0.6 x 0.8 x 5 mm, 1 x 1 x 5 mm, 1.2 x 1.2 x 5 mm), NEX (1, 2, 3) and VENC (200, 300, 400 cm/s). Measurements were repeated 9 times for each setting. Mean flow and peak velocity were calculated for each combination of settings and the least detectable difference (LDD) was computed.

Results or Findings: All PC-MRI mean flow measurements were higher than our standard reference (mean values ranging from 7.3 to 9.5 ml/s compared with 6.5 ml/s). Decreasing voxel size improved the accuracy of mean flow measurements, with measured values changing from 9.5 to 7.3 ml/s. LDD for mean flow decreased with increasing voxel size and NEX ($p < 0.05$). LDD for peak velocity decreased with increasing voxel size ($p < 0.05$). No change in LDD was observed with different VENC settings.

Conclusion: Accuracy in PC-MRI flow measurements in a small vessel phantom is low, with higher measured values than control. Improved accuracy is obtained with increased spatial resolution. Improved precision is obtained with decreased spatial resolution and increased NEX.

Limitations: Not applicable.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 2611-7 - Collateral status at single-delay arterial spin labelling MRI can non-invasively predict cerebral hyperperfusion after carotid endarterectomy (8 min)

Xiaoyuan Fan; Beijing / China



Author Block: X. Fan, T. Lin, Z. Lai, H. You, J. Qu, F. Feng; Beijing/CN

Purpose or Learning Objective: To explore and compare the predictive ability of collateral score systems assessed with single-delay ASL and conventional CT/MRI protocols for cerebral hyperperfusion after carotid endarterectomy (CEA).

Methods or Background: Eighty-five patients who underwent CEA between May 2015 and July 2021 were included (mean age 65.3 ± 7.1 years, 76.5% male). Cerebral hyperperfusion was defined as an increase in cerebral blood flow $>100\%$ compared with preoperative values. Preoperative ASL images were scored based on the presence of arterial transit artefacts (ATAs) in 10 regions of interest corresponding to ASPECTS methodology as follows: 0, no or minimal ASL signal; 1, low/moderate ASL signal with ATA; 2, high ASL signal with ATA; and 3, normal perfusion without ATA. The degree of stenosis, primary and secondary collaterals were evaluated on conventional CTA, MRA and T2 FLAIR images.

Results or Findings: Cerebral hyperperfusion was presented in 16 (18.8%) patients. Preoperative ASL score was an independent predictor of cerebral hyperperfusion (OR=0.47, 95% CI [0.32-0.71], $p < 0.001$). ROC curve analysis revealed that the predictive ability for cerebral hyperperfusion was statistically higher for ASL score (AUC=0.98, 95% CI [0.923-0.998]) than for degree of stenosis (AUC=0.786, 95% CI [0.684-0.868], $p=0.002$), type of circle of Willis (AUC=0.771, 95% CI [0.667-0.855], $p=0.002$) or leptomeningeal collaterals (AUC=0.798, 95% CI [0.697-0.877], $p=0.004$). The ASL score performed as well as the combination of degree of stenosis, type of circle of Willis and leptomeningeal collaterals (AUC=0.947, 95% CI [0.876, 0.984], $p=0.258$).

Conclusion: Single-delay ASL can non-invasively predict cerebral hyperperfusion after CEA in patients with carotid stenosis.

Limitations: The sample size was relatively small.

Ethics committee approval: This study was approved by the Medical Ethics Committee of the Peking Union Medical College Hospital.

Funding for this study: This work was supported by the Beijing Natural Science Foundation grant (L182067) and National Nature Science Foundation of China grant (82071899).

RPS 2611-8 - Microbleeds in cerebral fat embolism (8 min)

Omar Giyab; Pecs / Hungary

Author Block: O. Giyab, B. L. Balogh, P. P. Bogner, G. Orsi, A. Tóth; Pécs/HU

Purpose or Learning Objective: Our aim was to prove our hypothesis according to which cerebral fat embolism commonly presents with a characteristic microbleed pattern on MRI.

Methods or Background: We searched the literature and the database of our home institution for cases of cerebral fat embolism (CFE). The hypothesized CFE characteristic microbleed pattern (diffuse presence of round microbleeds of monotonous size in the subcortical white matter involving but not limited to the U-fibers, internal capsule and the corpus callosum, mostly sparing the corona radiata and the non-subcortical centrum semiovale on T2* GRE or SWI images), the starfield pattern as described by Parizel et al (scattered bright spots on a dark background in DWI with diffusion restriction), and confluent diffusion restriction in the corpus callosum were statistically compared. Temporal characteristics of the imaging features were also analysed.

Results or Findings: 141 patients with cerebral fat embolism were included. The characteristic "walnut kernel microbleed pattern" was found in 89.74%. Diffusion abnormality in general was seen in 97.64%. A definitive starfield pattern was ascertained in 68.5%. Confluent restricted diffusion was seen in the corpus callosum in 77.27%. The walnut kernel microbleed pattern had a more consistent presence among time periods compared to the starfield pattern.

Conclusion: Microbleeds in CFE are very common and mainly occur in a characteristic pattern in SWI or T2*, which along with the starfield pattern and corpus callosum diffusion restriction in DWI/ADC appear to be the most important imaging markers of CFE and may aid the differential diagnosis in clinically equivocal cases.

Limitations: More articles investigated diffusion abnormalities than microbleeds.

Ethics committee approval: The Institutional Review Board approved the institutional medical database search that was performed related to this study.

Funding for this study: Funding was received from the Bolyai Scholarship Hungarian Academy of Science.



RT 26 - From submission to publication: what you've always wanted to know

Categories: Education, General Radiology, Professional Issues, Radiographers, Research

ETC Level: ALL LEVELS

Date: March 6, 2022 | 15:00 - 16:00 CET

Moderators:

Michael Fuchsjäger; Graz / Austria

Regina G. H. Beets-Tan; Amsterdam / Netherlands

RT 26-1 - Chairpersons' introduction (2 min)

Michael H. Fuchsjäger; Graz / Austria

Regina G.H. Beets-Tan; Amsterdam / Netherlands

1. To know how editors handle your manuscript and how the review process of manuscripts is carried out.
2. To know how to carefully and systematically assess the outcome of scientific research (evidence) to judge its trustworthiness, value and relevance.

RT 26-2 - My manuscript was rejected, why? (10 min)

Yves Menu; Paris / France

RT 26-3 - How do I critically appraise a scientific publication (10 min)

Francesco Sardanelli; San Donato Milanese / Italy

RT 26-4 - Discussion (38 min)

Yves Menu; Paris / France

Luis Martí-Bonmatí; Valencia / Spain

Francesco Sardanelli; San Donato Milanese / Italy

RPS 2616 - Primary and secondary liver tumours

Categories: Abdominal Viscera, Imaging Methods, Oncologic Imaging, Translational Imaging

Date: March 6, 2022 | 15:00 - 16:00 CET

CME Credits: 1

Moderator:

Giuseppe Brancatelli; Palermo / Italy

RPS 2616-2 - Flow-compensated diffusion encoding in MRI for improved focal liver lesion detection (8 min)

Marc Saake; Erlangen / Germany

Author Block: F. B. Laun¹, T. Führes¹, H. Seuss², A. Müller¹, S. Bickelhaupt¹, A. Stemmer¹, T. Benkert¹, M. Uder¹, M. Saake¹;

¹Erlangen/DE, ²Forchheim/DE

Purpose or Learning Objective: To intra-individually compare diffusion-weighted imaging (DWI) of the liver acquired with conventional monopolar (MP) and flow-compensated (FloCo) diffusion encoding for as-sessing focal liver lesions (FLLs) in non-cirrhotic patients.

Methods or Background: Patients with known or suspected multiple FLLs were included, and DWI with MP and FloCo diffusion encoding was performed (b-values, 50 and 800 s/mm², respectively). DWI images were analysed independently by two board-certified radiologists. They issued Likert-scale ratings (1 = worst, 5 = best) for pulsation artefact severity and counted the difference of lesions visible at b = 800 s/mm² separately for small and large FLLs (i.e., < 1 cm or > 1 cm) and separately for left and right liver lobe. Differences between the two diffusion encodings were assessed with the Wilcoxon signed-rank test.

Results or Findings: Forty participants were included in the study. Both readers found a reduction in pulsation artefact in the liver with FloCo encoding (left liver lobe: p < 0.001; ratings \geq 4: reader 1, 9 of 40 cases for monopolar vs 35 of 40 for FloCo; reader 2, 11 of 40 for monopolar vs 37 of 40 for FloCo). More small lesions were detected with FloCo diffusion encoding in both liver lobes (left lobe: reader 1, six additional lesions; reader 2, seven additional lesions; p = 0.063 for both readers). Both readers found one additional large lesion in the left liver lobe.

Conclusion: FloCo is more effective than MP diffusion encoding for the detection of FLLs.

Limitations: The study was performed using one scanner from a single vendor.

Ethics committee approval: This retrospective study was approved by the IRB.

Funding for this study: Financial support by the DFG is gratefully acknowledged (DFG LA 2804/12-1, DFG LA 2804/15-1, DFG SA 4141/1).

RPS 2616-3 - Feasibility of quantitative dynamic contrast-enhanced MRI for prediction of microvascular invasion in small solitary hepatocellular carcinoma based on a dual-input two-compartment model (8 min)

Yongjian Zhu; Beijing / China

Author Block: C. Wei, Y. ZHU, X. Ma, X. Zhao; Beijing/CN

Purpose or Learning Objective: Microvascular invasion (MVI) serves as an important prognostic factor for hepatocellular carcinoma (HCC) after an operation. However, predicting MVI in patients with HCC is a clinical challenge as MVI is a histopathological diagnosis. The aim of this study is to investigate the feasibility of quantitative dynamic contrast-enhanced MRI (DCE-MRI) for predicting MVI in small solitary HCC (ssHCC).

Methods or Background: A total of 63 patients with pathologically confirmed ssHCC (\leq 3cm) underwent quantitative DCE-MRI studies and received hepatic resection. A dual-input two-compartment exchange model (2CXM) was used to calculate the values of quantitative permeability and perfusion parameters. The differences in parameters between different MVI status groups were analysed. Multivariate logistic regression was used to build the combined prediction model for MVI prediction with the statistically significant parameters. The predictive performance was evaluated using ROC analysis.

Results or Findings: Among the 63 patients with ssHCC, 22 (34.9%) exhibited MVI positive. The MVI positive group had higher volume transfer constant (Ktrans), reverse reflux rate constant (kep), portal vein blood flow (BFpv), and lower extracellular extravascular volume fraction (ve), hepatic arterial perfusion index (HPI) values than negative group (1.532 min⁻¹ vs. 0.853 min⁻¹, 0.547 min⁻¹ vs. 0.362 min⁻¹, 84.63 mL/min/100g vs. 34.95 mL/min/100g, 0.316 vs. 0.582, 65.32 vs. 84.59, respectively) (P<0.05). Quantitative parameters Ktrans, kep and BFpv values independently associated with MVI with OR values of 4.36, 2.53 and 3.74 (P<0.05) through multivariate logistic regression. ROC analysis showed that the AUC, sensitivity, specificity in predicting MVI by combined Ktrans, kep and BFv values were 0.903, 87.6%, 95.4%, respectively.

Conclusion: Quantitative DCE-MRI derived parameters showed potential value in the prediction MVI in ssHCC.

Limitations: The sample size was relatively small.

Ethics committee approval: Approved by the Independent Ethics Committee of the Cancer Hospital, CAMS (no. 20/412-2608).

Funding for this study: No funding was received for this study.

RPS 2616-4 - ADC voxel volume%: potential biomarker for tumour response and clinical stratification for hepatocellular carcinoma treated with PD-1 inhibitors plus bevacizumab (8 min)

Lu Li; Beijing / China

Author Block: L. Li, Y. Yang, Y. Xu, F. Ye, X. Zhao, a. zhou, w. zhang; Beijing/CN

Purpose or Learning Objective: We aim to assess the ability of the apparent diffusion coefficients (ADC)-based volumetric radiomic features changes in tumour response and stratification of outcomes in unresectable hepatocellular carcinoma (uHCC) patients treated with programmed cell death protein 1 (PD-1) inhibitors plus bevacizumab.

Methods or Background: Magnetic resonance imaging (MRI) examinations including diffusion-weighted imaging (DWI) were performed before and after Sintilimab plus bevacizumab treatment for 63 hepatic lesions in 42 patients with uHCC. The percentage of changes for ADC radiomic features were calculated. Tumour response was classified as either responding or nonresponding at lesion- and patient-level with reference to modified RECIST (mRECIST). Tumour response was compared using receiver operating characteristic (ROC) curves. In 35 patients, Kaplan-Meier analysis were used to correlate the response variables with progression-free survival (PFS) and overall survival (OS).

Results or Findings: The ADC voxel volume% was significantly higher for the responders than for the non-responders at patient - and lesion-level (AUCs = 0.80). Compared with ADC kurtosis%, RECIST1.1 and mRECIST, responders according to ADC voxel volume% had significantly prolonged PFS [16.1 months (95% CI: 11.5, 19.7) vs 8.4 months (95% CI: 5.5, 12.6), p = 0.039] and OS [not reached (95% CI: 21.6 to 27.1) vs 17.8 months (95% CI: 12.2, 20.4), p = 0.036] than nonresponders.

Conclusion: The percentage of changes for ADC voxel volume is a promising tool for identifying early tumour response and showed a better correlation with clinical outcomes in patients with uHCC treated with PD-1 inhibitors plus bevacizumab.

Limitations: The data size was insufficient to be divided into training and test sets.

Ethics committee approval: Written informed consent for treatment was obtained from all patients.

Funding for this study: This paper is supported by the Peking Union Medical College Youth Fund under Grant Nos. 2017320014.

RPS 2616-5 - Automated detection of hepatic tumours in liver ultrasound by mean of optimised ResNet50 model with transfer learning (8 min)

Oleksandra V. Ivashchenko; Leiden / Netherlands



Author Block: O. V. V. Ivashchenko¹, L. Nijskens², J. Smit², M. Fusaglia², T. Ruers²; ¹Leiden/NL, ²Amsterdam/NL

Purpose or Learning Objective: During oncological liver surgery, intraoperative ultrasound (iUS) plays a major role in the localisation and radical resection of target malignancies. However, identification of clear tumour boundaries is challenging with conventional 2D-iUS, requires a lot of time and is strongly dependent on iUS skills of the operator (surgeon) or even the type of OR-lights used. Among others, these factors increase the chances of positive resection margins and unnecessarily prolong anaesthesia time. Therefore, we investigated the feasibility of automated colorectal liver metastases (CRLM) detection in 2D-iUS images, which can be used as an assistance tool during oncological liver resections.

Methods or Background: ResNet-50 CNN, including pre-trained ImageNet weights, was optimised using an internal train dataset of 12.389 2D-iUS liver images. It was divided into the non-tumour (8.963), hypoechoic (Ho,1.272), hyperechoic (Hr,882) and mixed tumour (M,1.272) classes. Next, CNN models were trained using 1:1:2 (Hr:Ho:M), 1:1:1 (Hr:Ho:M) and 1:2:2 (Hr:Ho:M) data balancing variation, Adam (lr: 0.0001, decay: 0.9/0.999), Adam-grad or Adam-delta optimised, variable image augmentation and categorical cross-entropy loss function. Performance was evaluated on an internal test-dataset of 3.440 intraoperative and external (internet) test-dataset of 68 percutaneous US images.

Results or Findings: The best performing network was trained with 1:1:2 data balancing (Hr:Ho:M), augmented data and the Adam optimiser. It reached tumour detection accuracy/sensitivity/specificity of 0.95/0.93/0.94 and 0.78/0.74/0.82 on internal and external test datasets, respectively. Gradient-Class-Activation maps of the results confirmed that the model's classification is based on presence of CRLM in iUS.

Conclusion: We were able to develop an accurate and robust tumour detection method for intraoperative or percutaneous liver US, suitable for further clinical implementation.

Limitations: Detection of isoechoic tumours was not addressed.

Ethics committee approval: This retrospective study was approved by the IRB board(NKI-AvL). The data was handled according to the Data-Protection-Act.

Funding for this study: Not applicable.

RPS 2616-6 - The α -RECIST (alpha-fetoprotein-RECIST) criteria: a novel tool for identifying tumour response of conversion-radiotherapy for unresectable hepatocellular carcinoma before hepatectomy (8 min)

Ying Xu; Beijing / China

Author Block: Y. Xu, X. Zhao, F. Ye; Beijing/CN

Purpose or Learning Objective: To develop a novel criterion and demonstrate its performance in evaluating tumour response for patients with unresectable hepatocellular carcinoma (uHCC) treated with conversion-radiotherapy before hepatectomy.

Methods or Background: From June 2012 to December 2020, 39 patients with uHCC who received radiotherapy before hepatectomy were retrospectively included. Pre- and post-treatment contrast-enhanced magnetic resonance imaging scans were performed. Eight modified criteria were developed with the combination of Response Evaluation Criteria in Solid Tumours version 1.1 (RECIST 1.1), modified Response Evaluation Criteria in Solid Tumours (mRECIST) and percentage decrease of AFP, baseline AFP. Recurrence-free survival (RFS) was the primary endpoint.

Results or Findings: A novel evaluation criterion (α -RECIST) was developed for uHCC, in which more than 76% decrease in AFP change or \geq 30% decrease in tumour size of the target lesions was defined as PR. The median RFS and OS were 26.5 (IQR, 15.7-43.1), 38.8 (IQR, 18.4-53.6) months. Patients defined as responders by α -RECIST showed significantly better RFS and OS than those defined as non-responders ($p=0.035,0.048$). Response according to α -RECIST was correlated significantly with longer RFS (hazard ratio, 0.31 [95% CI: 0.10, 0.98]; $P = 0.046$).

Conclusion: Patients identified as responders by α -RECIST provided significant better RFS and OS. The α -RECIST criteria might be a user-friendly and reliable tool for identifying tumour response of conversion-radiotherapy for uHCC before hepatectomy.

Limitations: The limited sample size was the main limitation in the current study. As a result, generalisation of our conclusions should be interpreted with caution and prospective studies with larger sample sizes are urgently needed.

Ethics committee approval: This study was approved by the Institutional Review Boards of National Cancer Center/Cancer Hospital and informed consent was waived for its retrospective design.

Funding for this study: This work was supported by the National Natural Science Foundation of China (Grant No.81971589).

RPS 2616-7 - Hepatocellular carcinoma: radiomics analysis of contrast-enhanced computed tomography images in prediction tumour grade (8 min)

Mariia Shantarevich; Moscow / Russia



Author Block: M. Shantarevich, E. V. Kondratyev, G. G. Karmazanovsky; Moscow/RU

Purpose or Learning Objective: Poor tumour differentiation of hepatocellular carcinoma (HCC) correlates with lower overall and disease-free survival. Therefore, accurate non-invasive preoperative prediction of the tumour histologic grade is crucial for patient prognosis. The purpose of this study was to investigate the value of radiomics analysis of contrast-enhanced computed tomography images (CECT) in estimating the histologic tumour grade before surgery in patients with HCC.

Methods or Background: The 36 patients with HCC and preoperative liver CECT who had undergone surgical resection were retrospectively enrolled in the study (25 patients with the tumour Grade 1+Grade2, and 11 patients - with Grade 3). The LIFEx application software (version v7.1.0, www.lifexsoft.org) was used to obtain texture features. 3D ROI that covered the whole tumour was delineated in the images for each patient. Radiomic features were extracted from four phases (native, arterial, portal, and delay). A total of 497 radiomic features were extracted from each CECT phase.

Results or Findings: Tree radiomic features: CONVENTIONAL_HUKurtosis, DISCRETIZED_HUExcessKurtosis and GLZLM_SZE derived from native and arterial phases showed significant positive associations with the histologic grade ($p < 0,05$) and were selected after multiple linear regression analysis. The sensitivity and specificity of radiomics-based model in detecting poor-differentiated HCC from well- and moderate- differentiated HCC were 87,5% and 94,7%, respectively (AUC $0,901 \pm 0,078$ CI: 0,749-1,0).

Conclusion: The use of the CECT radiomics-based model reflects a better evaluating performance in the prediction of HCC grade, which may contribute to personalised treatment.

Limitations: The limitation of our research is the small number of included patients.

Ethics committee approval: Not applicable.

Funding for this study: Not applicable.

RPS 2616-8 - Assessment of radiogenomic venous invasion to predict the outcome after loco-regional therapies in patients with hepatocellular carcinoma (8 min)

Robin Schmidt; Berlin / Germany

Author Block: R. Schmidt, C. Hamm, H. XU, V. H. Broukal, L. A. Gottwald, B. Gebauer, L. J. Savic; Berlin/DE

Purpose or Learning Objective: Radiogenomic venous invasion (RVI) is a set of imaging biomarkers indicative of the presence of microvascular invasion. This study aims to investigate the predictive value of RVI regarding response and survival of patients with HCC receiving LRT.

Methods or Background: This retrospective study included 95 patients with unresectable HCC, who received ablation using CT-guided high dose-rate brachytherapy alone ($n=48$) or in combination with transarterial chemoembolisation (TACE, $n=47$) between 01/2016-12/2017. Patients were stratified according to positive or negative RVI assessed on baseline contrast-enhanced MRI using two decision-tree-models: RVI (art) and RVI (ven) based on the presence of internal vessels in the arterial or portal-venous phase, respectively, and the absence of both a hypointense halo and a sharp tumour-liver-transition in native T1-weighted images. Primary endpoints were overall (OS), progression-free survival (PFS), and time to progression (TTP). Statistics included Fisher's exact test and Kaplan-Meier analysis.

Results or Findings: Regarding brachytherapy alone, stratification according to RVI (art) achieved significant separation of OS ($p < 0,001$) and PFS ($p = 0,029$) but not TTP ($p = 0,142$), revealing poorer outcomes for RVI positive patients. RVI (ven) was predictive of TTP ($p = 0,032$) and PFS ($p = 0,004$) but not OS ($p = 0,078$). On the contrary, both RVI types achieved no significant stratification for any endpoint following TACE/brachytherapy. In patients receiving brachytherapy alone, median OS, PFS, and TTP were shorter for RVI (ven) positive compared to negative patients (12.4 vs 40.4, 5.9 vs 13.2, 6.4 vs 11.8 months). In contrast, no difference could be observed for patients receiving TACE/brachytherapy.

Conclusion: While decisions for LRT are currently based on visual assessments of tumour enhancement on baseline MRI, the findings underscore the potential of RVI to identify HCC patients who would benefit from TACE before brachytherapy.

Limitations: This study was done retrospectively at a single site.

Ethics committee approval: Ethics committee approval was obtained.

Funding for this study: No funding was received for this study.

RPS 2607 - Prostate cancer staging and management: where are we today?

Categories: Artificial Intelligence & Machine Learning, Contrast Media, Genitourinary, Hybrid Imaging, Oncologic Imaging

Date: March 6, 2022 | 15:00 - 16:00 CET

CME Credits: 1

Moderators:

Alexander Baur; Berlin / Germany

Lorenzo E. Derchi; Genoa / Italy

RPS 2607-2 - MR perfusion imaging of the prostate without contrast media using arterial spin labelling (8 min)

Matthias Boschheidgen; Düsseldorf / Germany

Author Block: M. Boschheidgen, L. Schimmöller, T. Ullrich, C. Arsov, G. Antoch, H. Wittsack; Düsseldorf/DE

Purpose or Learning Objective: To determine the capability of gadolinium-free arterial spin labelling (ASL) sequence as contrast-free, non-invasive alternative perfusion imaging method to differentiate prostate cancer (PCA) from benign prostate tissue compared to conventional DCE MRI.

Methods or Background: Thirty men with histologically confirmed PCA were included in this prospectively enrolled single-centre cohort study. All patients received multiparametric MRI (T2, DWI, DCE) at 3T with additional ASL of the PCA lesion. The primary endpoint was the differentiability of PCA versus normal prostate tissue in ASL in comparison to DCE. Secondary objectives were differences in signal intensities (SI), contrast ratios (CR), and differences in the attenuation pattern of peripheral (PZ) and transition zone (TZ) PCA.

Results or Findings: In both ASL and DCE, the average SI of PCA areas differed significantly from SI in reference areas in the TZ and PZ ($p < 0,01$, respectively). ASL had significantly higher CR discerning PCA and benign tissue in PZ and TZ (PZ=5.2; TZ=6.5) compared to DCE (PZ=1.6; TZ=1.4) ($p < 0.01$, respectively). In subjective evaluation, ASL could visualise PCA in 28 patients, compared to 29 in DCE.

Conclusion: ASL had significantly higher contrast-ratios discerning PCA and benign tissue in PZ and TZ compared to DCE and visual discrimination of PCA does not differ significantly between the two sequences. As perfusion gadolinium-based contrast media is seen more critical in the last few years, ASL seems to be a promising alternative to DCE in PCA detection.

Limitations: Single-centre design. Small sample size. Single slice sequence. Long acquisition time.

Ethics committee approval: The study was approved by the local ethics committee.

Funding for this study: No funding was received for this study.

RPS 2607-3 - Diagnostic performance of MRI-derived capsular enhancement sign for the detection of prostate cancer extracapsular extension (8 min)

Nikita Sushentsev; Cambridge / UK

Author Block: N. Sushentsev¹, I. Cagli¹, A. Colarieti², A. Warren¹, B. Lamb¹, N. Shah¹, T. Barrett¹; ¹Cambridge/UK, ²Milan/IT

Purpose or Learning Objective: To retrospectively determine the prevalence and diagnostic performance of the capsular enhancement sign (CES) on dynamic contrast-enhanced (DCE) magnetic resonance imaging (MRI) for the detection of prostate cancer (PCa) extracapsular extension (ECE).

Methods or Background: This retrospective study included patients who underwent DCE-MRI prior to radical prostatectomy. CES was defined as an area of asymmetrical early hyperenhancement on DCE-MRI that was adjacent to a peripheral zone tumour, matched or exceeded the tumour circumferential diameter, and persisted beyond the washout of contrast within the adjacent tumour. Two expert uro-radiologists evaluated the presence of CES on DCE-MRI, independently and then in consensus, with the interobserver agreement calculated using a bias-adjusted and prevalence-adjusted kappa (PABAK). CES diagnostic performance for prediction of ECE was assessed using sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV).

Results or Findings: The study included 146 patients, of whom 91/146 (62%) harboured ECE on final surgical pathology. Following the initial review of the images, Reader 1 called 12/146 (8%) CES-positive cases, while Reader 2 reported 14/146 (10%) CES-positive cases, and a total of 15/146 (10%) lesions were subsequently identified as CES-positive following a consensus read. PABAK for CES between the two readers was high at 0.90. All consensus determined CES-positive lesions represented pathological \geq T3a disease, with the overall prevalence of CES among tumours with confirmed ECE being 15/91 (17%). Hence, whilst showing 100% specificity and PPV for ECE detection, CES had sensitivity, NPV, and accuracy of 16.5%, 41.29%, and 47.38%, respectively.

Conclusion: The presence of CES on DCE-MRI is highly predictive for the presence of ECE and may improve local staging in the small but significant percentage of patients in whom it is demonstrated.

Limitations: Not applicable.

Ethics committee approval: This study was funded by the NREC East of England.

Funding for this study: Not applicable.

RPS 2607-4 - Utility of computed diffusion-weighted imaging b2000 for detection of prostate cancer (8 min)

Yeonjung Kim; Busan / Korea, Republic of

Author Block: Y. KIM, S. H. Kim, H. PARK, T. Baek; Busan/KR

Purpose or Learning Objective: To compare the diagnostic performance in tumour detection and inter-observer agreement between acquired diffusion-weighted imaging (aDWI) b2000 and computed DWI (cDWI) b2000 for patients with prostate cancer (PCa).

Methods or Background: A total of 88 patients (mean age: 68.6 years, range: 47-82 years) who had been diagnosed with PCa by radical prostatectomy and undergone pre-operative 3.0-Tesla magnetic resonance imaging (3T-MRI) including DWI (b values, 0, 100, 1000, 2000 s/mm²) were included in this study. cDWI b2000 was made from aDWI b0, 100 and 1000 under a mono-exponential decay model. Two independent reviewers performed a 4-week-interval review of aDWI b2000 images and then cDWI b2000 in random order for each session. T2-weighted images were presented for both sessions. A region of interest was drawn for an index tumour on each dataset, and a PIRADS score based on PIRADS v2.1 was recorded. Topographic maps served as the reference standard. The McNemar test was performed to compare the sensitivities for tumour detection, and kappa statistics were used to evaluate the inter-observer agreement on the PIRADS score on each dataset.

Results or Findings: The study population consisted of Gleason score (GS) 6 (n=16), GS 7 (n=53), GS 8 (n=9) and GS 9 (n=10) patients. For both reviewers, the sensitivities of cDWI b2000 and aDWI b2000 for detection of PCa showed no significant difference (for reviewer 1, both 94% (83/88); for reviewer 2, both 90% (79/88), P = 1.000, respectively). The kappa values of cDWI b2000 and aDWI b2000 for the PIRADS scores were 0.422 (95% CI, 0.240-0.603) and 0.495 (95% CI, 0.308-0.683), respectively.

Conclusion: cDWI b2000 showed comparable diagnostic performance and sustained moderate inter-observer agreement with aDWI b2000 for detection of PCa.

Limitations: No limitations were identified.

Ethics committee approval: This study was approved by the Pertinent institutional review board.

Funding for this study: No funding was received for this study.

RPS 2607-5 - Prediction of PET-positive lymph nodes with multiparametric MRI and clinical information in primary staging of prostate cancer (8 min)

Andreas M. Hötter; Zurich / Switzerland



Author Block: A. M. Hötter¹, U. J. Mühlematter¹, S. Skawran¹, S. Ghafoor¹, I. A. Burger², M. Huelner¹, O. F. Donati¹; ¹Zurich/CH, ²Baden/CH

Purpose or Learning Objective: To predict the presence of PET-positive pelvic lymph nodes in prostate cancer using quantitative parameters of multiparametric MRI (mpMRI) and clinical information.

Methods or Background: This study included 35 patients with high suspicion for prostate cancer undergoing multiparametric prostate MRI and PSMA-PET/CT prior to MRI-guided biopsy. All MRI examinations were assessed by a radiologist, and the Apparent Diffusion Coefficient (ADC, mean and volume), capsular contact length, volume and maximal diameter on T2-weighted sequences and parameters of dynamic contrast-enhanced MRI (iAUC, kep, Ktrans, ve) were calculated for the index lesion. Clinical data was extracted from the hospital information system to calculate the Briganti 2018 nomogram scores. PET examinations were evaluated by two board-certified nuclear medicine physicians and served as the standard of reference.

Results or Findings: Quantitative imaging parameters of mpMRI mostly demonstrated mediocre to good performance in prediction of PET-positive nodes (AUCs, ADCmean: 0.74, ADCvol: 0.55, iAUC: 0.42, kep: 0.71, Ktrans: 0.64, ve: 0.37, T2capsular: 0.59, T2diameter: 0.58, T2vol: 0.55), while the Briganti 2018 nomogram (including maximum diameter of the index lesion) reached an AUC of 0.78 (95%-CI: 0.61-0.95). Quantitative MR parameter did not provide added value to the Briganti 2018 model alone.

Conclusion: The Briganti 2018 model, which includes clinical/pathological data and the maximal tumour length of the index lesion on prostate MRI, performed well in predicting PET-positive lymph nodes and may serve as a tool to stratify patients for primary staging using PSMA-PET.

Limitations: The relatively low number of patients. Retrospective study design.

Ethics committee approval: Approved by local IRB.

Funding for this study: Not applicable.

RPS 2607-6 - Independent evaluation of the PI-QUAL score for prostate MRI: does it provide value? (8 min)

Nina Pötsch; Wien / Austria

Author Block: N. Pötsch¹, E. Rainer¹, P. Clauser¹, G. Vatteroni², T. H. Helbich¹, P. A. Baltzer¹; ¹Vienna/AT, ²Milan/IT

Purpose or Learning Objective: To test the inter-reader agreement of the Prostate Imaging Quality (PI-QUAL) score for multiparametric prostate MRI and its impact on diagnostic performance.

Methods or Background: Prebioptic multiparametric (T2-weighted, DWI and DCE) prostate MRIs (mpMRI) of 50 patients undergoing transrectal ultrasound-guided MRI-fusion and systematic prostate biopsy were included. Two radiologists independently assigned a PI-QUAL score to each patient. PI-RADS categories were assigned in a lesion-based approach, dividing the prostate into six regions (left and right: base/midglandular/apex). Additionally, the diagnostic quality of each sequence was evaluated independently. Inter-reader agreement was calculated by using Cohen's kappa and diagnostic performance was compared by the area under the ROC curve (AUC).

Results or Findings: In a total of 274 diagnostic areas, the malignancy rate was 62.2% (22.7% clinically significant prostate cancer ISUP \geq 2). Inter-reader agreement for the diagnostic quality was only slight for T2w (kappa 0.19) and fair for DWI and DCE (kappa 0.23 and 0.29). For PI-QUAL as such, the inter-reader agreement was moderate (kappa 0.51). For PI-RADS category assignments, the inter-reader agreement was almost perfect (kappa 0.86). Overall diagnostic performance was significantly better in studies with a PI-QUAL score $>$ 3 compared to a score \leq 3 (P=0.03; AUC 0.805 and 0.839).

Conclusion: In conclusion, the diagnostic performance of mpMRI for the detection of prostate cancer does depend on MRI image quality. Though there is room for improvement regarding inter-reader reproducibility, PI-QUAL is a tool that provides value by predicting the accuracy of diagnostic mpMRI results.

Limitations: As all patients underwent MRI-US fusion biopsy due to suspicious mpMRI findings, the rate of malignancy is higher compared to routine clinical practice which may bias the outcomes in non-selected patients.

Ethics committee approval: IRB waived the need for informed consent.

Funding for this study: No funding was received for this study.

RPS 2607-7 - Quantitative evaluation of diffusion-weighted imaging may help to avoid biopsies for low PI-RADSv2.1 categories in transition zone lesions (8 min)

Hannes Engel; Freiburg im Breisgau / Germany

Author Block: H. Engel, B. Oerther, M. Reiser, A. Sigle, E. Kellner, F. Bamberg, M. Benndorf; Freiburg im Breisgau/DE

Purpose or Learning Objective: To analyse whether low PI-RADS categories of transition zone (TZ) lesions can be downgraded based on mean apparent diffusion coefficients (mADC) without risking false-negative results.

Methods or Background: This retrospective cohort study consists of consecutive patients with TZ lesions in multiparametric prostate MRI and subsequent MRI-ultrasound-fusion-biopsy between 05/2017-04/2020. Patients with known prostate cancer (PCa) are excluded. All lesions are scored by two blinded radiologists according to PI-RADSv2.1 guidelines. To determine mADC, lesions are manually segmented. Regression and ROC analyses are performed to determine the diagnostic performance of PI-RADSv2.1 categories and mADC.

Results or Findings: Among 85 patients with 98 TZ lesions, 33 (33.7%) are PCa and 65 (66.3%) are benign. 24 (72.7%) of the 33 PCa lesions are clinically significant (csPCa, ISUP-grade>1). mADC for PCa are significantly lower than for benign lesions (894 vs 1.091 $\mu\text{m}^2/\text{s}$, $p<0.001$). AUC values from ROC analysis with csPCa as outcome variable are 0.916 for PI-RADSv2.1 and 0.806 for mADC. Compared to PI-RADSv2.1 alone, a combination with an mADC cut-off of 950 $\mu\text{m}^2/\text{s}$ for TZ lesions \leq PI-RADS 3 improves the negative predictive value (0.95 vs 1.00). Among 58 TZ lesions \leq PI-RADS 3, only 8 (13.8%) have mADC below 950 $\mu\text{m}^2/\text{s}$, 3 (37.5%) PCa and 1 (12.5%) csPCa.

Conclusion: The key question after a prostate MRI is whether a biopsy is indicated: cancer detection rates for PI-RADS 1+2 are very low while being too high for PI-RADS 3 to abandon biopsies completely. Thus, further parameters which allow avoiding unnecessary biopsies are desirable. Our data indicate that by applying an mADC cut-off for TZ lesions \leq PI-RADS 3 most biopsies could be avoided without overlooking prostate cancer.

Limitations: mADC can differ between vendors/algorithms. External validation of our findings is warranted before clinical use.

Ethics committee approval: The ethics committee approval was obtained.

Funding for this study: No funding was received for this study.

RPS 2607-8 - Improving workflow in prostate MRI: AI-based decision-making on biparametric or multiparametric MRI (8 min)

Andreas M. Hötter; Zurich / Switzerland

Author Block: A. M. Hötter, A. Tiessen, D. M. Raffaele, E. Konukoglu, O. F. Donati; Zurich/CH

Purpose or Learning Objective: To develop and validate an artificial intelligence algorithm to decide on the necessity of dynamic contrast-enhanced sequences (DCE) in prostate MRI.

Methods or Background: A convolutional neural network (CNN) was developed on 300 prostate MRI examinations. The consensus of two expert readers on the necessity of DCE acted as the reference standard. The CNN was validated in a separate cohort of 100 prostate MRI examinations from the same vendor and 31 examinations from a different vendor. Sensitivity/specificity were calculated using ROC curve analysis and results were compared to decisions made by a radiology technician.

Results or Findings: The CNN reached a sensitivity of 94.4% and specificity of 68.8% (AUC: 0.88) for the necessity of DCE, correctly assigning 44%/34% of patients to a biparametric/multiparametric protocol. In 2% of all patients, the CNN incorrectly decided on omitting DCE. With a technician reaching a sensitivity of 63.9% and specificity of 89.1%, the use of the CNN would allow for an increase in sensitivity of 30.5%. The CNN achieved an AUC of 0.73 in a set of examinations from a different vendor.

Conclusion: The CNN would have correctly assigned 78% of patients to a biparametric or multiparametric protocol, with only 2% of all patients requiring re-examination to add DCE sequences. Integrating this CNN in clinical routine could render the requirement for on-table monitoring obsolete by performing contrast-enhanced MRI only when needed.

Limitations: The decision rendered by the neural network was dichotomous. The performance of the AI could be improved by defining a range of probability values in which it's unsure and prompt the technician to call a radiologist for this particular examination.

Ethics committee approval: This study was approved by the institutional review board and the requirement for study-specific informed consent was waived.

Funding for this study: Not applicable.

CC - Closing Ceremony

Date: March 6, 2022 | 16:15 - 16:45 CET

Moderator:

Regina G. H. Beets-Tan; Amsterdam / Netherlands

- Closing Ceremony (30 min)

Regina G.H. Beets-Tan; Amsterdam / Netherlands

