EUROPEAN CONGRESS OF RADIOLOGY

ECR 2020

Book of abstracts

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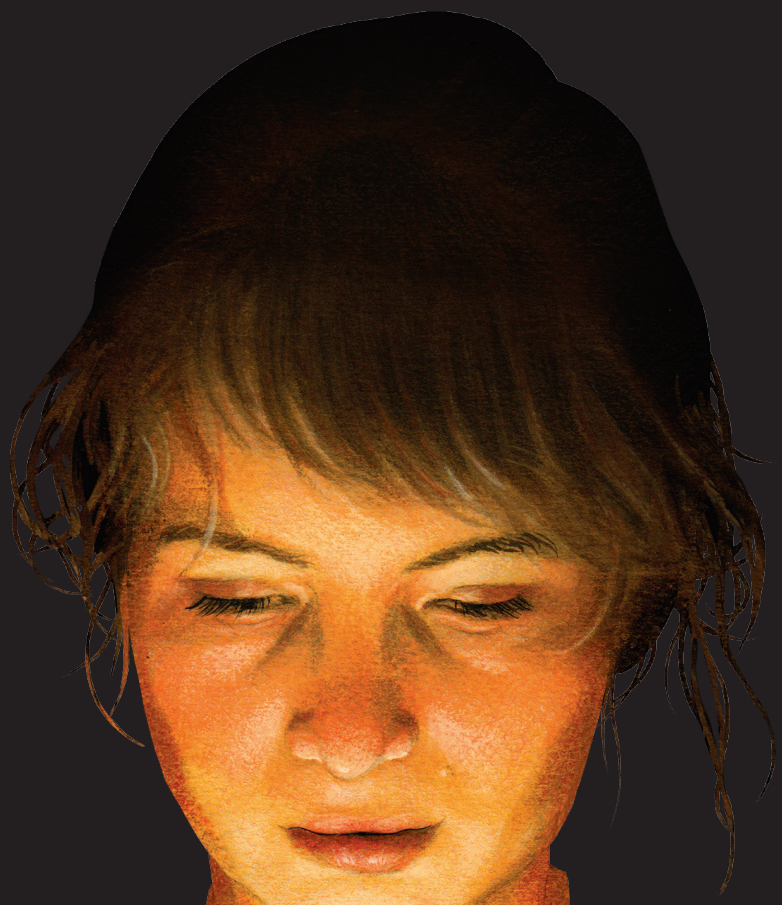

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B

Scientific Programme

Clinical Trials in Radiology (CTiR)
My Thesis in 3 Minutes (MyT3)
Research Presentation Sessions (RPS)
Student Sessions (S)

Wednesday, March 11 128
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Sunday, March 15 613

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RPS 706-6 14:40
Impact of ^{18}F-FDG-PET/CT on clinical management in patients with cholangiocellular carcinoma
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Purpose: To determine the impact of ^{18}F-FDG-PET/CT on clinical management in patients with cholangiocellular carcinoma (CCA).
Methods and materials: Patients with CCA undergoing clinically indicated PET/CT between 04/2013-08/2018 were prospectively included in the local PET/CT registry study. Questionnaire data from referring physicians regarding PET/CT indication (diagnosis/staging/suspected recurrence) and intended clinical management (non-treatment (watchful-waiting/additional tests)/palliative/curative treatment) were recorded before and after PET/CT. Post-PET/CT changes in clinical management were analysed. The outcome was determined using Kaplan-Meier-analysis.
Results: 27 patients (mean age: 60 years (IQR: 51.5-67.5 years), 56% males) with altogether 43 PET/CT-examinations were included. PET/CT indications were mainly "suspected recurrence" and "staging" (95.3%). Intended clinical management changed in 35 cases (81.4%) after PET/CT. Major changes (between non-treatment and treatment strategies) occurred in 27 cases (62.8%). Minor changes in non-treatment and among therapies were documented in 8 cases (18.6%). Additional tests (further imaging and/or biopsy) were intended in 21 (48.8%) and 9 (20.9%) cases before PET/CT. After PET/CT, imaging was performed in 1 (2.3%) and biopsy in 8 (18.6%) cases. In only one case biopsy was already planned before the PET/CT and performed afterwards, whereas in 8 cases, biopsy became unnecessary based on PET/CT results. Patients with intended curative treatment after PET/CT showed a mean survival of 2.21 years (95%-CI: 0.76-3.66 years), whereas patients with intended palliative or non-treatment showed a mean survival of 1.21 years (95%-CI: 0.72-1.69years) and 2.08 years (95%-CI: 1.27-2.89years).
Conclusion: ^{18}F-FDG-PET/CT influences clinical management in patients with CCA. It guides the decision for reasonable additional tests and helps to avoid unnecessary imaging and biopsy. Thus, a more appropriate and individualised treatment may be possible based on PET/CT results.
Limitations: Small cohort.
Ethics committee approval: The study was approved by the local institutional review board and ethics committee. Informed consent was obtained from all patients.
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RPS 706-7 14:46
Diagnostic efficiency of whole-body ^{18}F-FDG PET/MRI, MRI alone, and SUV and ADC values in the staging of primary uterine cervical cancer
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Purpose: To assess the diagnostic performance of PET/MRI and MRI alone in the local and whole-body staging of cervical cancer, and to evaluate the benefit of standardised uptake value (SUV) and apparent diffusion coefficient (ADC) in staging.
Methods and materials: Consecutive patients with biopsy-proven cervical cancer and whole-body ^{18}F-FDG PET/MRI obtained before the definitive treatment were retrospectively identified. Local tumour spread, nodal involvement, and distant metastases were evaluated using PET/MRI or MRI dataset alone. Histopathology or clinical consensus with the follow-up imaging were used as reference standard. Tumour SUVmax and ADC were measured and the SUVmax/ADC ratio calculated. The area under the curve (AUC) was determined to predict diagnostic performance and Mann-Whitney U test was applied for group comparisons.
Results: In total, 33 patients who underwent surgery (n=23) or first-line chemoradiation (n=10) were included. PET/MRI resulted in higher AUC compared with MRI alone in detecting parametrial (0.89 vs 0.73), vaginal (0.85 vs 0.74), and deep cervical stromal invasion (0.96 vs 0.74), respectively. PET/MRI had higher diagnostic confidence than MRI in identifying patients with radical cone biopsy and no residual at hysterectomy (sensitivity 89% vs 44%). PET/MRI and MRI showed equal AUC for pelvic nodal staging (both 0.73), whereas AUC for distant metastases was higher using PET/MRI (0.80 vs 0.67). The tumour SUVmax/ADC ratio, but not SUVmax or ADC alone, was significantly higher in the presence of metastatic pelvic lymph nodes (P<0.05).
Conclusion: PET/MRI shows higher accuracy than MRI alone for determining not only distant metastasis but also local invasive tumour spread. Tumour SUVmax/ADC ratio may predict pelvic nodal involvement.
Limitations: No evaluation of interobserver variability.
Ethics committee approval: This study was approved by the institutional ethics committee and informed consent was waived.
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J. Hynninen: nothing to disclose

RPS 706-8 14:52
The role of histopathological and biochemical parameters in predicting metastatic disease in Ga68 PSMA PET for prostate cancer
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Purpose: The aim of this study was to evaluate the role of histopathological and biochemical parameters in the prediction of the presence and number of PSMA positive lesions consistent with the metastatic spread of prostate cancer on Ga68 PSMA PET images.
Methods and materials: Biochemical, histopathological, and imaging data of 302 prostate cancer patients who underwent Ga68 PSMA PET/CT or PET/MR imaging for primary staging were retrospectively analysed. Patients were divided into two groups as "PET-positive" and "PET-negative" according to the presence of pathologic extra-prostatic PSMA involvement. "PET-positive" cases were additionally divided into three groups: Group A (N1+, M0), Group B (1-3 distant metastases), Group C (>3 distant metastates).
Results: The mean age of patients was 66.8 ± 7.6 years. Imaging modality was PET/MR in 223 (73.8%) and PET/CT in 79 (26.2%) patients. Total PSA, PSA density (PSAD), and tumour tissue ratio were found to be higher in Group C compared to both groups. PSMA PET positivity was observed in 3.8% of the low-intermediate risk groups (ISUP 1-3 and total PSA≤20 and PSAD<0.15). This ratio was 46% (p<0.001) in the high-risk group (ISUP 4-5 or total PSA>20 or PSAD≥0.15) with a relative risk of 12. The logistic regression model to predict the presence of distant metastasis had an accuracy of 89.7%; with ALP, total PSA and ISUP Gleason grade as significant predictors (p<0.05).
Conclusion: In this study, Ga68 PSMA PET positivity was significantly higher in the high-risk patient group than in the low-intermediate risk groups. The regression model used for predicting the presence of distant metastasis on PET imaging was successful with high accuracy.
Limitations: This study was retrospective.
Ethics committee approval: n/a
Funding: No funding was received for this work.
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S. Gülbahar: nothing to disclose
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L. Ö. Atay: nothing to disclose

RPS 706-9 14:58
Prostate cancer heterogeneity in high b-value DWI correlates with ^{68}Ga-PSMA PET/CT: preliminary results
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Purpose: To investigate whether radiomic features computed on high b-value DWI sequences referring to tumour cellularity correlate with the ^{68}GA-PSMA PET/CT ligand, highly specific for the diagnosis of prostate cancer (PCa).
Methods and materials: This study retrospectively enrols 17 patients belonging to a multi-cohort investigation for the clinical impact of 3T-mpMRI and ^{68}GA-PSMA PET/CT in PCa diagnosis and staging. PCa lesions were contoured in consensus by two experienced radiologists in either DWI or T2w sequences, depending on where they were more visible. 40% of SUV_{max} was used as the threshold to contour lesions on PET images and, on these regions, the median of the last decile of SUV (SUV_{M90th}) was computed. Instead, 84 radiomic features were computed on b-2000 DWI lesions and their value was correlated to SUV_{M90th} through the absolute Spearman index (ρ).
Results: Several radiomic features showed excellent correlations with ^{68}GA-PSMA-SUV_{M90th}. In particular, the radiomic feature performing as the best is related to local tumour heterogeneity and showed ρ≥0.7 in 82% of patients, ρ≥0.5 in just two cases, and one-only patient yielded ρ=0.3.
Conclusion: The outcome reveals a rank correlation between the degrees of PCa cellularity heterogeneity and ^{68}GA- PSMA -SUV_{M90th}. In other words, a wider expression of membrane receptors for PSMA seems corresponding to an over-proliferation of cells, which theoretically is suggestive of tumour onset and malignancy progression.
Limitations: A wider cohort of patients is needed to better understand this correlation and to deepen the physiological and biomolecular causes of such behaviour.
Ethics committee approval: IRB approval, written informed consent was waived.
Funding: No funding was received for this work.
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M. Mottola: nothing to disclose
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G. Paganelli: nothing to disclose

RPS 706-10 15:04

Assessment and evaluation of the significant role of 18F-FDG-PET/CT in determining the cause of fever of unknown origin (FUO) and inflammation of unknown origin (IUO)

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Purpose: Fever of unknown origin (FUO) and inflammation of unknown origin (IUO) are becoming diagnostically challenging conditions with relevance to various medical advances and newer techniques. Diagnosis of these underlying disease conditions may be significantly improved by 18F-fluorodeoxyglucose positron emission tomography (18F-FDG-PET).
Methods and materials: Retrospective study to test the diagnostic utility of 18F-FDG-PET/CT in a large cohort of patients with FUO or IUO and to define parameters to increase the likelihood of diagnostic 18F-FDG-PET/CT. Patients under the FUO or IUO category underwent 18F-FDG-PET/CT scanning in addition to the standard diagnostic work-up. 18F-FDG-PET/CT results were classified as helpful or non-helpful in establishing the final diagnosis. Binary logistic regression was used to identify clinical parameters associated with a diagnostic 18F-FDG-PET/CT.
Results: 60 patients underwent FDG PET-CT, 18 with FUO, 35 with IUO and 7 had FUO or IUO previously (exFUO/IUO). The diagnosis was established in 24 patients (79.2%). The leading diagnoses were Tuberculosis (15.3%) in the FUO group, large vessel vasculitis (21.1%) and polymyalgia rheumatica (18.3%) in the IUO group and IgG4-related disease (15.4%) in the exFUO/IUO group. In 34 patients (56.7% of all patients and 71.6% of patients with a diagnosis), 18F-FDG-PET/CT was positive and helpful in finding the diagnosis. Predictive markers for a diagnostic 18F-FDG-PET/CT were an age over 50 years (p=0.019), C-reactive protein (CRP) level over 30 mg/L (p=0.002) and the absence of fever (p=0.001).
Conclusion: 18F-FDG-PET/CT scanning is helpful in evaluating the correct diagnosis in more than 50% of the cases presenting with FUO and IUO. Absence of intermittent fever, higher age and elevated CRP level increase the likelihood for a diagnostic 18F-FDG-PET/CT.
Limitations: Differentials of malignant foci cannot be ruled out.
Ethics committee approval: n/a
Funding: No funding was received for this work.
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S. M. Shaikh: nothing to disclose

RPS 706-11 15:10

Initial evaluation of 18F-FDG biodistribution in healthy and oncology subjects scanned using the uEXPLORER total-body PET/CT

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Purpose: EXPLORER is a new generation PET/CT scanner with unprecedented sensitivity and total-body coverage. Its clinical implementation changes the way PET/CT is interpreted and the radiologist needs to gain familiarity with the new way that the functional anatomy is seen. This work aims to characterise aspects of the impact of this new technology on the visualisation of small structures through a semiquantitative evaluation.
Methods and materials: PET data from 19 subjects (healthy subjects, n=5, and oncology patients with limited disease, n=14) were acquired on the EXPLORER scanner for 20 min at 90-min post-injection of 18F-FDG. Data were reconstructed in 1-mm isotropic voxels using an OSEM iterative algorithm with 4 iterations and 20 subsets. At least 1-cm volumes of interest (VOIs) were placed on the liver (Lbkg), ascending aorta (AAbkg) and bone marrow at L3 vertebral body (L3), and smaller structures such as spinal cord (SC), adrenals (AG) and pituitary gland (PG). Semiquantitative values including the SUVmean, SUVmax and SUVpeak were recorded.
Results: SUVmean values for larger structures were: Lbkg=2.5±0.70; AAbkg=1.61±0.39; L3=2.39±1.33. For smaller structures, SUVmax & peak were: for SC, 4.13±0.1.42 & 2.70±0.59 (varied by region); for PG, 5.54±1.60 & 3.26±0.88; and for AGs, 4.64±2.14 & 2.73±0.92. When PG and AG values were normalised for Lbkg, their ratios were: 2.4 & 1.9 for SUVmax and 1.4 & 1.1 for SUVpeak, respectively. No significant differences were seen between healthy and cancer patients.
Conclusion: Initial EXPLORER scans in healthy and oncology subjects demonstrated that biodistribution values in small structures are higher than that usually seen from standard scanners. For example, the adrenals and pituitary gland uptake are higher than the liver background. This notion is critical to correctly interpret total-body PET/CT scans.
Limitations: Small sample size.
Ethics committee approval: IRB#1498688-1 &1341792-4
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B. Spencer: nothing to disclose
S. Cherry: Research/Grant Support at United Imaging, Other at UC Davis has a revenue sharing agreement with United Imaging Healthcare.
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RPS 706-12 15:16

Evaluation of the first integrated PET/dual-energy CT system in patients with lung cancer

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Purpose: The aim of this study was to prospectively evaluate the first integrated positron emission tomography (PET)/dual-energy computed tomography (DECT) system in patients with lung cancer.
Methods and materials: In this single-center HIPAA compliant prospective trial, we included 25 patients (age range, 41-84 years; mean age, 62±12.8) with NSCLC (n=21) or SCLC (n=4) who were referred for a PET study between May 2017 and June 2018. All patients received contrast-enhanced imaging on a clinical PET/DECT system. Data analysis included PET-based standard uptake values (SUV_{max}) and DECT-based iodine densities of tumour masses and lymph nodes.
Results: SUV_{max} and iodine density parameters were measured in 33 malignant lung masses (18.0 and 2.3 mg/mL, respectively) and 56 enlarged mediastinal or hilar lymph nodes (8.4 and 2.2 mg/mL, respectively). A moderate correlation was found for SUV_{max} and iodine density values in tumour masses (r=0.53). SUV_{max} and iodine density values of lymph node metastases showed a weak correlation (r=0.36). Additionally, iodine quantification analysis provided no added value for the differentiation of malignant from benign lymph nodes with an area under the curve (AUC) of 0.52 using PET-based SUV_{max} analysis as the reference standard.
Conclusion: The integration of PET/DECT in lung cancer staging can provide additional insights in the assessment of primary lung cancer and on the correlation between tumour vascularisation and metabolic activity, offering an alternative for tumour characterisation improvements.
Limitations: This is a pilot study with a small study size of 25 participants. The histological subtypes at various stages were not investigated in our study.