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EPS-039

Optimizing Dose Regimen for Ga-PSMA PET/CT Imaging While Preserving Image Quality required for Lesion Detection

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Aim/Introduction: PET/CT imaging using ^{68}Ga-PSMA has become a strong tool in prostate cancer imaging. Current guidelines of the European Association of Nuclear Medicine (EANM) recommend an injected dose of approximately 1.8-2.2 MBq per kilogram of body weight for Ga-PSMA studies. This unoptimized dose regimen causes image quality degradation, especially in the case of obese patients. This retrospective study aims to propose an optimized dose regimen providing acceptable image quality and lesion detection. ***Materials and Methods:*** Ga-PSMA PET/CT scans of 50 patients with prostate cancer were selected, retrospectively. For each patient, the signal-to-noise ratio (SNR, measured in the liver was normalized to the injected activity (A) and scan time (t) according to the following formula: SNRnorm= SNRL/A(MBq)×t(min) for different patient's parameters such as weight (kg), BMI and lean body mass. Nonlinear fitting was performed on SNRnorm data to find a function in the form of SNRnorm= $a.p^{-b}$, in which p was patient's parameter and a and b were fitting derived constants. Dose time product (DTP) was mathematically defined as DTP= A.t= $(SNRL/a)^2 \times p^{2b}$ was calculated for each parameter. DTP, injected activity, and scan time were calculated in both traditional and new formulas and Wilcoxon signed-rank was performed as a significant statistical test (p value<0.05) to evaluate changes. ***Results:*** Being revealed power equations for DTP, indicated their non-linear relationship with patients' parameters, which were DTP = $43.2\times W^{0.46}$, DTP = $69.6\times (BMI)^{0.46}$, DTP = $24.07\times (LBM)^{0.64}$ for weight, BMI, and lean body mass, respectively. Applying the new formula led to the DTP (MBq.min) decreasing from 633.4±28 to 316.5±20, injected dose (MBq) decreasing from 174.3±33 to 104.5±44, and scan time (minute) from 3.6±1.5 to 1.8±0.3. Findings showed a significant decrease in DTP, injected activity, and scan time by approximately 50%, 40%, and 50% (P<0.0001). ***Conclusion:*** We proposed a non-linear equation for an optimized injected dose regimen in Ga-PSMA PET imaging for different patient parameters. This dose regimen can significantly lower injected dose and scan time for such imaging while preserving image quality.

EPS-040

A highly reproducible ejection fraction estimation through PACS data-driven deep learning for automatic segmentation of diastole and systole regions of interest in ERNA scans

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Aim/Introduction: Planar equilibrium radionuclide angiocardiography (ERNA) is a useful imaging technique providing the ejection fraction (EF), which is by far the most important parameter for functional cardiac imaging. EF measurement by ERNA scans were done with commercially available software by manually or semi-automatically after manual definition of the location of left ventricle. This process requires the tracing of region of interest (ROI) in the end systolic and diastolic images selected from ERNA scans, which is not only labor-intensive and time-consuming, but posing disadvantages in terms of inter and intra-rater reliabilities. To resolve these issues, we devised a deep learning (DL)-based segmentation of target (i.e., end-diastole and end-systole) ROIs using the deep convolutional neural network model (deep CNN). ***Materials and Methods:*** A total of 41581 ERNA scans were performed at our institution between January 2010 and June 2021. All data were automatically downloaded after the study approval by Institutional Review Board. Among them, 41464 ERNA scans were applied to our technique, except for a total of 117 cases, which we found unsuitable for training, including inadequate left anterior oblique view, failure to properly reflect end-diastole/end-systole ROI, low count due to poor labeling efficiency, dextrocardia, and breast expander artifact in LV area cases. As for deep learning labels, binary ROI masks, which are manually-drawn by expert nuclear medicine radiological technologists and are available in our in-house PACS system termed PetaVision, for diastolic and end systolic images selected from ERNA scans were used. DL training with 24 input channels was conducted through 4-fold cross validation to resemble the ground-truth ROI on end-systolic and end-diastolic image. For model evaluation, we analyzed dice similarity coefficient between manually-traced ROIs and DL generated ROIs. Finally, we evaluated the concordance correlation coefficients (CCC) between EF values obtained through aforementioned different methods. ***Results:*** Our devised method achieved high VOI agreements between end-diastole/end-systole ROIs defined by both methods (i.e., manual tracing [ground truth] and DL) in terms of dice similarity coefficients (0.95±0.02/0.92±0.03, respectively). End-diastole/End-systole total counts and EF values obtained by both methods showed high CCC. (CCC=0.933 (95% confidence interval (CI) 0.931-0.934), CCC=0.969 (95% CI 0.968-0.97), and CCC=0.966 (95% CI 0.965-0.966), respectively, P<0.001). ***Conclusion:*** We established a novel deep CNN-based EF quantification method through automatic end-diastole/end-systole ROIs segmentation CNN trained using PACS data, reducing labor intensive process of manual ROI definition in ERNA scans quantification by experts.

509

Sunday, October 16, 2022, 15:00 - 16:30

Hall 111

e-Poster Presentation Session 3 - Inflammation & Infection Committee: Best e-Posters on Infection and Inflammation

EPS-041

18F-FDG PET/CT In Infective Endocarditis: Impact As A Major Diagnostic Duke Criterion And In The Evaluation Of Extracardiac Infectious Manifestations

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did not differ between the COVID-19 and pre-COVID-19 group, respectively. ***Conclusion:*** Besides slight differences in location of primary melanoma, interval to SLNB performance, and SPECT-CT use, we demonstrated that SLNB management and histopathologic features in our melanoma patients followed the pre-pandemic period a year after starting COVID-19 epidemic restrictions.

EPS-056

Incidential Covid-19-Associated Findings During Routine Oncological 18F-FDG-fdPET/CT Staging and Restaging

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Aim/Introduction: Incidential findings during routine 18F-FDG-PET/CT work up of oncological patients are quite common - including both unknown benign and additional primary malignant conditions. As Sars-Cov-2 became an inevitable part of our work, we started witnessing its traces or associated conditions. ***The aim*** of this study is to present some of the main Covid-19 related findings during oncological PET/CT imaging and their impact on patient management. ***Materials and Methods:*** 31 patients (15 male, 16 female) underwent 18F-FDG-full-digital (fd)-ultra high resolution 64-slice-PET/CT in our Clinic for oncological staging or restaging (11 breast cancer, 2 lung, 4 melanoma, 1 myeloma, 3 gynaecological, 2 lymphoproliferative, 5 head and neck, 3 urological, 2 gastroenterological, 1 unknown primary; 2 pts with more than 1 malignancy) in the period 11.2020-02.2022. 13pts had one PET/CT scan, 9 pts had two studies and 9 pts - 3 studies in the follow-up. ***Results:*** PET/CT found metabolically-active interstitial pulmonary lesions in 12 pts, unaware for being Covid-19-positive.They were appointed to further diagnostics and treatment in the follow-up. Eight pts showed partial to complete resorption, 4 unfollowed. In 14 pts PET showed non-avid post-Covid-19 remnant pulmonary findings and reactive mediastinal lymph nodes. In 4 pts FDG-avid axillary LN were found soon after anti-Sars-Cov-2 immunization. One patient showed no pathological remnants after Covid-19 infection. ***Conclusion:*** During routine oncological work-up PET/CT can detect previously unknown active Sars-Cov-2 infection and correctly appoint the patient for further diagnostic and therapeutic procedures also influencing concomitant oncological therapy. In the follow-up fdPET/CT discriminates remnant fibrous pulmonary finding from still active infection and can detect newly appeared metastatic pulmonary lesions. Basic pitfall remains the time after immunization and the tricky discrimination between reactive inflammatory from metastatic LN, pointing out the need for explicit patient information and correct timing for PET-studies.***Key words***: Covid-19-associated finding, fdPET/CT, oncological patients

EPS-057

Educational and Psychological Impact of COVID-19 Pandemic on Nuclear Medicine Residents - A Survey Study in Romania

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Aim/Introduction: The COVID-19 pandemic affected all fields of human activity and put the medical system in a state of continuous strain. The aim of our study is to evaluate the impact this event had on the quality of medical residency training in the field of nuclear medicine in Romania, along with the perception of career progression and psychological and social well-being. ***Materials and Methods:*** A 32-question web-based survey was administered to residents training in the nuclear medicine field in Romania. Responses for the survey were accepted for 8 days. Categorical variables are presented as frequency and percentage. Statistical analysis was made using GraphPad Prism 6.0; $p \leq 0.05$ was deemed to be significant. ***Results:*** Due to safety protocols, 86.2% of the trainees were limited during the pandemic from interacting with patients and 92% of them perceived this diminished interaction as moderately to extremely detrimental to their training program. The majority (75.8%) experienced a change in their work schedule and only 28% found these new adjustments beneficial to their training program. The average working time before the pandemic was 32.18h per week which decreased to 17.9h per week ($p<0.01$). Both theoretical and practical training programs underwent a decline that resulted in 80% of participants considering that this reduction has negatively impacted their training and 64.3% reporting that they might not have the means of reacquiring the missed learning opportunities in the following residency period. A higher than usual stress and anxiety level was predominant while working during the pandemic (72.4%) and a significant majority expressed concern about the possibility of contracting COVID-19 while fulfilling requirements for their training (82.7%). The use of protective equipment and safety protocols had a positive impact on decreasing those concerns for 70.8% of them ($p<0.01$). ***Conclusion:*** The COVID-19 pandemic had a significant impact on several key elements of the nuclear medicine residency in Romania. The average working time decreased and interaction with patients has been reduced, potentially limiting the learning opportunities for the trainees. The stress and anxiety of being exposed to the COVID-19 infection were significant, although proper implementation of safety protocols and the usage of protective equipment alleviated some of these concerns. Therefore, it might be beneficial to consider alternative strategies for replacing the missed training opportunities, along with maintaining adequate measures for limiting the exposure of nuclear medicine staff to the COVID-19 infection.