R.Impact of different standardized uptake value measures on PET-based quantification of treatment response.[J]. Journal of nuclear medicine : official publication, Society of Nuclear Medicine,2013,54(8):1188-94. DOI: 10.2967/jnumed.112.113332[2] Westerterp M , Pruim J , Oyen W , et al. Quantification of FDG PET studies usingstandardised uptake values in multi-centre trials: effects of image reconstruction, resolution and ROI definition parameters [J]. European Journal of Nuclear Medicine and Molecular Imaging, 2007, 34(3):392-404. DOI: 10.1007/s00259-006-0224-1[3] Zhang J,Qiu QT,Duan JH,et al. Variability of radiomic features extracted from multi-b-value diffusion-weighted images in hepatocellular carcinoma[J]Translational cancer research,2019,48(1), 152-163,DOI: 10.1002/jmri.26037

EPS-096

Development of an anthropomorphic rodent phantom

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Aim/Introduction: Develop a 3D printed tissue equivalent material (TEM) anthropomorphic rodent phantom with the intent to replace using animals when optimizing imaging protocols and assist in accurate scanner quality control validation. Research using positron emission tomography/computed tomography (PET/CT) continues its rapid increase as a key imaging technique across multiple biomedical preclinical research fields. Preclinical PET/CT is a powerful, pivotal imaging tool supporting investigations and evaluations of underlining biological mechanisms. Preclinical PET/CT is fully quantitative, providing biological functional information, whilst CT provides anatomical information. Additionally, the expansion of utilizing CT, as a dedicated system and with PET, SPECT or optical increases the need for new imaging protocols in several biomedical research fields. When designing or optimizing a preclinical experimental imaging protocol, usually, a priori knowledge of obtainable optimization is not known. To gain this information, small laboratory animals are generally used for testing. ***Materials and Methods:*** A CT acquisition of a scheduled 1 rodent was exported into OsiriX and PMOD for volume and surface rendering. The rodent's brain, heart, liver, kidney and lungs were imaged and exported in the same manner. All files were exported into Rhinoceros 3D CAD software. The prepared CAD files were used for 3D printing the anthropomorphic TEM rodent phantom. Phantoms were made with combinations of Tango Black Plus M, Vero Clear and Vero White Plus M 830. Furthermore, the phantom was designed with a void for lungs and a calcium hydroxyapatite (CaHA) skeletal insert. HU values were extracted by dawning volumes of interested using PMOD. Calculated 3D material linear attenuation coefficient were compared to tissue. ***Results:*** Selected commercially available 3D printing materials produced measured HUs within accepted ranges for soft tissue. Calculated 3D material linear attenuation coefficient compared well to measured attenuation coefficients. Tango Black Plus M measured the lowest values at -38HU. Perspex and Vero Clear measured -12HU and -17HU, respectively. Vero White Plus measured the greatest at 22HU. No tissue measured HUs for lung or cortical bone at the preclinical tube voltage. ***Conclusion:*** X-ray properties and HUs of materials corresponded to those of human tissues at diagnostic and preclinical energies for soft tissue. No 3D material measured a close similarity to lung or cortical bone. Collected data and the developed 3D printed TEM phantom support the usage of an anthropomorphic rodent phantom for preclinical protocol optimizations and quality control; replacing the use of animals. ***References:*** None

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Optimization of Quantitative ^{18}F-DCFPyL PET using a Realistic Anthropomorphic Phantom with Shell-less Radioactive Epoxy Lesions

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Aim/Introduction: Block sequential regularized expectation maximization (BSREM), as compared to OSEM reconstruction, has received significant interest for its ability to reach convergence with minimal noise amplifications. PET images with ^{18}F-DCFPyL (a PSMA-based tracer) have shown superior results in detecting prostate cancer. However, few phantom studies have evaluated the quantitative accuracy of BSREM for high contrast, small diameter (sub-10mm) lesions observed in ^{18}F-DCFPyL scans. This study aimed to design a realistic phantom experiment to optimize the reconstruction parameter (β) of the BSREM algorithm for quantification of prostate cancer metastasis imaged with ^{18}F-DCFPyL. In addition, the quality of the reconstructed images was also evaluated. ***Materials and Methods:*** Twenty-seven spherical lesions (diameters 3mm-16mm) were cast using Epoxy resin infused with 3 activity concentrations of ^{22}Na-NaCl. The diameters and concentrations were chosen based on an analysis of 10 prostate cancer patients imaged with ^{18}F-DCFPyL. A highly realistic anthropomorphic phantom [1] which features a liver, lungs, bladder, and ureters, was filled with ^{18}F-FDG

to achieve target concentrations determined from the patient segmentations. Ten scans were performed at 30min intervals using a GE Discovery D690 PET/CT scanner. Bed and scan durations were scaled to maintain similar count statistics. Images were reconstructed with OSEM (24,32 subsets, 1-4 iterations) and BSREM (32 subsets, 25 iterations, γ=2, β=100,150,200,250,300,400,500,650,800). Regions-of-interest were drawn with MIM (MIM Software Inc.) using a 40% of SUV_{max} fixed threshold and MIM's PET Edge+ method. ^{22}Na lesion ground truth activity concentrations were determined from a scan with fully decayed background. Metabolic tumour volume (MTV), contrast, signal-to-noise ratio, and recovery coefficients (max, mean, and peak) were calculated for each sphere size. ***Results:*** SUV_{mean} recovery coefficients were 130.4+/-13.5% and 98.3+/-6.9% (16mm), and 99.7+/-4.7% and 69.4+/-0.8% (10mm), for β=150 and β=300 respectively. Contrast-to-noise ratios for β=150 and β=300 were 55.3+/-14.4 and 65.3+/-5.6 (16mm), and were 15.4+/-1.8 and 4.6+/-1.4 (6mm). Signal-to-noise ratios were comparable with maximum values 81.2+/-1.0 (β =150) and 105.2+/-0.07 (β =300). PET Edge+ MTV bias was 0.2+/-0.01% at 6mm, but deviated 56.2+/-1.7% at 12mm. The 40% threshold deviated by over 176% for spheres smaller than 10mm, but reduced to 14.9% at 12mm. ***Conclusion:*** Our results suggest that β=150 and β=300 are optimal parameters for quantification of ^{18}F-DCFPyL PET scans for lesions of sizes of 3-10mm and 12-16mm, respectively. PET Edge+ segmentation is recommended for segmenting lesions of 3-10mm, while the 40% threshold showed better results on larger 12-16mm lesions. ***References:*** [1] Kadrmas,et al. J. Nucl. Med.,50,8,1315-1323, 2009.

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Dose-scan-time optimization for ^{18}F-PSMA-PET using a digital PET scanner

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Aim/Introduction: There is an increasing use of prostate specific membrane antigen (PSMA) in PET imaging of patients with prostate cancer. Current literature suggests to use a tracer dose of typically 2 MBq/kg without specifying the scan-time. We aimed to determine the dose-scan-time product (DSTP) that is needed for adequate ^{18}F-PSMA-PET imaging using a digital PET/CT scanner. ***Materials and Methods:*** ^{18}F-PSMA-1007 PET/CT scans (Vereos, Philips Healthcare) of 10 consecutive patients (mean weight 81 kg, range 54-100 kg) with initial or recurrent prostate cancer were used. Data were acquired using 2 MBq/kg and 4 minutes per bed position (DSTP=8). Previously, we determined optimal image reconstruction settings using ordered subset expectation maximization and DSTP=8 for ^{18}F-PSMA-PET, and we applied those optimized parameters in this study: 3 iterations, 7 subsets and point spread function modelling. Images based on DSTPs of 4, 5, 6 and 7 were simulated by reconstruction of clipped list-mode data. Three nuclear medicine physicians assessed the image quality based on a 4-point scale. Moreover, a semi-quantitative assesment was performed by measuring the SUV of reported lesions and background noise in the aorta. ***Results:*** Visual assessment of 50 ^{18}F-PSMA-PET datasets (10 patients × 5 reconstructions) showed comparable and adequate image quality for all DSTPs (p=0.72, p=0.72, p=1.0, p=1.0 for DSTPs of 4, 5, 6 and 7, respectively). There was a tendency towards lower scores for patients with the highest body weight. Reducing DSTP resulted in a noise increase up to 20% for DSTP=4, but SUVs of reported lesions (n=32) remained stable. The standard deviation of differences in SUV between default and reduced DSTPs increased up to 14%. ***Conclusion:*** Using optimized reconstruction settings for ^{18}F-PSMA-PET, the dose-scan-time product can be reduced to at least 4 MBq/kg/min for the Vereos PET/CT scanner. For example, when applying a tracer-dose of 2 MBq/kg, an acquisition time of 2 minutes is suggested. Future studies could investigate the relation between patient's bodyweight and ^{18}F-PSMA tracer dose for a constant image quality across all patients. ***References:*** None

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Results of different formulations on hepatic Standardized Uptake Value in pediatric FDG PET

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Aim/Introduction: [^{18}F]FDG PET is increasingly used in diagnosis and follow-up of pediatric cancer patients(1). For quantification of FDG uptake in tissue, the standardized uptake value (SUV) is used. SUV can be calculated using different formulations. The body weight (BW) corrected formulation and lean body mass (LBM) corrected formulations (according to James or Janmahasatian) are mostly used. For measurements in adults the LBM janmahasatian formulation is advised(2). It is not known which formulation is best for use in pediatric patients. To investigate results of different formulations for hepatic SUV in paediatric patients, a retrospective analysis was performed. ***Materials and Methods:*** Consecutive [^{18}F]FDG PET performed in pediatric aged <16 years between December 2018 and April 2020 were retrospectively reviewed. Liver SUV was measured with a 3-cm-diameter spheric region of interest in the right liver lobe. SUV was calculated using BW (SUVbw) and sex specific LBM formulations according to James and