peptides were cleaved off the solid support and clicked with ***N***-propargyl-***N***,***N***-dimethyl-ammoniomethyl-trifluoroborate to obtain the desired dual $AmBF_3$-Glu conjugated standard. Affinity to PSMA was measured via competition binding assays using LNCaP cells and ^{18}F-DCFPyL as the radioligand. Radiofluorination was conducted via ^{18}F-^{19}F isotope exchange reaction. PET imaging and biodistribution studies were performed in mice bearing PSMA-expressing LNCap PCa xenografts at 1-h post-injection, and results were compared with those obtained from ^{18}F-DCFPyL, the most popular ^{18}F-PSMA-targeted tracer in the clinic. For blocking studies, mice were co-injected with 0.5 mg of nonradioactive DCFPyL. **Results:** HTK01174 had high binding affinity to PSMA with K_i= 0.22±0.01 nM. ^{18}F-HTK01174 was obtained in 7±6% (n=3) decay-corrected radiochemical yield with >99% radiochemical purity and 211±48 GBq/μmol specific activity. Both ^{18}F-HTK01174 and ^{18}F-DCFPyL successfully delineated PSMA-expressing LNCap tumors in PET images with excellent tumour-to-background contrast and minimal hepatobiliary excretion (<0.4%ID/g average intestinal uptake for both tracers). Compared with ^{18}F-DCFPyL, ^{18}F-HTK01174 exhibited higher uptake in LNCaP tumors (7.95±1.64 vs 16.8±2.23%ID/g) and superior tumor-to-blood (26.1±3.33 vs 32.0±7.82), tumor-to-muscle (46.8±18.3 vs 78.0±33.3) and tumor-to-liver (3.64±0.57 vs 84.5±18.7) contrast ratios. Co-injection with nonradioactive DCFPyL reduced the uptake of ^{18}F-HTK01174 in LNCaP tumors by >95%, demonstrating its specific PSMA targeting. **Conclusion:** We successfully solved the high intestinal uptake problem of ^{18}F-HTK01157 with the conjugation of two $AmBF_3$-Glu motifs to the PSMA-617 pharmacophore. The resulting ^{18}F-HTK01174 showed not only minimal hepatobiliary excretion, but also superior tumor uptake and tumor-to-background contrast ratios when compared with ^{18}F-DCFPyL. With excellent tumor uptake, tumor-to-background contrast and ease of synthesis, ^{18}F-HTK01157 warrants further investigation as a PSMA PET imaging agent.

406 Sunday, October 14, 2018, 14:30 - 16:00, Hall Y

Do.MoRe: Image Processing / Analysis

OP-120

Multi-Task Deep Learning for the Detection of Lesions on 68Ga-PSMA PET/CT Imaging

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Purpose: The emerging PSMA targeted radionuclide therapy provides an effective method for the treatment of advanced metastatic prostate cancer. To optimize diagostics, therapy monitoring and ultimately the theranostic benefit, it is urgently needed to characterize all the lesions to target before the treatment. However, this is extremely challenging considering the factor that dozens of lesions of heterogenous size and uptake may distribute in a variety of anatomical context with different background. Until now, there is no successful computer-aided lesion detection methods for PSMA imaging. **Methods:** A cohort of 71 patients with advanced metastatic prostate cancer were scanned with ^{68}Ga-PSMA-11 PET/CT. For proof-of-concept, we focus on the detection and segmentation of bone & lymph node lesions in the pelvic area. To train the network, the bone and lymph node lesions were manually labelled by a nuclear medicine expert. A multi-task deep learning architecture (MulTi-Net) based on fully convolutional neural networks was developed to detect the lesions. It aimed to first extract salient features from PET and CT, the combined features would then be adopted to automatically detect all the lesions in a 3D manner. The framework contains five fully connected convolutional layers and two sigmoid classification layers. In contrast to conventional V-Net, it deleted pooling layer to avoid possible losing of fine texture information. A cross-hair filter was integrated to extensively reduce hyperparameters and speed up the training procedure. An additional regularization was added to deal with class imbalanced tumor-to-background ratio. For comparison, the detection accuracy of conventional W-Net (cascaded V-Nets) were calculated. **Results:** Compared with conventional W-Net, the multi-task deep learning has improved the detection precision from 72.8% to 90.2%, recall from 59.9% to 76.3% for bone lesion. For the lymph node lesion (n=63), it improved the detection precision from 57.8% to 81.4% ad recall from 44.1% to 62.6%. **Conclusion:** We proposed the first deep learning method for automatic detection of lesions on ^{68}Ga-PSMA-11 PET/CT images. A multi-task deep learning method was developed to improve the detection accuracy compared with conventional W-Net. The preliminary test on pelvic area confirmed the potential of deep learning methods. At the moment, more data is being processed, since increasing the amount of training data will further enhance the performance of the developed deep learning methods.

OP-121

Feature Extraction Optimization by Measuring Radiomics Feature Noise in 18-F-FDG PET Images: A multi-center study

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Aim: Radiomics evaluation based on in vivo Positron Emission Tomography (PET) has been widely performed for disease characterization. Nevertheless, several textural features have been reported to be sensitive to acquisition variations, reconstruction protocols, region-of-interest delineation and differences in PET value discretization. Our goal was to (a) measure the variance of several textural radiomic features in a multi-center study and (b) to establish a feature rank of radiomic features based on optimal feature extraction parameters. Our hypothesis built on the assumption that variations across multi-center evaluations with the same physical phantom with homogeneous spheres can help to characterize the radiomic noise of individual features. **Materials and Methods:** Reconstructed NEMA IQ PET images acquired with site-specific clinical routine protocols at 13 PET/CT systems were collected [1]. Semi-automated delineation of the four largest spheres was done using iso-count region grow-