

Dual ^{18}F -FDG and ^{68}Ga -DOTATOC PET/CT radiomic analysis in the evaluation of primary pulmonary neuroendocrine tumor

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Background:

The objective of this retrospective study was to evaluate whether radiomic features (RFs) extracted by ^{68}Ga -DOTATOC and ^{18}F FDG PET/CT are predictors of histology patterns in patients affected by lung NETs.

Materials/Methods:

We retrospectively analyzed data from 14 naïve-treatment patients who performed ^{68}Ga -DOTATOC and ^{18}F FDG-PET/CT prior to surgery, for histologically confirmed lung NET (Typical (TC; n=8); atypical carcinoid (AC; n=5) and small-cell neuroendocrine carcinoma (SCNEC; n=1). PET/CT images were obtained from 5 PET/CT scanners (referring to 4 Nuclear Medicine Units) with different reconstruction parameters. Manual Segmentation was performed by two experienced operators allowing extraction of 52 RFs (LIFEx 5.10): 10 conventional PET parameters; 6 histogram; 4 shape-based features; 32 second-order statistics texture signatures from all VOI>64 voxels. Lesions were gathered into 2 groups according to histological data (TC and AC/LCNEC/SCNEC). The Mann-Whitney test was used to compare RFs of the lesions among the 2 groups. The reproducibility of each RFs was assessed using intra-class correlation coefficient (ICC) between the two operators (RFs considered as robust if ICC>0.8). The correlation of each RF with all the others was studied using regression analysis, thus generating a matrix of Pearson correlation coefficients. ROC AUC were calculated for each independent RF and a multivariate logistic regression analysis was performed to identify a potential radiomic signature able to predict the histological type.

Results:

Among the 14 patients, 19 lesions (primary tumor (n=14), lymph node (n=5)) were segmented. None of conventional PET parameters from both ^{68}Ga -DOTATOC and ^{18}F FDG-PET/CT was significantly different between the two groups for both operators. Also RFs extracted from ^{68}Ga -DOTATOC PET were not significantly different between the two histologic class, whereas for ^{18}F FDG-PET/CT, 16 RFs show Mann Whitney p values lower than 0.05 and at the same time ICC between operators greater than 0.8.

After the Pearson correlation analysis, 4 uncorrelated RFs were selected allowing discriminating the 2 groups: GLCM_Entropy_log10 (AUC=0.80), GLRLM_LGRE (AUC=0.82), GLZLM_SZHGE (AUC=0.83), GLZLM_GLNU (AUC=0.82). The multivariate

logistic regression model including these RFs achieved an AUC value of 0.95 (95% CI 0.86–1).

Conclusion:

Our results suggest that RFs extracted from ^{18}F -FDG PET/CT might be used to distinguish TC from AC/LCNEC/SCNEC, while RFs from ^{68}Ga -DOTATOC appear to be not informative.