



Ruprecht-Karls-Universität Heidelberg
Medizinische Fakultät Mannheim
Dissertations-Kurzfassung

Diagnostic Performance for Lymph Node Staging in Head and Neck Squamous Cell Carcinoma: Comparison of ^{18}F -FDG PET/CT and Syngo ZOOMit Echo-planar Diffusion-weighted MR Imaging

Autor: Chunyan Li
Institut / Klinik: Institut für Klinische Radiologie und Nuklearmedizin
Doktormutter: Prof. Dr. M. Sadick

Introduction: Precise assessment of lymph node metastases is critical for prognosis evaluation and treatment planning for patients with head and neck squamous cell carcinoma (HNSCC). The first aim of this study was to evaluate diagnostic performance of the established PET/CT with reduced ^{18}F -FDG activity for lymph node staging. Secondly, we used it as a reference to investigate the diagnostic performance of the diffusion-weighted magnetic resonance imaging with a new Syngo ZOOMit technique (ZOOMit-EPI) in this setting. **Methods:** In a phantom study, image quality and signal-to-noise ratio (SNR) were measured for each sphere with stepwise reduced activity concentrations (3.7, 2.5 and 1.5 kBq/mL) and different sphere-to-background ratios (ratio 8:1, 4:1 and 2:1). In a prospective clinical study, 15 HNSCC patients were recruited for presurgical lymph node staging using PET/CT and MRI. Short-axis diameter, shape, maximal standardized uptake value (SUV_{max}) and apparent diffusion coefficient (ADC) were measured for each suspicious lymph node. Sensitivity and specificity were calculated for each modality after correlation with histological results. The additional value for the combined use of two modalities was also assessed. **Results:** The phantom study showed PET/CT with reduced activity concentration (3.7 kBq/mL) maintained good image quality and SNR for three ratios, but further reductions led to significant compromise, especially for ratio 2:1. Dose reduction had more effects on small spheres compared to large ones. For lymph node staging of HNSCC patients, ZOOMit-EPI had slightly lower sensitivity and significantly lower specificity compared to PET/CT. SUV_{max} proved to be the only reliable predictor of lesion characterization for PET/CT images, while short-axis size and ADC values measured on ZOOMit-EPI were valuable for evaluation of MR images. Combined use of both modalities did not result in better performance than PET/CT alone. **Conclusion:** PET/CT using reduced ^{18}F -FDG activity (250-270MBq per patient) maintained good physical and clinical performance in the setting of lymph node staging. Yet, further reduction is not advised because of significant compromise of image quality and SNR, especially for small lesions. Compared to the established PET/CT, ZOOMit-EPI had inferior diagnostic performance for presurgical lymph node staging of HNSCC. Further optimization of the sequence and investigation may be needed. No additional value was found for combined use of both modalities.

Keywords: lymph node staging, head and neck squamous cell carcinoma, PET/CT, diffusion-weighted magnetic resonance imaging, ZOOMit-EPI