Abstract:

OBJECTIVE: To assess the diagnostic value of whole-body positron emission tomography (PET), computed tomography (CT), magnetic resonance imaging (MRI), and the fusion of PET and CT (PET/CT) and PET and MRI (PET/MRI) in the detection of metastatic disease of gastrointestinal carcinoid tumors.

MATERIALS AND METHODS: This prospective study included six patients with extensive nonresectable metastases of gastrointestinal carcinoid tumors which were consecutively examined from the base of the skull to the proximal thigh using a state-of-the-art PET/CT scanner and a 1.5 Tesla whole-body MRI scanner. PET was performed with a carbohydrate-labeled somatostatin-receptor ligand ([superset18 F]FP-Gluc-TOCA) using a Pico-3D PET scanner. CT was performed with a venous-dominant contrast-enhanced phase using a 16-slice CT scanner. MRI was performed with a coronal T2-weighted Half-Fourier Acquired Single-Shot Turbo Spin Echo (HASTE) sequence, a coronal T2-weighted Turbo-Short Tau Inversion-Recovery (STIR) sequence, a coronal T1-weighted Turbo Spin Echo (TSE) sequence and a high resolution axial T2-weighted TSE sequence. The data sets from PET and CT were fused automatically. The PET and MRI data sets were fused manually. Lesions were rated as metastases if they were not clearly identified as benign lesions according to standard radiological criteria.
RESULTS: For PET, CT, MRI, PET/CT, and PET/MRI, the lesion-by-lesion based analysis showed an overall detection rate for liver metastases (n = 391) of 49.9% (P<.001), 37.1% (P<.001), 98.2%, 50.9% (P<.001) and 100%, for lymph node metastases (n = 37) of 91.9%, 83.8%, 64.9%, 100% and 97.3% and for osseous metastases (n = 12) of 100%, 8.3% (P<.005), 66.7%, 100% and 100%.

CONCLUSIONS: PET as single modality revealed the most lymph node and osseous metastases. MRI as single modality revealed the most liver metastases. The combination of molecular/metabolic with anatomical/ morphological information improves the diagnostic accuracy for the detection of metastases in comparison to the single modalities. Whole-body PET/MRI is a very promising diagnostic modality for oncological imaging due to the missing radiation exposure and the high soft tissue resolution of MRI in contrast to CT.