Whole-body MRI using a 32-channel system vs PET-CT for the detection of skeletal metastases

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Purpose: To evaluate the diagnostic accuracy of bone metastases screening using whole-body MRI (WB-MRI) compared to dual-modality PET-CT.

Materials and Methods: In a prospective, blinded study 32 patients (19 female / 13 male, average 56 years, 24-76 years) with different oncologic diseases and suspected skeletal metastases underwent FDG-PET-CT, as well as WB-MRI with the use of parallel imaging (PAT). MRI was performed on a 1.5 Tesla 32-channel scanner using coronal T1-w-SE- and STIR-sequences of the entire body and sagittal imaging of the spine. Acquisition time for WB-MRI in total was 39 minutes.

PET-CT was conducted using a low-dose CT for attenuation correction, a PET-emission scan and diagnostic contrast-enhanced CT scan covering the thorax, abdomen and pelvis. Two experienced radiologists read the MRI scans, another radiologist in combination with a nuclear radiologist read the PET-CT scans, each in consensus. The gold standard was constituted by histology and clinical-radiological follow up within at least 6 months.

Results: In 29 patients 102 malignant and 25 benign bone lesions were confirmed.). Findings were concordant for both modalities in 72% (91/127) of the detected bone lesions. WB-MRI showed a sensitivity of 94% (96/102) and specificity of 76% (19/25), PET-CT resulted in a sensitivity of 77% (78/102) and specificity of 80% (20/25). The negative- and positive-predictive value for WB-MRI was 76% (19/25) and 94% (96/102), PET-CT achieved 46% (20/44) and 94% (78/83), respectively. Diagnostic accuracy was 91% (115/127) for WB-MRI and 77% for PET-CT (98/127). Cut-off size for the detection of malignant bone lesions was 2mm for WB-MRI and 5mm for PET-CT. Large lesions with a diameter greater than 2cm were correctly diagnosed in 100% (14/14) with WB-MRI and 93% (13/14) with PET-CT, medium-sized lesions of 1-2cm in 91% (21/23) and 70% (16/23), small-sized lesions below 1cm in 88% (22/25) and 56% (14/25), respectively WB-MRI revealed 10 additional bone metastases due to the larger field of view.

Conclusion: WB-MRI and PET-CT are reliable imaging modalities for a systemic screening for metastatic bone disease. PAT allows whole-body MRI bone marrow screening in less than 40 minutes with a diagnostic accuracy superior to PET-CT.

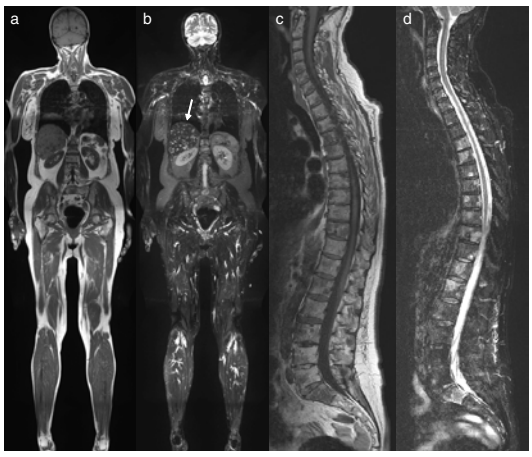

Figure 1: Whole-body MRI of a 62-year old patient with breast carcinoma using T1-w SE and STIR imaging on 5 body levels (a+b). Sagittal imaging of the spine reveals extensive mixed osteoblastic and osteolytic bone disease. The arrow in Figure 1b points out liver metastases as additional finding.

Figure 2: Sagittal fused PET-CT of the same patient shows no FDG-uptake in the spine (a). Axial CT images only reveal metastases with marked osteolytic bone marrow destruction (b). Axial CT of the sternum shows sclerotic changes and pathological FDG-uptake in this area. This lesion was confirmed as bone metastasis and missed in MRI due to unfavourable sectioning in the peripheral coronary plane**.**