INTRODUCTION & AIM OF THE WORK

The skeletal system is a frequent target of metastatic disease and early detection of bone metastases has an important impact on patient's management, disease outcome and the quality of life of the patient. In clinical practice, multi-modality algorithms are widely applied in case of suspected metastatic bone disease, including conventional X-ray, skeletal scintigraphy, positron emission tomography (PET), computed tomography (CT) and magnetic resonance imaging (MRI).

Malignant tumors are the second most common cause of death and are responsible for more than 12 % of all deaths worldwide. Mortality rates and the success of therapeutic approaches depend mainly on the type of cancer, and they also depend on the presence of metastases. Therefore, tumor staging plays a key role for further treatment options in patients with malignant tumors. Since metastatic disease can affect different anatomic parts of the body, patients have to undergo several examinations, such as plain radiography (X-Ray), ultrasonography (US), computed tomography (CT), magnetic resonance imaging (MRI), and scintigraphy, for detection of metastases. Thus, the staging process is often both time-consuming and expensive. Furthermore, the diagnostic accuracy remains limited. [(1)]

Plain radiographs have a low sensitivity for the detection of bone metastases and only become apparent after a loss of more than 50% of bone mineral content.[(2)]

At present time, 99mTc-phosphonate-based skeletal scintigraphy is the standard method for initial staging. However, at an early stage of disease, lesions may remain invisible in the absence of an osteoblastic response. Furthermore, false-positive findings may arise by a misinterpretation of tracer uptake in healing fractures or degenerative disease. (3)

Recent studies have indicated that whole-body fluorodeoxyglucose (FDG)-PET increases the specificity of bone marrow screening compared with scintigraphy, due to tracer uptake directly into malignant cells. (4)

Fused PET-CT scanners combine the functional data of' PET with the anatomical information of CT scanners in single examination and have further improved diagnostic accuracy and lesion localization. Moreover, the CT image data allow assessment of paraosseous tumor expansion and provide information on the extent ol'osteolysis as well as criteria of bone stability.(5)

In contrast, MRI is an imaging technique that provides visualization of the bone marrow components at a high spatial resolution and has proven to be very sensitive for the early detection of bone marrow pathologies.(6 & 7)

The fact that 40% of skeletal metastases occur in the appendicular skeleton stresses the need for accurate bone marrow imaging covering the whole body anatomy. [8]

However, different requirements in coil setup, sequence design and slice positioning, as well as time-consuming patient repositioning procedures in the past, have delayed the realization of whole-body MR imaging as a clinical application. With the recent introduction of multi-channel whole-body scanners, covering the patient's anatomy from head to toe, with its lack of ionizing radiation and excellent soft tissue contrast, MRI has become a promising candidate for whole-body bone marrow screening. Various studies have described the efficiency of MRI over CT and skeletal scintigraphy in the detection of primary bone neoplasms and metastases. [9& *10)*

Additionally, MRI enables precise assessment of the tumor extent within the bone marrow and into paraosseous structures, such as the spinal canal [11] successfully applied for whole body MR evaluation for the presence of metastases. [15, *16& 17)*

Furthermore, some of the proposed whole-body MR imaging approaches either were limited by long acquisition times [18), or provided only poor image quality owing to reduced spatial resolution and artifacts. [19]