Whole Body-MRI in 160 patients with musculo-skeletal diseases

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Introduction

Until today, the major disadvantage of MRI had been the restricted field of view, whereas skeletal scintigraphy, muscle scintigraphy, and FDG-PET were staging and screening procedures in clinical routine in the diagnosis of musculo-skeletal diseases. Since the introduction of the AngioSURF table, Whole Body-MRI is feasible for tumorstaging and screening patients with skeletal metastases and bone marrow infiltration due to plasmocytoma and muscle inflammation due to polymyositis (1-5).

Methods

160 patients with different musculo-skeletal diseases (skeletal metastases n = 100, plasmocytoma n=40 und myositis n=20) were studied by Whole Body-MRI. In 45 of 100 patients with solid tumors, Whole Body-FDG-PET was performed. Between the different examinations of Whole Body-MRI , skeletal scintigraphy, FDG-PET, plane films, and muscle scintigraphy no therapy (radiation therapy, chemotherapy and antibiotic therapy) was done. No previous chemotherapy within the last two months prior to FDG-PET was done.

The evaluation which was done by two experienced radiologists and nuclear physicians independently focussed on the skeletal infiltration due to metastatic disease, bone marrow disorders, and muscle infiltration. The gold standard was the clinical follow-up or in some cases biopsy is performed.

The MRI examinations were done using a rolling table platform Body Surf table for an unlimited field of view with a 1.5 Tesla system (Magnetom Sonnata, Siemens, Erlangen, Germany) For imaging of the different body regions including head, neck, thorax, abdomen, pelvis, and upper and lower extremities a coronal Turbo-STIR sequence with (TR5500-4230/TE102-94/T1160) was obtained. Skeletal scintigraphy was performed with 99 Tc-DPD four hours after injection of the radiopharmacon in anterior and posterior projections. The muscle scintigraphy was done with 99 m Tc-PYP For Whole Body FDG-PET, 300-500 MBq of FDG was injected intravenously and the uptake time was 90 min. The plane films for staging of plasmocytoma consisted of eight different projections.

Results

In the patients with the metastasized solid tumors in 82 of 100 patients (82 %) the imaging findings of Whole Body-MRI and skeletal scintigraphy were concordant. In 42 patients (42 %) both imaging techniques excluded skeletal metastases to the spine and appendicular skeleton. In 40 patients both imaging techniques were positive, whereas in respect of the extent of metastatic disease of the skeleton, MRI was superior in 55 % (22/40 patients).In 12 patients, MRI was superior whereas skeletal scintigraphy was false-negative. In six patients, it was vice versa, however skeletal scintigraphy was in four out of six patients false-positive.

Regarding the comparison of MRT versus PET in 45 patients, in 14 (31 %) both imaging techniques were positive, and in 25 both imaging techniques reveal no metastatic disease (56 %). In five patients, MRI was positive whereas Whole Body-FDG-PET was negative and in one patient it was vice versa, PET was positive, whereas MRI failed to detect an osteoblastic metastasis. In comparison to MRI vs. PET, MRI was superior in 57 % (8 out of 14 patients).

Regarding the findings in 40 patients with multiple myeloma and plasmocytoma, MRI and plane films were positive in 23 of 40 (58%), and in six patients (8%) both imaging techniques excluded bone marrow infiltration. In eight patients 8 (20%), MRI was positive, whereas plane films failed to detect osteolytic lesions. In three patients plane films were false-positive whereas MRI excluded bone marrow infiltration. Regarding the comparison between Whole Body-MRI versus 99 Tc-PYP muscle scintigraphy which was available in 20 cases, Whole Body-MRI and PYP scintigraphy reveal in eight patients (40%) muscle inflammation and excluded muscle infiltration, concordantly in three patients (15%). In four patients, Whole Body-MRI was positive, whereas PYP scintigraphy failed to detect a muscle infiltration. In one patient, it was vice versa.

Fig. 1a.. Whole-body-MRI indicates skip lesions of a PNET-tumour, whereas Skeletal scintigraphy and FDG-PET failed to detect metastases. Fig 1.b Whole-Body-MRI demonstrates a nultifocal bone marrow infiltration. Plain films were negative. Fig1c Whole-body-MRI concordantly reveals a muscle infiltration in comparison to 99 Tc m PYP scintigraphy.

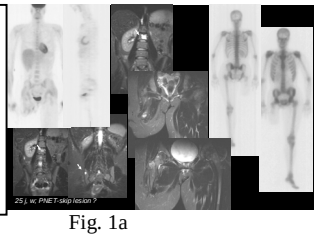

Fig. 1a

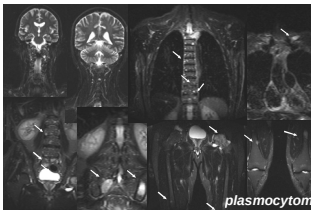

Fig. 1b

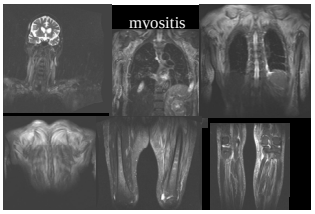

Fig. 1c

Discussion

Multistation Whole Body-MRI by the use of a rolling table platform in combination of the Turbo-STIR sequence is a fast, effective method for examining patients with musculo-skeletal diseases. Especially in patients with metastasized solid tumors and bone marrow disorders, Whole Body-MRI is a fast and accurate diagnostic imaging technique for evaluation of bone marrow infiltration due to metastasis and infiltration (2,3). Furthermore, Turbo-STIR-Whole Body-MRI can be performed instead of muscle scintigraphy in order to detect or exclude muscle infiltration due to polymyositis (5).

In agreement to the published data, Turbo-STIR-Whole Body-MRI imaging can be easily performed (1). In conclusion, Whole Body-MRI is a fast and effective imaging technique for the examination of cancer patients and patients with muscle diseases. It is more sensitive than skeletal scintigraphy, FDG, plane film, muscle scintigraphy in patients with solid tumors, bone marrow disorders or polymyositis. So in the future, Whole Body-MRI by the use of a TurboSTIR-sequence might replace Whole Body-FDG-PET, skeletal scintigraphy and muscle scintigraphy with respect to the detection of muscular skeletal diseases. In comparison to plane film, which are an integral part in the Salmon- and-Durie-classification, a Whole Body-MRI demonstrates clearly the extent of bone marrow infiltration.

References:

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