# Comparison of whole body MR-DWI and Scintigraphy in detecting bone metastases

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**Introduction**: Diffusion Weighted Imaging (DWI) could detect the restriction of the water diffusion, potentially showing its application for evaluating pathological lesions. It was reported that whole body DWI could applied for a fast screening of the body, but there were some limitation of it such as insufficient fat suppression and low contrast-to-noise (CNR). Several studies of whole body DWI have demonstrated that it is helpful for improving image quality by using short TI inversion recovery-echo planar imaging (STIR-EPI) sequence.

**Purpose:** To evaluate the application of whole body DWI in bone metastasis detection using skeletal scintigraphy as reference.

**Materials and Methods**: 42 healthy volunteers (21 males and 21 females aged 17-70 years) and 25 patients (12 males and 13 females aged 17-74 years) with malignant tumors were enrolled in our study. All the patients were performed the MRI and skeletal scintigraphy within 1 week. The MR examination was performed on GE signa 3.0T MR scanner using build-in body coil. Diffusion-weighted images were obtained in the axial plane with free breathing by using STIR-EPI sequence (TR5500ms, TE74.4ms, TI200ms, FOV400mm, matrix 96×96, NEX4, b values0 and 800s/mm$^2$, slice thickness and gap 8mm/0). The whole body was divided into eight stations with each station covering 200mm in Z-direction and the scan time of each station was 3’02’’. After the scanning, the primary images were combined together and reformatted to three-dimensional images. The images of DWI and scintigraphy were reviewed separately by two radiologists and two nuclear medicine physicians, who were blinded to the results of the other imaging modality.

**Results**: The skeletal system was divided into 7 regions in the study. The numbers of bone metastatic lesions in each region detected by whole body DWI and skeletal scintigraphy were displayed in the table. There was no significant difference between them. The regions missed by whole body MR-DWI were located mainly in scapula and skull. The whole body DWI could identify additional bone metastases in spine which were confirmed by contrast-enhanced MRI. Besides, whole body DWI identified other 50 metastatic lymph lodes and 10 tumor-related lesions in the organs (Fig 1).

Table 1

| examination | spine | ribs | pelvis | Sternum and clavicle | scapula | skull | limbs | total |
|---|---|---|---|---|---|---|---|---|
| Whole body DWI | 50 | 18 | 6 | 2 | 3 | 0 | 2 | 81 |
| Skeletal scintigraphy | 48 | 18 | 6 | 2 | 5 | 1 | 2 | 82 |

**Discussion:** STIR-EPI sequence allows potent fat suppression and adequate CNR for whole body DWI. Besides, the whole body DWI reveals excellent correlation with skeletal scintigraphy regarding bone metastasis, and the two techniques are complementary for each other.

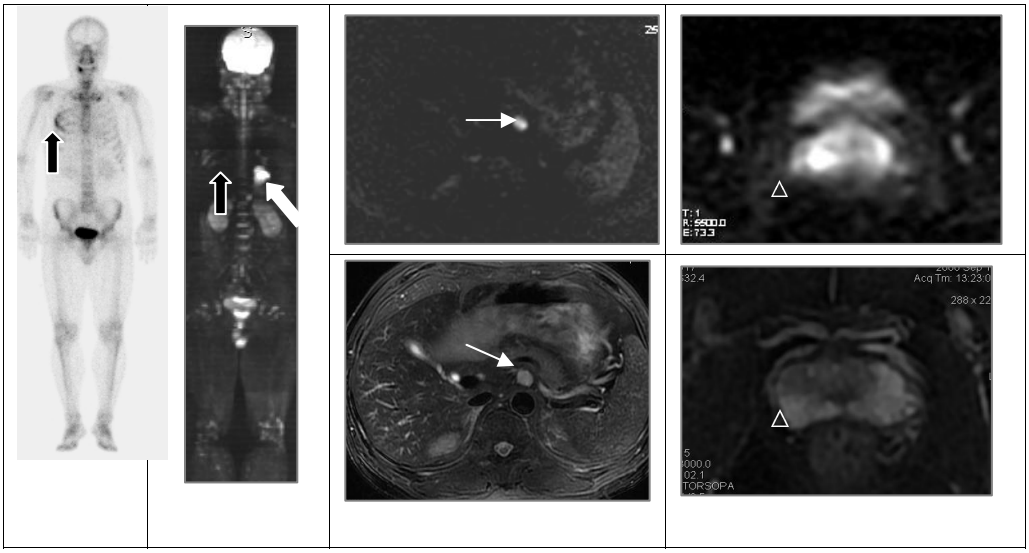

Figure 1 A 53 years old male patient with lung carcinoma (white arrow). Scintingraphy detected multiple metastases in ribs (black arrow) which were also detected by whole body DWI. Besides, whole –body DWI detected the retroperitoneal metastastic lymph nodes (arrow) and abnormality in the prostate (triangle) which were identified by T2WI.

References: (1) Lauenstein T, Goehde S, Herborn C, et al. Radiology 2004; 233(1): 139-148

(2) Takahara T, Imai Y, Yamashita T, et al. Radiation Medicine 2004; 22(4): 275–282