

Detection of hepatic metastases in diffusion-weighted single-shot echoplanar imaging with sensitivity encoding (SENSE-DWI): a comparison with superparamagnetic iron oxide-enhanced MRI (SPIO-MRI) based

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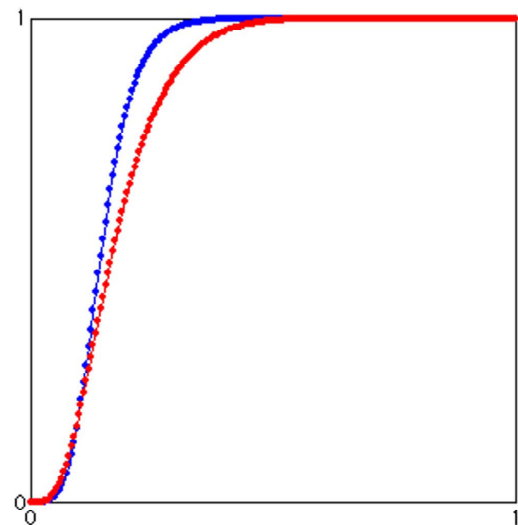
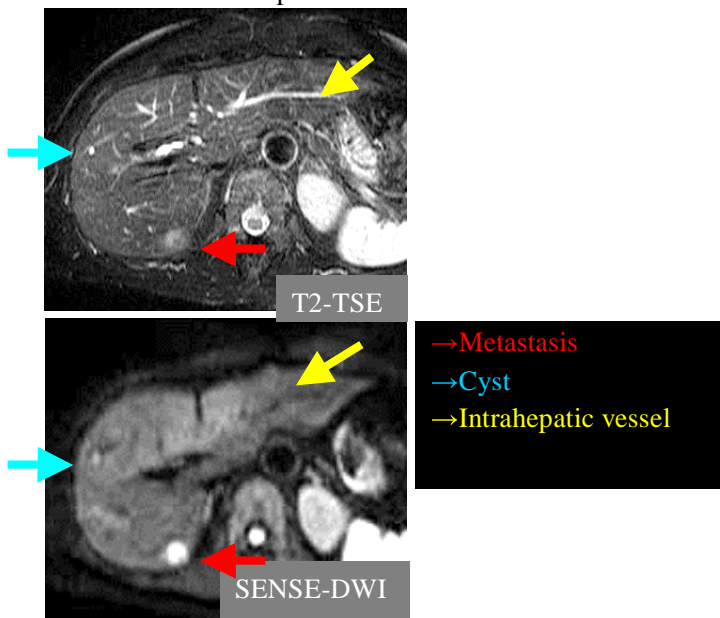
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Purpose: The past reports have mentioned that the simultaneous use of sensitivity encoding (SENSE) improved the image quality of diffusion weighted single shot echo planar imaging (SSDWI) dramatically. We indicated this method in hepatic imaging to determine hepatic metastasis. The purpose of this study was to compare the usefulness of SSDWI with SENSE (SENSE-DWI) with that of superparamagnetic iron oxide-enhanced MRI (SPIO-MRI) for imaging hepatic metastases, using receiver operating characteristics (ROC) analysis.

Materials and methods: 24 patients with 40 surgically resected hepatic metastases were examined. Before SPIO administration, SENSE-DWI (TR/TE = 1600/73, b-factor = 0/500 sec/mm²), T2-turbo spin echo (T2-TSE, TR/TE = 4062/90) and T1-dual echo fast field echo (T1-dual, TR/TE = 150/2.3, 4.6) were obtained. After enhancement, T2-TSE, T1-dual and T2*-fast field echo (T2*-FFE, TR/TE = 320/10) were acquired. The obtained images were divided into two image sets. The SPIO-MRI set consisted of pre- and post-contrast T2-TSE, pre- and post-contrast T1-dual and post-contrast T2*-FFE. The SENSE-DWI set included SENSE-DWI, pre-contrast T2-TSE and pre-contrast T1-dual. Diagnostic accuracy using these two image sets was evaluated by receiver operating characteristic (ROC) analysis. Separate image sets with 36 anatomical slice levels containing 40 metastatic nodules and 54 slice levels without metastases were interpreted individually.

Results: Hepatic metastases gave higher signals on SENSE-DWI than on T2-TSE. On the other hand, signals from vessels and cysts were suppressed with SENSE-DWI. ROC analysis showed higher Az values when interpreting the SENSE-DWI set than with the SPIO-MRI set. The mean Az values for each reading session were 0.85 and 0.79 respectively. During the SPIO-MRI reading session, lesions measuring 1 cm or less showed significantly lower sensitivity than the lesions larger than 1 cm. On the other hand, there was a statistically significant link between tumor size and sensitivity at the SENSE-DWI reading session. During the SENSE-DWI set reading session, the left lobe lesions showed significantly lower sensitivity than those in the right lobe. This matter was considered to be due to subcardiac signal loss artifact due to cardiac pulsation.

Conclusion: SENSE-DWI has a high ability to depict hepatic metastases. Combined image reading with SENSE-DWI and T2-TSE showed higher accuracy in detecting hepatic metastases than that of SPIO-MRI. This method has the potential to replace SPIO-MRI for preoperative evaluation of hepatic metastasis in near future, although it currently suffers problems with evaluation of the left hepatic lobe.



SENSE-DWI; Az = 0.85

SPIO-MRI; Az = 0.79