Evaluation of SPIO-enhanced diffusion-weighted PROPELLER T2-FSE MR Imaging

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Abstract

Our purpose was to evaluate the usefulness of SPIO-enhanced diffusion-weighted PROPELLER T2-FSE MR Imaging for the detection of the hepatic metastases. Eight patients were examined with SPIO-enhanced T2-FSE and SPIO-enhanced diffusion-weighted PROPELLER T2-FSE. The b-value of diffusion-sensitizing gradient was selected 9 s/mm^2 to suppress the signal of hepatic vessel. All metastases 1cm or greater (16 metastases) were detected with both pulse sequences. Among the metastases less than 1cm, SPIO-enhanced diffusion-weighted PROPELLER T2-FSE detected more hepatic metastases than SPIO-enhanced T2-FSE (57% vs. 79%). SPIO-enhanced diffusion-weighted PROPELLER T2-FSE is useful to detect small hepatic metastases.

Introduction

Super paramagnetic iron oxide (SPIO) is widely used to detect the liver metastases. It is known that to differentiate small metastases from the hepatic vessel is often difficult, because the hepatic vessel mimics small lesion. The diffusion-weighted echo planar imaging with a small diffusion-sensitizing gradient (DSG) suppresses the signal of hepatic vessel and is helpful to detect small hepatic metastases, however there is the limitation of spatial resolution. PROPELLER MR Imaging with radial scan variation of the fast spine echo sequence provides high spatial resolution diffusion-weighted image. This study was designed to evaluate SPIO-enhanced diffusion-weighted PROPELLER T2-FSE MR Imaging to detect small hepatic metastases.

Materials and Methods

Eight patients with hepatic metastases (seven with metastases from colorectal cancer and one with metastases from gastro-intestinal stromal tumor) were examined at a 1.5-T MR scanner (GE Medical Systems, Milwaukee, Wis). There were six males and two females with age ranging between 42 and 66 years. All patients were examined MR Imaging within two weeks before surgery. SPIO-enhanced T2-FSE and SPIO-enhanced diffusion-weighted PROPELLER T2-FSE were acquired with respiratory trigger using body coil with following parameters: TR/TE/ echo train length =4000-7500/80-90msec/16; section slice, 8mm; field of view, 30-38 cm; matrix, 256×256. The b-value of diffusion-weighted PROPELLER T2-FSE was selected 9 s/mm^2 to suppress the signal of vessel. The size and number of liver metastases obtained with both pulse sequences were compared to surgical and pathological results.

Results and Discussion

Forty-four metastases were confirmed in all patients. There were 16 metastases 1cm or greater and 28 metastases less than 1cm in surgical and pathological findings. All metastases greater than 1cm were detected with both pulse sequences. Among the 28 metastases less than 1cm, 16 metastases (57%) were detected with SPIO-enhanced T2-FSE and 22 metastases (79%) were detected with SPIO-enhanced diffusion-weighted PROPELLER T2-FSE. As expected, the small hepatic metastases near to the small vessels were difficult to detect with SPIO-enhanced T2-FSE. The SPIO-enhanced diffusion-weighted PROPELLER T2-FSE provided images with high spatial resolution and the signal of small vessel was suppressed by diffusion-weighted technique with a small DSG, therefore this technique contributed to detect the small hepatic metastases (Fig.1).

References

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Fig. 1 The small hepatic metastases. Left image is SPIO-enhanced T2-FSE and right image is SPIO-enhanced diffusion-weighted PROPELLER T2-FSE.