

Evaluation of periportal collar with black-blood T2-weighted SE-EPI imaging of the liver

Y. Watanabe¹, M. Nagayama¹, A. Okumura¹, T. Tabuchi¹, H. Mitsui¹, N. Morimoto¹, K. Nakada¹, M. Kumashiro¹, S. Komaki¹, T. Kiyono¹, Y. Amoh¹, S. Nakashita¹, M. Van Cauteren², Y. Dodo¹

¹Department of Radiology, Kurashiki Central Hospital, Kurashiki, Okayama, Japan, ²Philips Medical Systems, Best, DA, Netherlands

Purpose

To determine the feasibility of black blood T2-weighted SE-EPI imaging of the liver for the evaluation of periportal collar.

Introduction

Periportal collar encapsulated by Glisson fibrous capsule plays an important role in extension of inflammatory process as well as in invasion of malignant neoplasm. However, periportal lesions are difficult to assess accurately with conventional T2-weighted MR imaging because intrahepatic portal or hepatic veins show hyperintensity on T2-weighted imaging. If the signals from intrahepatic vessels were eliminated, T2-weighted images could detect periportal lesions more accurately. Application of double IR pulse composed of non-selective and selective IR can reduce the signals from flowing blood, but the effect is not complete because vessel with sluggish flow still remains bright.

Motion-probing gradient (MPG) makes the sequences very sensitive to flowing blood, which allows to completely eliminate signals from flowing blood. Then, MPG with very low b-factor ($b=8$) was applied for the SE-EPI sequence to obtain black-blood T2-weighted image under a single breath hold.

The purpose of this study is to determine the feasibility of this newly-developed black-blood T2-weighted SE-EPI liver imaging in the evaluation of periportal lesions.

Materials and Methods

Patients

This study included total 56 patients including 27 patients with malignant neoplasm (colon cancer 8 patients, gastric cancer 10 patients, pancreatic cancer 5 patients, gallbladder cancer 3 patients, Duodenal cancer 1 patient) and 29 patients with hepatobiliary inflammatory diseases (acute cholangio-cholecystitis 5 patients, acute viral hepatitis 2 patients, chronic viral hepatitis 16 patients, drug-induced hepatitis 3 patients, alcoholic hepatitis 3 patients).

MR Imaging

MR imaging was performed with 1.5 T units (ACS-NT, Intera; Philips). All the images were performed using SENSE (sensitivity encoding) with a synergy body coil. In all the patients, T1-weighted fast-field echo images, fat-suppressed (FS) T2-weighted TSE images (TE100) and black-blood SE-EPI images with TE 90 and TE 200 were obtained.

Black-blood SE-EPI imaging was performed by applying MPG ($b=8$) for single-shot T2-weighted SE-EPI sequences with both effective TE 90 and 200. The imaging parameters for TE 90 and TE 200 images were TR 2400 and 3980, effective TE90 and 200, EPI factor 59 and 53, 150×256 matrix, 330mmFOV, slice thickness/gap10/1.0mm. and acquisition time 14 and 23 seconds, respectively. Fat signal was suppressed by chemical shift-selective fat suppression technique.

Assessment of periportal collar

The criteria used for diagnosis of periportal lesion was hyperintensity which was found along both sides of the intrahepatic portal veins in TE 90 images. Dilated intrahepatic bile duct was diagnosed and differentiated from periportal collar lesion with the findings of hyperintensity observed along one side of the portal veins in TE90 images along with very high intensity in TE200 images. These findings were compared with those of FS-T2-weighted TSE images.

Results

1. In all the 56 patients, signals of intrahepatic vessels were completely eliminated on black-blood SE-EPI images, which facilitated to evaluate periportal collar.
2. In comparison with black-blood SE-EPI images and FS-T2-weighted TSE images, black-blood SE-EPI images were superior to FS-T2-weighted TSE images in the detection of lesions of periportal collar.
3. The hyperintensity of periportal collar on TE90 images was unevenly thick and prominent in the patients with malignant neoplasm who was suspected of having metastasis extending through the periportal collar. In contrast, the periportal hyperintensity was found thin and minimal in the patients with hepatobiliary inflammatory diseases.
4. The differentiation of periportal hyperintensity from dilated intrahepatic duct was possible by interpretation of both TE90 and 200 images.

Conclusion

Application of MPG with very low b-factor gives excellent image contrast to T2-weighted SE-EPI images. This newly-developed imaging will allow to detect and characterize periportal lesions accurately.

Fig. 1 metastasis extending along the portal vein from rectal cancer. a: Black-blood SE-EPI TE90, b: Black-blood SE-EPI TE200

Fig. 2 periportal inflammation in a patient with alcoholic hepatitis. a: FS-T2-weighted TSE image, b: Black-blood SE-EPI TE90, c: Black-blood SE-EPI TE200

