

# Diagnosis of Liver Hemangioma: Novel Application of Gd-EOB-DTPA-Enhanced MRI in conjunction with Flow-Sensitive Black Blood Technique

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## Purpose

Liver hemangioma is the most common liver benign tumor, second to metastasis in whole liver tumors. However, some hepatic hemangiomas have been reported to be mimic malignant liver tumors on dynamic contrast-enhanced MR imaging with using extracellular contrast material, because liver hemangioma has various enhancement patterns due to its size or internal architecture such as fibrosis, thrombosis and hemorrhage (1,2). Gadolinium ethoxybenzyl diethylenetriamine pentaacetic acid (Gd-EOB-DTPA) is a liver-specific contrast material and enables lesion detection and combined evaluation of perfusion and hepatocyte-specific properties simultaneously in one examination, and it contributes increasing diagnostic performance of liver MR imaging. Flow-Sensitive Black Blood (FSBB) imaging is a new clinical tool with the use of MR susceptibility difference between tissue and vessels to provide a new image contrast, which is different from conventional MR imaging (3). It has been proven to be useful for brain imaging (4). Susceptibility weighted imaging has not been established for liver imaging yet, but may offer a valuable procedure for diagnosis of abdominal imaging. In this study, we extended the application of FSBB to the abdomen to find if FSBB could provide an additional benefit to diagnosis of liver diseases.

## Methods

A protocol optimization of the FSBB technique was performed on upper abdomen of healthy volunteers. Subsequently, the revised FSBB protocol parameters were applied to Gd-EOB-DTPA enhanced MR examinations on 10 patients with 14 hepatic hemangiomas, which showed a typical enhancement pattern in three-phase enhanced CT and had not changed in size. All the studies were performed on a 1.5T MRI system (EXCELART Vantage XGV Toshiba) equipped with a SPEEDER torso coil. Dynamic images were obtained before and after intravenous injection using 3D fat-suppressed T1-weighted gradient-echo breath-hold examination on axial series. FSBB imaging was subsequently performed as follows; T2\*-weighted 3D or 2D gradient echo sequence, TR/TE=29/22 ms, matrix=160x256, b value=4, FA=20, several times of breath-hold acquisition, slice thickness =7 mm and less than 30 sec acquisition time. The performance of FSBB on hepatic hemangiomas was assessed for the image contrast, as compared with unenhanced and Gd-EOB-DTPA-enhanced T1 and T2-weighted images.

## Results

Gd-EOB-DTPA-enhanced with the FSBB technique provided higher contrast between hepatic hemangiomas and hepatic vessels or the surrounding background liver parenchyma than a delayed hepatobiliary image as showing in Fig.1a-c. We have especially separated hemangiomas from adjacent vessels as showing in Fig.1d.

## Discussion

This study suggests that optimized FSBB on Gd-EOB-DTPA enhanced MRI provides an additional tool for diagnosis of liver hemangioma. The scan time of FSBB technique can easily be accommodated in a typical Gd-EOB-DTPA scan protocol in which delayed hepatobiliary-phase images are acquired up to 20 minutes post-injection. We successfully demonstrated that FSBB in conjunction with other sequences provides an effective contrast, which is applicable in the abdominal examination.

## References

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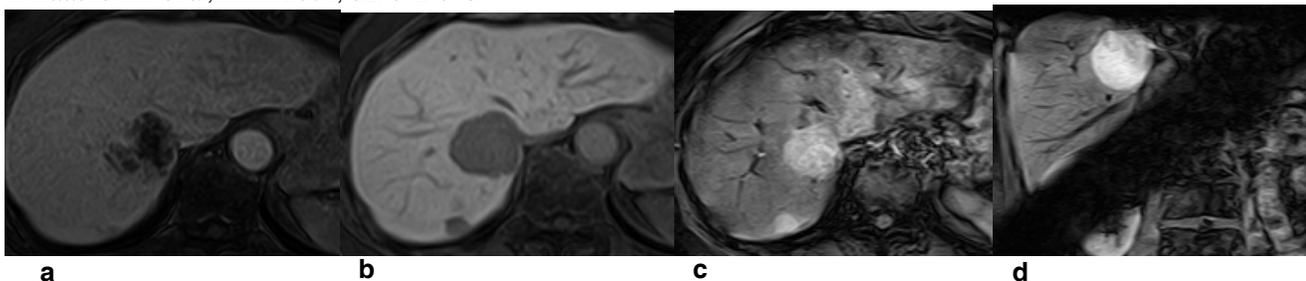


Fig.1) Gd-EOB-DTPA enhanced MRI of liver hemangiomas in a low-flow type on fat suppressed T1WI in the equilibrium phase at 3min (a), in the delayed hepatobiliary phase at 20min (b), Gd-EOB-DTPA-enhanced MR imaging in conjunction with FSBB (c/d). While liver hemangiomas showed inhomogeneous enhancement and ill-defined border in the equilibrium phase (a), FSBB imaging following enhancement (c/d) provided high contrast between the mass and surrounding liver tissue or hepatic vessels compared to hepatobiliary phase (b) as a black blood contrast imaging.