Nondiffuse Fatty Infiltration of the Liver: Does the Uptake of Iron-oxide Increase or Decrease at SPIO-enhanced MR Imaging ?

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Purpose: Nondiffuse fatty infiltration of the liver such as focal fatty deposition and focal spared areas is a well-known entity that is occasionally detected by imaging modalities. There have been several previous reports describing the features of nondiffuse fatty infiltration of the liver at SPIO-enhanced MR imaging. However, it is controversial whether SPIO uptake increases or decreases in areas of fatty change compared with the surrounding areas of nonfatty change. Some clinical and experimental studies showed a decreased uptake of SPIO in fatty liver (1,2), whereas others demonstrated an increased uptake of SPIO in focal fatty liver (3) as well as an increased Kupffer cell activity in experimental fatty livers (4). Hence, in this study, we tried to clarify whether the uptake of SPIO increases or decreases in areas of fatty change compared with the surrounding areas of nonfatty change at SPIO-enhanced MR imaging, and to elucidate possible causes of the opposite findings reported previously; increased and decreased uptakes of SPIO in areas of fatty change.

Materials and Methods: This study included 14 patients with nondiffuse fatty infiltration of the liver who underwent SPIO-enhanced MR imaging (11 men and 3 women; mean age, 66.4 years; age range 53-79 years). These patients had been referred for MR imaging to evaluate the hepatocellular lesions in patients with cirrhosis (n=10), or for the screening of liver metastasis in patients with malignancies (n=4). In addition, 30 patients without nondiffuse fatty infiltration of the liver (10 noncirrhotic patients with diffuse fatty change of the liver=group A, 10 noncirrhotic patients without fatty liver=group B, and 10 advanced cirrhotic patients without fatty liver=group C) were included for the quantitative analysis as the reference cases. MR imaging was performed before and after injection of SPIO. MR images were reviewed by two radiologists experienced in abdominal MR imaging. In-phase and T2*-weighted GRE MR images were evaluated for the relative signal intensity of the fatty area in comparison with the surrounding nonfatty area in 14 patients with nondiffuse fatty infiltration. Additionally, as the quantitative analysis, the percentage of signal intensity loss of the fatty area and of the surrounding nonfatty area before and after SPIO administration was calculated. In 30 patients without nondiffuse fatty infiltration, the percentage of signal intensity loss of the liver parenchyma was calculated using the same formula.

Result: In 14 patients with nondiffuse fatty infiltration of the liver, areas of fatty change showed relatively high signal intensity compared with the surrounding areas of nonfatty change on the SPIO-enhanced MR images in 7 paitents, indicating decreased uptake of SPIO in areas of fatty change. Among these 7 patients, 4 had mild cirrhosis and 3 did not have cirrhosis. In the remaining 7 of the 14 patients with nondiffuse fatty infiltration of the liver, areas of fatty change showed relatively low signal intensity compared with the surrounding areas of nonfatty change on the SPIO-enhanced MR images, indicating increased uptake of SPIO in areas of fatty change. Among these 7 patients, 6 had advanced cirrhosis. One patient did not have cirrhosis but had arterioportal shunt in the surrounding areas of nonfatty change. Regarding the quantitative analysis, the mean percentage of signal intensity loss (48%) of the group A (diffuse fatty liver group) was significantly lower ($p<0.05$) than that of the group B (noncirrhotic liver group) (58%), and was significantly higher ($p<0.03$) than that of the group C (advanced cirrhotic liver group) (37%). Our results indicated that the uptake of SPIO decreased in the fatty liver, but SPIO uptake seemingly increased in areas of fatty change in advanced cirrhosis because of markedly decreased SPIO uptake in fibrotic liver parenchyma.

Conclusion: The uptake of SPIO generally decreased in areas of fatty change compared with the surrounding areas of nonfatty change at SPIO-enhanced MR imaging seen as areas of relatively high signal intensity. However, in patients with advanced cirrhosis or other particular conditions, areas of fatty change shows relatively low signal intensity compared with the surrounding areas of nonfatty change because the uptake of SPIO in the surrounding areas of nonfatty change severely decreased due to liver fibrosis or arterioportal shunt.

Reference

1) Radiology 2000;217:415-420. 2) JMRI 1992;2:463-471. 3) Abdom Imaging 2001;26:157-160. 4) J Gastroenterol Hepatol 1995;10:S24

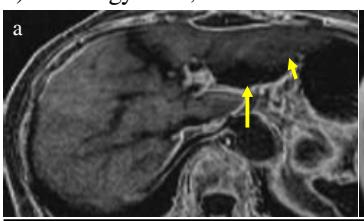

Fig.1 Increased uptake of SPIO in areas of fatty change in normal liver patient. a) Fat image (subtraction of IP from OP) shows fatty change as high signal (short arrow) compared with normal liver parenchyma (long arrow). b) IP GRE image shows decreased SPIO uptake (high signal) in areas of fatty change (short arrow) compared with normal liver (long arrow).

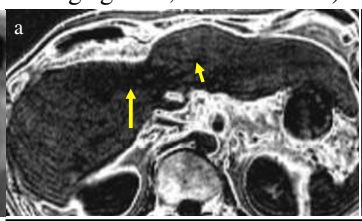

Fig.2 Seemingly increased uptake of SPIO in areas of fatty change in cirrhotic patient. a) Fat image (subtraction of IP from OP) shows fatty change as high signal (short arrow) compared with cirrhotic liver parenchyma (long arrow). b) T2*-weighted GRE image shows seemingly increased SPIO uptake (low signal) in areas of fatty change (short arrow) compared with cirrhotic liver (long arrow).