Right Posterior Hepatic Notch Sign: A Simple Diagnostic MR Sign of Cirrhosis

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Introduction

Previous studies have described several imaging findings suggestive of cirrhosis including morphologic changes of the liver, such as enlargement of the caudate lobe and the lateral segment of the left hepatic lobe and atrophy of the right hepatic lobe. Some reports indicated the diagnostic value of measurements of the hepatic diameter (the ratio of transverse caudate lobe width to right lobe width), and volume analysis of each liver segment from the cross-sectional area at CT or MR imaging. However, these measurements and calculations require additional time for data analysis, and are rarely used in daily reading sessions. Recently, the expanded gallbladder fossa (GBF) sign has been reported to be an often present, specific indicator of cirrhosis at MR imaging. However, the disadvantage of this sign was its relatively low sensitivity.

By using MR imaging for evaluation of the liver, we noted that a sharp notch in the right posterior surface of the liver was frequently seen in patients with cirrhosis. We call this appearance the right posterior hepatic notch (RPHN) sign. If a simple visual MR finding can be used for diagnosing cirrhosis, it would be more helpful in clinical MR practice. The purpose of this study was to determine the frequency of the finding of the RPHN sign on MR images, and to assess its sensitivity and specificity as a simple diagnostic MR sign of cirrhosis.

Methods

This study population included a total of 330 patients with pathologically proved cirrhosis (n=202, cirrhosis group) or without clinical evidence of chronic liver diseases (n=128, control group). Patients in the control group had undergone MR imaging for reasons other than chronic liver diseases (eg. suspected liver cyst or hemangioma, or benign disease of other organs). Patients in the cirrhosis group had been referred for MR imaging for evaluating the severity of cirrhosis and portal hypertension, for the preoperative evaluation of liver transplantation, and/or for the screening or further examination of the liver lesions which were suspected with other imaging modalities.

All patients were imaged at 1.5-T MR instruments. All underwent axial T1- and T2-weighted MR imaging. T1-weighted imaging included the following one or more sequences: conventional spin-echo (SE) imaging, in-phase gradient-echo (GRE) and opposed-phase GRE sequences. T2-weighted imaging included breathing-averaged or breath-hold fast SE sequences with or without fat suppression. Most patients also underwent T1-weighted GRE imaging after intravenous injection of 0.1mmol/kg of gadopentetate dimeglumine with multiphasic dynamic techniques. Other imaging parameters included 256 x 128-256 imaging matrix, usually with use of a rectangular field of view to reduce the number of phase-encoding views, and 7-12 mm section thickness with 2 mm or less section gap.

MR images were reviewed retrospectively and independently by three of four radiologists experienced in abdominal MR imaging and blinded to the final diagnosis with regard to the presence of cirrhosis, and were qualitatively evaluated for the presence of the RPHN sign. The RPHN sign was considered present if there was a sharp notch in the right posterior surface of the liver, probably corresponding to the boundary between the caudate lobe and the right posterior segment (Fig.1). The presence of the expanded GBF sign was also evaluated during the same reading session. Cases from the cirrhosis group and the control group were randomly mixed. When there was disagreement in their opinions regarding the presence of these signs, a majority opinion was used for data analysis as the final decision.

Results

The RPHN sign was observed in 145 of the 202 patients in the cirrhosis group while this sign was seen in only 2 of the 128 patients in the control group, showing a significant difference between these two groups (p<.0001). The sensitivity, specificity and accuracy of the RPHN sign for the MR diagnosis of cirrhosis were 71, 98, and 82%, respectively.

The expanded GBF sign was seen in 122 of the 202 cirrhotic patients while this sign was seen in 3 of the 128 control patients. This difference was also statistically significant (p<.0001). The sensitivity, specificity and accuracy of the expanded GBF sign were 60, 98, and 75%, respectively. The RPHN sign and/or the expanded GBF sign were observed in 172 of the 202 patients in the cirrhosis group while these signs were seen in 5 of the 128 patients in the control group (p<.00001). The sensitivity, specificity and accuracy of these signs for the MR diagnosis of cirrhosis were 85, 96, and 89%, respectively.

Discussion

Our results showed that the RPHN sign had high specificity (98%) for the diagnosis of cirrhosis. The RPHN sign in cirrhotic livers may be dependent upon the hypertrophy of the caudate lobe and the atrophy of the right posterior segment of the liver because a sharp notch was seen in the right posterior hepatic surface, probably corresponding to the boundary between these two segments. The RPHN sign is simpler to evaluate in clinical practice compared with quantitative measurements. Although this sign can also be assessed by means of CT, MR imaging can offer a more extensive, comprehensive evaluation of cirrhosis than can other imaging methods, including findings such as minimal ascites, fat and iron deposition and detection of dysplastic nodules. When this sign was used in combination with the expanded GBF sign, sensitivity and accuracy for the diagnosis of cirrhosis were increased.

In conclusion, the RPHN sign is an often present, specific indicator of cirrhosis. This sign can be used as a simple and highly specific sign of cirrhosis, if present. Additionally, the diagnostic performance can be improved under the combination use of the expanded GBF sign.

References

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