

The value of Gd-EOB-DTPA enhanced MR imaging in characterizing cirrhotic nodules with atypical enhancement in Gd-DTPA enhanced MRI imaging

Yi-Chun Wang^{1,2}, Wen-Pei Wu^{2,3}, Cheng-In Hoi², Chen-Te Chou^{2,3}, and Ran-Chou Chen^{2,4}

¹Radiology, taoyuan general hospital ministry of health and welfare, Taiwan, Taoyuan, Taiwan, ²Biomedical Imaging and Radiological Science, National Yang-Ming

Medical University, Taipei, Taiwan, ³Radiology, Chang-Hua Christian Hospital, Taiwan, ⁴Radiology, Taipei city Hospital, Taiwan, Taipei, Taiwan

Purpose

According to AASLD, a diagnosis of HCC can be made by that a nodule larger than 1.0 cm showed typical enhancement (hypervascularity on arterial phase, contrast washout in venous/late phase) on dynamic CT or MR. However, up to 44% HCCs show atypical features on dynamic contrast-enhanced images. (Fig.1) Gadoxetic acid (Gd-EOB-DTPA) has been demonstrated to increase the detection of focal liver lesions and to provide differential diagnostic information comparable to nonspecific extracellular gadolinium chelates. Could the contrast agent be also effective in HCCs with atypical features during conventional MR dynamic studies? The purpose of this study was to evaluate whether Gd-EOB-DTPA enhanced hepatocyte phase MR images can improve the diagnosis of HCC in patients with atypical enhanced cirrhotic nodules detected on conventional dynamic MR images.

Materials and methods

From Jan. 2009 to Dec. 2013, we retrospectively enrolled 74 consecutive patients with 97 atypical enhanced nodules. All of them underwent conventional gadolinium-enhanced MRI and Gd-EOB-DTPA -enhanced MR imaging within 3 months. Using reference of standards, we determined that 23 of the nodules were DNs and that 74 were true HCCs. All nodules had histological confirmation and DNs were monitored either by CT or MR imaging at three-month intervals over a period of more than a year. Signal intensity on precontrast T1WI and T2WI, and the arterial/portal/venous/equilibrium phase behavior of dynamic enhancement and hepatobiliary(HB)-phase appearance on Gd-EOB-DTPA-enhanced MR images were evaluated by two radiologists separately.

Results

There were significant differences in hyperintensity on T2WI, hypointensity on T1WI, typical HCC enhancement pattern on dynamic MR images, and hypointensity on hepatocyte-phase images between DN and HCC. Using HB hypointensity as HCC diagnostic criterion alone, 83.5% diagnostic accuracy was demonstrated. The diagnostic performance was better than conventional MR imaging features. The sensitivity and specificity were 87.8% and 69.6% for HB-phase hypointensity and 47.3% and 95.7% for HB-phase hypointensity combined with hyperintensity in AP (Table 1).

Discussion

Small HCCs frequently presented atypical features in dynamic studies. They are diagnostically challenging in daily practice. It is extremely important to differentiate benign cirrhotic nodules from atypical HCC since the strategies of the treatment is different. In this study, we followed the AASLD guidelines and found that repeated MR dynamic studies enabled us to correctly characterize only 20.3% (15 of 74) of the HCC lesions with atypical enhancement patterns seen on dynamic MR images. In our study, hypointense on hepatocyte phase as HCC diagnostic criterion showed 83.5% diagnostic accuracy is superior to that of the dynamic study. In combination of hypointensity on HB-phase with arterial hypervascularity, the specificity could achieve 95.7%. According to our results, atypical cirrhotic nodules depicted hypointensity on HB-phase with arterial hypervascularity should be treated aggressively.

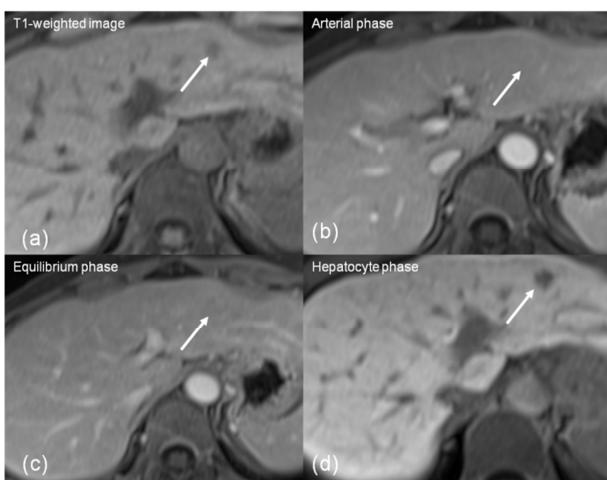


Table 1. Diagnostic Performance of Gd-EOB-DTPA enhanced MR Imaging Features

	Sensitivity (%)	Specificity (%)	NPV (%)	PPV (%)	Diagnostic accuracy (%)
HB hypointensity	87.84	69.57	64.00	90.28	83.51
HB hypointensity & isointensity in AP	40.54	73.91	27.87	83.33	48.45
HB hypointensity & hyperintensity in AP	47.30	95.65	36.07	97.22	58.76

AP=arterial phase HB=hepatobiliary-phase

Figure 1. A 63-year-old male with a well-differentiated hepatocellular carcinoma (indicated by arrow) at S3 of the liver underwent gadoxetic acid-enhanced MR imaging and liver segmentectomy. (a) The tumor showed hypointensity on the T1-weighted image. (b)(c) The tumor depicted isodensity relative to the adjacent liver parenchyma on the arterial/equilibrium phase of dynamic MRI study. (d) The tumor showed hypointensity on the Gd-EOB-DTPA enhanced hepatocyte-phase T1-weight image.

Conclusion

Due to Gd-EOB-DTPA enhanced hepatocyte-phase imaging provided high accuracy in differentiation of benign dysplastic nodules from HCC, Gd-EOB-DTPA enhanced MR studies with hepatocyte-phase imaging are recommended for patients with atypical cirrhotic nodules seen on images taken during dynamic MR studies.