Characterization of cirrhotic nodules with gadoxetic acid-enhanced MR imaging: the efficacy of hepatocyte-phase imaging

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Purpose:
Nodular lesions against a background of cirrhosis are diagnostically challenging in daily practice. Dynamic imaging represents an obligatory tool for characterization of focal liver lesions. Gadoxetic acid is a more recently developed liver-specific MR imaging contrast medium with combined perfusion and hepatocytes-selective properties. The purpose of our study was to evaluate the efficacy of hepatocyte-phase in characterization of cirrhotic nodules with gadoxetic acid enhanced MRI.

Materials and Methods:
The study was approved by the institutional review board of our hospital. 38 patients with liver cirrhosis and histologically proven lesion were prospectively enrolled in this study. A total of 66 nodules within the 38 patients were found. The evaluation of standard of reference revealed 15 dysplastic nodules, 7 well-differentiated HCCs, 44 moderately differentiated HCCs. MR imaging was performed with a 1.5-T MR scanner and all patients received a 0.025 mmol/kg dose of gadoxetic acid. Two image sets (set A and set B) were prepared in which set B consisted of all of the images of set A plus a contrast-enhanced hepatocyte-phase FS-T1WI. Characterization of nodules based on the following criteria. A tumor presenting with the following characteristics was considered as HCC: first, arterial enhancement followed with washout on the dynamic MR images; second, hyperintense on T2WI/FS-T2WI; third, hypointense on 20 min delayed hepatocyte-phase FS-T1WI. Qualitative analysis of the lesions was compared with the adjacent liver parenchyma was performed. Quantitative analysis of the tumors on the dynamic study and the hepatocyte-phase were recorded. Statistical differences for both imaging sets were compared by the McNemar test. A paired t-test was used to confirm the difference in the SNR/CNR for the precontrast/postcontrast imaging. A Kappa statistic was used to evaluate the interobserver difference.

Results:
An excellent agreement of inter-observer agreement between the two reviewers was noted in the imaging set A (κ=0.83) and the set B (κ=0.90). The imaging features of the 66 tumors are shown in Table 1 and enhancing pattern is shown in Table 2. The SNR/CNR of each lesion type is shown in Fig. 1. There were 12 (12/44) mHCC and 6 (6/7) wHCC showed atypical HCC enhancing profile in dynamic study. There were only 4 mHCC showed heterogeneous and one wHCC showed homogeneous enhancement in hepatocyte-phase imaging. There were 7 additional HCC diagnosed by the imaging set B compared to the imaging set A (Fig. 2). All the 15 benign nodules were considered to be benign cirrhotic nodules by the both imaging set A and set B. The diagnostic performance of the imaging set B is significantly higher than the imaging set A in characterization of focal liver lesion among cirrhotic liver (P<0.016). In compared with the adjacent liver parenchyma, the mean SNRs/CNRs of mHCC were significantly increased in arterial phase and significantly decreased in portal, venous and hepatocyte phases (P<0.05). The mean SNRs/CNRs of wHCC were significantly decreased in hepatocyte phase (P<0.05), but no significant difference in the other phases (P>0.05). The mean SNRs/CNRs of DN showed no significant difference in dynamic study and hepatocyte-phase (P>0.05).

Conclusion
Additional information for differential diagnosis is achieved using gadoxetic acid-enhanced hepatocyte-phase T1WI for characterization of malignant versus benign cirrhotic nodules. Combination of gadoxetic acid-enhanced dynamic study and hepatocyte-phase T1WI could provide better diagnostic performance than dynamic study only in characterization of focal liver lesion among cirrhotic liver.