Magnetic resonance imaging follow-up of small arterially enhancing liver lesions detected with gadolinium-enhanced 3D interpolated technique in patients at risk for hepatocellular carcinoma

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Introduction
Hepatocellular carcinoma (HCC) is a common malignancy and is highly prevalent in patients with cirrhosis. MRI of the liver is frequently performed for the surveillance of HCC in this patient population. The diagnosis of HCC is elicited when a liver lesion is detected that has an early arterial enhancement on gadolinium-enhanced T1-weighted image and a high signal intensity on T2-weighted image. However, this signal characteristic is not 100% specific for HCC. In particular, the differentiation of HCC from other benign pathologies is very difficult in a small lesion (<20mm) that lacks other helpful morphologic features. The purposes of this study are to evaluate the signal characteristics and the usefulness of follow-up imaging studies for diagnosis of HCC and to estimate an appropriate time interval for follow-up MR imaging.

Materials and Methods
Between July 1999 and August 2002, we reviewed 253 patients with cirrhosis who underwent a standard clinical liver MRI examination. 53 of these patients had a small (<20mm) arterially enhancing lesion in the initial MRI and had at least 1 month follow-up MRI (follow-up range 1-20 months; average 7 months). After excluding patients with a history of chemoembolization, RF ablation, or ethanol injection, we identified 44 patients (141 MR studies and 65 lesions). The lesions that disappeared in the follow-up studies (n=42) or were stable in size over 18 months (n=13) were considered benign. The remaining 10 lesions were proved to be HCC by biopsy or surgery. Our clinical liver MRI sequences include FSE T2 and gadolinium-enhanced 3D interpolated T1 images. For each lesion, we recorded its diameter, shape, location, enhancement pattern, and signal intensity on T1 and T2 images. Correlation analysis was performed between lesion diagnosis and imaging features. By comparing the lesion size in the initial and follow-up MRI, we calculated the percent change and doubling time of the lesion volume [Yankelevitz, 2000 #32]. An appropriate MR follow-up time was estimated for the HCC.

Results
The size (geometric mean diameter) of the lesion sizes on initial MR studies ranged between 2 mm and 19 mm (mean 7 mm). All HCC lesions were larger than 7 mm. A significant correlation was observed between diagnosis of HCC and lesion size growth (P =0.002), but no significant correlation between diagnosis of HCC and T1 (P =0.54) or T2 signal intensity (P =0.08), washout (P =0.67) and shape of each lesion (P =0.17). While 7 of 10 HCC lesions increased significantly in size in the follow-up MRI, 3 HCC lesions (>10mm) had no significant change in size (up to 6 month follow-up). But these 3 lesions showed a change in signal characteristics (hyper T2 intensity, rim enhancement, or heterogeneous enhancement) in subsequent follow-up MR. Mean doubling time was 70 and 35 days for small (<10mm; n=3) and large (>10mm; n=4) HCC lesions, respectively.

Conclusion
MR signal characteristics alone cannot differentiate HCC from benign lesions. The most sensitive feature for diagnosing HCC is an increase in size in the follow-up studies. From the doubling time analysis in our study of small sample size, appropriate time for follow-up MRI appears 6 and 4 months for small (<10mm; n=3) and large (>10mm; n=4) HCC lesions, respectively.

Reference