Accuracy of MR Imaging for the Detection of Hepatocellular Carcinoma in Patients with Cirrhosis: Correlation with the Whole Explanted Liver

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PURPOSE : Imaging has become the basis for the diagnosis of hepatocellular carcinoma (HCC) after the United Network for Organ Sharing relaxed the biopsy requirement for arterially enhancing lesions with typical imaging characteristics of HCC. Our aim is to evaluate the accuracy of MR imaging for the detection of HCC and the cause and frequency of false interpretation cases based on histologic examination of explanted liver.

METHOD AND MATERIALS : Eighty patients without history of treated HCC who underwent MR imaging and liver transplantation within 90 days were included in this study. MR imaging was performed on 1.5T field strengths using T1-weighted gradient-echo (GRE), T2-weighted fast spin-echo, and multiphase dynamic gadolinium-enhanced 3-D spoiled GRE sequences. An independent retrospective review of the MR images was performed by two radiologists who were blinded to the initial MR interpretations and the pathologic findings in the explanted liver. Lesion detection, characterization, and reader confidence levels were recorded. Interobserver agreement was determined using Kappa statistic. The sensitivity, specificity, positive and negative predictive values of MR imaging for the detection of HCC, on a patient-by-patient basis, were evaluated. On a lesion-by-lesion basis, sensitivity of MR imaging for the detection of HCC was evaluated.

RESULTS : Twenty eight (35%) of 80 patients had HCC in the explanted liver. There was excellent interobserver agreement (k=0.9); Reader 1 detected HCC in 27 patients and had 7 false positive and 1 false negative HCC diagnoses, and reader 2 detected HCC in 26 patients and had 7 false positive and 2 false negative HCC diagnoses. The mean number of tumors per patient on pathology was 1.6 compared to 1.9 on MR imaging (p=0.5), and the mean maximum diameter was 2.6 cm compared to 2.5 cm on MR imaging (p=0.265). For the detection of HCC on a patient-by-patient basis, MRI had an overall sensitivity, specificity, positive predictive value, and negative predictive value of 96%, 86%, 79%, and 97%, respectively. The sensitivity for the detection of HCC on a lesion-by-lesion basis was 71%. Ten (83%) of twelve false negative lesions were less than 1 cm. The causes of twelve false positive lesions with arterially enhancement were regenerative nodules (n = 10), high grade dysplastic nodule (n = 1), and infarcted regenerative nodule (n = 1).

CONCLUSION : MR imaging is a reliable technique for the detection of HCC prior to liver transplantation. Major cause for false positive diagnosis of HCC was arterially enhancing nodules and that of false negative diagnosis was small tumor size less than 1cm.

Table. MR detection rate of HCC according to the size of HCC based on histologic examination of explanted liver.

Size of HCC	Number of true positive lesions	Number of false negative lesions	Detection rate of MRI
≤ 1cm	2	10	16.7%
1-2 cm	10	1	90%
2-3 cm	10	0	100%
3-5 cm	6	1	86%
> 5cm	2	0	100%
Total	30	12	71%

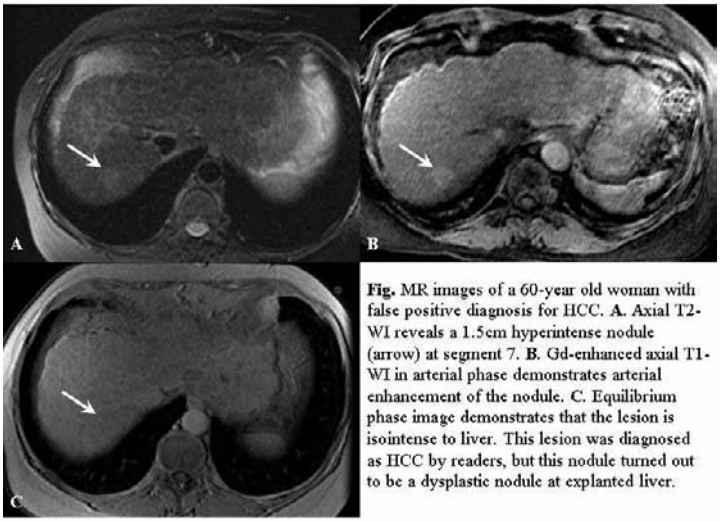

Fig. MR images of a 60-year old woman with false positive diagnosis for HCC. **A.** Axial T2-WI reveals a 1.5cm hyperintense nodule (arrow) at segment 7. **B.** Gd-enhanced axial T1-WI in arterial phase demonstrates arterial enhancement of the nodule. **C.** Equilibrium phase image demonstrates that the lesion is isointense to liver. This lesion was diagnosed as HCC by readers, but this nodule turned out to be a dysplastic nodule at explanted liver.

References

Krinsky GA, et al. Liver transplantation 2002; 8: 1156-1164.