

MRI of Infiltrative HCC- Characterization of Imaging Features in Association with Clinical Presentation

B. Kalb¹, D. Vander Kooi², D. Karolyi¹, B. Patel¹, K. Salman¹, and D. R. Martin¹

¹Radiology, Emory University, Atlanta, GA, United States, ²Radiology, Langley Airforce Base, Hampton, Virginia, United States

Introduction

Chronic liver disease (CLD) and hepatocellular carcinoma (HCC) is now amongst the top ten causes of mortality in the USA, with rising incidence here and around the world. MRI provides superior diagnosis of HCC compared to all other methods, with an accuracy of diagnosis exceeding 95%. MRI provides the standard for diagnosis of curable focal HCC; focal HCC representing the most common growth pattern. Infiltrative-type of HCC (I-HCC) is an incurable, less common growth pattern that may mimic fulminant CLD. Distinction of I-HCC on MRI is critical for optimal management and to avoid inadvertent transplantation of incurable disease.

Purpose

To characterize I-HCC on MRI in association with clinical presentation with the overarching objective of maximizing MRI diagnostic accuracy.

Methods

Patients: This study was IRB-approved and HIPPA compliant. A retrospective electronic search of our imaging database was undertaken for diagnostic field terms with "hepatocellular carcinoma", "HCC", "diffuse" and "infiltrative" over a four year period from January 2004 to December 2008. On review, a total 31 patients had a final diagnosis of infiltrative HCC (28 male, 3 female). **Clinical data:** Available clinical and pathologic data was collected, including alpha-fetoprotein (AFP) levels temporally related to the MRI exam, liver biopsy, and clinical course. **Imaging:** All MR exams were obtained with our standard abdominal protocol, including pre-contrast axial T2-weighted single shot +/- SPAIR fat-suppression, and multi-phase gadolinium contrast enhanced T1-weighted 3D gradient echo (3D GRE) in precontrast, arterial, venous and delayed phases, with arterial phase images acquired with a bolus-triggered technique we have described previously. **Image analysis:** Two experts in body MR separately reviewed the images and results were recorded in a spreadsheet format subsequently averaged. MR images were evaluated for the following features: characteristic enhancement features of HCC, including arterial enhancement and washout with a late enhancing capsule; presence of abnormal T2 signal in focal or geographic pattern; qualitative analysis of tumor conspicuity on T2-weighted imaging and contrast-enhanced images; and the presence of characteristic arterial phase enhancing portal vein thrombosis (PVT), as a marker of intravascular HCC.

Results

Imaging: 87% (27/31) of patients had an abnormal pattern of enhancement on gadolinium-enhanced T1W 3D GRE sequences, while tumor was inconspicuous on postcontrast images in the remaining 13% (4/31). Arterial enhancement of the tumor was present in 81% (25/31), while tumor washout on delayed phase (3-5 minute) imaging was present in 77% (24/31). T2 signal was abnormal in 31/31 patients. Tumor conspicuity was assessed to be greatest on T2W images in 58% (18/31) versus contrast-enhanced images (Figure 1), while tumor conspicuity was similar on both T2W images and postcontrast images in 42% (13/31). In no patient was tumor conspicuity greater on the postcontrast images versus T2W images. 100% (31/31) of patients demonstrated arterial enhancing tumor thrombus in a major branch of the portal vein. **Clinical data:** AFP levels were available in 25/31 patients. 64% (16/25) had AFP levels >2400 ng/mL (the maximum value of our laboratory), while 12% (3/25) had AFP levels <5 ng/mL. In the 6/25 patients with measurable levels of AFP that were not above or below the reference standards of the assay, the average AFP value was 404 ng/mL (range 6.5-1753 ng/mL). 5/31 patients had tissue sampling of the tumor; 2/5 had poorly differentiated tumor on histologic analysis, 2/5 were moderately differentiated and 1/5 was well-differentiated.

Conclusions

I-HCC has imaging features that are distinct from the more common, focal-type of HCC. I-HCC is consistently conspicuous on T2W single shot images, demonstrating a geographic, rather than focal mass-like morphology, features relatively uncommon to focal HCC. In combination with PVT, a diagnostic accuracy of 100% may be achieved, even in the setting of a negative or low AFP and/or liver biopsy showing moderate or well-differentiated HCC. Our observational study is important to help improved clinical application of MRI in the setting of CLD and for consideration that T2 mapping, in future investigations, may yield insight into prognosticating biological behavior of HCC that is not currently achieved on biopsy specimens or clinical testing.

Kanematsu M, Semelka RC, Leonardou P, Mastropasqua M, Lee JK. Hepatocellular carcinoma of diffuse type: MR imaging findings and clinical manifestations. J Magn Reson Imaging 2003;18(2):189-195.

Figure 1A

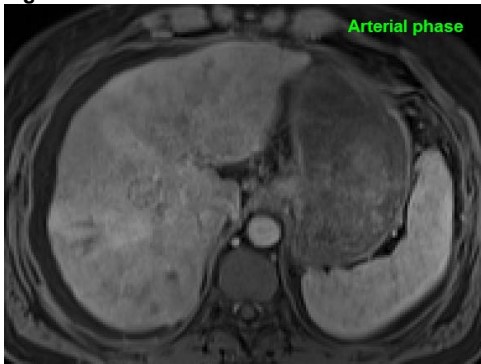


Figure 1B

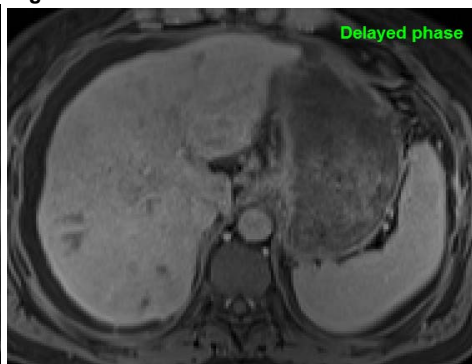


Figure 1C

