The value of delayed hypointensity of arterially-enhancing nodules in the cirrhotic liver for the diagnosis of hepatocellular carcinoma

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Introduction: The current United Network for Organ Sharing (UNOS) guidelines allow liver transplantation of TNM stage II hepatocellular carcinoma (HCC), which comprises a single nodule 2.0-5.0 cm, or up to three nodules all ≤ 3.0 cm. UNOS policy does not mandate histological confirmation of tumor for arterially-enhancing lesions larger than 2cm. Therefore, the diagnosis of HCC relies heavily on imaging characteristics. Patients with tumors smaller than 2 cm do not qualify for transplantation on the basis of tumor size but benefit most from other forms of therapies and have higher survival rates. Using arterial enhancement as the diagnostic feature of HCC, a study from a single center in the U.S.A. found that 33% of patients transplanted for HCC did not have tumor in the explant and 63% of the misdiagnosed tumors were arterially-enhancing lesions ≤ 2 cm (1). Another concurrent study (2) found that 31% of patients who underwent liver transplantation for tumors less than 2 cm and 9% of patients with TNM stage II tumor had no evidence of tumor in the explanted liver. Given the scarcity of transplant livers and the long waiting times, it is essential to find additional criteria to improve accuracy of imaging in characterization of HCC to ensure proper allocation of donor livers and allow other therapies to be applied in patients with small tumors to improve their survival. Delayed hypointensity of an arterially-enhancing lesion has been suggested as sign highly specific for malignancy (3). Our purpose is to determine the sensitivity and specificity of delayed hypointensity of arterially enhancing nodules as an indicator of HCC.

Materials and Methods: Liver MRI studies performed between Jan 01 - Dec 04 in patients with known chronic liver disease and cirrhosis were evaluated for arterially-enhancing nodules measuring between 1-5 cm maximum diameter in the axial plane. Signal intensity of these lesions on dynamic gadolinium-enhanced 3-dimensional T1-weighted gradient-recalled echo images acquired in the arterial-dominant, venous (60-90s post gadolinium) and interstitial (2min post gadolinium) phases of enhancement were evaluated qualitatively as hyperintense, isointense or hypointense relative to surrounding liver parenchyma. Studies were reviewed in consensus by two radiologists who regularly read liver MRI.

Final diagnosis was established using pathology reports of explant livers for 44 nodules and biopsy in 25 nodules. For 73 nodules, the final diagnosis was established by follow up imaging for at least 6 months (mean 16 months, range 6-37 months). Lesions demonstrating progressive growth were considered HCC (4). Lesions that did not persist on follow up imaging or remained stable in size over a minimum of 6 months were assumed to be benign lesions.

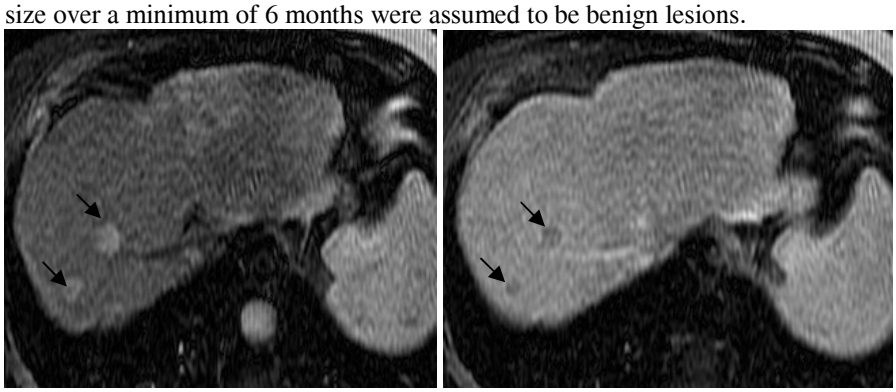

Figure: Two small arterially enhancing nodules (arrows on left image) measuring 8mm and 15mm, respectively in a cirrhotic liver show hypointensity relative to adjacent parenchyma on interstitial-phase imaging (arrows on right image). Both lesions were HCC at explant.

Results: 142 nodules were identified in 91 patients. 115 nodules measured 1-2.5 cm while 27 nodules measured 2.5-5.0 cm (mean size 1.9 cm). 77 (54%) of nodules were hepatocellular carcinoma (HCC) of which 55 measured 1-2.5 cm and 22 measured 2.5-5.0 cm. Of nodules measuring between1-2.5 cm, hypointensity on venous- or interstitial-phase imaging was 43% sensitive and 72% specific for HCC. Of nodules measuring between 2.5-5.0 cm, hypointensity on venous or interstitial-phase imaging was 81% sensitive and 100% specific for HCC.

Conclusion: The finding of hypointensity on venous- or interstitial-phase imaging in arterially enhancing nodules in patients with cirrhosis is highly sensitive and specific for HCC nodules measuring between 2.5-5.0 cm. Smaller HCC, however, are less likely to demonstrate hypointensity.

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3. Marrero JA, et al. Liver Transpl 2005; 11(3):281-9
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