

## MRI is superior to 64-slice CT in detection of HCC in the cirrhotic liver

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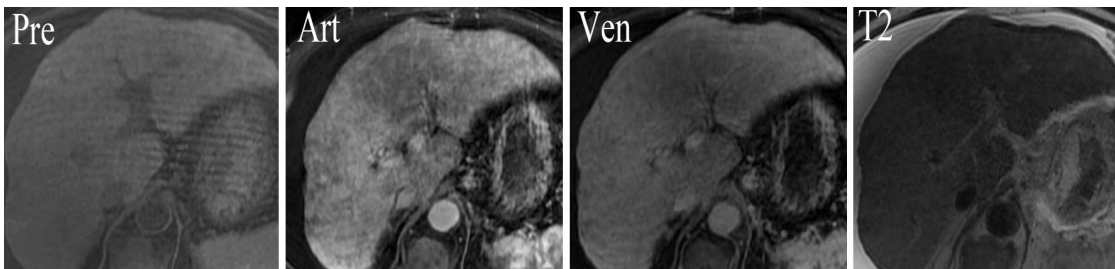
**BACKGROUND:** Hepatocellular carcinoma (HCC) is the 5<sup>th</sup> most common malignancy worldwide and according to a recent metanalysis (Colli, 2006 Mar;101(3):513-23), MRI and CT have a sensitivity of 81% and 68% respectively, but suffer from poor ability to recognize subcentimeter lesions in the cirrhotic liver. Recent advances in MRI including higher resolution 3D acquisition have improved MRI such that we have noticed that small lesions are more commonly identified on MRI compared to CT. To assess the ability of current MRI technology to accurately identify small HCC, we compared pre-transplantation liver MRI and CT with histopathologic findings at explant.

**PURPOSE:** To assess the accuracy of MRI and CT to detect HCC on a per-patient and per-lesion basis in patients undergoing liver transplantation using histopathological analysis of the explant as the reference standard.

**METHOD AND MATERIALS:** At our institution, explanted livers are first sectioned into 10mm sections in the axial plane, with additional sectioning as needed. Pathology reports were reviewed from patients who underwent total liver transplantation from 2005 to 2010. Next, radiology reports were reviewed for patients with high resolution 3D gadobenate dimeglumine (Gd)-enhanced MRI at 1.5 and 3.0T or triple phase abdominal 64 slice CT. Patients with chemo- or radioablative therapy prior to imaging had the treated segments excluded from analysis. Patients with imaging greater than 120 days before transplant, with partial hepatectomy, under the age of 18, and non-cirrhotics were excluded. Of 202 transplants, 107 met inclusion criteria for per-patient and per-lesion sensitivity calculation. Welch's t-test and p-values were then computed to assess statistical significance.

**RESULTS:** Of the 107 patients, 28 (MRI:23, CT:5) had no pre-transplant ablative therapy; 74 (MRI:62, CT:7, both:5) underwent chemo- or radioablative treatment on a portion of the liver. The per-patient MRI sensitivity for HCC detection was 91.1% (82/90) and for CT 70.6% (12/17), ( $p = 0.02$ ). The per-lesion sensitivity for MRI: 85.1% (63/74), CT: 42.9% (6/14) ( $p = 0.05$ ). The sensitivity for <1cm lesions with MRI 80.0% (12/15) and CT 0% (0/2) ( $p = 0.01$ ), 1-2cm MRI 72.5% (29/40) and CT 42.9% (3/7) ( $p = 0.65$ ), >2cm MRI 89.5% (17/19) and CT 60% (3/5) ( $p = 0.20$ ). Five patients with missed lesions by MRI had post-transplant recurrent HCC by AFP and/or imaging follow-up; two for CT.

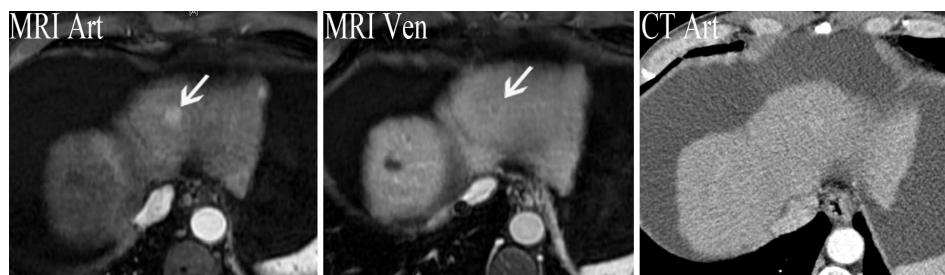
**CONCLUSION:** Our 91% per patient sensitivity for HCC and 80% sensitivity for lesions <1cm represents an improvement over the results of Colli et al which analyzed older technology pre-2006. Our data also show substantial superiority of MRI over triple phase CT. However, the experience of missing lesions in 5 patients who developed recurrent HCC post-transplantation indicates that there continues to be a need for further improvement. Although CT has higher resolution than MRI, the superiority of MRI over CT for subcentimeter lesions as small as 0.5cm supports the point that spatial resolution is no longer a limitation and current MRI resolution is much finer than the size of lesions we are missing, i.e. multifocal and diffuse disease. Hence, future advances in sensitivity may require new strategies such as better contrast agents and pulse sequences to maximize tumor to liver contrast.



**Fig 1.** 61-year-old man with diffuse HCC (pathological stage 4a) which was incorrectly interpreted as cirrhosis without evidence of HCC. The patient went on to have recurrent HCC post-transplant.



**Fig 2.** 53-year-old man with 0.6cm HCC (pathological stage 1) in segment 8 which was correctly identified on arterial phase Gd enhanced MRI as HCC. It also demonstrated portal venous washout (not shown).



**Fig 3.** 47-year-old man with 1.1cm lesion in segment 2 which on MR imaging, enhances on arterial phase and washes out on the portal venous phase. It was correctly identified as HCC. The tumor was missed on triple phase contrast-enhanced CT as it was not visible on any of the 3 phases.