Case Study

ARFI Imaging

Managing Patients with Liver Disease

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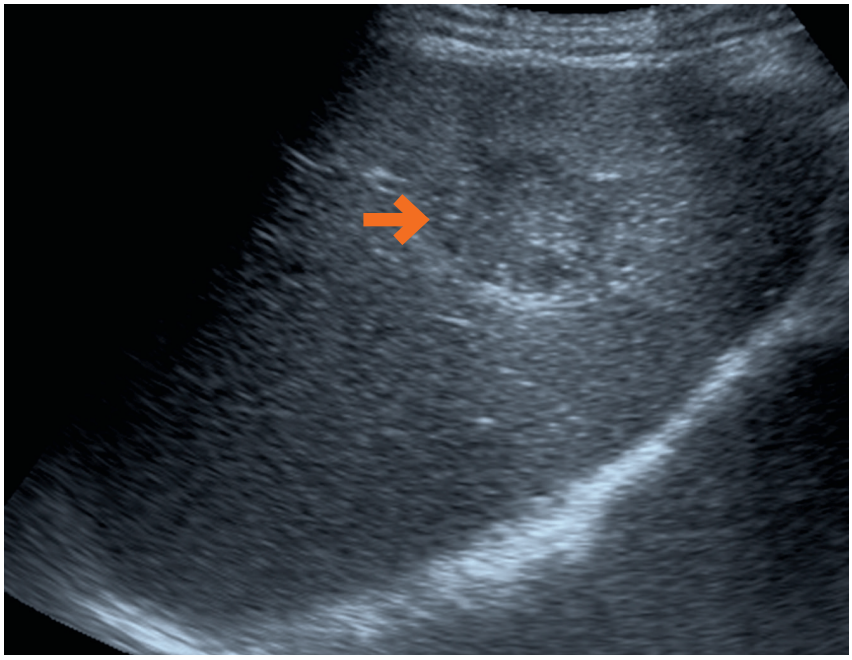


Figure 1. A focal liver lesion (arrow) on a background of mildly increased echogenicity. The patient had a previous sonographic examination suggesting the presence of a hemangioma in the liver; the appearances are not typical for a hemangioma, but in the presence of a fatty liver a hemangioma can be of low echogenicity.

Acoustic Radiation Force Impulse (ARFI) Imaging

A 62-year-old man was referred to the Ultrasound Department from his primary-care physician for a right upper quadrant and liver examination as part of investigations for continuing upper abdominal pain following an injury. His past medical history included diet-controlled diabetes and hypertension.

The sonographic examination demonstrated mild hepatosteatosis, and a 36 x 36 mm mixed reflective lesion in the central aspect of the liver (Figure 1).

On questioning, the patient had a previous sonographic examination of the liver approximately 3 years previously and was told that he had a “benign“ liver hemangioma.

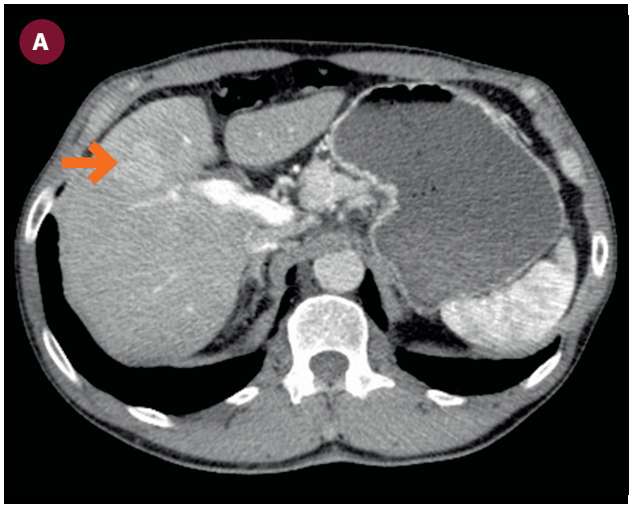


Figure 2a. An arterialized lesion (arrow) is demonstrated on the CECT examination, suggestive but not conclusive of a HCC.

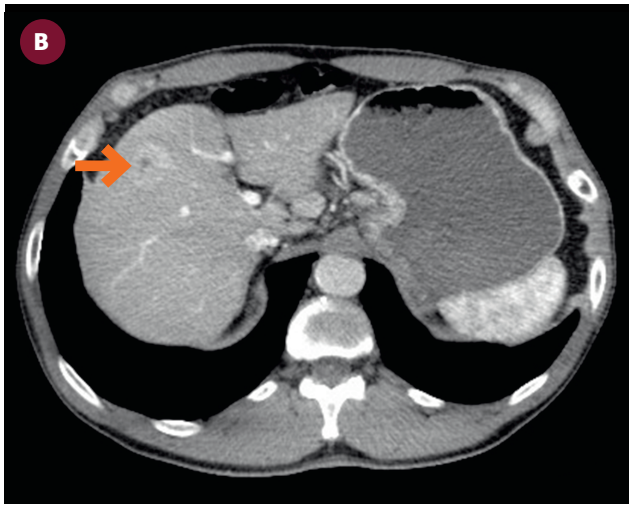


Figure 2b. Minor central washout (arrow) was seen on the portal venous image.

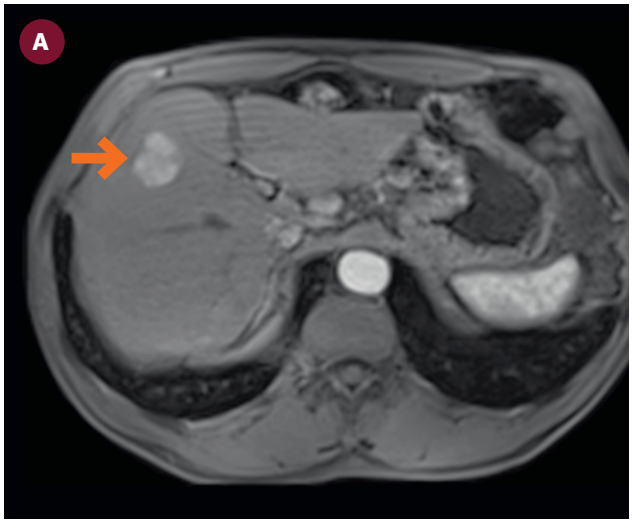
Further hematological work-up by the primary-care physician indicated a positive result for hepatitis C and a normal feto-protein (AFP). Further imaging with contrast-enhanced computed tomography (CECT)(Figure 2) and magnetic resonance (MR)(Figure 3) imaging indicated that the abnormality in the right liver lobe was vascular, but retained hepatospecific contrast at 20 minutes, atypical of a hepato-cellular carcinoma (HCC).

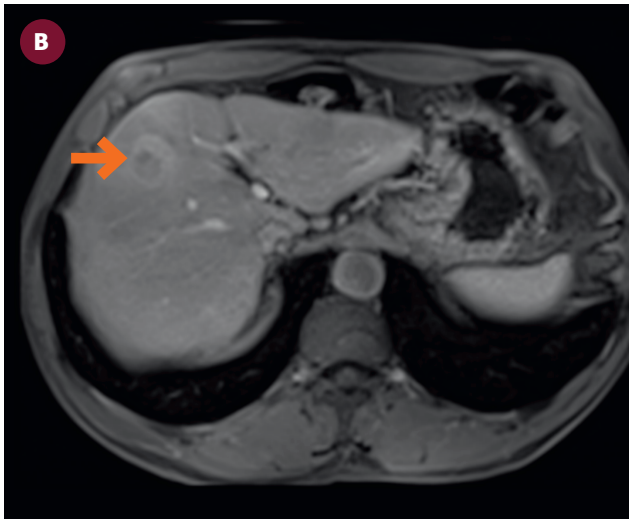
The indeterminate focal lesion needed to be subject to confirmation by histology for further appropriate clinical management; an HCC was suspected. The clinical management pathway needed to ascertain the presence of any underlying chronic liver fibrosis or cirrhosis; advanced underlying liver disease would alter the patient management pathway, as advanced fibrosis will not regress on treatment. The grey-scale sonographic evaluation alone demonstrated a fatty liver but no other evidence of chronic liver disease.

The need for containing the size of the HCC with a trans-arterial chemoembolization (TACE), and resection or then consideration of eventual liver transplant, is dependent on the extent of underlying diffuse liver disease. The underlying liver was subject to an ultrasound scan using Virtual Touch quantification (acoustic radiation force impulse [ARFI] imaging), with sampling from the right liver lobe demonstrating a median of 1.48 m/sec, (Figure 4). This result indicated that a biopsy of the underlying liver was also required. When the biopsy of the liver was performed, it confirmed the degree of fibrosis estimated from the ARFI measurement.

The HCC was subject to a TACE procedure with reduction in the size of the HCC (Figure 5). Liver transplantation is awaited.

This case indicates the importance of the role of ARFI in encouraging the need to stage the patient adequately for correct management, and in this case, biopsy of both the focal liver lesion (confirmed as HCC) and the background liver (METAVIR score F3) was performed to optimize clinical management.





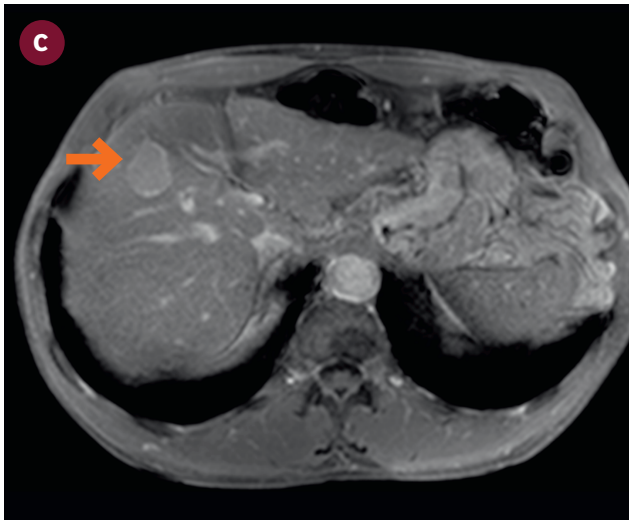


Figure 3a. Gadolinium-enhanced MR imaging in the arterial phase demonstrates vascular enhancement of the lesion (arrow).

Figure 3b. Portal venous phase images indicate the possibility of an HCC.

Figure 3c. Hepatic-specific contrast imaging at 20 minutes shows wash-out of contrast (arrow), which is not a typical feature of HCC.

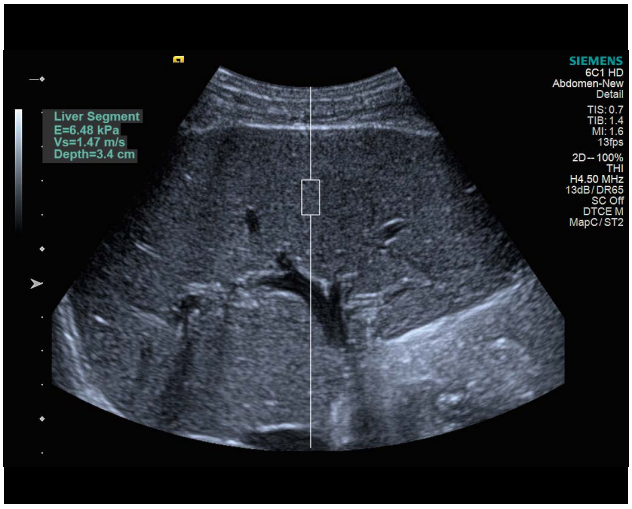


Figure 4. The ARFI measurement from deep within the right liver lobe indicates a reading that is higher than normal (1.47 m/sec). Ten separate readings are obtained and the median calculated.

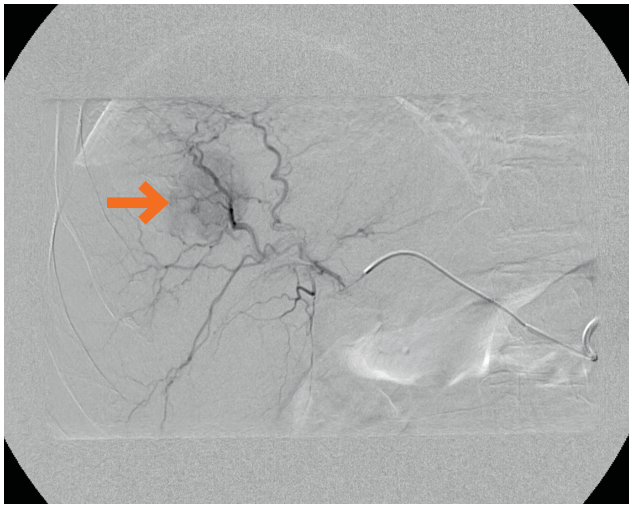


Figure 5. The arterial phase of the TACE procedure demonstrates the lesion vascularity (arrow).

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