

## Customer Case Study

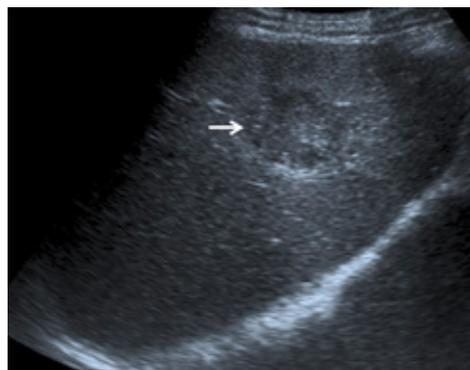
# Acoustic Radiation Force Impulse (ARFI) Imaging

Paul S. Sidhu FRCR  
Eleni Konstantatou MD  
Dylan Lewis FRCR

Department of Radiology,  
King's College Hospital,  
Denmark Hill, London,  
United Kingdom

A 62-year-old man, a recent immigrant, was referred to the Ultrasound Department for a right upper quadrant and liver examination, from his primary care physician, 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 hepato-steatosis, and a 36 x 36 mm mixed reflective lesion in the central aspect of the liver (Fig. 1). On questioning the patient had a previous sonographic examination of the liver in his native country approximately 3 years previously and was told that he had a 'benign' liver hemangioma.



**Figure 1**

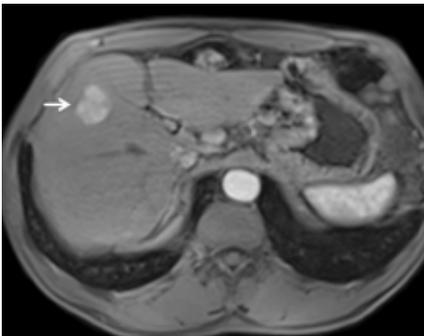
A focal liver lesion (arrow) on a background of mildly increased echogenicity. The patient had a previous sonographic examination suggesting the presence of a hemangioma in the liver; the appearances are not typical for a hemangioma, but in the presence of a fatty liver a hemangioma can be of low echogenicity.



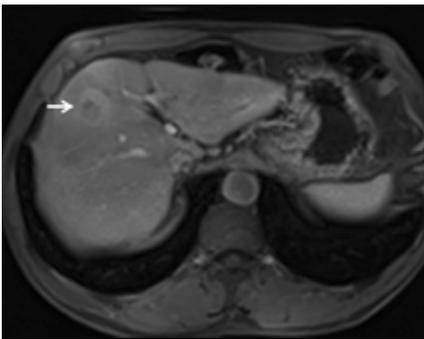
**Figure 2a**  
An arterIALIZED lesion (arrow) is demonstrated on the CECT examination, suggestive but not conclusive of a HCC.



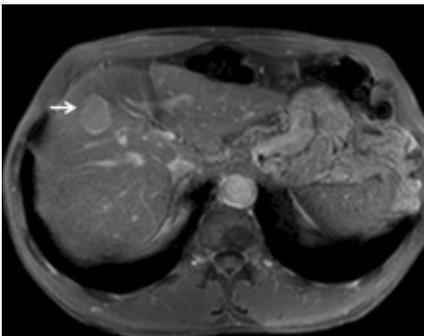
**Figure 2b**  
Minor central washout (arrow) was seen on the portal venous image.



**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.

Further hematological work-up by the primary care physician indicated a positive result for Hepatitis C, and a normal  $\alpha$  feto-protein (AFP). Further imaging with contrast-enhanced Computed Tomography (CECT) (Fig. 2) and Magnetic Resonance (MR) (Fig. 3) imaging indicated that the abnormality in the right liver lobe was vascular, but retained hepato-specific contrast at 20 minutes, atypical of a hepato-cellular carcinoma (HCC).

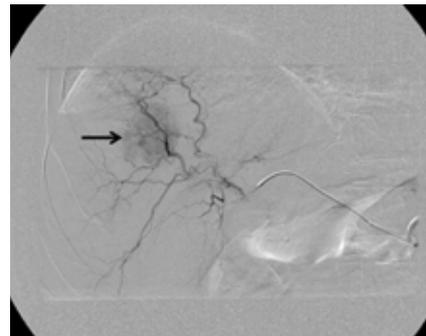
The indeterminate focal lesion needed to be subject to confirmation by histology for further appropriate clinical management; an HCC was suspected. The clinical management pathway needed to ascertain the presence of any underlying chronic liver fibrosis or cirrhosis; advanced underlying liver disease would alter the patient management pathway, as advanced fibrosis will not regress on treatment. The gray-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 the Virtual Touch™ Quantification (Acoustic Radiation Force Impulse (ARFI) imaging), with sampling from the right liver lobe demonstrating a median of 1.48 m/sec, (Fig. 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 (Fig. 5). Liver transplantation is awaited.



**Figure 4**  
The ARFI measurement from the 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).

## Bibliography

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### Global Siemens Headquarters

Siemens AG  
Wittelsbacherplatz 2  
80333 Muenchen  
Germany

### Global Siemens Healthcare

**Headquarters**  
Siemens AG  
Healthcare Sector  
Henkestraße 127  
91052 Erlangen  
Germany  
Phone: +49 9131 84-0  
[www.siemens.com/healthcare](http://www.siemens.com/healthcare)

### Legal Manufacturer

Siemens Medical Solutions USA, Inc.  
Ultrasound  
685 E. Middlefield Road  
Mountain View, CA 94043  
USA  
Phone: +1-888-826-9702