

# Ultrasound In Diagnosing Acute Calculous Cholecystitis

## Case

A 44 year old female presented to the Accident and Emergency (A&E) department with an acutely tender upper abdomen. A previous ultrasound examination reported a solitary, mobile gallstone. She was in good health; a non-smoker and not diabetic. A full blood count revealed a raised white blood cell count of  $12.2 \times 10^9$  suggestive of inflammation.

Abdominal ultrasound imaging was requested. The request read:

“1 day history of right upper quadrant and epigastric pain, increased white blood cell count ? cholecystitis”.

An abdominal ultrasound was performed with patient consent.

A single, 19mm, gallstone is seen within the neck of the gallbladder (image 1, 2); on movement into the decubitus position it was immobile. When slight pressure was applied the patient was tender indicating a positive Murphy's sign.

The fundus of the gallbladder contained numerous smaller gallstones and some biliary debris (image 1). The gallbladder wall was thickened and oedematous measuring 13mm (image 3).

Alongside the full blood count a diagnosis of acute calculous cholecystitis was made. On discussion with the hepatobiliary team a laparoscopic cholecystectomy was successfully performed the following week.

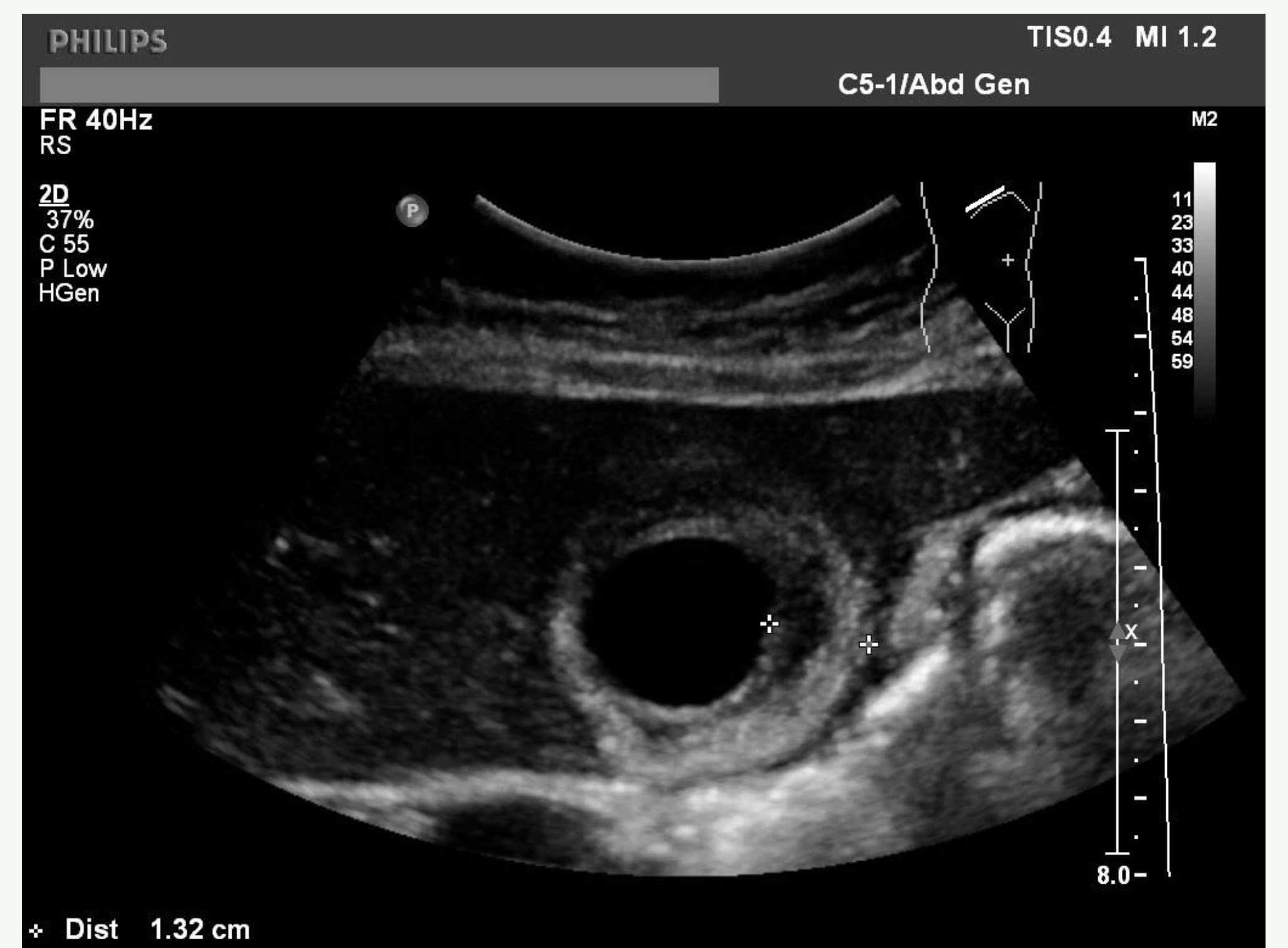
Image 1 – Longitudinal view of the gallbladder in the supine position. Biliary sludge and small, mobile gallstones seen in the fundus of the gallbladder



Image 1 – Longitudinal view of the gallbladder in the left lateral decubitus position depicting an immobile gallstone in the neck of the gallbladder



Image 3 – Transverse view of the gallbladder demonstrating a thickened and oedematous wall (measuring 13mm)



## Discussion

Acute cholecystitis affects about 1 in 10 adults in the United Kingdom (National Health Service (NHS) choices, 2016). 95% of patients with acute cholecystitis have gallstones (cholelithiasis), the remaining 5% have acalculous cholecystitis (Halpin, 2014).

Early diagnosis with appropriate diagnostic tests is imperative to relieve pain and plan for surgical management for patients with suspected acute calculous cholecystitis. This patient underwent a full blood count, liver function test and an abdominal ultrasound as recommended by the National Institute for Health and Care and Excellence (NICE) (2014) when gallstone disease is suspected. However, the accuracy of ultrasound in diagnosing acute calculous cholecystitis has been described as imperfect with its sensitivity widely varied between studies. With some reporting it as low as 26% (Rodriguez et al. 2016) and as high as 89% (Golea et al. 2012). The wide range of sensitivities and specificities indicate heterogeneity in the diagnostic performance of ultrasound.

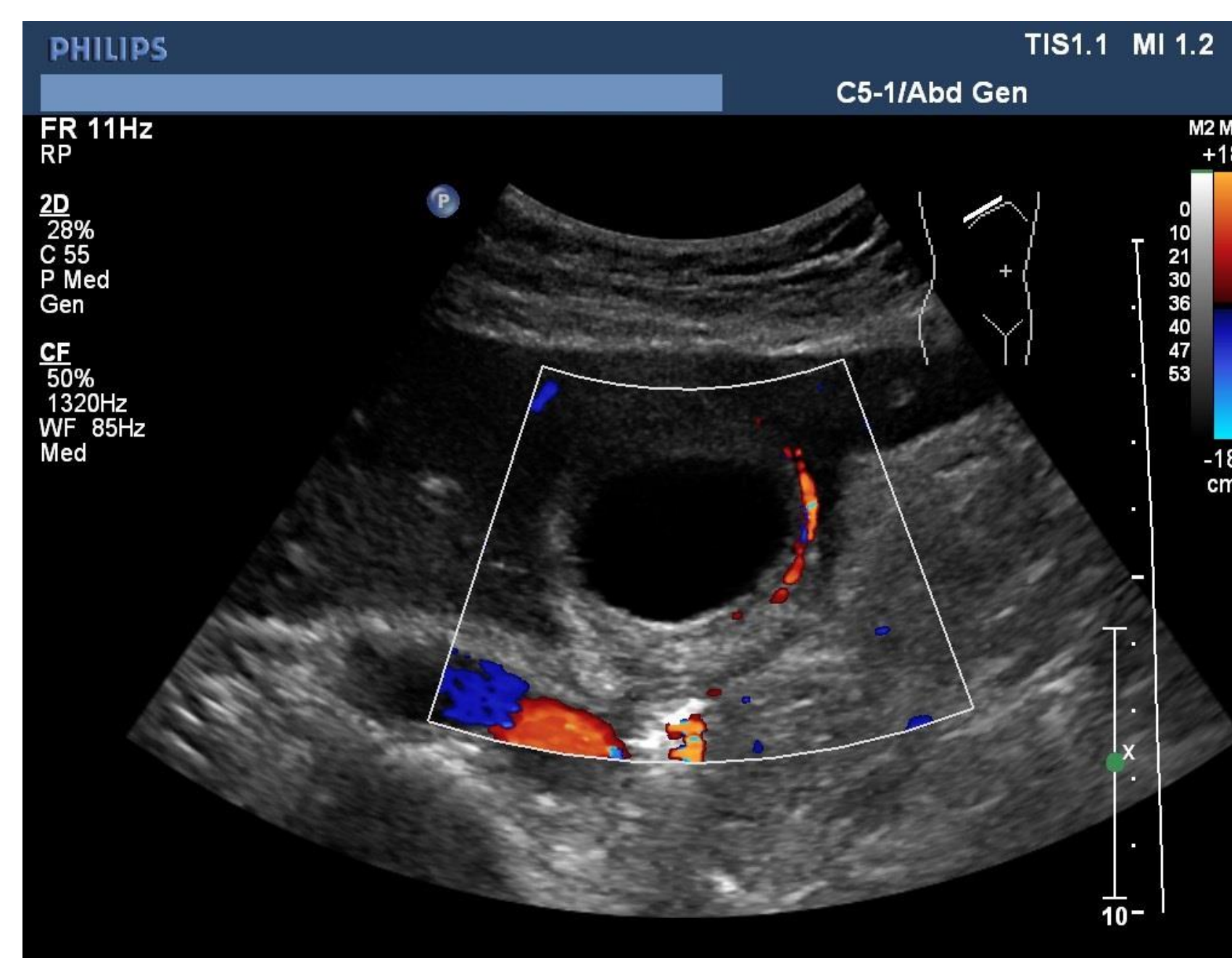
However, ultrasound has a high sensitivity and specificity in detecting cholelithiasis which is one of the main findings in acute cholecystitis and in this case. Golea et al. (2012) and Hwang et al. (2014) report 100% sensitivity for cholelithiasis in acute cholecystitis on ultrasound. The presence of cholelithiasis and a positive Murphy's sign, as in this example, is highly specific for acute cholecystitis (Runner et al. 2014).

## Conclusion

In this case ultrasound alone allowed for a full and accurate assessment of the gallbladder, to come to a conclusion of acute calculous cholecystitis. This demonstrates the necessity of the modality, being easily accessible and acknowledged as having a high diagnostic value, to facilitate further treatment. In the future CEUS may be more widely offered as an accepted method in diagnosing complications of acute calculous cholecystitis.

Alongside cholelithiasis, sonographic indicators for acute cholecystitis have been described as: gallbladder wall thickening (image 3), wall oedema (image 3), increased vascularity in the wall (image 4), gallbladder

Image 4 - Transverse view of the gallbladder using colour Doppler



distension pericholecystic fluid and a sonographic Murphy sign (Bates, 2004; Bingener et al. 2004; Pinto et al. 2013; Katabathina et al. 2015). All of which are demonstrated in this case increasing the confidence of the diagnosis. A study found a 94% positive predictive value when gallstones, Murphy's sign and wall thickening were present on ultrasound (Ralls et al. 1985).

Contrast enhanced ultrasound (CEUS) is emerging as a promising modality for diagnosing complications of the gallbladder. A recent study found CEUS was accurately able to diagnose wall defects in all patients confirming perforation or gangrenous cholecystitis (Sagrini et al. 2016). There is also work regarding CEUS and the adjacent liver parenchyma in identifying acute cholecystitis, however this is using agents not supported in the UK at this time (Kawai et al. 2016).