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Ultrasound Clinical Case Study

The use of the Aplio™ i-series in high BMI acute abdomen at Fiona Stanley Hospital

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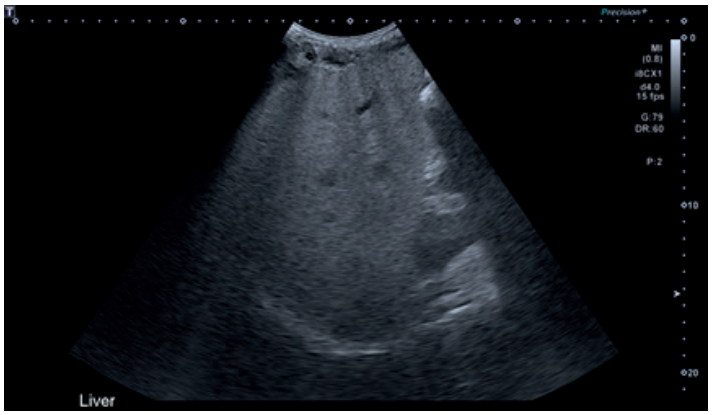
Patient History

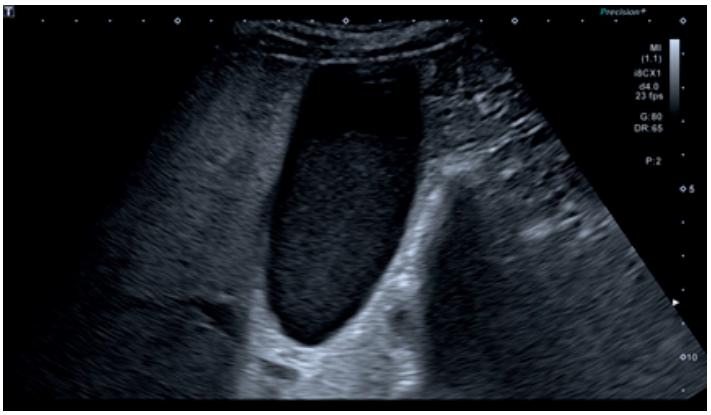
46 year old male presented to the FSH emergency department with right upper quadrant pain, nausea and reduced appetite over a six day period. The patient was a smoker, a poorly controlled Type 2 Diabetic, and had a raised BMI (45). The patient was afebrile. Anamnesis revealed a soft abdomen, with right upper quadrant guarding on palpation. Blood tests revealed elevated Bilirubin (26), ALT (53), GGT (180), mildly elevated lipase (132) and known hypercholesterolemia. The patient had a previous myocardial infarct with stent surgery at age 32, but had no other relevant surgical history.

An abdominal ultrasound was requested.

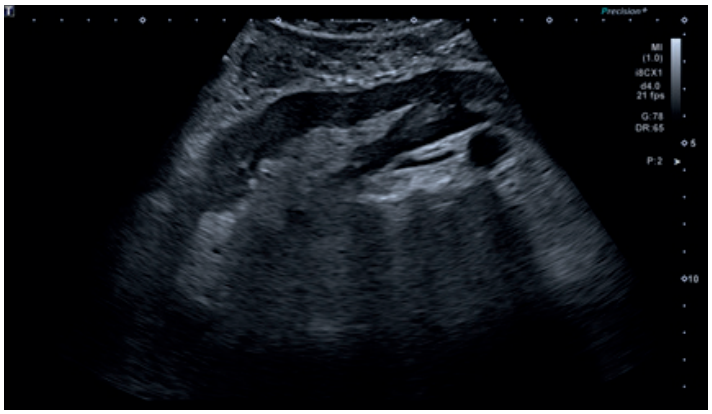
Findings



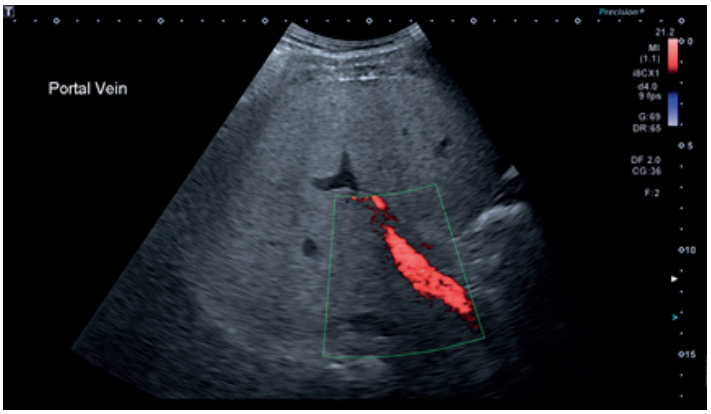
Liver – hepatomegly



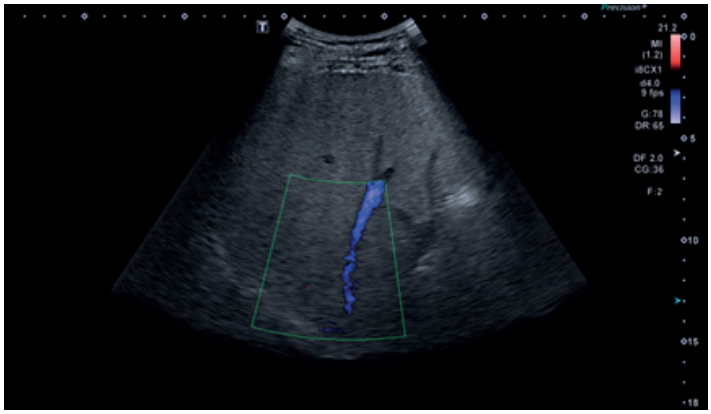
GB – thin walled gallbladder with internal echoes reflective of biliary stasis.



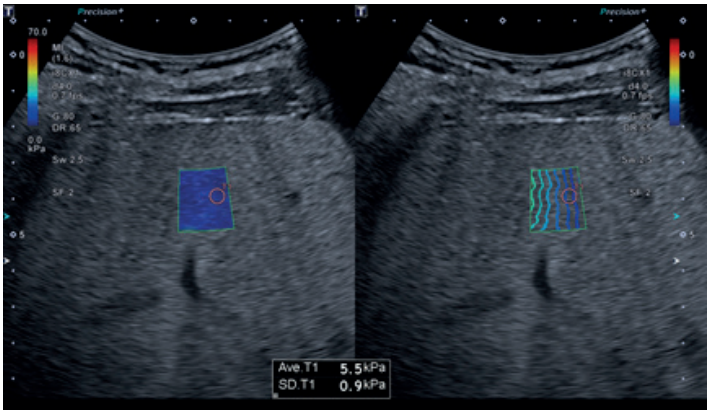
Horseshoe Kidney - incidental finding (Virgin Abdomen).



PV – patent portal vein exiting the liver at the porta hepatis



HV – patent main hepatic vein seen coursing towards the IVC.



Shear wave – SWE confirms the sonodense liver to be F0-1

Discussion

A systematic survey of the abdominal viscera was undertaken. The patient's high BMI and clinical presentation required a high resolution and large field of view ultrasound study. The new technologies on the Aplio™ i-series facilitated this through the use of Differential Tissue Harmonics, SMI to visualise deep hepatic vasculature and SWE to evaluate hepatic elasticity.

The patient's liver was found to be enlarged, with the right lobe measuring 180.3mm antero-posterior diameter in the mid-clavicular plane. The liver echotexture was increased, yet the posterior margin of the liver was visualised. Historically, sonography of highly attenuating livers impeded this. Since the Aplio™ i-series has been utilised, this criteria has been superseded. The department now relies on the diagnosis of sonodense livers by demonstrating reduced vascular markings in the periphery, and increased hepatic echotexture relative to the kidney. Furthermore, an hepatic SWE is undertaken.

The improved SWE on the iSeries increases diagnostic confidence in the estimation of liver stiffness. In this case, the B Mode imaging shows increased echogenicity, but it cannot differentiate advanced fibrosis or cirrhosis from fatty infiltration. The SWE tool demonstrates a low elasticity value (5.5 kPa – F0-1). This score indicates the increased echogenicity is due to fatty infiltration as opposed to a fibrotic or cirrhotic liver. Hence a diagnosis of NAFLD in association with the patient's hypercholesterolemia was likely.

Routine liver assessment at FSH requires demonstration of flow in the hepatic vessels. Due to the improved sensitivity of Doppler functionality on the iSeries, this can be achieved at greater depths. In this patient, flow was detected in the hepatic and portal veins. This enables the reporting radiologist to exclude venous thrombosis as a cause of acute LFT derangement.

Due to the patient habitus and hepatomegaly, the gallbladder was extrahepatic and superficial in location. Historically, optimal visualisation of this type of gallbladder would require extensive alterations in scanning factors, as well as transducer changes. On the Aplio™ i-series, imaging from the anterior image through to deep tissues has been improved to allow continuous scanning with one abdominal preset. This factor improves workflow, restricting scanning times and increasing efficiency. In this case, the gallbladder imaging clearly demonstrates a clear meniscus of echoes in a thin walled gallbladder, reflective of static bile salts associated with long term fasting.

The patient presented with no previous abdominal imaging or surgical history. Hence, an incidental finding of a horsehoe kidney was discovered. Again, due to the improved resolution throughout the field of view and at depth, the connecting renal isthmus was able to be identified.

The new Aplio™ i-series' improved efficiency in workflow, optimised ergonomics and advanced imaging results in a streamlined approach with a reduction in scan times. In this case, sixty seven images utilising B Mode, Doppler and SWE were collected in a fifteen minute scanning time.