

Introduction

The objective was to introduce an accurate, quantitative method of measuring liver stiffness and fatty infiltration, allowing early detection of diffuse liver disease. Early intervention and treatment of liver disease greatly improves prognosis (1-3).

Liver disease is prevalent in Western society due to lifestyle, diet, alcohol consumption and some medication (4, 5).

The risk of metabolic dysfunction-associated steatotic liver disease (MAFLD) is greater for patients with existing or potential health issues (figure 1). 20-30% progress to metabolic dysfunction-associated steatohepatitis (MASH), which can lead to advanced fibrosis, cirrhosis, primary liver tumour, portal vein thrombosis or liver failure.

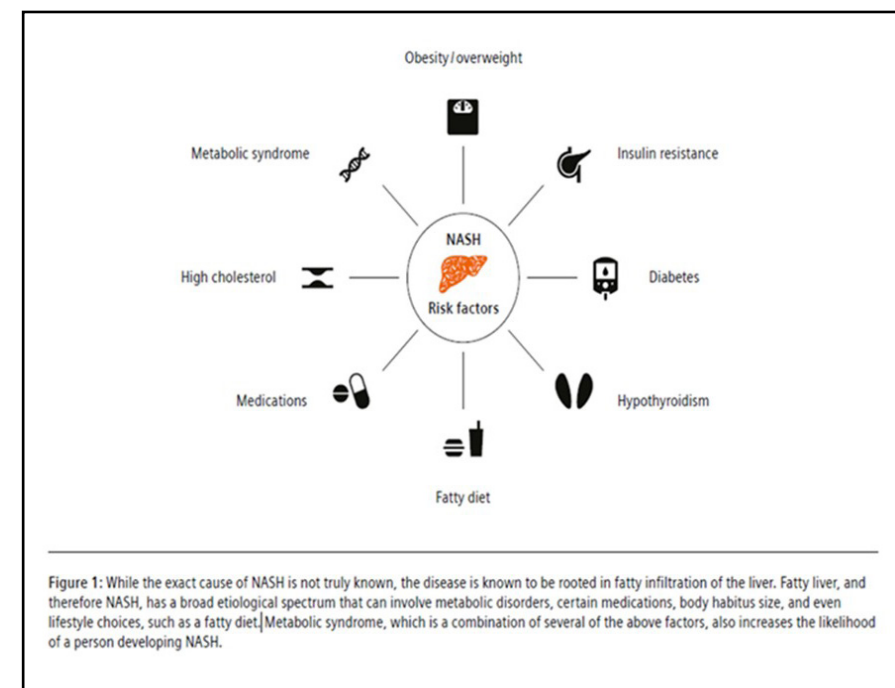


Figure 1 (image right). Risk factors for MASH (previously known as non-alcoholic steatohepatitis NASH)

Liver disease is often symptomless, complicating early identification and delaying potentially life-saving treatment. In 2023, the first ever relevant parliamentary debate described liver disease as a "silent killer", as many people are diagnosed too late for effective treatment.

Shear Wave Elastography: Shear Wave Elastography (SWE) provides a comprehensive, quantitative, liver assessment of tissue stiffness with Ultrasound Derived Fat Fraction (UDFF®) to measure hepatic fat. This can streamline patient care pathways, and potentially avoid invasive intervention.

Fibroscan machines (6) (figure 2), the current gold standard, use SWE to measure liver stiffness with no visual guide for data collection.



Figure 2. – Fibroscan machine

The advantages of combining conventional ultrasound and elastography for liver assessment are visual placement of measurements to avoid vessels, liver capsule and so forth ensuring accuracy, reproducibility, and best practice for optimum results (figure 3); Non-invasive, quantitative assessment of tissue stiffness overcoming complications and limitations of biopsy.



Figure 3. Siemens Healthineers ACUSON Sequoia Ultrasound System

Method

Funding was acquired and several ultrasound systems were trialed. Two Siemens Healthineers ACUSON Sequoia ultrasound systems were installed in December 2023 with the Liver Software Package incorporating SWE to measure liver stiffness and ultrasound derived fat fraction (UDFF®). Elastography training was provided by Siemens Healthineers.

Results are comparable with magnetic resonance fat analysis and valid for clinical application (figure 4). IQR is used to determine accuracy confidence level.

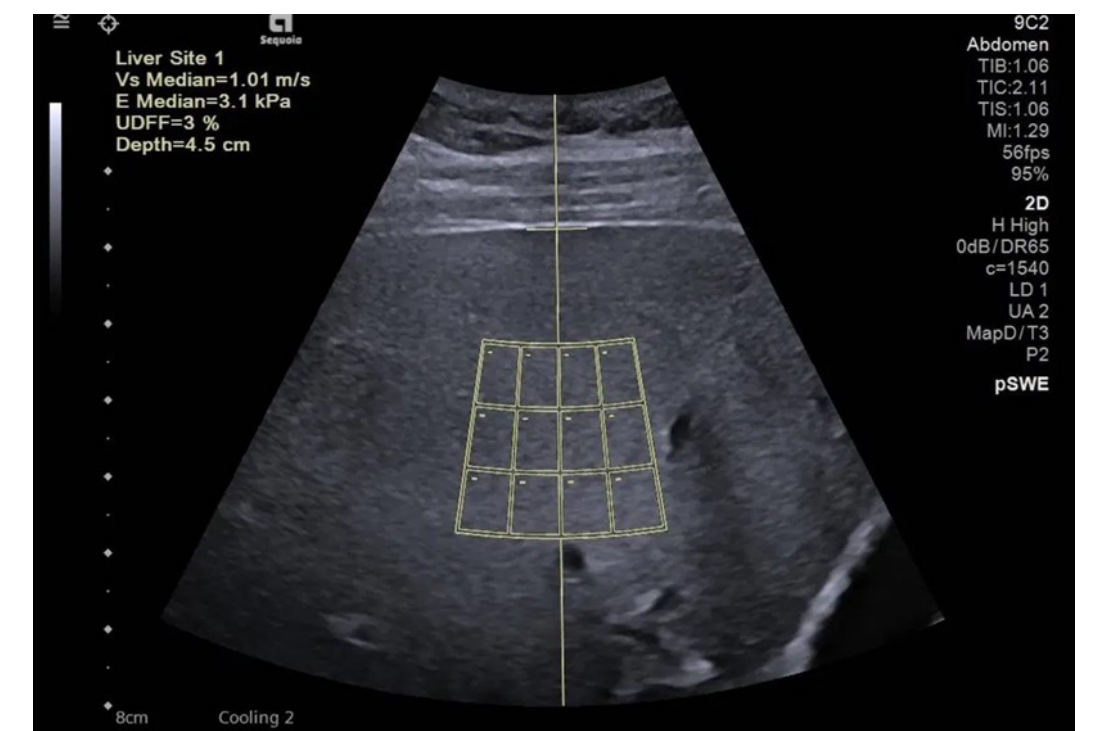


Figure 4. data collection box placement within the liver parenchyma.

Patients are referred through GI consultants, privately through GPs, through Benenden Healthcare membership and self-pay.

	Absent or mild fibrosis	Significant fibrosis	Severe fibrosis	Cirrhosis
Metavir Score	F0-F1	F2	F3	F4
Siemens Healthineers values*	1.2 m/s 4 kPa	1.3 m/s 5 kPa	1.5 m/s 7 kPa	1.7 m/s 9 kPa
Society of Radiologists in Ultrasound (SRU)*	1.3 m/s <5 kPa Likely Normal	1.5 m/s <7 kPa Unlikely cACLD	1.7 m/s 7-9 kPa Potential cACLD >9 kPa Suggestive of cACLD	2.1 m/s >13 kPa Highly suggestive of cACLD

Figure 5 – Siemens ACUSON Liver Software validity

Results

In the initial six months, we have received 103 referrals and the number of referrals is approximately two-to-three a week. The DNA rate is very low (1), however, two patients required rebooking due to not fasting for six hours as per instructions. One patient cancelled, no reason given. 95 have been examined successfully, the rest have appointments arranged or awaiting booking. Most patients are booked within five days and have an appointment within two weeks if possible.

Discussion

Patients tolerate the liver ultrasound and elastography and the breathing required with ease. The accuracy of the results is superior to Fibroscan due to visualisation of the liver throughout the quantitative data collection process. The patients breathing can be monitored to ensure the measurement is not taken on full inspiration to give optimum accuracy (full inspiration can compress the liver giving false positive results). The reports are written straight away, and emailed to the referrer.

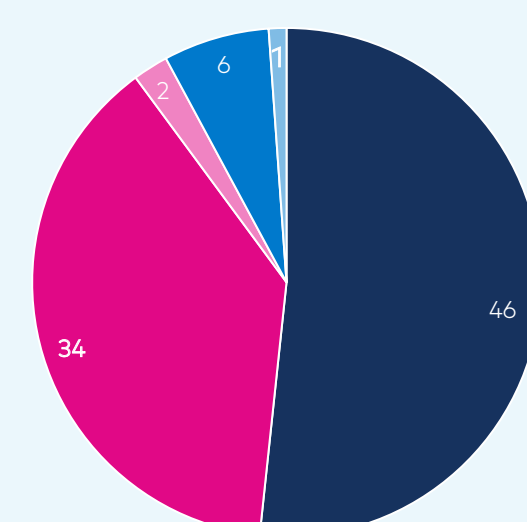
The GI consultants now refer for this service in preference to Fibroscan for a variety of reasons, logistical as well as improved accuracy and reproducibility.

An increasing awareness of this service in the community is reflected in the rising number of self-pay, private medical insurance and Benenden Health referrals.

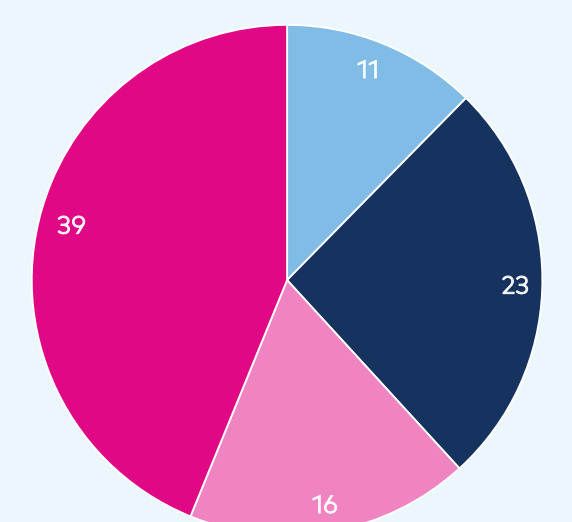
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Liver elastography : kPa scoring



Liver Elastography : UDFF scores



UDFF <5% is normal

