

Introduction to pSWE

In pSWE, focused acoustic radiation force is used to cause a focal micrometer tissue displacement. The resultant perpendicular shear waves are tracked in an approximately 1 cm³ region, yielding a shear wave speed estimate. pSWE technology is available on multiple ultrasound platforms and has been shown to be useful for the assessment of liver fibrosis caused by multiple etiological factors including, HBV, HCV, hepatic toxicity, alcoholic liver disease, and autoimmune hepatitis¹.

When and how to use pSWE

pSWE is useful in chronic liver (CLD) disease, where it can be used to stage liver fibrosis and risk stratify CLD patients. Unlike transient elastography, pSWE can be successfully performed in patients with perihepatic ascites. Higher values are expected at higher stages of liver fibrosis. As in other types of elastography, to get the most reliable shear wave speed values, patients should be positioned in the supine or left lateral decubitus position and the right arm should be elevated above the head. Ten measurements should be obtained from the right lobe of the liver at least 2cm beneath the liver capsule. When selecting the measurement location, vessels, bile ducts, rib shadows, and focal lesions should be avoided. pSWE imaging is best performed through an intercostal acoustic window, typically the right 7th or 8th intercostal spaces. Measurements should only be obtained after a minimum of four hours of fasting.

Accuracy and reliability of pSWE

pSWE is useful in differentiation of liver fibrosis stages. Reported area under the receiver operating curve (AUC) values to distinguish liver fibrosis stages range from 0.649 to 0.934 for METAVIR liver fibrosis stage F_{≥2}, 0.848 to 0.97 for F_{≥3} and 0.723 to 0.98 for F4². pSWE has been shown to have high reliability with reported ICC of 0.89 (95%CI, 0.85-0.92) for intra-observer and 0.85 (95%CI, 0.76-0.90) for inter-observer agreement³.

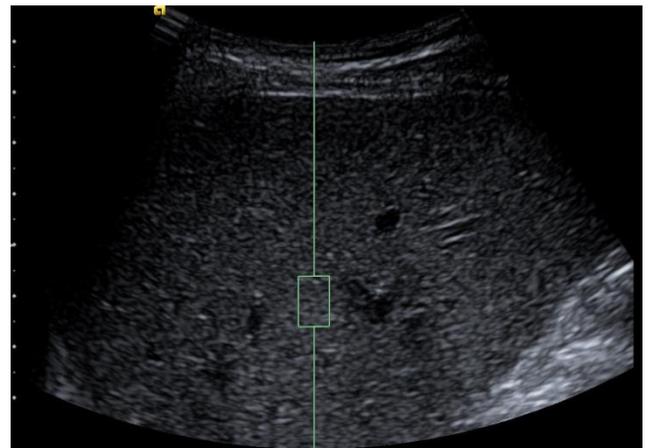
Limitations of pSWE

pSWE cannot accurately stage patients into individual liver fibrosis stages and should not be used for this purpose.

pSWE is more accurate for the diagnosis of cirrhosis than for the intermediate stages of liver fibrosis.

pSWE implementations vary across manufacturers. There

is presently limited evidence regarding variation of measurements between vendors, limiting comparability of results and seamless disease tracking when using different systems manufactured by different vendors. The correct number of measurements to ensure optimal accuracy is presently unknown, with a variety of different proposed strategies, depending on the vendor and/or expert guidelines selected.



The pSWE measurement location is selected on the B mode image pSWE does not provide a colorized stiffness “box”.

References:

1. Dhyani, M., Anvari, A. & Samir, A. E. Ultrasound elastography : liver. 698–708 (2015). doi:10.1007/s00261-015-0373-4
2. Hu, X., Qiu, L., Liu, D. & Qian, L. Acoustic Radiation Force Impulse (ARFI) Elastography for non-invasive evaluation of hepatic fibrosis in chronic hepatitis B and C patients: A systematic review and meta-analysis. *Med. Ultrason.* **19**, 23–31 (2017).
3. Balakrishnan, M. *et al.* Liver and spleen stiffness measurements by point shear wave elastography via acoustic radiation force impulse: Intraobserver and interobserver variability and predictors of variability in a US population. *J. Ultrasound Med.* **35**, 2373–2380 (2016).