

Hepatic Fibrosis Quantification Across Ultrasound Vendors: Principles and Practical Differences

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Ultrasound-based elastography has become an essential noninvasive tool for assessing liver fibrosis, providing quantitative measurements of liver stiffness that correlate with histologic disease severity. The fundamental principle relies on the relationship between tissue stiffness and shear wave propagation, whereby stiffer tissues transmit shear waves at higher velocities. Clinically, three main techniques are used: vibration-controlled transient elastography (TE), point shear wave elastography (pSWE), and two-dimensional shear wave elastography (2D-SWE). TE is the most extensively validated method, whereas pSWE and 2D-SWE offer the advantage of integration with conventional B-mode ultrasound, enabling simultaneous anatomical and functional assessment.

Despite their clinical utility, variability in liver stiffness measurements remains a critical limitation, particularly across ultrasound vendors. Key sources of variability include differences in shear wave excitation frequency, proprietary measurement algorithms, and acquisition parameters such as depth and region-of-interest (ROI) placement. Among these, acquisition depth has been identified as a major determinant of measurement variability. Although repeatability within individual systems is generally excellent, inter-system agreement is only moderate to good, with an overall variability of approximately 10%. Given that, liver stiffness values obtained from different platforms are not directly interchangeable.

To ensure reliable measurements, adherence to standardized acquisition protocols is essential. Current guidelines recommend fasting, adequate patient positioning, appropriate probe orientation, and strict quality criteria such as an interquartile range-to-median ratio of less than 30%. Interpretation of liver stiffness should be performed in the clinical context, accounting for potential confounders including inflammation, cholestasis, and hemodynamic factors. Given the overlap between fibrosis stages, contemporary approaches emphasize risk stratification, particularly the identification of compensated advanced chronic liver disease, rather than precise histologic staging.

This presentation will review the fundamental principles of ultrasound-based elastography, discuss key sources of variability, and highlight standardized acquisition protocols to ensure reliable and clinically meaningful measurements.