# Ultrasound Liver Elastography – A New Accepted Vendor-Neutral Rule of Four

*Article Review*

BARR, R. G., WILSON, S. R., RUBENS, D., GARCIA-TSAO, G. & FERRAIOLI, G. 2020. Update to the Society of Radiologists in Ultrasound Liver Elastography Consensus Statement. *Radiology,* 296**,** 263-274.

The statement review article, 'Update to the Society of Radiologists in Ultrasound Liver Elastography Consensus Statement', was published by the RSNA in April 2020. With the significant improvement in acoustic radiation force impulse (ARFI) technology and addition of shearwave propagation, the delta change in liver stiffness measurements are now rendering a non-invasive diagnostic tool for compensated advanced chronic liver disease (cACLD). This article confirms the panel's recommendation of a vendor-neutral rule of four for interpretation of liver stiffness results to simplify and provide a more consistent approach for the interpretation process.

Liver cirrhosis can be a silent asymptomatic progressive disease which sometimes only shows symptoms when signs of decompensation begin to occur; namely consequential effects such as ascites, variceal haemorrhage and hepatic encephalopathy (Heidelbaugh & Bruderly 2006). This severe form of asymptomatic liver disease is termed compensated advanced chronic liver disease (cACLD). In these patients, the degree of portal hypertension by means of measuring the hepatic venous pressure gradient (10mmHG or higher) is predictive of decompensation and/or death (Augustin, Pons & Genesca 2017). Liver biopsy is the most commonly used tool for staging fibrosis however studies have shown considerable interobserver variability and its invasive nature renders this technique both time consuming and invasive with risk to patients who need longitudinal monitoring (Goodman 2007, Pavlides et. al 2017).

The panel recommends the use of a vendor neutral 'rule of four' for patients with viral hepatitis or NAFLD (non alcoholic fatty liver disease) as follows:

| **Liver stiffness** | **?cACLD** |
|---|---|
| ≤5 kPa (1.3 m/sec) | Normal (high probability) |
| < 9kPa (1.7 m/sec) | Rules out cACLD in absence of other clinical signs. If there are known clinical signs, may need further testing for confirmation of cACLD. |
| 9-13 kPa (1.7-2.1 m/sec) | Highly suggestive of cACLD but needs further testing for confirmation. |
| 7 – 9 kPa in patients with NAFLD | follow up or additional testing required to confirm cACLD |
| >13kPa (2.1 m/sec) | Rules in cACLD |
| >17kPa (2.4 m/sec) | Suggestive of clinically significant portal hypertension (CSPH) |

Based on the results of over a thousand patients from prospective and retrospective studies, the delta change of liver stiffness values over time using the same equipment should be utilised instead of the use of absolute values according to the RSNA. Each patient will be their own control and a delta change of greater than 10 percent is considered clinically significant. This 10 percent is due to the 10 percent variability in measurements that exists within a vendor and between vendors. Some

patients with known chronic viral hepatitis who have been successfully treated should have their baseline liver stiffness reading obtained after viral eradication or suppression post treatment. Guidelines for patient positioning and how to perform shearwave elastography for liver stiffness assessment is detailed in the article.

The article also elaborates on assessing liver stiffness in paediatric patients which is greatly beneficial in this context as it avoids the need for a liver biopsy. NAFLD is the most common cause of chronic liver disease in these patients. The RSNA advises the same process of liver elastography used on adults for the paediatric population. If the child cannot hold their breath, a 2D SWE cine loop should be obtained for about 30 seconds and the image with the most stable pattern for stiffness measurement can then be retrospectively chosen for assessment. Only one image should be taken from each cine loop. In saying this, it is important to stress that the rule of four cannot be applied yet to the paediatric population due to the lack of literature in this area to support its use.

The article also touches on the value of assessing splenic stiffness using shearwave elastography (SWE). The spleen is stiffer than the liver and the literature supports that portal hypertension leads to splenic congestion which in turn increases splenic stiffness (Colecchia et. al 2012). Increased splenic stiffness can indicate splenic fibrosis but this should only be assessed in patients with cACLD as lower levels of fibrosis do not exhibit significant portal pressures (Mejias et. al 2010). In saying this, the panel stresses that there are no agreed cut-off values yet for splenic fibrosis assessment, however, this may be a useful application for patients with portal hypertension in the future.

In summary, liver stiffness assessment can be used for all conditions that lead to an increase of liver stiffness including non-fibrotic causes such as congestive heart failure. Reporting should include the system vendor name, the SWE technique (pulse SWE or 2DSWE), the probe that was used, the IQR/M (should be ≤30%), number of acquisitions and conclusions. The conclusion should include the rule of four as previously described and an example of a report is demonstrated in the article. The accepted vendor rule of four simplifies the interpretation of liver stiffness results and will allow for a more reliable comparison of liver stiffness readings across different machines.

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