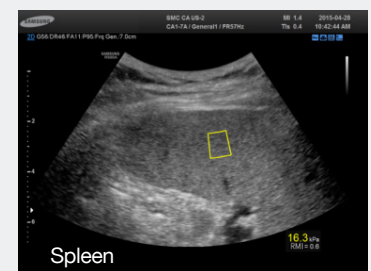


# Liver stiffness measurement using S-Shearwave : initial experience

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*“ Liver stiffness measurement using S-Shearwave is comparable to that of using transient elastography. And RMI(Reliable Measurement Index) can be a standard index to compute the reliability of calculated/measured stiffness. ”*

## Introduction

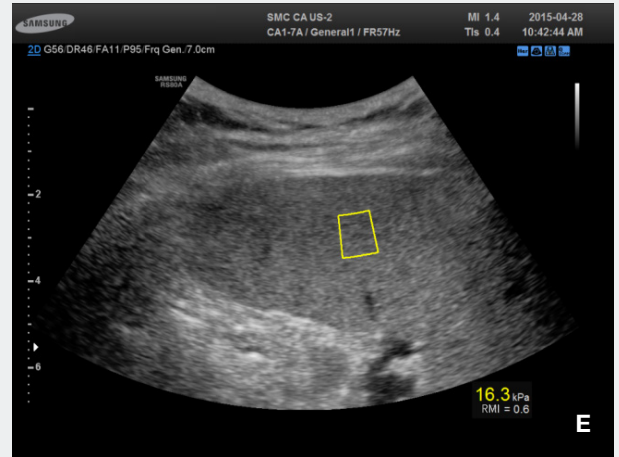
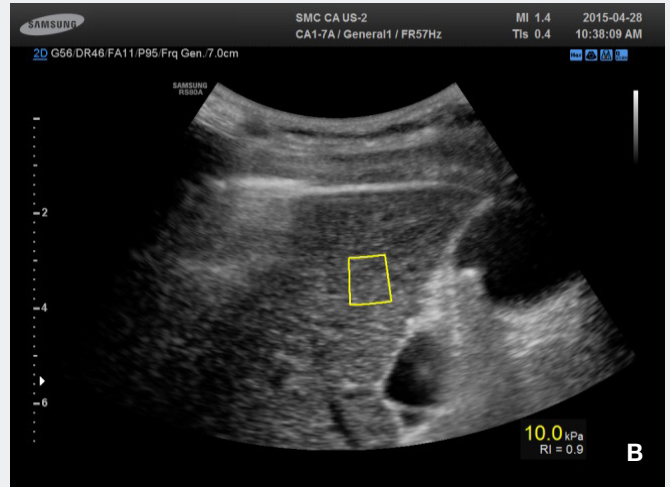
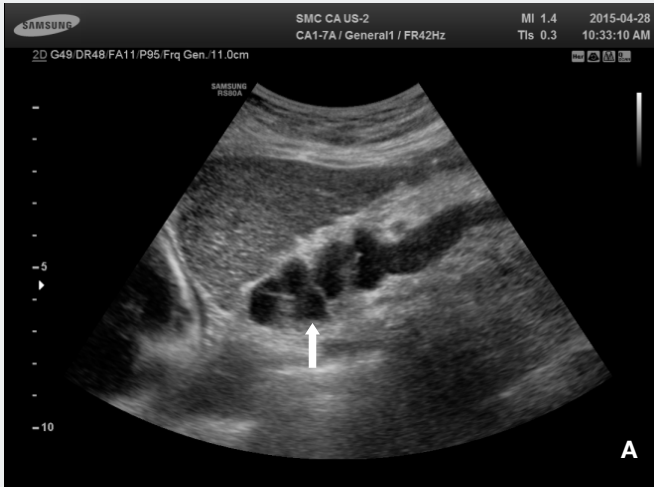
Accurate assessment of the degree of liver fibrosis is important to estimate patients' prognosis and decide on an appropriate course of treatment for cases of chronic liver disease with various etiologies.<sup>1</sup> Various non-invasive methods have been developed to estimate the degree of liver fibrosis and portal hypertension. Also, ultrasound elastography including transient elastography and shear wave-based elastography is very promising and many evidences about clinical applicability have been published by researchers. S-Shearwave installed in RS80A with Prestige is a technology enables quantitative analysis of tissue stiffness for assessing liver fibrosis. And Reliable Measurement Index (RMI) displayed with stiffness, a new parameter which indicates reliability of the measurement and an interquartile range (IQR) of all successful measurements of median value, may help to evaluate the measured stiffness. This paper includes some clinical cases of S-Shearwave and the usefulness of RMI in practice.

## CASE 1



A 49-year-old woman with primary biliary cirrhosis underwent ultrasonography with S-Shearwave. Grayscale intercostal image shows heterogeneous echotexture and multiple hyperechoic nodules in the liver (A,B). Median value of 11 measurements was 5.3 kPa with 30.2% of interquartile range per median (IQR/Med) (C). The patient had undergone transient elastography 2 years before, and the liver stiffness measurement was 6.4 kPa (D). Liver biopsy was performed for pathologic diagnosis, and revealed to primary biliary cirrhosis (stage III). During follow-up, there was not any evidence of portal hypertension nor development of hepatocellular carcinoma on ultrasonography and all the laboratory findings were within normal range except hemoglobin (below 10 mg/dL).

## CASE 2



A 77-year-old woman who had HCV hepatitis underwent ultrasonography with S-Shearwave. Grayscale sagittal image shows a nodular surface of the liver and tortuously engorged varices (arrow), and the patient was diagnosed as cirrhosis (A). Liver stiffness measured at segment V of the liver is 10.0 kPa with 0.9 of RMI, which represents F3 (severe) or worse degree of fibrosis when the cut-off of transient elastography is referred (B). On the collective data, 12 measurements were performed and median value was 10.2 kPa and its interquartile range per median (IQR/Med) was 42.9% (C). However, when the measured values which are smaller than 0.8 of RMI were excluded to the final calculation, the median value of stiffness was 9.4 kPa and IQR/Med was 21.3% (D), which is in acceptable range as valid measurements. The stiffness of the spleen can be measured by S-Shearwave, which represents the degree of portal hypertension in the patients with cirrhosis. In this case, the value of splenic stiffness was 16.3 kPa with 0.6 of RMI (E), which could be diagnosed to clinically significant portal hypertension.

## CASE 3



Fatty liver is another challenge to US elastography. A 40-year-old man with severe fatty liver visited hospital, and US elastography was performed. A Grayscale image showed bright echogenicity of hepatic parenchyma which attenuated when the parenchyma becomes deeper (A). Collective data of liver stiffness measurement showed that a median stiffness of 11 measurements was 3.5 kPa and IQR/Med was 22.9% (B). The result can be interpreted as the patient has just a simple fatty liver without any significant fibrosis and all of the measurement result was reliable (RMI:  $0.9 \pm 0.1$ ).

## Discussion

Using S-Shearwave for liver stiffness measurement, overall result values seem to be similar to that of transient elastography, and somewhat lower than that of SSI method. And RMI (Reliable Measurement Index) indicates reliability of the measurement, and if it is higher than 0.8, it may guarantee to obtain the measurement within 30% of IQR/Med. RMI over 0.5 is generally recommended to be selected. However, the selection can be easily edited if the users feel necessary to remove a certain point.

## Summary

S-Shearwave for liver stiffness measurement is a simple and reliable method for liver stiffness measurement, even under severe fatty liver. The liver stiffness measurement by S-Shearwave is comparable to transient elastography. And Reliable Measurement Index (RMI) is a unique parameter to compute the reliability of the measurements to support selection for measured values obtained from S-Shearwave, and it could be a standard index for reliability of US elastography.

## Supported Systems

- RS80A with Prestige

## References

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