



Aixplorer® Tips

Imaging of Liver using ShearWave™ Elastography on Aixplorer®

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Introduction

From a clinical standpoint, staging liver fibrosis is of major importance^{1, 2}:

- to assess a prognosis
- to follow up the evolution of chronic liver diseases (cirrhosis or hepatitis)
- to monitor the action of antifibrotic treatments

ShearWave™ Elastography (SWE™) performed with Aixplorer® is a 2D imaging mode^{3,4} that provides a view of the organ and a map of stiffness over the region of interest from soft to hard color.

Apart from fibrosis, many studies demonstrated the influence of several clinical factors on liver stiffness:

- Respiration⁵, deep breath
- Central venous pressure & portal hypertension^{2, 6}
- Intrahepatic cholestasis⁶⁻⁷
- Hepatic necro-inflammatory activity (steatosis⁸, for example)
- Peliosis hepatitis (affection of the liver parenchyma vasculature)
- Thrombosis of hepatic vein (clot)...
- Congestive hepatopathy⁹

They have to be considered when assessing liver stiffness.

The known limitations of conventional ultrasound examination also apply for the SWE™ mode: narrow intercostal spaces, thick layer of fat...

Noteworthy: the presence of ascites is not a limitation for the evaluation of liver fibrosis with SWE™.

References

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9. Ultrasound-based Hepatic Elastography Origins, Limitations, and Applications, Eric B. Cohen, MD* and Nezam H. Afdhal, MDw (J Clin Gastroenterol 2010;44:637-645).
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Imaging & Analysis Protocol

1- The patient

- He/she lies in the supine position, with the right arm in maximum abduction. This makes the right hypochondrium accessible.
- Fasting is mandatory.
- Normal breathing is recommended.



2- The probe

- Choose the SC6-1 curved probe, with the preset "**Liver**" in the "Abdominal" application.
- Scan intercostally with a possible pressure of the probe that will be absorbed by the ribs without impacting soft tissue.
- The patient can be scanned subcostally, although it is not recommended. In this case, apply the slightest compression which may be required for visualization in B-Mode.
- Slow or even no movement of the probe is recommended to avoid motion artifact and to allow the stabilization of the map.



The SWE™ acquisition of the right lobe is recommended in priority. However, if it has to be performed on the left lobe, apply the slightest compression, which may be required for visualization in B-Mode.

Be aware that the SWE™ acquisition on the left lobe is more subtle and requires no pressure.

3- The SWE™ and B-Mode images

Ensure a perfect B-Mode image before engaging the SWE™ Mode and placing the SWE™ box.

- The B-Mode image needs to be optimized as best as possible.
- Enlarge the intercostal space, by using correct patient positioning and gentle pressure on the probe.
- Ensure the best possible contact between the probe and the skin.
- Avoid the ribs (shadowing).

4- The SWE™ map

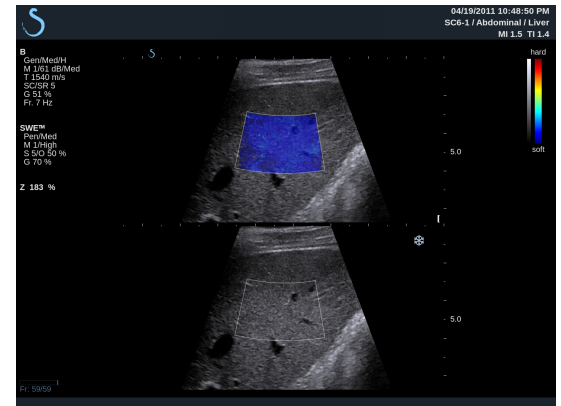
The SWE™ default settings have been optimized to image a wide range of fibrosis levels.

Run the first exam with the default settings.

Adjust them only if it is necessary.

a. The SWE™ Box

- Move it onto a vessel-free parenchyma.
- Place it within a zone of uniform parenchyma as defined by the B-Mode image.
- The most robust acquisition is performed from 3 to 7 cm in depth.
- It is recommended to avoid placing the SWE™ Box close to the liver capsule.



b. The SWE™ Optimization (Res/Std/Pen)

If a lack of SWE™ signal is observed, turn to "Penetration".



c. Freezing the image

- The patient is asked to hold his/her breath for at least 4 seconds during the expiration phase.
- This delay allows sufficient filling of the SWE™ box and stabilization of the image in a no-movement context.
- Freeze.

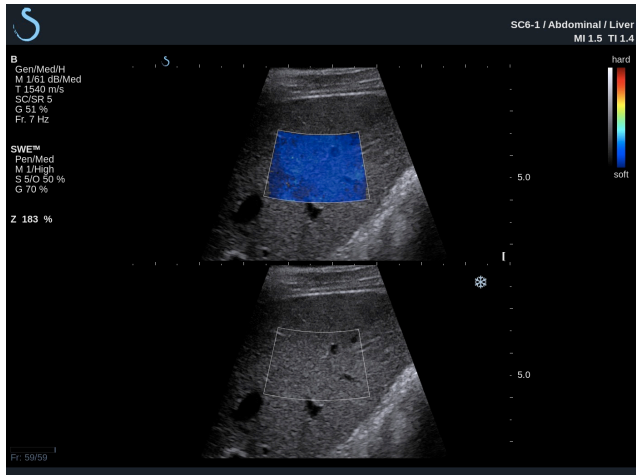
d. Assessing the reliability of the SWE™ acquisition

- This procedure is repeated 3 times in order to acquire 3 independent SWE™ images of the same scanning view.
- If the 3 acquisitions are not similar, it is recommended to consider the test a failure.

5- SWE analysis

The above recommendations being exactly applied, the analysis of the map can be performed.

A shade varying from blue to red indicates an increase in liver stiffness.

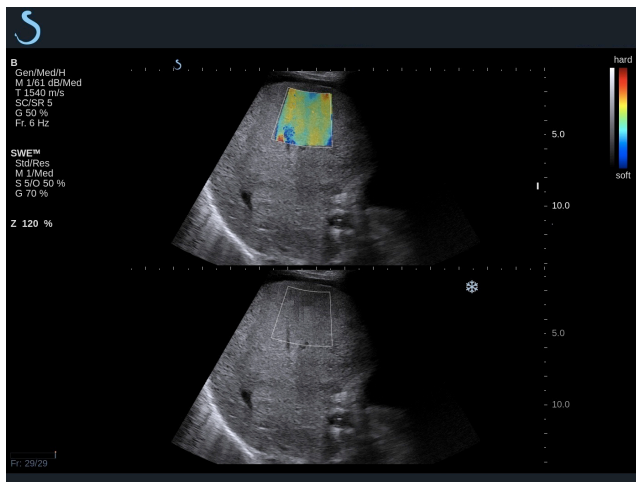


Homogeneous, dark blue

Normal liver stiffness

Analysis of the SWE™ Map:

- Homogeneity: very good
- Dominant maximum color: dark blue

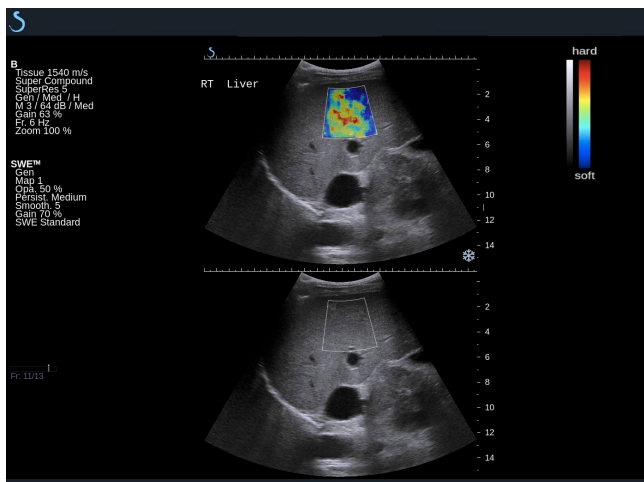


Not homogeneous, light blue and green patterns

Medium liver stiffness

Analysis of the SWE™ Map:

- Homogeneity: fair
- Dominant maximum color: yellow



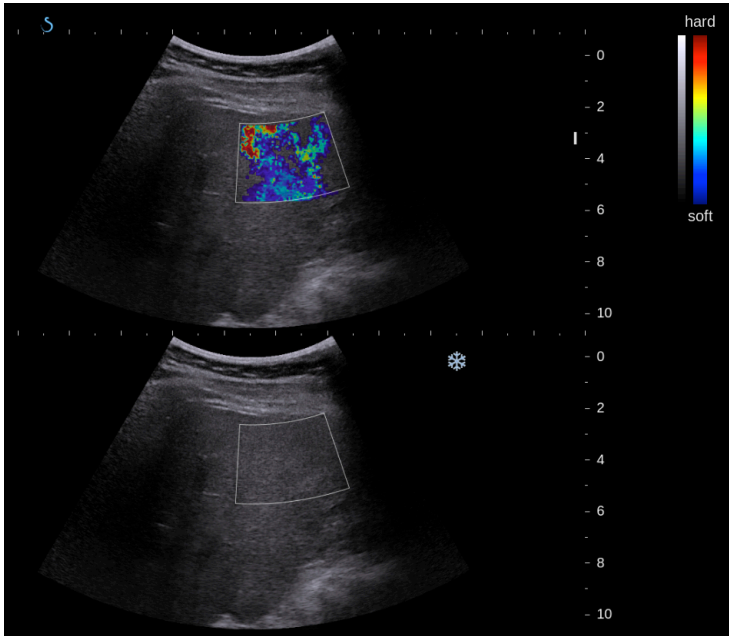
Not homogeneous blue, green, up to red patterns

High liver stiffness

Analysis of the SWE™ Map:

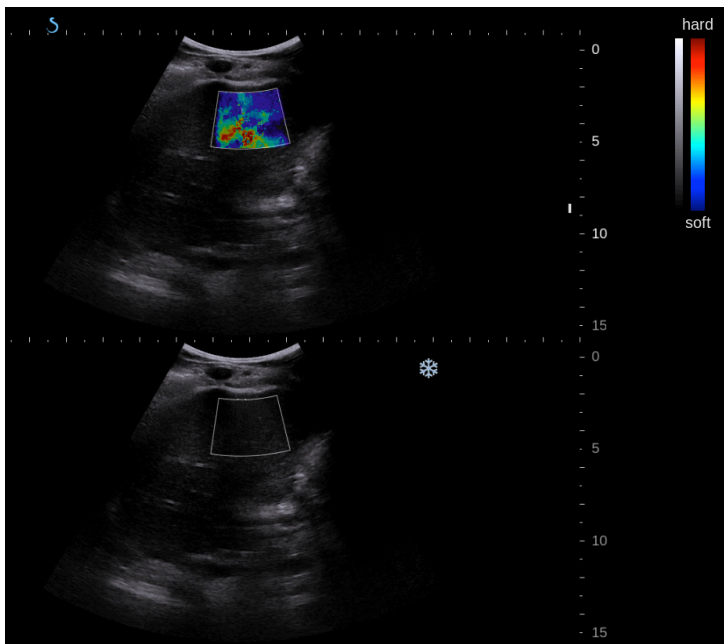
- Homogeneity: heterogeneous
- Dominant maximum color: orange

Examples of acquisitions that should not be considered as successful



SWE box underneath the liver capsule, liver motion due to patient respiration, rushed acquisition.

Not reliable for the SWE map and lack of SWE signal.



B-Mode: shadowing, poor image quality, rushed acquisition.

Not reliable for the SWE™ map.