

Quick Guide

Breast Elastography

NTE

Natural Touch Elastography

STE

Sound Touch Elastography

STQ

Sound Touch Quantification



Natural Touch Elastography (NTE)

Strain Elastography (SE)

Natural touch

- No manual compression
- Compression by respiratory movements

Stable real-time visualization

- High quality B/Elasto image
- Relative strain in the tissue is displayed in color coded image

Pressure indicator

• Strain E Curve: Display the intensity and stability of the pressure for acquiring an adequate elastography image

Unique shell analysis

- Provide the stiffness of the surrounding tissue of malignant breast lesions
- A good tool for assessment of infiltrating breast tumor

Sound Touch Elastography(STE) & Sound Touch Quantification (STQ)

Shearwave Elastography(SWE)

Real time imaging

- More diagnostic information
- Immediate results in a real-time with good reproducibility
- Generate a real time quantitative map of tissue stiffness

High frame rate & Better penetration

- HFE (High frame rate Elastography): Shear wave imaging obtains high frame rate for realtime
- HQE (High quality Elastography): Improvement in the penetration of shear wave, Diagnosis for hard, deep and large tumors

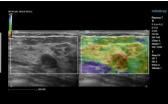
Quality control

- M-STB: Indicator for the stability of tissue motion
- RLB Map/Index: Indicator of the reliability of shear wave
- Elasto bar: Elasticity analysis in multiple frames to improve the accuracy and reliability

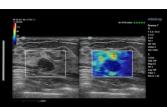
Quantification analysis

- E-Avg: Statistics of multiple measurements resulted from serial frames
- Measurement results:
 ROI depth, ROI size, E
 mean/max/min
- Overall statistics:
 Median, IQR,
 IQR/Median, Average,
 STD, STD/Average
- Shell quantification toolbox
- Report





Sound Touch Elastography





Use NTE enabled transducer and system, select Breast exam

Keep the probe lightly touching the skin and still, try not to apply pressure or give "minimal vibration"

Touch the "Elasto" and choose "StrainE" on the touch screen

The ROI should partly include subcutaneous tissue and the pectoralis muscle

No need to hold the breath, Compression by respiratory movements

If necessary, adjust "Opacity" and "E scale" on the touch screen using knob button to change the color transparency and elasticity

NTE Imaging needs to continue until the color of the entire target is completely stable

Freeze and select an optimal NTE image for interpretation

Press "Measure" button, choose strain ratio to classify lesions and save the result (A: Lesion, B:Reference-Fat)

You can also classify lesions using visual scoring system which is a five-point scale that visually grades the stiffness of a lesion (Tsukuba score=Elasticity score)

Go to the report

^{*}Note: Features may vary depending on machine models/software version



Use STE/STQ enabled transducer and system, select Breast exam

Keep the probe lightly touching the skin and still, try not to apply pressure

Touch the "Elasto" and choose "STE" on the touch screen

The ROI should partly include subcutaneous tissue and the pectoralis muscle

Ask the patient to hold the breath

Acquire STE image when the image looks constant and stable (Elasto bar looks constant when Fixed-ROI is on)

Freeze image and select an optimal image, RLB index > 80% and M-STB stars show green

Press "measure" button, choose "Mass" to quantify maximum stiffness of the lesion

You can use "Shell thick" function to evaluate the infiltration of the lesion (2mm is recommended)

Repeat STE acquisition to get reliable result

Go to the report

Touch the "Elasto" and choose "STQ" on the touch screen

Put the fixed ROI at the location of the desired measurement

Ask the patient to hold the breath

Press "Update" to activate STQ

Freeze the image when the elasto bar looks constant & stable and M-STB stars show green

Select a single or multiple frames using "E Avg" knob button and save it

5 to 10 measurements are needed to obtain a median value

Go to the report and deselect any low reliable result



Recommended imaging techniques

- > Elastography should be performed and interpreted along with standard B-mode imaging.
- ➤ Obtain a good B-mode image to get a good elastography image.
- Keep the angle of the probe perpendicular to the skin.
- Strain Elastography
 - Compression or vibration methods
 - No Manual Compression Keep the probe lightly touching the skin and try not to apply pressure
 - "minimal vibration" is recommended for elastography imaging of minute lesions. In the case of deep lesions, however, "significant compression" may be better for acquiring an adequate elastography image.
 - ROI
 - The ROI should partly include subcutaneous tissue and the pectoral muscle for a more consistent scale range, and it should be expanded to its maximal width to express relative values more accurately. Ribs and lungs should not be included.
 - Imaging time
 - Imaging needs to continue until the color of the entire target is completely stable in order to acquire reliable results.
 - Classification by interpretation
 - Tsukuba score: five-point scale that visually grades the stiffness of a mass
 - EI/B ratio: the ratio of the lesion size on elastography to the B-mode size
 - Strain ratio: fat-lesion ratio (FLR), Numerical value to the stiffness

> Shear Wave Elastography

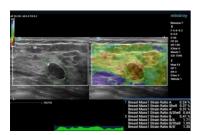
- Multiple measurements within the lesion and surrounding tissue need to be obtained to acquire optimal measurements
- The best performing SWE features were the quantified maximum stiffness of the lesions (inside or on the periphery) as E Max measurement
- Shear waves do not propagate in low viscosity liquids; therefore, simple cysts will not be color-coded.
- Quality measure tools will help in eliminating possible false negative cases .
- Classification by interpretation: kPa (unit of stiffness), m/s (unit of shear wave speed)

Cautions

- > SE should not be used if the lesion is larger than the FOV box.
- Accuracy of the SE differs between shallow sites and deep sites due to problems associated with propagation of vibration energy.
- ➤ Elastography (SE or SWE) should not be used when a lesion is very superficial (<3 mm) from the skin surface.



NTE

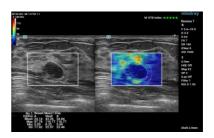


Interpretation 1) Elasticity score (Tsukuba score)

- A five-point scale that visually grades the stiffness of a mass.
- If a lesion is classified between 1 and 3, it is considered benign; if classified 4 or 5, it is considered to be malignant.



STE & STQ



Interpretation) Stiffness and Shear wave speed

- kPa (unit of stiffness), m/s (unit of SWS)
 :Quantitative values calculated for the Shear wave speed determined by stiffness in Shear Wave Elastography system.
- The best performing SWE features are the quantified maximum stiffness of the lesions (inside or on the periphery)
- A: Mass area, Shell: Shell area,
 A/Shell: A-Shell ratio, A': Mass + Shell area

Interpretation 2) Strain ratio

- Relative numerical value to the stiffness (tissue elasticity)
- fat-lesion ratio (FLR)
- ROI A: Lesion, ROI B: Fat, B/A: fat-lesion ratio