The addition of elastography to every breast ultrasound has now produced a positive biopsy rate in excess of 80% because fewer biopsies that are later found to be unnecessary are performed.”

Richard G. Barr, MD, PhD, FACR, FSRU, FAIUM

Overview
The eL18-4 PureWave linear array transducer is used by clinicians at Southwoods Imaging as a state-of-the-art solution for breast imaging that enhances diagnostic confidence through powerful tools such as excellent B-mode imaging (Figure 1), integrated ElectroMagnetic (EM) tracker, strain and shear wave elastography, and MicroFlow Imaging.

In addition, panoramic imaging is useful to assess diffuse disease, identify large amounts of fibrocystic change, and mark the distance between two lesions (Figure 2). Whenever we are doing breast imaging, excellent image quality and full solution elastography are essential to make a confident diagnosis and aid in patient care.

The Philips eL18-4 PureWave linear array transducer is our first high-performance transducer featuring ultra-broadband PureWave crystal technology with multi-row array configuration, allowing for fine-elevation focusing capability.

Figure 1 The eL18-4 transducer features exceptional detail resolution and tissue uniformity (right), with seamless trapezoid imaging (left).

Figure 2 Panoramic imaging (left) captures information beyond a single field of view (right) and aids surgical planning.
One of the challenges of shear wave elastography is that very stiff cancer lesions may be displayed as soft, which results when a lesion is so hard that the shear wave does not propagate through it and is then represented as soft. Using a combination of strain and shear wave elastography allows determination of true positives for greater diagnostic certainty. The eL18-4 transducer offers 2D shear wave imaging in real time. Using elastography during biopsy allows the stiffest area in a lesion to be targeted. Also, several cases that at first suggested a single lesion on B-mode were revealed to be two lesions (benign and malignant) when elastography was also used. Without the additional information offered by elastography, there is potential to biopsy a fibroadenoma that happens to be situated close to a malignant lesion, rather than the malignancy itself (Figures 3 and 4).

**Figure 3** The resultant stiffness can be measured in either kPa or m/sec. This fibroadenoma on the left demonstrates a low stiffness value versus the malignancy on the right, which shows very high stiffness values.

**Figure 4** One of the challenges of shear wave elastography is that very stiff cancer lesions may be displayed as soft, which results when a lesion is so hard that the shear wave does not propagate through it and is then represented as soft. Using a combination of strain and shear wave elastography allows determination of true positives for greater diagnostic certainty.

**ElastQ Imaging shear wave elastography during biopsy**

The eL18-4 transducer offers 2D shear wave imaging in real time. Using elastography during biopsy allows the stiffest area in a lesion to be targeted. Also, several cases that at first suggested a single lesion on B-mode were revealed to be two lesions (benign and malignant) when elastography was also used. Without the additional information offered by elastography, there is potential to biopsy a fibroadenoma that happens to be situated close to a malignant lesion, rather than the malignancy itself (Figures 3 and 4).
ElastQ Imaging confidence map
The ElastQ Imaging confidence map smartly analyzes echo and shear wave signal and provides an indication of quality across the stiffness map. This assists the user in obtaining measurements from the areas with the highest shear wave quality with designating areas as green (“Go”), yellow (“Caution”) and red (“Stop”) (Figure 5).

Quantitative ElastQ Imaging
Choose stiffness values either in kPa or m/sec. Values of 60 kPa, corresponding to 4.5 m/sec, mark the practice’s cutoff value between benign and malignant lesions (Figure 6).

Strain elastography
Philips Strain elastography algorithm requires very little motion to produce strain maps. In most cases, the practice finds that just holding the transducer very still or using the patient’s breathing offers enough motion for an excellent elastogram. Use of the elastographic lesion length to B-mode lesion length ratio has been found to be a sensitive technique for cancer diagnosis (Figure 7).

Full solution elastography (strain and ElastQ Imaging)
In this case (Figure 8), both strain and shear wave elastography were negative for malignancy, and the lesion was a fibroadenoma upon biopsy. Diagnostic confidence is enhanced when both techniques produce the same results.
Results from case studies are not predictive of results in other cases. Results in other cases may vary.

Reference