



Without the use of SWE, this lesion may have gone undetected. The left MLO demonstrates a small 0.7 cm parenchymal thickening.



The CC view is negative.

Evaluating the impact of ShearWave Elastography

By Kamilia Kozlowski, M.D.



Over the past two decades radiologists have witnessed the introduction of several new imaging technologies into the breast center, including digital mammography, magnetic resonance imaging (MRI), tomosynthesis and advanced ultrasound technologies. Incorporating these technologies in clinical practice is a decision that is not taken lightly. Finding the balance between efficacy and outcomes can be difficult to evaluate.

Factors to consider

For a clinical breast radiologist, keeping up with the latest technologies that can impact the ability to find early breast cancers is critically important. Ultrasound has been used for many years in the breast center, and clinical

studies have demonstrated that adding ultrasound to mammography improves detection. This improvement may come with a drawback — an increase in the number of false-positive results¹. This increase in false-positives can lead to unnecessary biopsies, which can result in a reduction in diagnostic confidence for the radiologist and added stress for the patient.

One technological advance, ShearWave Elastography (SWE), has brought new appeal to how ultrasound can be used as a powerful tool within the breast center, without the shortcomings.

SWE provides quantitative information about tissue elasticity to the breast radiologist. After fast-moving shear waves are sent through the tissue, their propagation speed is calculated, and a color-coded, real-time SWE map is produced showing quantitative (in kilopascals or m/s) local tissue stiffness.

Quantification of the stiffness of the lesion

and its surrounding tissue provides important information to the clinician. The ability to quantify tissue elasticity can have an impact on the Breast Imaging-Reporting and Data System (BI-RADS) classification, location and morphology of a specific lesion. As a result, the physician is able to use the information for more accurate diagnosis and planning.

Clinical impact

SWE provides critical data that has resulted in a reduction in the number of unnecessary biopsies, has helped prevent false negative diagnoses and has improved overall diagnostic confidence and patient management^{2, 3}.

In an effort to evaluate the impact of SWE on our clinical practice we compared data from before the addition of SWE with data post-SWE. The data demonstrates an increased yield of cancer diagnoses in ultrasound-only findings in women who have a negative mammogram.

The only change in variable in the ultrasound evaluation was the addition of SWE to complement the evaluation.

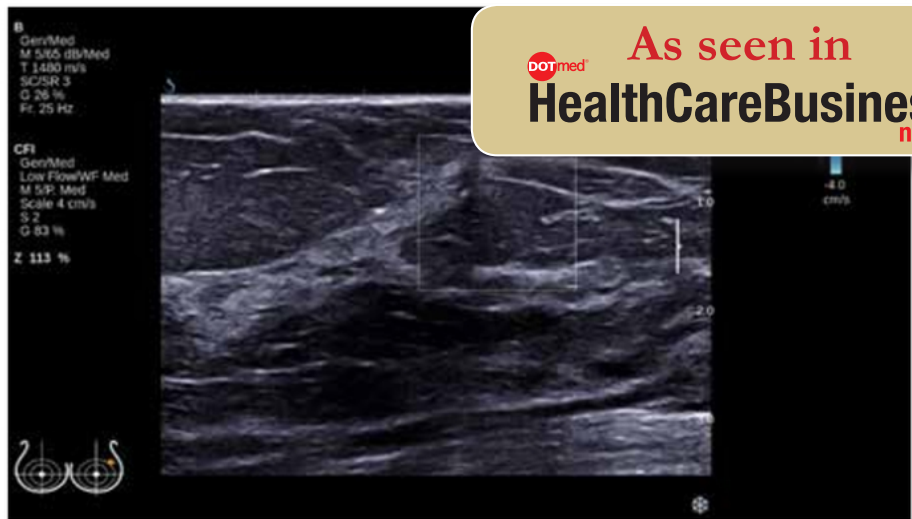
It is important to note that the percentage of positive ultrasound biopsies with negative mammograms would be higher if those biopsies performed for fibroadenomas were removed. The American College of Radiology (ACR) recommends against the biopsy of benign lesions, but many women want confirmation that a lesion is in fact benign. As a physician, it is just as important to be able to reduce the stress levels of patients and ensure the peace of mind that only a biopsy can provide.

In addition, the ability to downgrade a lesion through the use of SWE as well as upgrade when necessary provides an increased level of confidence to the radiologist. A prospective multicenter study of 958 women confirmed that adding SWE improved specificity of ultrasound mass assessment without loss of sensitivity². The data from our breast center suggests similar results. The addition of SWE has resulted in an increase in cancers detected, a reduction in unnecessary biopsies, the ability to upgrade and downgrade lesions and an increase in overall diagnostic confidence for the breast radiologist.

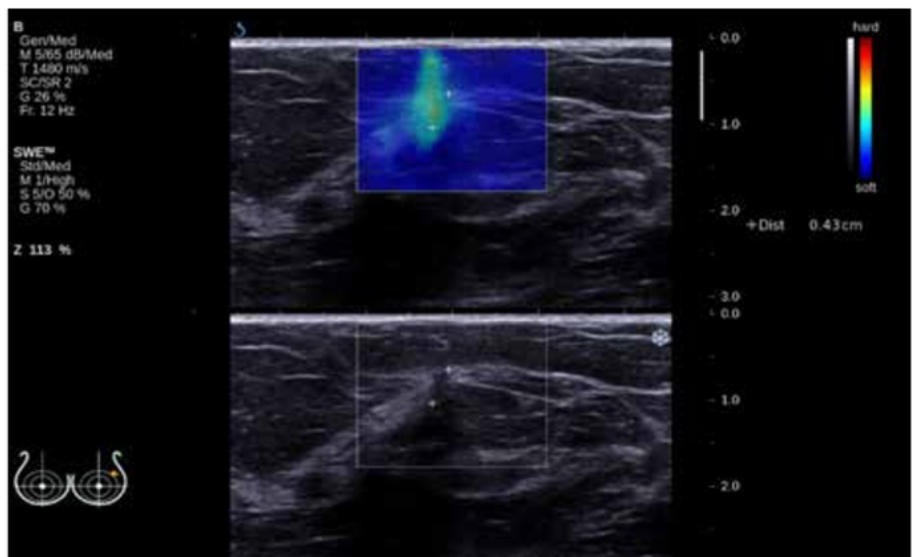
Patient outcomes

In addition to the clinical impact of SWE, there are notable benefits to the patient. The finding of cancers that may have otherwise gone undetected is a clear benefit, but several others are also important to note. The reduction in stress for the patient cannot be overstated. For the patient who is able to avoid an unnecessary biopsy, the anxiety of having to go through the procedure is circumvented. For those that do require a biopsy, the ability to quickly identify the need for the biopsy, as well as conduct the biopsy efficiently, results in a less stressful situation for the patient.

SWE is a technological advance that has breathed new life into a trusted modality within the breast center — ultrasound. The additional information that SWE provides the radiologist allows for an improved level of diagnostic confidence, a reduction in unnecessary biopsies, fewer false positives and false negatives. For the patient, the reduction in stress and anxiety is profound. Unfor-



Ultrasound shows an ill-defined, hypoechoic area with some posterior shadowing. The ultrasound with Doppler does not show any hypervascularity.



The SWE reveals stiffness of the ultrasound finding. Core biopsy was positive for invasive ductal carcinoma, Grade 3, triple negative.

tunately, though, education and adoption remain as the two major challenges to date.

SWE does continue to be a benefit to the breast center, and as clinical use increases, so too will the inevitable benefits to clinician, patient and staff.

About the author: Kamilia Kozlowski is a board-certified diagnostic radiologist. She attended the University of Rhode Island, and earned her B.S. from Simmons College in Boston. She received her Doctor of Medicine from Wayne State University Medical School in Detroit. When Dr. Kozlowski relocated to Knoxville, Tennessee, in 1983, she started the Knoxville Breast Center. Practicing as a clinical breast radiologist, she has paved the

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way to developing a more efficient delivery of breast health care.

Footnotes:

1. Wendie A. Berg, M.D., Ph.D. et al. Detection of Breast Cancer With Addition of Annual Screening Ultrasound or a Single Screening MRI to Mammography in Women With Elevated Breast Cancer Risk. *JAMA*. 2012;307(13):1394-1404.
2. Berg, W.A. et al: Shear wave Elastography improves the specificity of breast US: the BE1 multinational study of 939 masses. *Radiology* 262 (2): 435-49, 2012.
3. Evans, A. et al: Invasive breast cancer: relationship between shear wave elastographic findings and histologic prognostic factors. *Radiology* 263(3) 673-7, 2012.

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