
Breast Density and Automated Whole Breast Ultrasound

EFW Radiology Medical Brief

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Most breast cancers (70-80%) occur in patients with no identifiable risk factors. Population based screening with mammography is therefore an essential primary strategy to reduce mortality from breast cancer. While mammography performs very well in fatty breasts, sensitivity is lower in dense, fibrous breasts. This is an intrinsic limitation of the mammogram which is the summation of a 3D volume into a 2D image. In the absence of intrinsic tissue contrast (provided by fat), lesions and parenchyma which have similar density overlap making detection more challenging. In addition, it is more difficult for the technologist to position for deep tissue due to loss of the normal retro-mammary fat zone. The reduced mammographic sensitivity in dense tissue is reflected by a higher interval cancer rate (odds ratio for interval cancer of 17.8 compared to fatty tissue in one study),¹ larger size and more advanced stage at diagnosis. Furthermore, there is weak evidence that dense breast tissue may be an independent risk factor for breast cancer.²

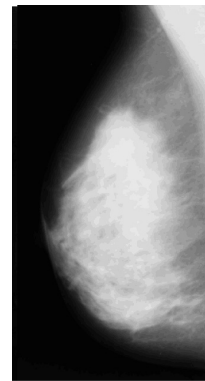
Breast Density

There is an increasing awareness that screening with mammography alone may not be enough in women with dense breasts. While breast MRI is recognized by the American Cancer Society as a complementary screening tool in women at very high risk for the development of breast cancer, due to its lower specificity, higher cost and limited accessibility, it has not been recommended in intermediate risk or dense breasted women. While recent technologic advances including computer aided detection, digital mammography and

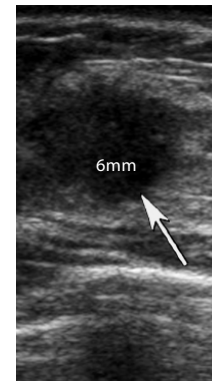
tomosynthesis have somewhat improved mammographic sensitivity particularly in dense breast tissue, a substantial number of cancers are still being missed. For these women in the presence or absence of additional risk factors, there is room to improve screening efficacy. Ultrasound is an attractive supplementary tool for women who have dense breasts but do not meet criteria for adjunctive screening with MRI due to wide availability, relatively low cost and acceptance by patients (no additional ionizing radiation or intravenous contrast). Supplementary assessment with whole breast ultrasound presents an opportunity for women who might not be optimally served by mammography alone to personalize their breast cancer screening program.



FATTY BREAST
(lesion obvious)



DENSE BREAST
(undetectable cancer)



ULTRASOUND

Breast density is a subjective assessment by the interpreting radiologist, with a degree of interobserver variability. Volpara[®] software is a computerized program that performs a quantitative analysis on the mammogram after it is acquired with no additional radiation exposure. It measures the relative volume of parenchyma to fat and generates a score. A **Volpara[®] score of 3 or greater** indicates a denser breast. Dense breasts may benefit from supplementary imaging with Automated Whole Breast Ultrasound.

Automated Whole Breast Ultrasound (AWBU)

Several studies assessing the addition of Whole Breast Ultrasound to mammographic screening in dense breasts have shown a mean increase in detection rate of 4.2 additional cancers per 1000 women screened. Many of the cancers detected with ultrasound are small (<1cm) non invasive, node negative, clinically significant cancers affording an opportunity to detect cancers at a curable stage and to improve overall cancer detection when both imaging modalities are combined.³⁻⁶ Most of these studies were done using hand held real time ultrasound assessment which is operator dependent and lacks reproducibility. AWBU uses a computer driven articulated arm allowing a controlled and reproducible position of the transducer and acquisition speed. The entire scan is stored and can be archived to PACS to serve as a baseline for future follow-up exams. Viewing conditions can be more readily controlled thus limiting interruptions which can be distracting and lead to errors. Furthermore, the images are reviewed on a high resolution monitor improving the conspicuity of small cancers.

While the data is encouraging, the improved detection rate comes at a cost of higher recall rates, which we understand can lead to patient anxiety. The addition of supplementary bilateral whole breast ultrasound may also adversely affect the positive biopsy rate, which for mammography alone is in the 20-40% range, to a reported range 5.6%-19%.^{7,8}

EFW's implementation of AWBU seeks to minimize the false positive rate in a number of ways. Only our sub-specialist trained breast imaging radiologists will interpret the AWBU exams. While screening mammograms can be performed at any of our facilities, AWBU exams will be performed at a single location with specially trained technologists. Final reporting of mammograms will be done in conjunction with the AWBU exam to ensure a comprehensive reporting of breast screening.

Discussion

Ultrasound is not intended to replace screening mammography, it is considered complementary. In particular, ductal carcinoma in situ, detected by visualization of abnormal calcifications on the mammogram, may be missed by ultrasound. The addition of AWBU is not considered beneficial in mostly fatty breasts (**Volpara[®] score of <3**) due to lower sensitivity and specificity. These women are already well served by mammography as long as they adhere to the recommended population based mammographic screening program intervals. At this time, there is no consensus in the professional community regarding the use of supplemental or alternative imaging tests in women with dense breast tissue without other significant risk factors (keep in mind that up to 80% of newly diagnosed breast cancers occur in women without additional risk factors other than being female). At EFW we are committed to offering patients state of the art imaging procedures. The AWBU program provides an opportunity for women with dense breast to personalize their breast cancer detection program. Our hope is to help in saving lives through detection of additional cancers at an earlier and curable stage.

Reference Articles:

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4. DeFelice C, Savelli S., et al. Diagnostic utility of combined ultrasonography and mammography in the evaluation of women with mammographically dense breasts. *J Ultrasound* 2007;10(13): 143-51.
5. Berg WA, Blume JD et. Combined Screening with ultrasound and mammography vs mammography alone in women at elevated risk for breast cancer. *JAMA* 2008 299: 2151-2163.
6. Kolb TM, Lichy J, Newhouse JH. Comparison of the performance of screening mammography, physical examination and breast US and evaluation of factors that influence them. *Radiology* 2002; 225: 165-75.
7. experience with Connecticut Public Act 09-41. *Radiology* 2012; 265(1):59-69.
8. Berg WA, Blume JD, et al. Combined screening with mammography and US vs mammography alone in women at elevated risk of breast cancer. *JAMA* 2008; 299(18):2151-2163

An automated whole breast ultrasound exam:

- does not involve breast compression, injection or radiation;
- is performed while lying in a comfortable position and is painless;
- provides images of the entire breast that are carefully reviewed by a radiologist with expertise in breast images; and
- permanently records the results for future needs.

EFW provides the Volpara[®] breast density assessments on mammogram reports. We encourage a discussion regarding breast density and AWBU with your patient. If she would like to have an AWBU examination to complement her mammogram, this appointment can be booked by calling our central booking line at 403-541-1200.