

## **To evaluate the role of sonography as an adjunct to mammography in women with dense breasts**

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### **Abstract**

**Objective:** To assess the role of sonography as an adjunct to mammography in women with dense breast tissue by determining yield and validity of sonography using histopathology/follow-up mammography as gold standard.

**Methods:** It was a descriptive analytical study conducted at the Radiology Department of Aga Khan University Hospital, from September 2005 to April 2007. A total of 76, mammographically dense breasts were evaluated with ultrasound. Of these 32 had palpable lumps on mammography, and were excluded from the study. A total of 44 patients had either symptoms of vague nodularity, nipple discharge, mastalgia or had no symptoms and the mammograms showed dense breast parenchyma without any focal abnormality. All these patients underwent whole breast ultrasound. The findings on ultrasound and subsequent histopathology and follow-up mammography were used to calculate the sensitivity, specificity, positive and negative predictive value of whole breast ultrasound as an adjunct to mammography.

**Results:** The age range of patients was 35 to 56 years, mean age was  $42 \pm 7.33$  years. Of the 44 patients included, 37 had normal ultrasound examinations and had the same findings on one year follow-up mammograms and ultrasound examinations. The remaining, seven patients were categorized as BI RADS category 4 due to presence of suspicious findings on ultrasound examination. They underwent ultrasound guided biopsy of the detected lesions. Out of seven solid lesions biopsied six were benign and one was reported malignant on histopathological examination. The sensitivity, specificity, positive and negative predictive values were 100%, 85%, 14% and 86% respectively.

**Conclusion:** Breast ultrasound can be a useful adjunct to mammography in women with dense breast by detecting small cancers not identified on mammography or clinical breast examination. Larger studies will be required to suggest that ultrasound could be used as an adjunct (JPMA 59:298; 2009).

### **Introduction**

Mammography is a sensitive tool for the detection of early breast cancer.<sup>1,2</sup> The reported sensitivity of screening mammography varies from 65% to 91%,<sup>3</sup> despite a decline in mortality from breast cancer after the introduction of mammography.<sup>4</sup> The sensitivity of mammography in this respect is variable and influenced by many factors such as age, breast density and family history.<sup>5</sup> One of the important factors is the effect of breast parenchymal density.<sup>6</sup> Dense breast parenchymal density on mammography is associated with increased risk of breast cancer.<sup>7</sup> Furthermore, the cancer tissue could easily be missed in the background of dense breast parenchyma.

Breast sonography has been conventionally used to differentiate cysts from solid masses. It is also used to evaluate specific abnormalities detected both on clinical examination or mammography and for guidance in interventional procedures.

However, studies performed to evaluate its role as a screening modality have failed to establish its efficacy, and it has been concluded that breast ultrasound should not be used

as a screening tool.<sup>8,9</sup> The value of breast sonography was believed to be dependent on its use as a problem-solving tool for clinically palpable lesions and as an adjunct to mammography.<sup>10,11</sup> Recent studies performed with state of the art new ultrasound equipment have proven it to be a useful tool in evaluation of mammographically dense breast.

Literature<sup>12-17</sup> shows that breast sonography can detect an occult malignancy in women with mammographically dense breast parenchyma and normal mammograms. Early detection of breast cancer is associated with good prognosis, thus reducing mortality and morbidity associated it. All such studies have been conducted in the west, and those conducted in Pakistani settings have not taken into account the final histopathology results of sonographically detected lesions or follow-up mammograms to calculate the yield of sonography as an adjunct to mammography.<sup>18,19</sup>

The present study was conducted to assess the role of sonography as an adjunct to mammography in mammographically dense breast to determine the validity and yield of the sonography. Histopathology and follow-up mammography were used as a gold standard.

## Patients and Methods

It was a descriptive analytical study, conducted at the Radiology department of the Aga Khan University Hospital, from September 2005 to April 2007.

The study was planned to include all the patients with complaints of vague nodularity, nipple discharge, mastalgia, increase in size of breast and those without any sign and symptoms related to the breast. All patients with dense breast parenchyma without any focal abnormality on mammograms were included in the study. Convenient sampling was used. All patients with clinically palpable lumps and abnormal mammograms were excluded from the study.

The mammograms were performed on GE Senograph or Siemens Mammomat 3000 Nova, two standard Cranio-caudal and mediolateral oblique views of both breast were obtained. The whole breast ultrasounds were conducted using a 7.5 MHz frequency linear probe on GE logiq 500 or Aloka Pro-Sound 4000. All mammograms were read by two radiologists with 2-3 years of experience in mammographic reporting; double reading of mammograms was performed, in order not to miss any findings. Same radiologists did the ultrasound examinations.

A total of, 76 patients had breast mammographic examination, 32 of these patients had clinically palpable lumps and their mammograms were abnormal and therefore were excluded from the study. Finally, 44 patients with dense breast parenchyma, and no mammographic abnormality were included in the study. Informed verbal consent was taken from all patients for performing breast ultrasound. Of the 44 patients studied, 37 had normal sonographic results.

Since histopathology could not be conducted, the patients with normal sonographic results were followed up with subsequent mammographic and sonographic examination after one year. All normal patients had normal breast issue on subsequent examination and therefore labeled as "true negative". Informed written consent was taken from all seven patients in whom biopsy was recommended on the basis of ultrasound findings. Biopsies were only performed after discussion and agreement with the referring physician.

Data was entered using SPSS 14 software. The yield and validity of sonography was determined by calculating sensitivity, specificity, positive and negative predictive value of breast ultrasound by using NCSS PASS programme.

## Results

The mean age of patients was  $42 \pm 7.33$  years (range 35-56 years). Out of 44 patients twelve were asymptomatic; twenty had vague nodularity without any discretely palpable lump. There were nine patients with mastalgia, two with nipple discharge and one with complaints of generalized

increase in size of both breasts.

The ultrasound (U/S) examination of the 44 patients with dense breast revealed that 37 had normal findings. The first U/S was substantiated with a repeat U/S after a year. All patients with normal breast at first U/S showed normal breast on follow-up U/S, and were labeled as "true negatives".

The remaining seven patients were reported as BIRADS "category 4" on U/S. Among them four patients had solid lesions with well-defined margins and posterior acoustic shadowing. One had a complicated cyst with solid and cystic components (biopsy was done from the solid component). Similarly, one had an ill-defined solid lesion hypoechoic to breast parenchyma with no posterior acoustic enhancement.

All seven patients underwent biopsy approximately 2-4 weeks after the initial U/S examination. The histopathological findings confirmed benign lesions in six (86%) patients: fibrocystic change (3), ductal hyperplasia (1), sclerosing adenosis (1) and fibrosclerosis (1). These were labeled as false negative.

However, one patient, who had a solid lesion with slightly ill defined margins and no posterior acoustic enhancement on ultrasounds (Figure 1), was diagnosed as having ductal carcinoma in situ. The patient was categorized as "true positive". The mammogram of this patient showed dense breast parenchyma without any definite focal lesion (Figure 2).

The calculated sensitivity, specificity, positive and negative predictive values of sonography as a complement to mammography were 100%, 85%, 14% and 86% respectively.

## Discussion

The results of this study indicated that there is a potential to use U/S as an effective second line screening modality in the evaluation of mammographically dense breast.

Breast cancer is the most common cancer worldwide. It is the leading cause of cancer related deaths among the female population in Pakistan. There is no definite treatment available for patients suffering from breast cancer. The foremost need is to capture the disease at an early stage in order to reduce mortality. Among them dense breast density is the single most important factor in limiting the role of mammography in detection of early breast cancer. Dense breast is echogenic on ultrasound and because most breast pathologies and especially breast cancers are hypoechoic on ultrasound, cancers can be easily detected. The hypoechoic lesions in back ground of echogenic breast parenchyma, provide a high index of suspicion.

The cancer detection rate in the study was, 1.3%,

which is slightly higher than reported by Kaplan<sup>20</sup> (0.3%) but is comparable to those of Crystal et al (0.49%-1.3%).<sup>21</sup>

The higher rate of breast cancer detection as compared to the Kaplan study<sup>20</sup> can be attributed to the fact

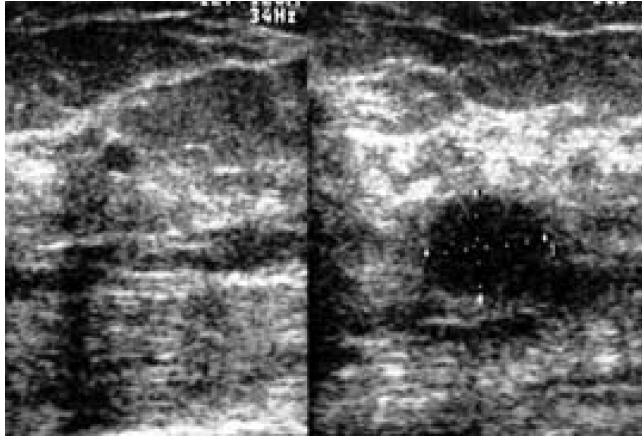


Figure 1: Ultrasound image showing a solid hypoechoic lesion in left breast with ill-defined margins and no posterior acoustic enhancement.

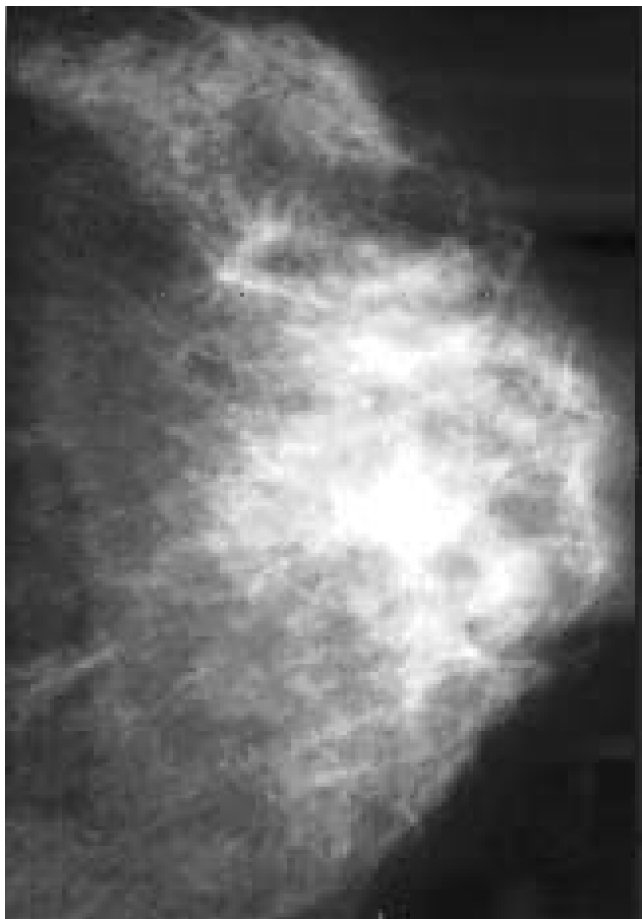


Figure 2: Cranio-cuadal view left breast showing dense breast parenchyma with out any discrete lesion on mammogram.

that all ultrasounds in our study were performed by radiologists, where as in the Kaplan<sup>20</sup> study the majority were performed by a sonographer/ technologist/ radiology fellow. This might have affected the results as the ultrasound findings are dependent on the type of equipment, technique of examination and experience of operator performing the exam.

The sensitivity was 100% and specificity 85%.<sup>21</sup> Comparing with the results of Crystal et al,<sup>21</sup> the former was similar and the latter slightly lower. This difference, was because we included screening mammograms of patients coming for routine checkup and patients who were coming for follow-up screening after contra lateral mastectomy for breast cancer as well as patients coming with breast symptoms without a discrete clinically palpable lump. Crystal et al<sup>21</sup> had included only women coming for routine screening without any history of breast cancer or symptoms related to the breast. Our rate of intervention was 16% which is higher than reported by Buchberger et al<sup>13</sup> (7.33%). The reason for this high figure can be attributed to the fact that all the sonographic findings were discussed with the clinician and those considered at high risk on clinical grounds received the required procedure. The other cause was lack of compliance of patients which made biopsy necessary. Ultrasound guided biopsies are less expensive, easy to perform as this involves real time imaging as compared to mammographically guided biopsies. Also the patient is not exposed to ionizing radiations. The positive predictive value 14% was lower than for mammographically detected lesions (20%-30%) in the study by Kaplan et al.<sup>20</sup> This could be due to lesser experience with screening sonography, and a tissue diagnosis was obtained which gave a final diagnosis.

There were a few limitations of our study. The sample size was small, and both screening and diagnostic mammograms were included.

The high intervention rate is due to lack of patient compliance secondary to a low level of awareness and also economic reason.

To design screening recommendation, larger studies on patients undergoing mammograms are necessary.

## Conclusion

Breast ultrasound can be a useful adjunct to mammography in women with dense breasts as small cancers cannot be seen on mammography or clinical breast examination can be detected.

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