

REPORTING BREAST ULTRASOUND: CHALLENGES IN MEETING IMAGING STANDARDS IN THE THIRD WORLD

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PJR January - March 2023; 33(1): 05-08

ABSTRACT

In the last two decades, early detection of breast cancer using mammographic techniques and reliance of high-quality images has significantly reduced mortality from breast cancer.¹ Although improvement in image quality has largely revolved around the modality of breast imaging. Ultrasonography (US) plays a critical role in the diagnostic evaluation of palpable breast lesions or those flagged up by screening programmes. This study highlights the results from two cycles of an audit comparing American College of Radiology standards for breast ultrasound imaging, performed at a tertiary care centre in third world country. **METHOD:** Two rounds of audit were carried out. After the results of first audit, action plan was implemented after discussion in departmental meeting. In first round a prospective analysis of a consecutive sample of 100 images and reports of breast ultrasound performed at the Radiology Department of Aga Khan University Hospital, Karachi, Pakistan was performed, in month of June 2021. Six months after the first cycle, a second audit of another prospective 100 breast ultrasound images and reports was reviewed in month of December 2021 and second action plan was implemented and the results were compared for future directions. **RESULTS:** The results of first audit revealed poor compliance in reporting certain parameter as part of the formal report, these included margins, texture, and shape of the lesion. There was significant improvement in all parameters in second cycle. We were able to maintain a reporting rate of 100% in all three of the parameters which was achieved in the 1st round of auditing. **CONCLUSION:** The compliance increased significantly by creating awareness and discussions in departmental meeting. The aim of those meetings were to highlight the current lack in practice standards to the faculty. This acted as reinforcement to their clinical practices and knowledge of reporting a breast ultrasound.

Keywords: Breast cancer, Ultrasound, Shape, Texture.

Introduction

Ultrasound (US) with a high-frequency transducer is essential for accurate non-invasive diagnosis of breast cysts and has shown potential in the differentiation of benign from malignant solid masses.^{2,3} However, like mammography, breast US can be technically challenging and requires state-of-the-art equipment, with appropriate technical settings to create an optimal image. Imaging utilising breast US is highly operator dependent, as normal tissue can sometimes mimic

a pathological breast lesion, whereas other breast cancers may be subtle to detect. In addition to this, considerable variability has previously been demonstrated in the interpretation of breast sonograms.^{4,5} Although no legal requisite, similar to that of The Mammography Quality Standards Act of 1992,⁶ govern the practice of breast US, professional guidelines for performing high-quality breast US have been established by the American College of Radio-

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Submitted 15 December 2022, Accepted 10 February 2023

logy (ACR) standards.⁷ These Guidelines specify variables like equipment, technical factors, image annotation, and personnel availability. This audit was undertaken to assess our practice of breast ultrasound reporting while comparing it with ACR reference standards. This is considering the concern that lack of a structured reporting template, may lead the radiologist to undermine pertinent clinical findings which may be crucial for clinician to recommend further management plans.

Standards as set by the American College of Radiology for Breast Ultrasound:

1. The breast sonogram should be correlated with clinical signs and/or symptoms and with mammographic and other appropriate breast imaging studies. If sonography has been performed previously, the present examination should be compared with prior sonograms, as appropriate. A lesion or any area of the breast being studied should be viewed in 2 orthogonal projections, and real-time scanning by the interpreter radiologist frequently aids in correlating ultrasound findings with clinical and imaging findings.

2. The images should be labelled as right or left breast or axilla, and the location of the lesion should be recorded using clock face notation, distance from the nipple (as CM FN), and the orientation of the transducer concerning the breast (example, transverse or longitudinal, radial or antiradial). It may also be shown on a diagram (in addition, but not in place of clock face) of the breast. Distance from the nipple shouldn't be measured from the sting of the areola but from the nipple itself with a ruler, as areolar width is variable.

3. Mass characterization with ultrasonography is highly dependent on technical factors. A breast ultrasound should be performed with a high-resolution transducer. Gain settings, focal zone selections (it should be at the lesion or within 1 cm, any focal zone placement more than 1 cm anterior or posterior to the lesion is not acceptable), and fields of view should be optimized to obtain high-quality images. The patient should be positioned to attenuate the thickness of the portion of the breast being evaluated. For evaluation of lesions in, on, or just beneath the skin, a standoff device or thick layer of gel may be helpful.

4. The size of a lesion should be determined by recording its dimensions in 3 orthogonal planes if possible; the largest measurement should represent the longest axis of a lesion. Images of a lesion should be obtained without and with callipers. One or more colour or power Doppler images of the lesion are recommended to be obtained to assess/document the internal vascularity of the lesion.

At our institution, all breast ultrasounds are performed by a radiologist with greater than 5 years of experience in breast imaging. We have two dedicated machines (Aplio i600) with high-frequency transducers (upto 14MHz) for performing breast ultrasound. During this audit we investigated standard for the examinations, for breast lesion characterization and other related technical factors.

Indicators:

The following indicators from the American College of Radiology standard were utilized.

Breast Lesion Characterization (description of the parameter):

- Clinical indication
- Side
- Quadrant
- Size
- Distance from nipple (distance from nipple and not areola in centimeter)
- Solid/cystic
- Echogenicity (anechoic, hypoechoic, hyperechoic, mixed)
- Texture (homogeneous. Heterogeneous)
- Shape (round, oval, irregular)
- Margins (Circumscribed, Not circumscribed - Indistinct - Angular - Micro lobulated Spiculated)
- Doppler (vascularity present/absent)
- Focal zone setting (focal zone within one centimeter of lesion)
- Correlation with mammography findings

Targets:

All above standards must be met in 95% of reports.

Methodology

First cycle:

A prospective analysis of a consecutive sample of

100 images and reports of breast ultrasound performed at the Radiology Department of The Aga Khan University Hospital, Karachi, Pakistan was performed, in month of June 2021. Exemption has been sought prior to initiation of this review from the institution ethical review committee. All patients had had clinical suspicions of lump(s) and underwent diagnostic mammograms before breast ultrasound and had positive findings of breast masses on ultrasound. All patient with negative ultrasounds, dilated ducts etc. were excluded. All ultrasound were done performed by consultant radiologists with more than 5 years of experience. The analysis of breast ultrasound images and reporting was performed by two qualified radiologists with more than 10 years of breast ultrasound experience. The data was analyzed using SPSS version 2.1, and percentage reporting parameter were the main outcome measure calculated.

Results

Results of the 1st cycle:

Result of first audit round: in terms of completion rate of parameter commented on were as follows:

First Cycle	June 2021
Parameter	Yes (%)
Side	100
quadrant	100
size	90
distance from nipple	84
solid/cystic	56
echogenicity	90
texture	14
shape	22
margins	6
Doppler	94
focal zone setting	100
Correlation with mammogram	64

Table 1

First action plan:

These results revealed poor compliance in reporting certain parameter as part of the formal report, these included margins, texture, and shape of the lesion. The results of first cycle of the audit were then

presented in a monthly departmental audit meeting. This meeting included all faculty members, fellows, and residents within the department. Subsequently a separate meeting for the breast imaging faculty within the department was then held, where the findings of the 1st cycle were discussed. A plan was made to re-audit performance after six months.

Results of second Cycle:

Six months after the first cycle, a second audit of another prospective 100 breast ultrasound images and reports was reviewed in month of December 2021. The results of which are as follows:

Second Cycle	December 2021
Parameter	Yes (%)
Side	100
quadrant	100
size	100
distance from nipple	98
solid/cystic	98
echogenicity	100
texture	42
shape	98
margins	100
Doppler	94
focal zone setting	100
Correlation with mammogram	72

Table 2

There was significant improvement in all parameters in second cycle.

We were able to maintain a reporting rate of 100% in all three of the parameters which was achieved in the 1st round of auditing i.e. side, quadrant and focal

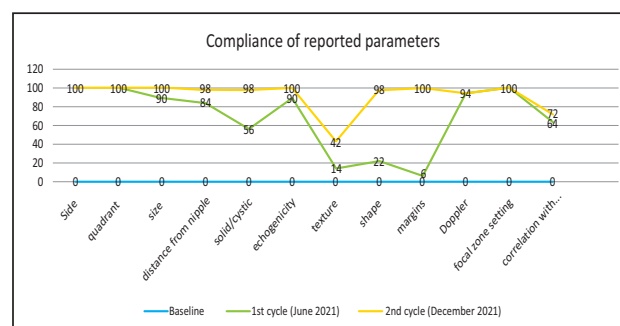


Figure 1: Comparison of two cycles of audit indicating better compliance of reporting in second cycle

zone setting. We noticed a 100% reporting rate on three further parameters after the refresher intervention i.e: size, echogenicity and margins as shown in (Fig.1).

Second action plan:

These results will be discussed in our Breast imaging faculty meeting and a third cycle of the audit re-audit will be performed after six months to increase compliance to standards even more.

Discussion

The aim was to highlight the current lack in practice standards to the faculty in the first action plan by the end of first audit. To improve compliance and to follow these standards we stipulated a refresher exercise of each breast imaging faculty member reporting 10 test cases. These were then reviewed on an individual basis with each faculty member whereby the missed parameters in the individualized reports were highlighted. This acted as reinforcement to their clinical practices and knowledge of reporting a breast ultrasound. The aim was to maintain 100% compliance in the parameters which we achieved such compliance, with a view to improve compliance in other deficient areas during reporting.

Performance was overall better in terms of compliance across all parameters in second cycle, compliance of reporting texture was the lowest at 42% as majority of reports still failed to mention it. In hindsight, this could be that the radiologists were reporting echogenicity and assuming it to be synonymous with texture.

Furthermore, as correlation with mammogram may not be possible in all cases due to focally dense or heterogeneous dense breast parenchyma obscuring the pathological lesion on ultrasound. This was confirmed through a retrospective review of the images, as lesion noted to be apparent on ultrasound and those deemed clinically palpable were not easily visualized on mammograms, in lieu of the density of breast parenchyma.

Conclusion

There are challenges in meeting the ACR standards for breast ultrasound reporting in the third world. Our

audit showed improved compliance with the ACR standards in second audit cycle. As such, a next cycle of the audit is planned.

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