

ROLE OF ULTRASOUND IN EVALUATION OF BREAST DISEASES (WITH FOCUS ON BI-RADS 1-3 VS. BI-RADS 4-5): A STUDY OF 131 CASES

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ABSTRACT

BACKGROUND

Ultrasound is a radiation free, readily available imaging modality that is routinely used for evaluation of breast. The patient usually are for routine checkup to nonspecific symptoms with few showing specific signs and symptoms. In this study, an attempt has been made to understand the role of ultrasound in diagnosing benign lesions with a drawback focused on early malignant lesion. Also, the differentiation of solid and cystic lesions can reduce biopsy.

MATERIALS AND METHODS

This study was done retrospectively evaluating 131 consecutive patients. The ultrasound study included evaluation of mainly female patients with few male cases.

RESULTS

Most common lesions were benign lesions. Among these benign lesions, fibroadenomas and fibrocystic disease were the commonest. However, there were no early malignant lesion seen in this study.

CONCLUSION

Breast ultrasound is choice of investigation in benign breast diseases. Also, such lesions can be easily followed up at primary level. However, there is a limited role in detecting early malignant lesions, which will require additional workup at a higher level especially in high-risk groups.

KEYWORDS

Benign Breast Disease, Fibroadenoma, Fibrocystic Disease, BI-RADS.

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BACKGROUND

Ultrasound is a routinely used imaging modality for evaluation of breast diseases. The majority of breast lesions is benign. Breast cancer is the most common malignancy in women in western countries, however, the benign diseases are far more frequent.⁽¹⁾ Benign diseases can be easily diagnosed and followed up with ultrasound. Also, there is a reduction of unnecessary biopsies following diagnosis of benign cysts. A retrospective study of 131 patients was done.

AIM AND OBJECTIVES

1. To evaluate the role of ultrasound in breast diseases and grade it by BI-RADS system.
2. To highlight its importance in the diagnosis of benign breast lesions.
3. To highlight the limitation of ultrasound in certain benign and early malignant lesions.

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MATERIALS AND METHODS

This study was done retrospectively by evaluating 131 consecutive patients between 2015 to 2016. These patients were referred for breast related problems as well as for screening study. Dedicated ultrasound was performed by a radiologist. Operator technique used: The patient in supine position with evaluation of breast usually in clockwise fashion using high frequency linear probe on Medison ultrasound machine. There were 124 number of females and 7 males for this study. The age group ranged from 15 months to 64 years. The distribution shown in chart, 1. BI-RADS score was assigned to the lesions. BI-RADS final assessment score per breast (Score of 1-Negative; 2-Benign; 3-Probably benign; 4-Suspicion of malignancy; or 5-Highly suggestive of malignancy) was also done.

RESULTS

The lesions found were fibroadenoma (23 cases), fibrocystic disease (22 cases of multiple cysts and 15 cases of simple cyst), coexistence of fibroadenoma and fibrocystic disease (6 cases), breast implants (7 cases), focal fat inflammation (2 cases), pseudogynaecomastia (2 cases), postoperative scarring (2 cases), duct ectasia (2 cases), acute mastitis and abscess (4 cases), mastectomy (1 case), intraductal papilloma (1 case), intramammary lymph nodes (7 cases). Most of aforementioned lesions were BI-RADS 2 and few BI-RADS 3 especially few

fibroadenomas and postoperative scars, axillary lymph nodes (80 cases) and BI-RADS 4 malignant lesion (1 case). One case of blood-tinged nipple discharge was seen in which the ultrasound study was normal (BI-RADS 1). The lesions are shown in chart 2. There were 45 cases of BI-RADS 1 breast, 70 cases of BI-RADS 2 breast lesions (with 5 cases suggestive of BI-RADS 3 breast lesions), 1 case of BI-RADS 4 breast lesions and no case of BI-RADS 5, which are shown in Chart 3.

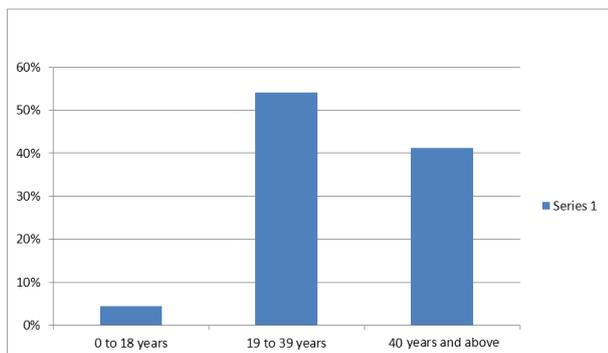
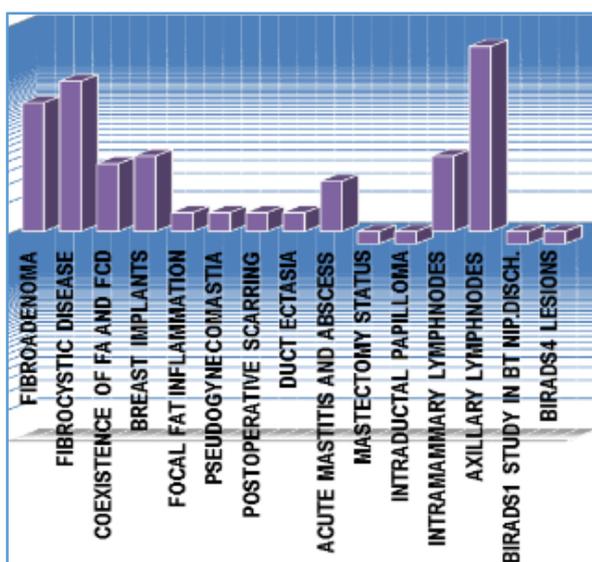


Chart 1



FA- Fibroadenoma.
 FCD-Fibrocystic disease
 BT NIPP.DISCH.-Case of blood tinged nipple discharge.

Chart 2

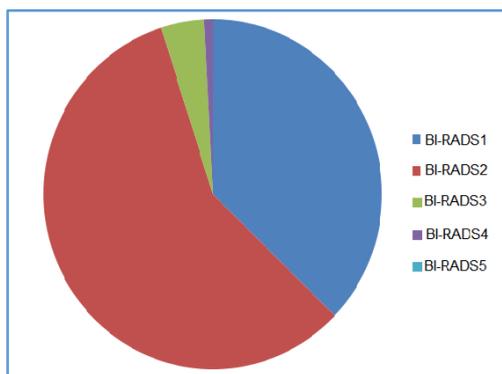


Chart 3

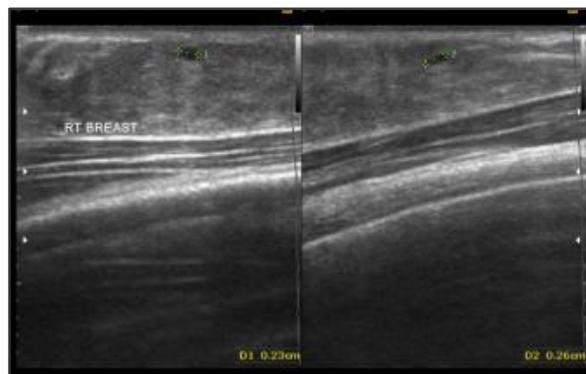


Image 1. BI-RADS 2 Lesion. Sonomammogram of a Male Patient Revealed Pseudogynecomastia with Fibrocystic Disease

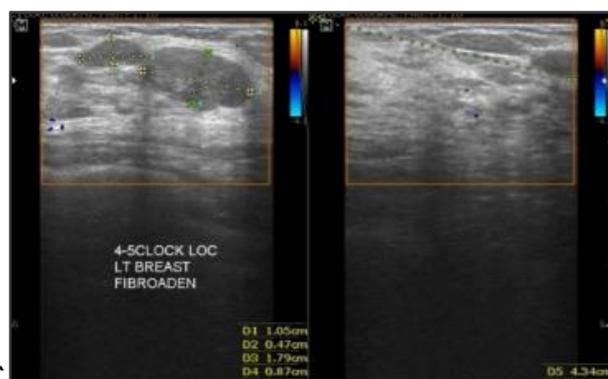


Image 2a

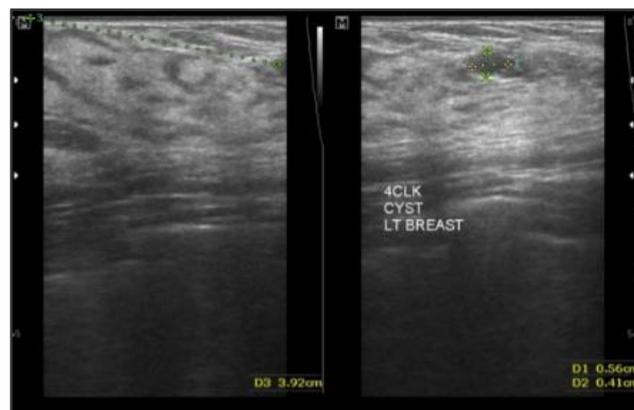


Image 2b. BI-RADS 2 Lesion. Sonomammogram Revealed Coexisting Fibroadenoma and Fibrocystic Disease.

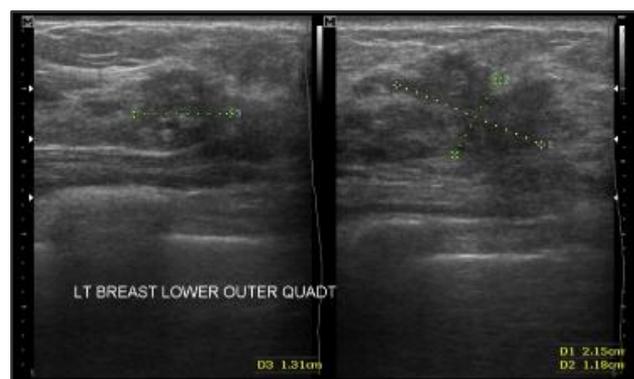


Image 3. BI-RADS 2 Lesion. Sonomammogram Revealed a Speculated Lesion, which Corresponded to the Scar Site. However, the Differential is Recurrence of Malignancy, but the Lesion was Stable

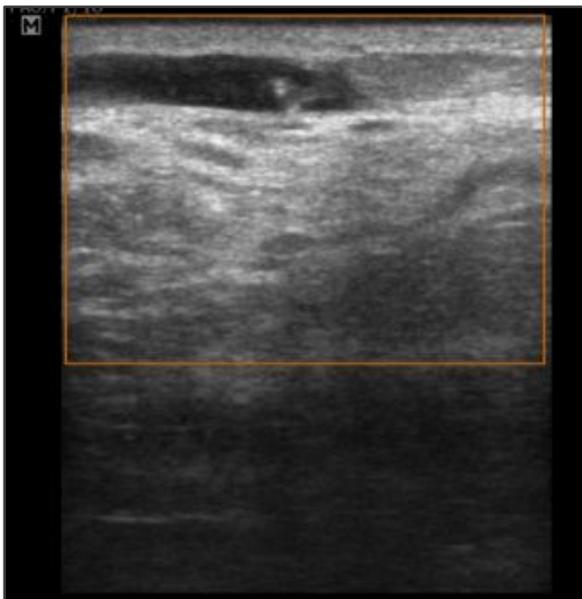


Image 4. BI-RADS 3 Lesion. Sonomammogram Revealed Intraductal Papilloma with Close to Nipple

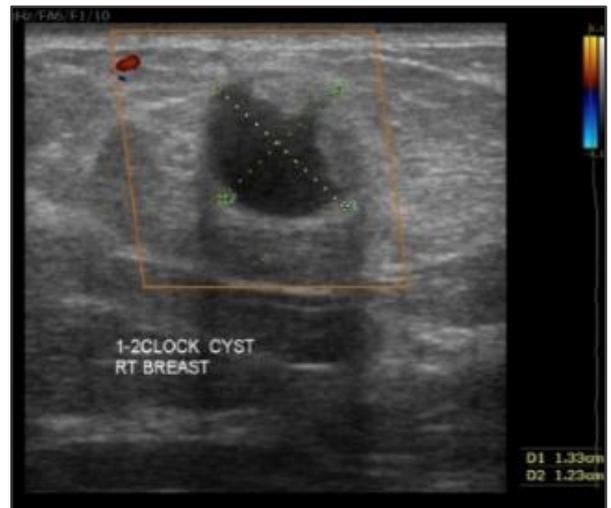


Image 5c

Image 5. BI-RADS 2 and 3 Lesions. Patient Sonomammogram Revealed Fibrocystic Disease (5b). There were Nodules with Early (5a) to Marked Necrosis (5c), which were Assigned BI-RADS 3 Category with Differential Including Necrotic Intramammary Lymph Nodes, Fibrocystic Disease and Fat Necrosis

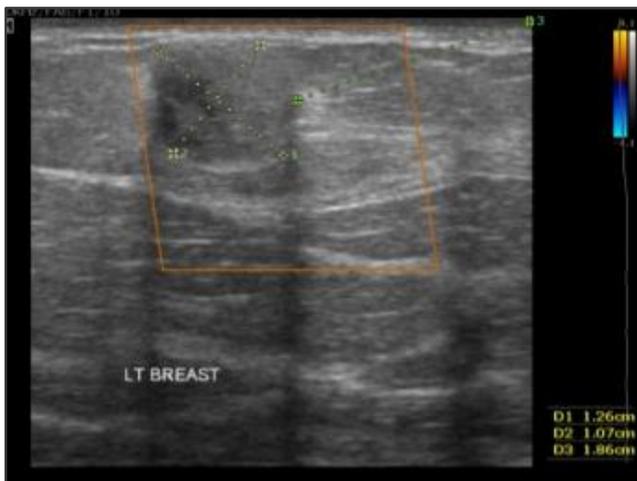


Image 5a

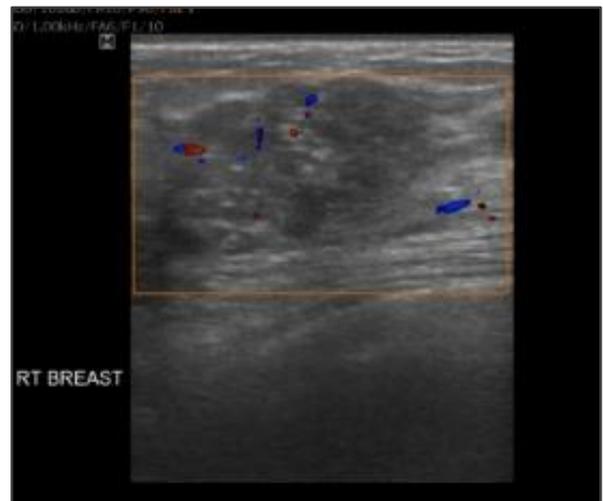


Image 6a



Image 5b



Image 6b

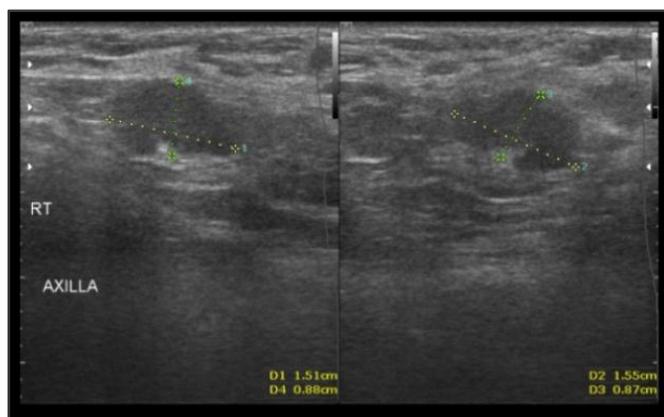


Image 6c

Image 6. BI-RADS 4 Lesion. Sonomammogram Revealed a Large Intramammary Mass Lesion with Speculated Margins and Speck of Calcification with Increased Vascularity with Axillary Lymph Nodes showing Loss of Fatty Hilum, However, the Lymph Nodes were Less than 2 cm in Length

DISCUSSION

Ultrasound is commonly used to diagnose benign lesions. The first known clinical use of breast ultrasound was reported in 1951 by Wild and Neal.⁽²⁾ Since then, it's has been ever increasingly used modality for evaluation of breast lesions, both to detect subclinical disease (screening) as well as for lesion characterisation.⁽³⁾

Clinically, patients are referred for various symptoms like pain in breast, palpable mass, discharge from nipple as well as screening mammography abnormalities. An attempt has been made in this retrospective study to evaluate common breast lesions by ultrasound. Most cases found in this study were between BI-RADS 1 to BI-RADS 3 range with only one case of BI-RADS 4. Only one case showed a significant difference in sonographic finding and clinical symptom where sonography revealed BI-RADS 1 study and patient had blood-tinged nipple discharge. This patient had a normal MRI breast study. This finding needed further imaging studies for evaluating intraductal pathology at a tertiary level. BI-RADS 2 findings and less likely to be BI-RADS 3 lesions as described in the above results included fibroadenomas, fibrocystic disease, benign cyst, scars, focal fat inflammation and breast implants.

A solid mass with circumscribed margins, oval shape, and parallel orientation can be classified as probably benign (category 3).⁽⁴⁾ BI-RADS category 3 is used for findings whose morphologic characteristics suggest that a lesion is probably benign. Fewer than 2% of lesions classified in this category should be malignant. It has been suggested that these masses maybe managed with periodic imaging surveillance and that stability at imaging for at least 2 years strongly indicates benignity.⁽⁵⁾ Only one case of BI-RADS 4 and none BI-RADS 5 lesions were found. Fibroadenomas are commonly diagnosed. It occurs in approximately 10% of women.⁽⁶⁾ In 25% of cases, fibroadenomas are nonpalpable and are diagnosed with mammography and ultrasound.⁽⁷⁾ Fibroadenomas can be

classified as simple or complex according to histological features.

Complex fibroadenomas differ from simple fibroadenomas because of the presence of cysts (3 mm), sclerosing adenosis, epithelial calcifications or papillary apocrine changes.⁽⁸⁾ In our study, fibroadenoma was the second most common breast lesion accounting for 18 per cent of cases in females. In this series, all fibroadenomas were simple. The incidence of carcinoma within fibroadenomas is estimated as 0.1-0.3%.⁽⁹⁾ The mean age of patients with carcinoma in FA has been reported as 42-44 years, ~20 years subsequent to the peak age of occurrence of fibroadenoma.^(10,11) Complex fibroadenoma does not confer increased breast cancer risk beyond other established histologic characteristics.⁽¹²⁾ Patients with benign proliferative disease in the parenchyma adjacent to the fibroadenoma had a relative risk of 3.88 (95 per cent confidence interval, 2.1 to 7.3).⁽¹³⁾ Patients with a family history of breast cancer in whom complex fibroadenoma was diagnosed had a relative risk of 3.72 as compared with controls with a family history (95 per cent confidence interval, 1.4 to 10).^(13,9)

Fibrocystic disease is a common, noncancerous condition that affects more than 50% of women.⁽¹⁴⁾ These are most often diagnosed between the age of 20 and 40 with the peak before or at menopause.⁽¹⁵⁾ In this study, fibrocystic disease was seen in 28 per cent of cases (simple cyst and multiple cysts accounting for 11 and 17 per cent, respectively). Fibrocystic disease is very rare in adolescence and even rare in male breasts. In our study, fibrocystic disease was seen in one male patient at the age of 15 years (Image 1). Ultrasound diagnosis of benign cysts avoided unnecessary biopsy procedures and overall reduction in medical costs. A followup is recommended unless complex cyst develops. Routine cytologic examination of all breast fluids is thus not recommended as a cost-effective practice.⁽¹⁶⁾ These non-proliferative lesions have no increased risk of subsequent cancer except in patients with a strong family history of cancer.⁽¹⁷⁾ Solid lesions in fibrocystic disease may need further evaluation by other imaging modalities like MRI.

Coexistence of fibroadenoma and fibrocystic disease (Image 2) can occur^(18,19) as is noted in 8.8 per cent of cases in females in this study. Focal fat inflammation represents the early phase of fat necrosis⁽²⁰⁾ and was noted in 1.6 per cent of female patients in this study. In a study by Tan PH et al, fat necrosis was seen in 2.75% of all benign breast lesions.⁽²¹⁾ These patients often have a history of trauma, radiation or surgery, although it can occur even in the absence of trauma. These lesions can resolve or progress to cystic degeneration. These findings can be easily demonstrated on ultrasound. However, at a very late stage in fat necrosis, calcification and fibrotic reactions can mimic malignancy unless the characteristic benign lucent-centered or coarse rim calcifications are seen.⁽²⁰⁾

Mastitis and breast abscess were seen in 3 per cent of total cases (accounting for 14 per cent of breast lesions in males and only 2.4 per cent in females). Breast abscess is a serious complication of mastitis. Mastitis is a complication most often encountered in primiparous women and develops in 1%-24% of breastfeeding women.⁽²²⁾ Breast abscesses develop as a complication of mastitis in 5%-11% of cases.⁽²³⁾ Ultrasound can easily diagnose these lesions and follow up can be done. However, a non-resolving abscess after a course of antibiotics as well as in non-lactating patients and patients above 40 years of age should raise the suspicion of malignancy.⁽²⁴⁾ In this study, one male patient had mastitis with early abscess formation. Infectious complications also occur in men, although they are very rare.⁽²⁵⁾

Pseudogynaecomastia was seen accounting for 28 per cent breast lesions among male patients in this study. Ultrasound shows the presence of lobular areas of adipose tissue that are homogeneously hypoechoic and separated from one another by thin hyperechoic bands of fibrous tissue.⁽²⁶⁾

Postoperative scar (Image 3) was noted accounting for 1.6 per cent of breast lesions in females in this study. These lesions appeared as an area of architectural distortion or speculated mass typically located at the patient's cutaneous scar site.⁽²⁷⁾ Ultrasound follow up can be easily performed to look to reduction in size or stability. Any increase in size should raise suspicion of malignant change. Duct ectasia was seen accounting for 1.6 per cent of breast lesions in female patients in this study. Normal ducts are seen as collapsed ducts or ducts measuring 1-2 mm in diameter. In ultrasound study of duct ectasia, the subareolar ducts appear dilated and fluid filled with inspissated secretions often seen within it.⁽²⁹⁾ Observation of particulate movement within is another diagnostic feature of duct ectasia.⁽²⁸⁾ Followup case of mastectomy accounted for 0.8 per cent of breast lesions in female patients in this study. There was no recurrence or residual mass lesion seen. Breast cancer recurrence rates for patients who undergo these newer procedures are comparable to those for patients who undergo Modified Radical Mastectomy (MRM) at about 1%-2% per year.^(29,30,31)

There were breast implants seen in situ with no ultrasound evidence of rupture. Ultrasound can evaluate the mastectomy site for fluid collections, postoperative fibrosis, lymphadenopathy and cancer recurrence as well as implants. Intraductal papilloma (Image 4) accounting for 0.8 per cent of breast lesions in female patients in this study. It was seen as an intraductal polypoidal mass with a speck of calcification within a dilated duct close to the nipple. Typically, they are located within a few centimetres of the nipple and grow within the duct usually resulting in duct obstruction.⁽³²⁾ Minority of these solitary lesions are associated with malignancy.⁽³³⁾

Breast implants accounted for 5.6 per cent of breast lesions in female patients (3.2 per cent were normal and 2.4 per cent were suspected/rupture) in this study.

In this study, the findings of asymmetry of implants and loss of contour of the implant with history of trauma in some cases were suspicious for rupture on ultrasound. Irregular implant contour can be a sign of rupture, but is unreliable and peri-implant fluid collections is not a feature of rupture.⁽³⁴⁾ The most reliable sign of intracapsular rupture is the visualisation of multiple linear or curvilinear lines traversing through the interior of the implant at various levels termed the "stepladder" sign.⁽³⁵⁾ Small amounts of free silicone (silicone granulomas) mixed within the surrounding breast tissues give rise to the characteristic echogenic "snowstorm" (statistically significant for extracapsular rupture, $p \leq 0.05$ and the most sensitive and specific sign at the ultrasound.⁽³⁶⁾ This sign is the most reliable sign of extracapsular rupture.⁽³⁷⁾ Rupture can be suspected or diagnosed by ultrasound, although MRI is the best modality to rule out implant rupture. Screening MRI is advised to rule out asymptomatic implant rupture.⁽³⁸⁾

Intramammary lymph nodes accounted for 5.6 per cent of breast lesions in female patients in this study. The lymph nodes were enlarged with loss of fatty hilum with loss of reniform outline, necrotic (Image 5) and calcified with no associated breast mass lesion. ILNs are by definition lymph nodes that are completely surrounded by breast tissue, a histologic feature that distinguishes them from low lying axillary and deep pectoral lymph nodes.⁽³⁹⁾ Benign aetiologies include regional inflammatory process, infectious diseases, rheumatoid arthritis and malignant aetiologies include metastatic breast cancer and lymphoma.⁽⁴⁰⁾ Highly symptomatic patient with blood-tinged discharge with negative ultrasound and MRI study accounted for 0.8 per cent of breast lesion in females in this study. This is a definite limitation of ultrasound to detect intraductal lesions where galactography is required for further evaluation. One BI-RADS 4 lesion (Image 6) was noted in female patient accounting for 0.8 per cent of breast lesions with an intramammary speculated hypoechoic mass with enlarged axillary lymph nodes. There was no BI-RADS 5 lesion seen in this case series.

Across several series of women with symptoms and normal US and mammography findings, 1118 (98.6%) of 1134 women did not have cancer.⁽⁴¹⁾ Thereby, its role as definite screening for breast malignancy is limited. Other modalities are recommended over ultrasound as a first line of investigation.⁽⁴²⁾ Axillary lymph nodes accounted for 61 per cent of lesions in this entire case series (58 per cent benign, 2.2 per cent infectious and 0.7 per cent metastatic). Axillary lymph node can be easily picked up and assessed. Most of the lesions were BI-RADS 2. Only very few lymph nodes had BI-RADS 3 categorisation. One had findings of BI-RADS 4 and none BI-RADS 5. Thus, the commonly found axillary lymph nodes are less likely to have occult malignancy in it. This also does not affect clinical outcome as was noted in a study by NSABP B-32 where it was found that women diagnosed with early stage breast cancer with occult metastases in a clinically negative sentinel lymph node do almost as well as women without occult metastases.⁽⁴³⁾

CONCLUSION

Ultrasound is highly recommended for evaluation of benign breast diseases. It's a radiation free imaging modality. Most of the lesions seen in routine breast ultrasound are benign (BI-RADS 1 to 3) and can be followed up. Only in case of a history of breast cancer and suspicious lesions (BI-RADS 4 to 5), the patient can be referred to a higher level for better management. Also, this modality should be second line of investigation in screening for breast malignancy at primary level as the rate of detection of suspicious malignant (BI-RADS 4) lesion is less due to operator dependency and rare occurrence in general population, however, this needs further study with larger number recruited patients.

Abbreviations

BI-RADS- Breast Imaging Reporting and Data System, MRI-magnetic resonance imaging.

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