ORIGINAL RESEARCH PAPER

Volume-7 | Issue-4 | April-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

ROLE OF ULTRASONOGRAPHY IN DIFFERENTIAL DIAGNOSIS OF PALPABLE BREAST LUMPS

Radiology

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ABSTRACT

Background: With advent of high frequency high resolution Ultrasonography, breast lumps can be evaluated in a much better and safer manner, as an adjunct to clinical examination and mammography.

Purpose: Present study has been done to evaluate the role of Ultrasonograpphy as a singular diagnostic modality in differential diagnosis of breast lumps.

Material and methods: This prospective study was conducted over 1 year in which 50 consecutive patients with palpable breast lumps on clinical examination were further evaluated with sonography and later underwent biopsy. Sonological results were compared with clinical diagnosis and histopathological diagnosis and thus, its diagnostic significance probed.

Results: The typical appearance of most of benign lesions on sonography was circumscribed, smoothly marginated, homogenously hypoechoeic mass with posterior acoustic enhancement or no alteration while most of malignant masses were irregular or speculated heterogeneously hypoechoeic lesion with or without posterior shadowing. Sonography showed an overall accuracy of 93.6%, with 97.5% sensitivity for benign and 86.9% sensitivity for malignant masses. The specificity of sonography for the diagnosis of benign masses was 86.9% and for malignant masses it was 97.5%, respectively.

Conclusion: With all diagnostic indices were statistically significant in this study, USG seems to be a good predictor of breast masses before going for any invasive procedure.

KEYWORDS

Introduction:

Breast lumps are common in females all over the world and any breast lump carries a sinister possibility of being malignant. A lump is the commonest symptom (>80%) in patients with cancer breast 1 which is the most common cancer among women.2 With changing life-style, the incidence of breast cancer is increasing and recently even in India, it has became the most common cancer in women surpassing the cancer cervix.3 Timely and accurate diagnosis of a breast lump with early intervention can bring down morbidity and mortality of malignant disease.1 USG is one of the easily and commonly available modality and considered as the extension of clinical examination in recent time. It offers a unique technique to demonstrate textural details of normal and abnormal breast in a far superior way to mammography. Wheareas both ultrasongraphy and mammography can identify air ,fat ,water and calcium , only ultrasonography can differntiate between different water densities .4 Its role in differentiation of cystic from solid lesions and in evaluation of lesions in radiographically dense breasts and as guidance for interventional procedure is widely accepted. With the use of modern high resolution , linear array , real time transducers and colour Doppler probes, now most carcinomas more than 1 cm in diameter can be identified and analysed with respect to sonographic features and therefore has been recommended as the initial imaging method in young women with palpable breast lesions and in acute inflammatory lesions of the breast.4,5 However, there are controversies regarding its value in the breast cancer diagnosis depending on equipment standards, substantial inter-oveserver variation in the interpretation, clinical objectives and skills of medical professionals with different specializations.6 Also, the low sensitivity of sonography have been reported in detection of solid masses smaller than one centimetre and with in situ and microinvasive ductal carcinomas.4 Therefore , in the scenario of the advent of uniform diagnostic criteria ,this study has been done to revaluate the role of ultrasonography in the differential diagnosis of palpable breast lumps. and to probe the diagnostic accuracy of ultrasonography.

Material & methods

This prospective study was conducted over 1 year in the department of Radiology of a tertiary health care centre of eastern India after ethical committee approval. Fifty consecutive patients presenting with palpable breast lumps, who were referred to the department of radiology from hospital OPDs and from in patient wards for radiological evaluation and were ready to undergo biopsy irrespective of radiological findings, were taken up for the study. After prior consent and information of the study, detailed history and clinical examination, each patient was subjected for Ultrasonography, which was performed with conventional real time scanners (LOGIQ 500 Version 4.10, GE medical system) having linear multi frequency probes ranging 4-15 MHz. Paranomic and 3-D views were used in most of the cases at 7.5 MHz. Patients over 40 years of age were also underwent Xeromammography. Sonographic examination in most of the patients was done in the supine position while a few were also examined in the sitting position. Whenever required, the mass was immobilized using examiner's fingers. In laterally placed masses, the patients were turned slightly to the contralateral side to achieve evenly draping and flattening of the breast tissue over the chest wall that ensured complete penetration of the breast parenchyma with the 7.5 MHz transducer. Different and specific sonographic diagnoses were formulated based upon the following observations.

1. Site and size of the mass
2. Shape : Round/ Oval/ Lobulated
3. Contour : Smooth / irregular/ speculated
4. Internal Echoes
   a)Pattern : Uniform / non-uniform / echofree
   b)Strength : Strong/ intermediate/ weak
5. Boundary Echoes
   a)Anterior : Strong/ intermediate/ weak
   b)Posterior : Strong/ Intermediate/ Absent
6. Attenuation effects
   Acoustic enhancement/ intermediate/ acoustic shadowing
7. Secondary signs of malignancy Present/ Absent
   a)Axillary lymph nodes
   b)Liver/ abdominal ultrasound

Based upon the given aforesaid observations, the breast masses were classified into cystic (anechoeic) or solid (echoeic). Solid masses were further classified into benign or malignant based primarily upon the regularity of the wall, internal echo pattern and attenuation effects on the beam by the mass. The sonographic diagnosis made, was later compared with histopathological examination obtained from tru-cut or excision biopsy of the breast lumps in all cases and its significance tested against clinical diagnosis using chi-square test.

Results:

A total of 63 palpable breast lumps in 50 patients (all females, ranged between 14 and 62 years) were examined in the study. Apart from lump, pain was the most common (24%) symptom. In the majority (88%) of cases, the lump was solitary. In 4 cases, the lumps were present in only one breasts and were multiple while in one case lumps were bilateral and multiple. In another one case, there were single lump

in both the breasts. The lumps were seen most commonly in the upper outer quadrant (41.26%). Out of 63 lumps, 40 (63.5%) were benign and 23(38.5%) were malignant. Fibroadenoma (24) was the most common (38.5%) benign mass encountered, while others were 5 cysts (7.9%), 3 abscesses (4.8%), 5 fibrocystic disease (7.9%), 2 galactoceles(6.4%) and 1 benign cystosarcoma phylloides (6%) .

91.6% fibroadenomas (22) were correctly diagnosed with ultrasonogram while 1 was not seen and completely missed. 31.81% of fibroadenomas were round, 40.9% oval and 27.29% lobulated. Though all (100%) were hypoechoeic, 81.81% cases had a smooth regular margin and 81.19% cases had uniform internal echoes within.

Cysts were appeared as well defined anechoeic masses with lateral edge shadowing and marked posterior enhancement while galactoceles were appeared as cystic masses containing adhesions and all were correctly diagnosed on USG.

Fibrocystic disease appeared as well circumscribed nonhomogenous lesions with cystic and hyperechogenic components and one of these was incorrectly diagnosed as carcinoma on USG.

Chronic breast abscesses were regular marginated uniformly hypoechoeic masses with thick walls and posterior enhancement. One of them had a nonhomogenous appearance containing hyperechoeic adhesions and wrongly diagnosed as malignancy. Another lump which was suspected malignant clinically was found to have uniform hypoechogenicity with posterior enhancement and correctly diagnosed as abscess.

Cystosacroma phylloides appeared as a well circumscribed hypoechoeic mass with nonhomogenous internal echo pattern and no change in through transmission.

There were 23 histologically proved carcinomas in 22 patients and 90.48% of them were solitary lumps. 20 of these 23 carcinomas were correctly diagnosed by sonography while 2 were misdiagnosed as fibroadenomas, and 1 was missed which had a size of 1.1 cm on xeromammography.

Sonologically malignant lumps were nonhomogenous in 85% with irregular margins in 90% and with hypoecoeic internal echo pattern in 95%.While acoustic shadowing was present in 75% of the carcinomas Posterior wall was not seen in 40%, intermediate in 35% and prominent in 25% of the infiltrating duct carcinomas.

Associated axillary lymphadenopathy noted in 9 patients and bilateral pleural effusion was seen in one case, and these were the added advantages of sonography.

The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of Ultrasonography in the diagnosis of benign masses were 97.5%, 86.9% , 92.8%, 95.2% and 93.6% respectively. Sonographic approach has the highest sensitivity in diagnosis of cysts (100%), Galactocele (100%), Cystosarcoma phylloides (100%) and Fibroadenoma (96%). Sonography had nearly 100% specificity for fibroadenomas, cysts, fibrocystic diseases, galactocele and cystosarcoma phylloides and such appears to be a great tool to diagnose benign breast diseases.

For the diagnosis of malignant masses, sensitivity, specificity, positive predictive value, negative predictive value and accuracy of ultrasonography were 86.9%, 97.5%, 95.2%, 92.8% and 93.6% respectively. In comparision to clinical diagnosis, these all diagnostic indices for sonography were statistically significant (P value < 0.001).

Discussion

The role of Mammography as basic breast imaging modality and screening tool for the detection of breast cancer is well known .Studies have shown that the mammography allows detection of palpable or non palpable breast cancers with a good sensitivity which results in statistically significant reduction in mortality from breast cancer.6 But mammographic screening does not solve all breast problems. In dense breasts, where there is higher risk of breast cancer development, mammography has limited sensitivity.7 The specificity of this technique is also insufficient for accurate differentiation of lesions; False-positive & False-negative mammograms result in unnecessary biopsy and false reassurance respectively.8,9 Also, a definite differentiation between cystic & solid lesions is not possible by mammography.4 So, an alternative & complementary modality is needed to avoid unnecessary biopsies in breast masses to ascertain the pathology. In comparison, high frequency, high-resolution breast Ultrasonography allows the physicians to detect even small breast tumors not seen by long-established mammography, particularly in thick breasts or lumps which are not palpable.2 In the past, ultrasound was only considered useful for the diagnosis of cysts. But now with better resolution, and panaromic view, it improves the differential diagnosis of different benign and malignant lesions of breast as well as it helps in local preoperative staging and guided interventional diagnosis.6 Lack of radiation exposure is an added benefit and therefore this is quickly becoming a routine procedure for diagnosing lumps in young women.[2,10,11]

In the present study, the overall accuracy of sonography in the pathological diagnosis of palpable breast masses was 93.6%. This is comparable to the accuracies found by most of the previous authors like Fleischer et al (85%), Hayashi et al(83.1%), and Van Dem et al (87.7%).12,13,14 In this study, the sensitivity of sonography in diagnosing benign breast masses was 97.5% which is quite comparable to that found by most of previous authors like Van Dem et al (91.6%), Zonderland et al(94.3%) and Pandey and Lohani (94.1%).[14,15,16]

In the present study 20 of the 23 malignant masses were correctly identified on sonography (sensitivity of 86.9). 2 well circumscribed malignancies were misdiagnosed as fibroadenomas, and another one was missed on sonography. The sensitivity of sonography in diagnosing malignant masses is less than that found by Hayashi et al (87%) and Guyer et al (93%) and is more than that found by Fleischer et al (71%); and Van Dem et al (78%).[13,14,17]

The sensitivity of Sonography in diagnosing fibroadenomas was 96.3 % in this study which is comparable to that of Fleischer et al (89%),Hayashi et al (93%),Guyer et al (91%) and Van Dem et al (90%).12,13,14,17 One fibroadenoma was misdiagnosed as fibrocystic disease because of associated posterior attenuation and another one was missed on sonography because of its small size and lack of sonographic contrast because of fatty breast.

In the present study cysts were diagnosed on sonography with 100% accuracy while fibrocystic disease had a sensitivity of 90%. Such high sensitivity for cyst is comparable to that of Feleischer et al (96%), Hayashi et al (96%) and Gordan et al (96%).[12,13,18]

In diagnosing malignant masses, sensitivity of sonography in the present study was 86.9%. Almost similar sensitivity for malignant mass was reported by Hayashi et al (87%) and Vander et al (78%).12,13 Although, Kolbe et al (98.1%) and Pandey & lohani (95%) have reported a much higher sensitivity for malignant masses in ultrasonographic diagnosis.[16,19]

Most importantly 42 lumps that were predicted as non-malignant on ultrasonography, three were diagnosed as cancerous after histopathology/cytology and so the negative predictive value of present study was only 92.8%. In its comparison, negative predictive value in previous studies were as high as 99.5% (Stavros et al), 99.8% (Soo et al)and 93.73% (Pandey & Lohani).16,20,21 Although value in this study is lower them other studies, still a value of 92.8% is very much statistically significant with a p value of <0.001, and are comparable to the values obtained by different studies conducted elsewhere and so it can save a lot of patient from unnecessary biopsy and surgery and promote conservative arrangement with follow up.

Also, positive predictive value for malignant mass in the present study is as high as 95.2% that guides the clinician for the surgical planning in a very much significant manner (P value <0.001) and therefore USG seems to be a good predictor of breast masses before going for any invasive procedure.

Conclusion:

Being non invasive to patient, its relatively easy availability and cost effectiveness with having highly significant diagnostic values, ultrasound makes a good first line diagnostic method for localization and characterization of the breast lumps. Randomised clinical studies

should be done to investigate the impact of screening Ultrasonography on early diagnosis and ultimate mortality of breast cancer.

TABLE - 1 ULTRASONOGRAPHIC FEATURES OF 24 BIOPSY PROVED FIBROADENOMAS

Sl. No.	Feature	No. of Lumps	%
1	Visible Mass	23	95.65
2	Shape – Round – Oval – Lobulated	7 10 6	31.81 40.90 27.29
3	Margins – Regular – Irregular	19 4	181.81 18.19
4	Size < 2 cm 2.1 – 5 cm > 5.1 cm	4 16 3	18.19 68.16 13.65
5	Internal Echoes Strength – Hypoechoeic – Hyperechoeic – Isoechoeic Uniformity – Uniform – Nonuniform	23 – – 19 4	100% 81.81 18.19
6	Posterior Wall echoes Strong Intermediate Weak	14 8 1	59.09 36.36 04.55
7	Through Transmission Acoustic shadowing No change Enhancement	2 14 7	04.55 63.64 31.81

TABLE - 2 ULTRASONOGRAPHIC FEATURES OF 23 BIOPSY PROVED CARCINOMAS

Sl. No.	Feature	Infiltrating duct Carcinoma(21)	Paget's disease (1)
1	Visible Mass	20	1
2	Margins – Regular – Irregular	2(10%) 18(90%)	– 1
3	Internal echoes Strength – Hypoechoeic – Hyperechoeic – Isoechoeic Uniformity – Homogenous – Nonhomogenous	19 (95%) 01 (5%) – 3 (15%) 17 (85%)	1 1
4	Posterior Wall Prominent Intermediate Not seen	5 (25%) 7 (35%) 8 (40%)	1
5	Through Transmission No change Inhancement Posterior shadow	5 (25%) 15 (75%)	1

TABLE - 3 ACCURACY OF SONOGRAPHY IN DIAGNOSING BREAST MASSES

Diagnostic Index	Malignant masses	Benign masses
Sensitivity	78.2%	97.5%
Specificity	95.0%	86.9%
Accuracy	88.8%	93.6%
Positive predictive value	90.00%	92.8%
Negative predictive value	88.30%	95.2%

Figures:

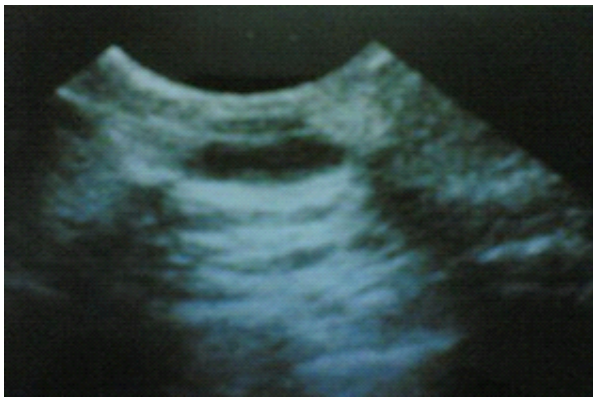

Fig 1. Breast abscess- thick walled with marked posterior inhancement

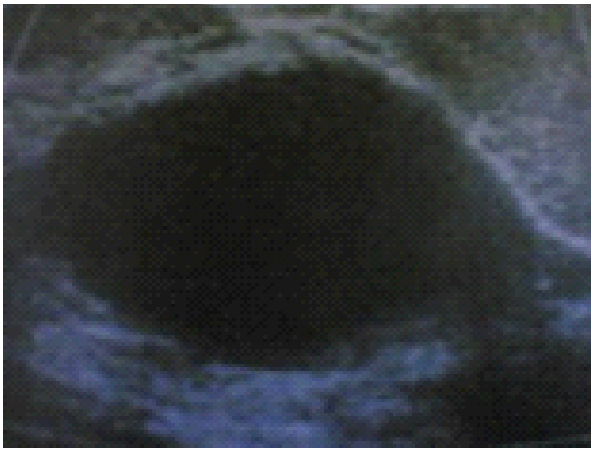

Fig 2. Galactocele- containing emulsified fat producing anechoic pattern

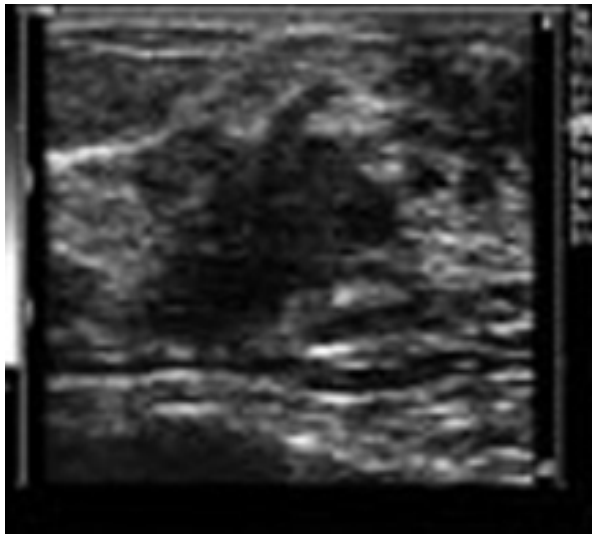

Fig 3. Carcinoma Breast- irregular margins with ductal invasion

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