



Radiodiagnosis

EVALUATING SYMPTOMATIC BREAST DISEASE BY COMPLEMENTARY SONOGRAPHY AS AN ADJUNCT TO MAMMOGRAPHY: A MUST.

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ABSTRACT **Objectives:** To evaluate symptomatic breast disease by imaging and calculate sensitivity and specificity of mammography (MG) and ultrasound (USG) independently and using them as a combined modality.

Materials and Methods: 352 patients presenting with symptomatic breast disease in the Out-Patient Department or admitted in the wards were included in our study. 193 patients underwent Fine needle aspiration cytology (FNAC) of the abnormality detected either on MG or USG and constituted the study population. Sensitivity, specificity and Negative Predictive Value of MG, USG and MG+USG was calculated.

Results: Out of 352 patients included in our study, the maximum number of patients (158) were between 31-40 years. Pain and palpable lump were the common complaints in our study group. The most common lesion was fibroadenoma present in 58 patients followed by fibrocystic breast disease in 52, abscess in 18, cysts in 12, and benign duct ectasia in 12 patients. Carcinoma was present in 41 patients and most were in the older age group. The sensitivity of MG, USG, MG+USG in diagnosing breast disease was calculated to be 72.7%, 90.9%, and 96.96% respectively and specificity of MG, USG, MG+USG was calculated to be 92.35%, 89.28%, 100% respectively. The negative predictive value (NPV) of MG was lower 74.28% whereas USG had NPV of 89.28%. A higher NPV of 96.55% was seen when MG and USG were used complementary to each other.

Conclusion: Using MG and USG as complementary to each other increases the NPV and enhance the confidence of the radiologist in the detection and characterization of the lesion. Age-based criteria should be used to choose the type of diagnostic modality to be used for evaluating the breast.

KEYWORDS : Breast disease, Mammography, Ultrasound, Breast cancer

INTRODUCTION

Breast carcinoma is the second most common cancer after carcinoma cervix in India and its incidence is gradually rising. Increasing trends of higher education and employment in women result in their late marriages resulting in late pregnancy, fewer children and short lactation period. All these factors predispose them to carcinoma breast. (1) Age adjusted incidence of breast carcinoma is found to be the highest in Delhi followed by Chennai and Bangalore. (2)

Clinical examination by a physician can confirm the presence of any palpable abnormality but cannot reliably distinguish benign from malignant pathology, so imaging forms an essential part of the evaluation of any breast disease. However, a dilemma still exists in the mind of clinicians as to what imaging modality to choose to evaluate breast disease.

The breast can be evaluated radiographically by mammography (MG), ultrasound (USG), magnetic resonance imaging (MRI), and positron emission tomography (PET) scanning. MG is used as a screening tool for breast cancer and it reduces cancer-related deaths through early detection. (3) Because of the risk of ionizing radiation and its use is limited in dense breasts, USG has emerged as first-line investigation in young women and mammographically dense breasts. (4) USG is cheap, easily available, non-invasive, and allows real-time evaluation of any breast lesion.

In the present study, USG was used as a supplementary tool to MG in all patients with symptomatic breast disease, and FNAC was performed on any abnormality diagnosed on imaging. The sensitivity and specificity of USG and MG independently and using them as a combined modality was calculated.

MATERIALS AND METHODS

This prospective longitudinal study was carried out in the Department of Radiodiagnosis, Government Medical College and Hospital, Patiala over 2 years. 352 patients presenting with symptomatic breast disease in the Out-Patient Department or admitted in the wards were included in our study. Women with a fungating mass in the breast and mass adherent to the chest wall and pregnant women were excluded. All patients with symptomatic breast disease underwent MG followed by USG and Fine Needle FNAC was performed only when any abnormality was detected on MG or USG. 193 patients had

abnormality detected either on MG or USG and underwent FNAC and they constituted the study population.

MG was performed using the Allengers MAM-VENUS mammography machine. The standard mammographic examination consisted of mediolateral oblique (MLO) view and craniocaudal (CC) view of the breast and lesions were categorized according to Breast Imaging Reporting and Data system (BIRADS) criteria. Breast USG was performed using a 7.5 MHz linear array transducer probe on Philips Envisor USG Machine. The breast was scanned in minimum of two orthogonal planes i.e. radial and antiradial planes. The axillary region was also seen for lymph nodes. The location of the lesion was labeled according to breast quadrants or according to the o'clock position and distance from the nipple example 12:00/ 2 cm and the provisional sonographic diagnosis was made according to BIRADS. FNAC was performed on any abnormality detected on MG or USG and the results were correlated.

The data was entered into a secure Excel (Microsoft) spreadsheet. Sensitivity, specificity and Negative Predictive Value of MG, USG and MG+USG was calculated.

RESULTS

Out of 352 patients included in our study, the maximum number of patients (158) were between 31-40 years (Table 1). Pain and palpable lump were the common complaints in our study group (Table 2). Although the number of patients presenting with breast complaints was higher in the younger age group but the rate of malignancy was more in the older age group (>50 years) (Table 3). Benign breast disease was present in most of the patients. The most common lesion was fibroadenoma present in 58 patients followed by fibrocystic breast disease in 52, abscess in 18, cysts in 12, and benign duct ectasia in 12 patients. Carcinoma was present in 41 patients and most were in the older age group (Table 4). Comparative analysis of MG, USG, MG+USG was done to diagnose the disease (Table 5). The sensitivity of MG, USG, MG+USG in diagnosing breast disease was calculated to be 72.7%, 90.9%, and 96.96% respectively and specificity of MG, USG, MG+USG was calculated to be 92.35%, 89.28%, 100% respectively. The NPV of MG was lower 74.28% whereas USG had NPV of 89.28%. A higher NPV of 96.55% was seen when MG and USG were used complementary to each other (Table 6).

DISCUSSION

Although, palpable breast masses have traditionally been diagnosed with an excisional biopsy, less invasive methods of diagnosis are needed to reduce the number of unnecessary biopsies, allay the anxiety of patients, and control cost.(5,6) Accordingly, this study was conducted to evaluate the breast disease non-invasively in a series of patients using MG, USG, and using them as complementary to each other.

Breast pain (called mastalgia) is the most common breast complaint. Patients may complain of heaviness or tenderness, maybe cyclical with only approximately 15% of women requiring treatment. No abnormalities are usually found in the painful area, and if detected were benign and the prevalence of cancer is low in these women. (7) Imaging is not indicated in bilateral cyclical asymptomatic pain. However, if pain is associated with other symptoms or palpable mass, ultrasound should be advised to rule out any abnormality. (8) Mammography may be reassuring to the patient but is usually not of much help in evaluating breast pain. (9) In present study, out of 159 patients presenting with pain, only 54 had findings. All 54 patients had benign pathology. Fibrocystic change in the breast was the most common benign breast condition, and more than half of women experience some form of fibrocystic change during their lifetime.(10,11) The most common clinical manifestation of fibrocystic change is pain and tenderness, followed by a palpable lump and nipple discharge.(12) MG findings are variable ranging from no visible abnormality to a focal mass or asymmetry, microcalcifications, architectural distortion, areolar skin thickening.(10,11)

Majority of the patients of fibrocystic breast disease were under 40 years of age and showed variation of the pain with the menstrual cycle. In our study, out of 52 patients, 29 patients were reported as normal while others showed focal asymmetry. USG may be normal or show heterogeneous non-mass like lesion, solid mass or cyst. (11) USG diagnosed all the cases with most of the patients of fibrocystic breast disease showing heterogeneous echotexture of breast parenchyma with no discrete mass lesion. Ultrasound is the first line of investigation for evaluating fibrocystic disease and harmonic imaging or elastography may aid in evaluating cysts with thick contents. (8)

Palpable breast mass is the second most common complaint of women particularly during the reproductive years.(13) However, not all palpable abnormalities are discrete masses especially in women younger than 40 years, in whom normal glandular nodularity may be mistaken for dominant masses.(14) In patients complaining of palpable lump about 25% of the patients had no finding and those with lumps the majority (64.6%) had benign findings.

Fibroadenomas account for 68% of the palpable breast masses and a large proportion of breast biopsies.(15) They are mostly found in 20 - 50 year age group with peak between 20 to 24 years.(16) Increased Body Mass Index (BMI) increases while multiparity and use of oral contraceptives decrease the risk of fibroadenoma.(17) Fibroadenoma was the most common lesion which appeared as a well circumscribed mass lesion with smooth margins on mammography (Figure 1). A dark halo may be seen around the mass on mammography known as the Mach effect which is an optical illusion caused by the inbuilt edge enhancement mechanism of human retina.(17) Involuting fibroadenomas particularly in postmenopausal females may show calcification.(18) Out of 58 cases, only 41 were diagnosed on MG, the rest of the mammograms were read as normal due to obscuration of the lesion by increased breast density. On USG, well-defined round or oval hypoechoic mass lesion was seen which was wider than taller and showed no distal acoustic shadowing (Figure 2). USG diagnosed 81% of the lesion with confidence while the detection rate increased to 89.6% when combined MG and USG were used for diagnosis.

A breast cyst may present as a palpable mass. The sensitivity of MG was very low in our study for detection of the cysts as the majority of the patients were under 50 years of age and dense fibro-glandular tissue obscured the lesion. USG detected 100% of the lesions. They appear as well-defined round or oval anechoic masses with thin walls. (19) Multiple cysts were detected in 4 patients.

Most of the nipple discharge results from the physiological or benign process. The physiological nipple discharge can be seen during reproductive years and is often associated with nipple stimulation. Physiological discharge is mostly bilateral, milky, green, or yellow in color. (20) Other common causes include benign papilloma, ductal ectasia and malignancy is the least common. (21) Intraductal papilloma

is the most common cause of bloody nipple discharge. Biopsy is required to differentiate them from papillary carcinomas. (22) In our study, none of the cases of benign duct ectasia were picked up on MG while USG showed 100% sensitivity in diagnosing this condition. Intraductal papilloma can be seen as a well-defined hypoechoic mass lesion within a dilated duct (Figure 3) however, can be missed in absence of associated duct dilatation. (23,24,25)

The National Cancer Institute recommended those women in their forties and older should have MG regularly every one to two years.(25) The incidence of breast cancer deaths can be reduced by 30% by the routine screening of healthy women with MG.(27,28) Due to variations in technology and the distribution of disease in screened populations, the reported sensitivity of MG ranges from 60% to 94% and the specificity from 88% to 99%. (29) Because the NPV of MG is less than 100%, it must be emphasized that a normal mammogram does not rule out breast cancer and any clinically suggestive finding requires a timely evaluation. (29)

USG is safe, cheap, easily available, and non-invasive modality. It is better at characterizing a lesion, distinguish solid from cystic lesions and can serve as a real-time guide for any intervention if required. In our study, the majority of the patients had no abnormality in imaging, 152 had a benign disease and only 41 had malignant pathology. Use of targeted USG was found to increase cancer detection by 14% in patients with symptoms who were evaluated with both MG and USG.(30) When both MG and USG findings are negative in the evaluation of a palpable breast mass, the NPV is high, ranging from 97% to 100%.(30-35) Similarly in our study, the NPV of combined use of MG and USG was significantly higher (96.5%) as compared to when MG and USG were used independently.

CONCLUSION

To conclude, MG and USG do not replace each other instead they complement each other. The type of imaging modality to be used for assessing symptomatic breast disease is primarily guided by the age of the patient.

Table 1 Age distribution of the patients.

Age (in years)	No. of patients	Percentage (%)
≤30	99	28.1
31-40	158	44.9
41-50	44	12.5
51-60	21	6
≥60	30	8.5
Total	352	100

Table 2 Main presenting features of 352 patients included in our study.

Age (in years)	Lump	Pain	Nipple Discharge	Nipple Retraction	>1 Complaint	Total
≤30	18	52	29	0	00	99
31-40	59	82	12	05	00	158
41-50	05	19	14	00	06	44
51-60	15	06	00	00	00	21
≥60	12	00	06	00	12	30
Total	109	159	61	05	18	352

Table 3 Age of patients and diagnosis of FNAC results.

Age category (in years)	FNAC	
	Benign	Malignant
≤30	63	0
31-40	61	6
41-50	24	6
51-60	0	12
≥60	4	17
Total	152	41

Table 4 FNAC with comparative analysis.

FNAC Diagnosis	No. of Cases	MG ALONE	USG ALONE	MG +USG
Fibrocystic Disease	52	23	52	52
Fibroadenoma	58	41	47	52
Abscess	18	06	18	18
Cyst	12	00	12	12
Duct Ectasia	12	00	12	12
Carcinoma	41	41	35	41

TABLE 5 Sensitivity, specificity, PPV and NPV of individual tests and MG and USG in combination.

	Mammography (MG)	Sonomammography (USG)	Mammography (MG) + Sonomammography (USG)
Sensitivity	72.73%	90.90%	96.96%
Specificity	92.35%	89.28%	100%
PPV	92.30%	90.90%	100%
NPV	74.28%	89.28%	96.55%

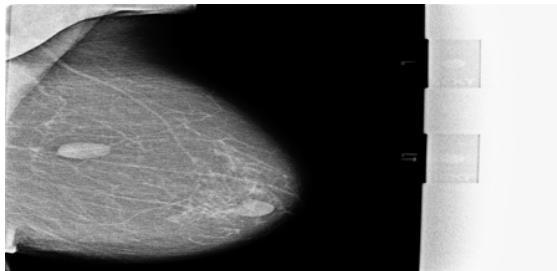
Appendices

Figure 1 – Mammography (Mediolateral oblique view) of right breast showing well defined oval radiopaque lesion in superior quadrant of right breast signifying benign disease. On USG and FNAC it was diagnosed to be fibroadenoma.

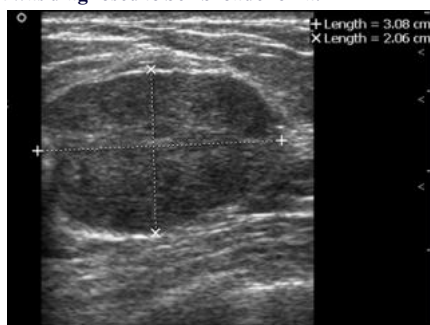


Figure 2 – USG of right breast of the patient presenting with palpable lump shows a well-defined oval hypoechoic lesion which is wider than taller. No distal acoustic shadowing is seen. On FNAC, confirmed to be fibroadenoma.



Figure 3 – USG of breast of patient presenting with nipple discharge showing well defined hypoechoic mass lesion within the dilated duct consistent with findings of intraductal papilloma.

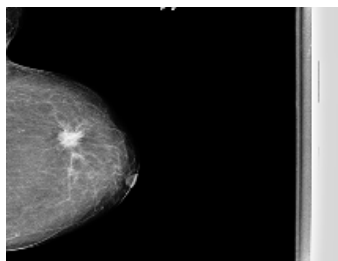


Figure 4 – Mammography (Cranio-caudal view) of right breast showing a spiculated mass lesion in the superior quadrant consistent with the malignant pathology. The lesion was confirmed to ductal carcinoma on histopathology.

Abbreviations

MG - Mammography
 USG - Ultrasonography
 PPV - Positive Predictive Value
 NPV - Negative Predictive Value
 MLO - Medio-lateral oblique
 CC - Craniocaudal
 BIRADS - Breast Imaging Reporting and Data System
 FNAC - Fine needle aspiration cytology
 MRI - Magnetic Resonance Imaging
 PET - Positron Emission Tomography

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