COMPARATIVE DIAGNOSTIC STUDY ON BREAST LESIONS

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ABSTRACT

BACKGROUND

The aim of the study is to evaluate the breast lumps using ultrasound and mammogram independently and in combination.

METHODS

In this study group there were 30 patients, out of whom 29 were female and one male patient. They presented with breast symptoms such as palpable lumps, breast pain and nipple discharge. They were examined prospectively over a period of six months. After examining with both the methods, FNAC correlation was done with each method.

RESULTS

In this study the sensitivity of the mammogram is 95% in detecting lesions and the specificity is 67% giving an accuracy of 90%; the sensitivity of USG is 90% and specificity is only 40% giving an accuracy of 70%. Cytology has a sensitivity of 85% and specificity of 50% and the accuracy is 77%. With the combined modality, the sensitivity is 96% and the specificity is 83% and accuracy is 94%. The study concludes that the sensitivity is increased when both the modalities are used in conjunction and with a needle biopsy it achieves a satisfactory specificity and it avoids unnecessary benign surgical biopsies.

KEYWORDS

Mammogram, Ultrasonogram, FNAC, HPE.

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INTRODUCTION

The breast or mammary gland is a distinguishing feature of the class mammalia. From puberty to death, the breast is subjected to constant physical and physiological alterations that are related to menstruation, pregnancy, gestation and menopause. The impact of breast disease assumes greater importance as the incidence of breast cancer continues to increase steadily.^{1,2} Interest in the knowledge about breast diseases, esp. Breast cancer has increased greatly in recent years. Increasing public awareness of routine self-examination of breast has facilitated early detection of breast lesions. The use of mammography to screen asymptomatic women of 40 yrs. of age and over has been shown to detect breast cancer in the very early stages and consequently has reduced the mortality.^{3,4} rates by 20 to 30 percent. Mammography is the only effective technique employed in screening of breast carcinoma. As the patient with a breast symptom attends the breast clinic, a careful history is recorded. The duration of symptoms, fluctuation with menstrual cycle is assessed.

Inspection and palpation of the breast is done in all positions and followed by examination of axillary and supraclavicular regions. Both breasts are examined thoroughly. Although numerous advantages and improvements in mammography have occurred within the last few decades and has greatly improved image quality, the technique is not without shortcomings resulting in limitation in the sensitivity and specificity of this imaging modality.

The use of ultrasonogram in evaluation of breast lesions has its own place, especially in young females.^{4,5} and in individuals with small breasts. Neither clinical nor imaging modality alone can detect breast cancers with certainty. To achieve an effective result, all the clinical and imaging modalities are to be done in conjunction with FNAC or HPE. With more emphasis being placed on early detection of cancer breast and breast conservation surgery, the relative merits of ultrasonogram and mammogram with FNAC correlation should be carefully evaluated. This study aims at comparing the effectiveness of mammography, ultrasonography and FNAC and to understand the efficacy of evaluation using the three modalities in combination in managing breast lesions.

AIM

The aim of the study is to evaluate the breast lumps using ultrasound and mammogram independently and in combination.

MATERIALS AND METHODS

In this study group there were 30 patients, out of whom 29 were female and one male patient. They presented with breast symptoms such as palpable lumps, breast pain and nipple discharge. They were examined prospectively over a period of six months. All patients were evaluated using all the three methods, but there were a few technically difficult situations because of the small sized breast.

Clinical Examination

Of the 30 patients evaluated 7 patients were less than 30 years, 10 patients were between 31 to 40 years, 5 patients were between 40 to 50 years, 5 patients between 51 to 60 years, 3 patients were more than 60 years as given below in the table. These patients were examined clinically and were found to have either solid or cystic masses.

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Few patients also had nipple discharge. All patients were given adequate explanation about the procedure and consent was obtained.

Equipment

Mammography was performed in a dedicated mammographic unit. It has a radiographic stand to radiograph the patient in both standing and sitting posture in combination with mammographic X-ray tube assembly with compression paddle. The cassette used for mammogram was KODAK min 30 R with single-sided screen with ultrasensitive films with emulsion coated on single side. Patients submitted for mammogram were positioned for craniocaudal and mediolateral oblique views of the breast. For MLO view, the tube and the cassette were angulated between 45 to 60 degrees.

Ultrasonogram was performed on F sonic real time scanner with hand-held linear electronic array transducer. The transducer could be operated in the frequency range of 7.5 MHz and was provided with a built-in fluid offset.

For USG, patients were positioned in supine with hands held above their heads. FNAC was done with a 10 cc disposable syringe with a 23 or 24 G needle. Smear was made and cells were air dried. FNAC was done in lying position. Nipple discharge was squeezed and applied over a slide and sent for cytological studies.

RESULTS

Age Group	No. of Patients
Below 30 Years	7
31-40 Years	10
41-50 Years	5
51-60 Years	5
>60 Years	3

Sex of the Patient	No. of Patients
Female	29
Male	1
Sex Distribution	

Unilateral/ Bilateral	Location of Mass	Consistency	Skin Thickening	Nipple Retraction	Nodes	Opposite Breast
All Masses Unilateral	LUO—6 LUI-8 LLO—2 LLI-1 RUO-2 RUI-2 RLO—2 RLI—2 CENTRAL-7	CYSTIC-1 SOFT-1 FIRM-17 HARD-4	One	Seven	AXILLARY NODES UNI—10 BILATERAL—NIL	Normal
Clinical Evaluation of the Masses was Done and Findings were Analysed						

The masses were overlapping the quadrants in few cases. Regarding the consistency, some had variable consistency like firm to hard.

Nature	2 cm	2-5 cm	5 cm	Total
Benign	4	7	2	13
Malignant		4	5	9
Size of the Mass				

The masses were separated according to the size and its histopathological correlation was analysed. It was observed that out of the total HPE proved and accurately measured masses, 4 were less than 2 cm in size and they were benign; 7 were in 2-5 cm range and was benign and 2 were over 5 cm and found to be benign. Majority of cases were in 2 to 5 cm group. Nine cases were malignant and 5 were in the 5 cm group.

Pattern	Benign	Malignant	Total
Dense	5	-	5
Mixed	9	9	18
Fatty	4	1	5
Density of the Mass			

Types of Discharge	No. of Patients
Serous	5
Milky	2
Blood Stained	1
Nipple Discharges	

One patient who had blood stained discharge showed evidence of duct ectasia on ductogram. Rest of the cases had normal mammographic findings corresponding to the age.

Distribution of Malignancy

Of the 30 cases analysed, 11 were found to be malignant with HPE correlation.

Categorization of malignant cases according to the age group was done.

Age Group (Years)	Frequency	Percentage
<30 Years	0	0
31-40 Years	2	18%
41-50 Years	5	46%
51-60 Years	2	18%
>60 Years	2	19%
Total	11	100%

The age group distribution of malignancy corresponds well with WHO statistics, i.e. about 77% of women with newly diagnosed cancer breast belonged to over the age of 40 years and cancer breast is relatively rare in women between 20-24 years of age.

MAMMOGRAPHIC FINDINGS

Findings	No. of Cases	Unilateral/ Bilateral	Density	Margins	Calcification	Number	Halo	Skin Thickening	Breast Pattern	Fibroglandular Architecture	Quadrants
Fibroadenosis	7	Bilateral	Increased	Diffuse		Single	+	-	-	Diffusely Dense	Uo ui Lo.li
Fibroadenoma	3	Bilateral	Increased Round Oval Lobulated	Well Defined		Single	++	-	Mixed Glandular	No Distortion	Uo ui Lo li
Infection	2	Unilateral	Increased	Diffuse		Single	-	-	Mixed Glandular	No Distortion	Uo
Malignancy	10	Unilateral	Asymmetry Increased Density	Irregular	Micro Calcification	Single	-	+	Mixed Fatty	Distorted	Uo lo Ui li Retro Areolar
Cystosarcoma Phyllodes	1	Unilateral	Hyperdense	Irregular Lobulated		Single	-	-	Mixed	Distorted	Uo lo Ui li
Duct Ectasia	1	Unilateral									Retro Areolar

ULTRASONOGRAM FINDINGS

Findings	No. of Cases	Unilateral/ Bilateral	Echogenicity	Margin	Calcification	Single/ Multiple	Internal Echoes	Posterior Enhancement	Post Acoustic Shadowing	Quadrants
Fibrocystic Disease	7	Bilateral	Hypoechoic	Diffuse	-	Single	-	7	Diffusely Dense	
Fibroadenoma	3	Unilateral	Hypoechoic	Well Defined	-	Single	-			Uo ui
Infection	1	Unilateral	Hypoechoic	Well Defined	1	Single	With Internal Echoes		1 case	Uo
Malignancy	11	Unilateral	Mixed Echogenic	Irregular	2	Single	With Internal Echoes Degenerative Changes	2 cases	9 cases	All Quadrants

Comparative Analysis of Imaging Modality

On analysis with the above data, it was found that combined modality was 100% in diagnosing fibrocystic disease, fibroadenoma and intramammary lymph node.

Findings	No. of Cases	Mammogram	Ultra- sonogram	Combined
Fibrocystic Disease	7	7	7	100%
Infection	1	1	-	
Fibroadenoma	3	3	3	100%
Carcinoma	11	10	11	<Than 100%
Cystosarcoma Phyllodes	1	1	-	
Intra mammary Lymph node	1	1	1	100%

Fibrocystic Disease	7
Infection	1
Fibroadenoma	3
Cystosarcoma Phyllodes	1
Galactorrhoea	1
Duct Ectasia	1
Lymph Node	1
Eczema	1
<i>In this Study there were 16 Cases with Benign Breast Diseases</i>	

The benign masses showed calcifications. These calcifications help us for determining the nature of the neoplastic process. The malignant calcifications are micro calcifications occurring in clusters with pleomorphism. Benign calcifications are picked up by ultrasonogram.

	Mammogram	Ultrasonogram	Both
Malignant	6	2	8
Benign	2	1	3
<i>Table showing the Comparative Analysis of Mammogram and Ultrasonogram in Picking up Calcifications</i>			

Evaluation of Lymph Node Status

Evaluation of lymph node is essential in staging the disease. Lymph nodes evaluation done by clinical methods, ultrasound and by mammogram.

Clinical	10
Ultrasonogram	9
Mammogram	1

Lymph nodal disease evaluation is better with ultrasonogram. Mammogram identifies intramammary lymph node.

DISCUSSION

The comparative evaluation of breast mass by mammogram, ultrasonogram and FNAC reveals that combined approach of these modalities claim superiority over the single modality when used alone.^{6,7,8}

Fibrocystic Disease

Seven cases were picked up by mammogram and six by ultrasonogram. A case sclerosing adenosis was suspected in mammogram and it was confirmed by HPE. By combined approach, all the cases were identified. Another case of diffuse lump was identified, where a malignancy could not be excluded. But ultrasonogram showed evidence of a tiny cyst surrounded by echogenic fibrous tissue. This is in accordance with the observation of Rosner that ultrasonogram provides a better description of lesions in fibrocystic disease. Hence, suspicious malignant cases can be easily differentiated with ultrasound and HPE. In another case where it was suspected clinically to be malignant, but ultrasonogram and mammogram confirmed it as infective pathology. In this chronic abscess, mammogram had a picture of a mass. Ultrasound showed evidence of an abscess as evidenced by the cystic nature of the swelling with internal echoes with posterior acoustic enhancement. Abscess can mimic as malignancy in mammogram, but with USG and FNAC this can be diagnosed correctly.

Fibroadenoma

Out of the total 3 cases both the modalities were able to identify the lesions and it was confirmed by FNAC/HPE. On USG, most of the fibroadenoma are either oval or lobulated. They had a smooth contour, weak internal echoes and uniform echo distribution. There is no post acoustal shadowing, because there was no calcification in a fibroadenoma.

Cysts

In this study, there was no case of any cystic lesions. There were cystic changes in a solid lesion. Ultrasound was better in identifying the cystic lesion and solid lesion as they are better delineated.

Carcinoma

Out of the 11 cases of carcinoma in this series mammogram was useful in diagnosing 10 cases, but ultrasonogram was able to identify all the 11 cases. HPE confirmed as malignancy in all cases; 100% accuracy was achieved in this study for diagnosing malignancy in combined modality. In one case mammogram was not able to identify the malignancy because an adequate compression could not be given due to large size mass. Ultrasound was able to identify calcification in 2 cases. Axillary lymph nodes was documented in ultrasonogram in 9 cases. Mammogram was not used to identify axillary disease.

Cystosarcoma Phyllodes

The only case of phyllodes tumour was diagnosed by mammogram. It was diagnosed based on large size, smooth contours and increased density. Ultrasound showed a lobulated mass with smooth contours with areas of cystic change, which had posterior acoustic enhancement.

Nipple Discharge

Out of the 8 cases with nipple discharge 5 had serous, 2 had milky discharge and 1 had blood stained discharge. One case had a Duct Ectasia, which was documented with ductogram. Another patient with nipple discharge showed areas of architectural distortion, but ultrasonogram and cytology were not positive for malignancy. HPE was also not positive. She is under close observation.

Intramammary Lymph Node

In one case, mammogram was helpful in identifying an intramammary lymph node. On ultrasound, she had axillary adenitis. HPE proved to be Tuberculosis.

FNAC

In this study, the role of cytology was helpful in documenting malignancy. Out of the 11 cases of malignancy, cytology was helpful in documenting malignancy in all the cases giving it 100% accuracy; 8 cases were diagnosed in the first sitting itself, rest required a second try. Trucut biopsy was done and HPE confirmation was done. In the benign cases, a case of sclerosing adenosis was diagnosed by Trucut biopsy alone. Abscess was diagnosed by the presence of inflammatory cells. Cystosarcoma phyllodes was diagnosed by Trucut biopsy.

In this study, not a single case of malignancy was below 30 years of age. Hence to conclude that ultrasound may be solely employed as the first modality in evaluating symptomatic breast in women less than 30 years of age, it was observed that mammogram showed a decreased diagnostic accuracy in young patients due to the dense nature of the breast. Ultrasonogram can identify lumps much more easily in the dense breasts. In elderly patients with fatty breasts, however, mammogram is a better diagnostic procedure as lumps stand out against the homogeneous ground-glass breast in mixed glandular pattern of breast. Though a definitive diagnosis is possible with non-invasive imaging procedures, for most lesions biopsy/fine needle aspiration cytology are essential for obtaining reliable results.⁶⁻⁸ Patients with palpable breast masses commonly present for imaging evaluation. Unfortunately, false-negative mammographic findings in the setting of a palpable breast mass have been estimated between 4% and 12%.⁹⁻¹⁰ Therefore, malignancy cannot be excluded when mammographic findings of a palpable mass are negative. Mammogram can help physicians determine whether a lesion is potentially malignant and also screen for occult disease in the surrounding tissue.^{11,12-13} It was found from the literatures that mammogram is a well-established diagnostic modality for the breast. It has high diagnostic yield, but is not 100% accurate.¹⁴⁻¹⁵ Mammogram when combined with USG can yield significant improvement in accuracy rates.

MAMMOGRAM	ULTRASONOGRAM
Solid and Cystic Masses Cannot be Differentiated	Operator Dependent
Intracystic Lesions Cannot be Diagnosed	Isoechoic Masses May be Missed Especially when Small
Young Breast have Dense Fibroglandular Parenchyma and Obscure Masses	Microcalcification may not be Identified
Fibrocystic Disease Masks the Margin of a Benign Lump	Circumscribed Carcinoma may be Labelled as Benign
Abscess and Tuberculosis may Mimic Carcinoma	Multicentric Carcinoma may be Missed
Evaluation of Small Tender Breasts is Difficult and Inadequate	
Lactating and Pregnant Patients cannot be Evaluated	

MAMMOGRAM	ULTRASONOGRAM
Microcalcification Can be Seen Well	Solid and Cystic Masses are Differentiated
Multicentric Carcinoma Can be Picked Up	Young Breast with Dense Fibroglandular Parenchyma are Easily Diagnosed
Characteristics of Mass are Better Defined	Contour of Mass Better Visualised Even in the Presence of Adenosis
	Tender and Small Breasts Can Be Evaluated Better
	Abscess are Better Defined
	Pregnant Patients are Examined Safely

MAMMOGRAM		
ULTRASOUND	D	22
	D*	2
		1
		5

Sensitivity	92%
Specificity	83%
Positive Predictive Value	96%
Negative Predictive Value	71%
Accuracy	90%
Prevalence Pretest Probability	80%

CYTOLOGY		
ULTRASOUND	D	22
	D*	4
		3
		3

Sensitivity	83%
Specificity	50%
Positive Predictive Value	87%
Negative Predictive Value	42%
Accuracy	77%
Prevalence Pretest Probability	80%

CYTOLOGY			
MAMMOGRAM	D	20	4
	D*	4	2

Sensitivity	83%
Specificity	33%
Positive Predictive Value	83%
Negative Predictive Value	33%
Accuracy	73%
Prevalence Pretest Probability	80%

Comparative Analysis

BIOPSY		
MAMMOGRAM D	20	2
D*	1	4

Sensitivity	95%
Specificity	67%
Positive Predictive Value	91%
Negative Predictive Value	80%
Accuracy	89%
Prevalence Pretest Probability	78%
Pretest Probability Positive Result	91%
Pretest Probability Negative Result	25%

Comparative Analysis

BIOPSY		
CYTOLOGY D	17	3
D*	3	3

Sensitivity	85%
Specificity	50%
Positive Predictive Value	85%
Negative Predictive Value	50%
Accuracy	77%
Prevalence Pretest Probability	77%
Pretest Probability Positive Result	85%
Pretest Probability Negative Result	50%

Comparative Analysis

BIOPSY		
ULTRASOUND D	19	8
D*	2	5

Sensitivity	90%
Specificity	38%
Positive Predictive Value	70%
Negative Predictive Value	71%
Accuracy	71%
Prevalence Pretest Probability	62%
Pretest Probability Positive Result	70%
Pretest Probability Negative Result	29%

Comparative Analysis

BIOPSY		
COMBINED D	20	4
D*	4	2

Sensitivity	96%
Specificity	83%
Positive Predictive Value	96%
Negative Predictive Value	83%
Accuracy	94%

EVALUATION OF THE RESULTS

	Sensitivity	Specificity	Accuracy
Mammogram	95%	67%	89%
Ultrasonogram	90%	40%	70%
Cytology	85%	50%	77%
Combined	96%	83%	94%

Hence, by evaluating the test by using a combined modality the specificity of the test and accuracy gets improved.

CONCLUSION

The primary objective of a Breast Cancer Clinic is to maximize cancer detection whilst minimizing the number of unnecessary benign surgical biopsies.

The triple assessment of symptomatic breast lesions is the mainstay of modern breast diagnosis. Clinical examination requires experience to distinguish benign from malignant.

Breast imaging has an extremely important role in deciding whether an abnormality is present or not and its likelihood of malignancy. Each of the components of the triple assessment has its own limitations. It is therefore essential for a safer patient management that interpretation is undertaken by multidisciplinary team, so that accuracy of each component is known.

Mammogram has a good diagnostic yield in detection of breast lesions. Ultrasonogram can be used as a single modality in patients who are less than 30 years of age, in pregnant and lactating females as it does not employ ionizing radiation. Breast density does not limit its use in ultrasound.

In this study, the sensitivity of the mammogram is 95% in detecting lesions and the specificity is 67% giving an accuracy of 90%. The sensitivity of USG is 90% and specificity is only 40% giving an accuracy of 70%. Cytology has a sensitivity of 85% and specificity of 50% and the accuracy is 77%. With the combined modality, the sensitivity is 96% and the specificity is 83% and accuracy is 94%.

The gold standard of symptomatic breast diagnosis for more than a decade has been clinical examination, needle biopsy and imaging studies. This study analyses the place of mammogram and shows that the resultant sensitivity is extremely high, but it must be used in conjunction with USG

and needle biopsy to achieve a satisfactory specificity and to avoid unnecessary benign surgical biopsies.

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