Evaluation of breast lesions with Ultrasonography and Mammography in Correlation with FNAC/HPE

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Abstract
Objective: To detect and characterise breast lesions by mammography and ultrasonography of the breast. To compare the mammographic and ultrasonographic findings of the breast lesions and to correlate their findings with FNAC/HPE.
Methods: This cross-sectional study was performed on 100 patients with breast lesions, who were referred to MediCiti Hospital, Telangana, India during January 2018 to September 2019 Results: Maximum number of cases are seen between 31-40yrs(35%) followed by 41-50yrs (26%). The youngest patient was aged 16 years, the oldest being 82 years. Maximum number of benign cases were seen between 31-40yrs(30%). All the cases below 30 years were found out to be benign whereas the ones identified after 70 were almost all malignancies. Most of the patients were women; however, 3 male patients were identified. Of the 3 male patients, 2 were diagnosed as having gynaecomastia and 1 patient had duct ectasia. 58 patients had lesions on the right side, 37 patients have shown lesions on the left side and rest of the 5 people had bilateral pathology. Most of the malignancies were identified on the right side. Most of the benign lesions were seen in the upper outer quadrant, whereas most malignancies are seen in the upper inner quadrant. Of all the benign lesions, maximum were fibroadenomas i.e., 37 and invasive ductal carcinomas constitute the maximum number of malignancies i.e., 10. Each case was given a TTS wherein each component of TT was given a score 1, 2 & 3 for benign, suspicious and malignant results respectively. TTS is the sum of these scores. The obtained p value is 0.0001 which is less than 0.05. Therefore, with 95% confidence levels this study highly statistically significant.
Conclusion: Higher combined specificity of ultrasonography and mammography for detecting breast masses including malignancies. Ultrasonography could detect majority of the benign lesions and mammography could detect majority of malignant lesions. However it is better advised to undergo both the modalities for diagnostic accuracy. When affordability is a concern, and asked for a single modality of evaluation, then ultrasound is better for characterisation of lesions in young people and mammography in older individuals.
Keywords: Ultrasonography, mammography, breast lesions.

I. Introduction

Breast cancer is one of the leading causes of death in women. Cancer is the second most common cause of death followed by heart disease. It is more prevalent in the developed regions compared to the less developed counterparts of the country. Increasing incidence in younger age, rising number in India, decreasing survival rates, late presentation, aggressive cancers in younger age groups are the reasons of concern for taking up this study. The reasons being lack of awareness, lack of screening and financial concerns. The burden of breast cancer has rapidly increased over the past two decades. With respect to current trends prevailing in the country, it shows that there is an increased risk of disease burden by 2020. Therefore it is necessary to educate people regarding the risk factors, screening protocols and available treatment options to reduce the mortality. Some of the risk factors are obesity, parity, radiation exposure, genetic predisposition, duration of breast feeding which is inversely proportional to the disease. Early detection of breast cancer reduces the morbidity and mortality rate. Post-menopausal and younger women with a genetic predisposition are more likely to develop breast cancer. Screening in the form of mammography is recommended for them. Mammography and sonomammography of the breast are routinely used for the detection of breast lesions. Ultrasonography of the breast is used to evaluate abnormalities detected on mammography. It is particularly useful in the evaluation of dense breasts which is a limitation of mammography. It is also considered to be more effective in differentiating between solid and cystic masses. Mammography is a non invasive radiological examination of the breast using a special imaging device. A mammography film, called mammogram is used to aid in the diagnosis of breast diseases in women. Mammograms are used as a screening tool to detect early breast cancer in women with no symptoms and to detect and diagnose breast disease in women experiencing symptoms such as lump, pain or nipple discharge. Ultrasonography uses sound waves to produce pictures of internal structures of the breast. It is

a safe and non invasive investigative modality. This modality is used to characterise the size, shape, consistency, echogenicity of the lesion. Doppler ultrasonography is used to detect the flow characteristics and velocity of blood. It is used for women aged less than 30years to reduce the risk of radiation. Guided biopsy and aspiration of the area of interest can be done. By using both the imaging modalities together, the sensitivity and specificity for detection of breast lesions increases. Histopathological examination enables us to confirm the findings of mammography and ultrasonography of the breast. For any suspicious breast lesion biopsy/FNAC is generally performed. A systematic approach to breast lesions which are detected on mammography and ultrasonography to characterise a lesion will reduce the need for unnecessary biopsy. The purpose of this study is to compare the sensitivity and specificity of mammography and ultrasonography in the evaluation of breast lesions in correlation with FNAC / histopathological examination.

II. Material And Methods
Source of data: All women undergoing mammography, ultrasonography of the breast and histopathological examination in MediCiti Institute of Medical Sciences, Ghanpur.
Study design: Cross sectional study
Study period: The study period is for twenty one months January 2018 to September 2019
Study area: MediCiti Institute of Medical Sciences, Ghanpur.
Sample size: 100

Statistical methods:
Descriptive statistics for the detection of breast lesions using mammography and ultrasonography of the breast will be computed and expressed in terms of percentages.The sensitivity, specificity, positive predictive value and negative predictive value for the detection of breast lesions by mammography and ultrasonography of the breast were evaluated.

Chi-square test was used to compare the sensitivity and specificity of mammography and ultrasonography of the breast in the evaluation of breast lesions.
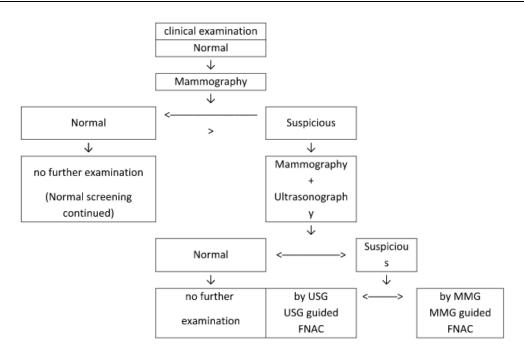
Inclusion Criteria:
Asymptomatic patients undergoing screening mammography and ultrasonography of the breast with subsequent biopsy/FNAC. All patients who are clinically symptomatic and suspected to have breast pathology undergoing mammography and ultrasonography of the breast with subsequent biopsy/FNAC.

Exclusion Criteria:
Asymptomatic women who are less than 40 years of age (unless indicated as per ACR recommendations). Pregnant and lactating women. Women with breast implants. Old cases that come for follow-up – ipsilateral breast will not be assessed.

III. Data Collection
The sample population was all patients who have undergone all the three examination techniques of mammography, ultrasonography of the breast and histopathological examination. All patients who have undergone mammography and ultrasonography of the breast followed by histopathological correlation. GE Senographe mammography unit has been used for mammography of the breast by using standard views i.e. medio-lateral oblique and cranio-caudal views. Philips HD7 and ENVISOR ultrasounds unit with 10MHz probe were used for ultrasound examination of the breast.

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BI-RADS Assessment Categories
Category 0: Additional Imaging Evaluation and/or comparison to prior mammograms is needed.
Category 1: Negative.
Category 2: Benign (non-cancerous) Finding.
Category 3: Probably Benign Finding – Follow-Up in a Short Time Frame is Suggested.
Category 4: Suspicious Abnormality – Biopsy Should Be Considered.
 4A: Finding with Low Suspicion of being Cancer
 4B: Finding with an Intermediate Suspicion of being Cancer.
    4C: Finding of Moderate Concern of being Cancer, but not as high as Category 5.
Category 5: Highly Suggestive of Malignancy – Appropriate Action Should Be Taken.
Category 6: Known Biopsy Proven Malignancy– Appropriate action Should Be Taken.

IV. Review Of Literature
STUDIES USED FOR COMPARISON
Malik G, Waqar F, Buledi G. Sonomammography for Evaluation of Solid Breast Masses in Young Patients. This study was carried out at Radiology Departments of PNS Shifa Karachi and CMH Rawalpindi from February 2002 to April 2005. Sonomammography of 56 young patients with breast lump was done. Lesions were characterised by using sonographic criteria as benign (n=49), malignant (n=2) and intermediate (n=5) masses. Results of this evaluation were assessed by fine needle aspiration cytology. No false positive result was noted in 49 benign lesions while only one intermediate mass turned out to be malignant. Sensitivity of sonomammography was more for benign 92% than malignant lesions 67%, and its specificity was high for malignant lesions 92.4%. Retrospective scanning was done for intermediate masses. This study proves the efficacy of ultrasound as a method of choice to evaluate breast masses in young patients avoiding the need of biopsy. This study also reflects that benign diseases dominate the disease spectrum in young patients.
Shetty MK, Shah YP, Sharman RS. Prospective evaluation of the value of combined mammographic and sonographic assessment in patients with palpable abnormalities of the breast. J Ultrasound Med 2003. One hundred and sixty five (40.1%) of 411palpable abnormalities had a benign assessment; 97 (58.7%) of the 165 benign lesions were visible on both mammography and sonography; 66 (40%) of 165 benign lesions were mammographically occult and identified at sonographic evaluation. In 60 (14.6%) of the 411 cases, imaging evaluation resulted in a suspicious assessment; 49 (81.7%) of the 60 lesions categorized as suspicious underwent biopsy; 14 (28.5%) of49 lesions were histologically proved to be carcinoma. Nineteen (31.6%) of the 60 lesions categorized as suspicious were mammographically occult and identified only on sonography; 14 (73.7%) of these
19 lesions underwent biopsy; 12 (63.1%) of 19 were benign, and 2 (10.5%) were malignant. One hundred eighty six (45.2%) of the 411 palpable abnormalities had negative imaging assessment findings;12 patients with negative imaging findings underwent biopsy, and all had benign findings. The sensitivity (14 of

14) and negative predictive value (186 of 186) for a combined mammographic and sonographic assessment were 100%; the specificity was 80.1% (186 of 232).

Correlation of Ultrasound & Mammography to Histopathology Results in Breast Cancer. A One Year Study at King Khalid Hospital, Najran, Saudi Arabia. The *Egyptian Journal of Hospital Medicine* (April 2018). This study showed that mammography is the preferred modality in screening breast cancer patients, as in our sample population used in this study was aged above than 35years. For the younger age group use of complementary tests such as magnetic resonance imaging and ultrasonography is suggested for diagnosis of malignant and benign lesions in cases with high breast density as seen in below 30 years, increasing the speed of detection, and also reducing the costs, especially in high-risk women. Women above 40; mammogram has best results in earliest detection of disease with a higher sensitivity; the results are near to open biopsy. *P.K. Tiwari, Suvendu Ghosh, V K Agrawal* Diagnostic Accuracy of Mammography and Ultrasonography in Assessment of Breast Cancer (2017).The mammography and USG are individually effective diagnostic modalities for detection of breast pathologies. In our study, detection of breast carcinoma is higher in mammography in comparison to USG; however the accuracy of detection of breast carcinoma significantly improves when MG was combined with USG. The study also implies that, in comparison to mammography USG is better modality for detecting lesions in mammographically dense breast. This study confirms that the mammography (MMG) and ultrasound (USG) when combined have significantly higher sensitivity and negative predictive value than observed for a single modality in detecting the both benign and malignant lesions of the breast. The statistical finding leads us to the conclusion that with the use of the combination of the two non-invasive procedures (i.e. MMG+USG) we can almost achieve the accuracy of the FNAC in detecting breast malignancy. *K.Taori et al* 2013 Evaluation of Breast Masses Using Mammography and Sonography as First Line Investigations. This study confirms the higher combined specificity for ultrasonography and mammography for detection of breast masses including malignancies. USG is better in cystic lesions, ectasias, infections and inflammatory conditions, pregnancy-lactation, dense breast evaluation and real time image guidance, whereas mammography is better in detecting microcalcifications, spiculated masses for early detection of occult malignancies and for stereotactic biopsies. Ultrasonography and mammography cannot replace each other but to suggest single modality, ultrasonography is better in younger population and BIRAD 1, 2 & 3 lesions. Whereas, mammography is better in older population and BIRAD 4 & 5 lesions. However, sonomammographic correlation is best in both. Extrabreast lesions can mimic breast mass, its awareness and careful cross sectional imaging can be problem solving. Mammography do not help much in these cases.

V. Other Recent Studies

Samardar P, Paredes E, Grimes M, Wilson J. Focal Asymmetric Densities Seen at Mammography: US and Pathologic Correlation. According to this study a positive US finding such as a solid mass or an area of focal shadowing increases the level of suspicion for malignancy. A thorough knowledge of the patient's clinical history, along with a fundamental understanding of the ACR BI-RADS lexicon and the role and limitations of supplementary breast imaging, will allow more accurate interpretation of these potentially perplexing soft-tissue findings. *Popli M.* Physiology, pathology and imaging of the young breast. Indian Journal of Radiological Imaging 2000; 10:147-51. Results of ultrasound of the breast carried out in 58 patients, 42 were normal on US while in 8 patients, cyst(s) were detected and the patient was advised follow up. A hypoechoic lesion with well-defined margins, and homogeneous internal echo pattern, was detected in four patients and follow up was advised as an alternative to excision. FNAC was done in 3 patients with suspicious US features which were reported as a fibroadenoma, the other a tubercular lesion and the third one as epithelial hyperplasia. Cytology was done for both patients complaining of discharge and the patients with a complaint of single duct discharge were taken up for ductography. In 54 of the 58 patients US alone was enough to reach a diagnosis. *Irwig et al* (2002) reviewed and summarized evidence on the investigation of breast symptoms based on triple testing. The triple test (where any component is positive) has a sensitivity of 99.6%, a specificity of 62%, a likelihood ratio of 2.62 for a positive result, and a likelihood ratio of 0.006 for a negative result. They presented measures of test accuracy for the components of the triple test that allow easy estimation of the probability of breast cancer in symptomatic women, given any possible combination of results. In her report on fine needle aspiration cytology in diagnosis of breast lumps, Tiwari (2007) claimed FNAC of breast as simple, cost effective and less traumatic method for diagnosis of breast lump which reduces need for open biopsy and recommended its application as a routine method for determining the nature of breast lumps. With the aim to evaluate the accuracy of TTS as a clinical tool for the diagnosis of a palpable breast lump, study was carried out on 117 patients admitted with breast diseases from the breast clinic over thirteen months. 87 had breast lumps. Fifty patients underwent Triple Test Score (physical examination, mammography and fine needle aspiration cytology) and were categorized into benign, suspicious and malignant. This was later correlated with the histopathological findings. Nineteen patients with breast lumps interpreted by TTS as benign correlated with the histopathological findings whereas of 31 malignant lumps, 30 turned out to be malignant and one benign. This gives TTS an overall accuracy of

98% with 100% sensitivity, 95.2% specificity and positive predictive value of 95.7&. Carcinoma was seen in 29 (58%) cases in the age group of 35 to 70 years. The mean age of diagnosis of benign and malignant disease was 41.8 and 45.1 years, respectively. In conclusion, TTS is an accurate and least invasive diagnostic test based on which definitive treatment can be initiated. ***John T. Vetto et al***(2002)studied 55 women below the recommended age of screening mammography < 33 years with unilateral palpable breast lesion using modified triple test (MTT : Physical examination, USG instead of mammography and FNA). They found that when all the 3 components are concordant (in agreement), the MTT had 100%diagnostic accuracy. However, when they were non concordant, FNA and physical examination were more accurate than USG. However, in terms of accurately predicting whether the index lesion was a cyst, USG had a sensitivity of 100% and a specificity of 94%. Further, it was shown that though the standard TT was efficient in evaluating palpable breast masses in older women, the mammography component of standard TT is rarely useful in younger women. It was also found that FNA which is generally associated with a higher false negative rate than false positive rate, had the relationship reversed in young women. Performing FNA prior to the sonogram can render the imaging study un-interpretable (or false positive) for weeks after the needle stick. John Vetto et al also studied 46 lesions in 43 patients and found that triple test was 100% accurate in diagnosis of palpable breast lesion when all three elements were concordant. ***Morris et al*** studied a total of 259 patients with 261 palpable breast masses between 1991 and 1997 with an objective to evaluate their experience with the triple test. They found that the triple test (TT) for palpable breast masses yields 100% diagnostic accuracy when all 3 elements (i.e. physical examination mammogram and FNAC) are concordant (all benign or all malignant). They said that the clinician could proceed directly with definitive therapy without an interventional open biopsy, if all the components of triple test were malignant. If all the components were benign, the patient can be safely observed 13, 14, and 15. However, patients with masses that have non-concordant TT results were considerable in their study. In examining the TT elements individually in these patients they found that fine needle aspiration was typically more accurate than physical examination or mammography (Morris et al 1998). ***Katherine T. Morris et al*** studied a total of 484 palpable breast lesions in 479 women from 1991 through July 2000. In this study physical examination, mammography and FNA were each assigned a score of 1, 2 and 3 for benign, suspicious or malignant results. Triple Test Score (TTS) is the sum of these scores. TTS has a minimum score of3 (concordant benign) and a maximum score of 9 (concordant malignant). All lesions with TTS < 4 were benign and all lesions with TTS > 6 were confirmed malignant. Thus, TTS retains its diagnostic sensitivity and specificity of 100% when the score does not equal 5 points. They also found that FNA has the highest sensitivity and specificity of 3 TTS components and provides a tissue diagnosis. However, FNA does have its share of false negative (8%) and (4%) false positive results 12. Katherine T. Morris et al12 also evaluated breast masses in 113 women of age less than 40 years using modified triple test score. They assigned scores of 1 point for benign, 2 points for suspicious or 3 points for malignant findings from physical examination, USG and fine needle aspiration. The MTTS was a sum of the three scores. MTTS was found to be a rapid and accurate assessment of breast masses in women under age 40 years, a population in which the incidence of breast cancer is low. However, it is also within this population that most cases of missed diagnosis of breast cancer occur. MTTS has 100% diagnostic accuracy when other than 5 points. ***Ghazala malik, Fareesa waqar,et al*** made a study on 56 patients by using sonomammography for evaluation of solid breast masses from Feb 2002 to Apr 2005. No false positive result was noted in 49 benign lesions while only one intermediate mass turned out to be malignant. Sensitivity of sonomammography was more for benign 92% than malignant lesions 67%, and its specificity was high for malignant lesions 92.4% A 10-year retrospective cohort study carried out in the Pathology Department of UCH. All FNAB and histologically diagnosed cases of breast lesion the pathology department between January 1996 and December 2005 were reviewed. The cytological diagnoses were then categorized into one of five diagnostic categories in accordance with the recommendations of the NHSBSP. The positive predictive value for malignancy was 99.3% with a complete sensitivity of 97.7% and specificity (full) of 94.2%. FNAB as a clinically effective diagnostic procedure for breast lesions.

A combination of these modalities allows us to attain a more accurate diagnosis of the detected breast lesions while histopathological correlation facilitates a definitive diagnosis.

VI. Observations And Results

This study evaluation of breast lesions with mammography and ultrasonography in correlation with FNAC / histopathology is based on 100 patients who have undergone all the above investigative procedures.

Table1: Age wise distribution

Age	Benign	Malignant	Total
0 - 20 yrs	5	0	5
21 - 30 yrs	20	0	20
31 - 40 yrs	30	5	35
41 - 50 yrs	13	3	26
51 - 60 yrs	7	6	13
61 - 70 yrs	4	4	8
71 - 80 yrs	0	2	2
81 - 90 yrs	0	1	1

Maximum number of cases are seen between 31-40yrs(35%) followed by 41-50yrs (26%). The youngest patient was aged 16 years, the oldest being 82 years. Maximum number of benign cases were seen between 31-40yrs(30%). All the cases below 30 years were found out to be benign whereas the ones identified after 70 were almost all malignancies.

Table2: Sex preponderance

	Benign	Malignant	Total
female	75	22	97
male	3	0	3

Most of the patients were women; however, 3 male patients were identified. Of the 3 male patients, 2 were diagnosed as having gynaecomastia and 1 patient had duct ectasia.

Table3: Side predominance

Side	Benign	Malignant	Total
right	41	17	58
left	32	5	37
bilateral	5	0	5

58 patients had lesions on the right side, 37 patients have shown lesions on the left sideand rest of the 5 people had bilateral pathology. Most of the malignancies were identified on the right side.

Table4: Quadrant wise distribution

Quadrant	benign	malignant	Total
C	20	5	25
UOQ	25	5	30
UIQ	16	8	24
LOQ	7	0	7
LIQ	5	1	6
MIXED	5	3	8

Most of the benign lesions were seen in the upper outer quadrant, whereas most malignancies are seen in the upper inner quadrant.

Table5: Various histological types of breast lesions seen in the present study

HISTOPATHOLOGIC DIAGNOSIS	No. of cases
FIBROADENOMA	37
INVASIVE DUCTAL CARCINOMA	10
DUCTAL CARCINOMA INSITU	6
DUCT ECTASIA	5
GRANULOMATOUS MASTITIS	6
PAPILLARY CARCINOMA	3
GALACTOCELE	2
LACTATING ADENOMA	3

SUBCUTANEOUS EMPHYSEMA	1
MUCINOUS CARCINOMA	3
ABSCESS	2
FAT NECROSIS	3
PHYLLODES TUMOUR	2
GYNAECOMASTIA	2
BENIGN PROLIFERATIVE BREAST DISEASE	4
CAPILLARY HEMANGIOMA	1
FIBROCYSTIC DISEASE	10

Of all the benign lesions, maximum were fibroadenomas i.e., 37 and invasive ductal carcinomas constitute the maximum number of malignancies i.e., 10.

Table6: BIRADS grading of lesions

No. of cases	BIRADS SCORE
74	II
3	III
9	IV
14	V

Table7: TTS scoring of the lesions

No. of cases	PE	MMG/USG	FNAC	TTS
76	1	1	1	3
2	1	2	1	4
1	2	2	1	5
4	2	2	3	7
6	3	2	3	8
11	3	3	3	9

Each case was given a TTS wherein each component of TT was given a score 1, 2 & 3 for benign, suspicious and malignant results respectively. TTS is the sum of these scores.

STATISTICAL ANALYSIS

Table8:

	MMG	USG	MMG/USG	FNAC
TP	22	22	22	22
TN	77	74	74	78
FP	1	4	4	0
FN	0	0	0	0
SENSITIVITY	100%	100%	100%	100%
SPECIFICITY	98.71%	94.87%	94.87%	100%
PPV	95.65%	84.61%	84.61%	100%
NPV	100%	100%	100%	100%

All suspicious cases were considered having malignant pathology for better diagnostic accuracy.

VII. Discussion

The first step in the management of every patient presenting with a breast lesion is a detailed assessment consisting of clinical evaluation, mammogram and / or USG and FNAC. These allow precise initial diagnosis of palpable breast lesions and reduce the risk of misdiagnosis. In the present study 100 cases were assessed by all the three components. A total of 78 benignities and 22 malignancies were identified, taking cytological and histopathological findings as the diagnostic modalities. Of the 78 benign lesions, 74 were concordant benign; and out of 22 malignancies, 12 were concordant malignant. Of the remaining 14 non concordant cases, 10 were malignant and 4 were benign on FNAC.The study group included all the patients who have undergone all the three modalities of investigations (taking in consideration, the inclusion and exclusion criteria). The youngest individual was 16 years and the oldest being 82 years. Maximum number of patients were between the age group 31-40 years (i.e., 35), whereas maximum malignancies were in the age group 51-60years (i.e.,6). There are 97 female patients and 3 male patients in this study. Majority of the lesions were seen in the upper outer quadrant i.e., 30 whereas majority of the malignancies are seen in upper inner quadrant i.e., 8. In the present study, there were 58 lesions on the right side, of which 41 are benign and 17 are malignant. On the left side 37 are seen, of which 32 are benign and 5 are malignant. Rest of the 5 cases have shown bilateral distribution and all of them were benign. In the retroareolar central quadrant 25 lesions were seen of which 20 are benign and 5 are malignant. In the upper outer quadrant, 25 are benign and 5 are malignant of the 30 cases seen. In lower outer quadrant all are benign lesions i.e.,7. In the lower inner quadrant 6 lesions are seen, of which 5 are benign and 1 is malignant. However, 8 lesions have shown distribution in more than one quadrant. In the lesions which have shown mixed distribution, 5 are benign and 3 are malignant. In total 17 histological types of breast lesions were seen. Fibroadenomas constituted the majority of the lesions i.e., 37 and they form the majority of benign lesions. Majority of the carcinomas are invasive ductal carcinomas i.e.,10. There are 6 ductal carcinoma insitu, 3 papillary carcinomas and 3 mucinous carcinomas. Two patients with ductal carcinoma insitu had Paget's disease of the nipple. Among the benign lesions(78), 37 are fibroadenomas, 10 fibrocystic breast diseases, 6 granulomatous mastitis, 5 duct ectasia, 4 benign proliferative breast diseases, 3 lactating adenomas, 3 with fat necrosis, 2 galactocele, 2 gynaecomastia, 2 phyllodes tumours, 2 abscesses, 1 subcutaneous emphysema and 1 capillary haemangioma. One of the patients with fat necrosis had coexisting abscess. The patients with fibroadenomas had ischemic changes (3) and cystic changes (8). In BIRADS scoring based on mammography was given for each lesion. Seventy four lesions are classified as grade II, 3 as grade III, 9 as grade IV and 14 as grade V. Triple test scoring was done based on physical examination, mammography and FNAC findings. Seventy six lesions are scored 3, 2 lesions are scored 4, 1 lesion has score 5, 4 lesions are scored 7, 8 lesions are scored 6 and rest of the 11 lesions are scored 9. The sensitivity, specificity, PPV and NPV of FNAC/HPE is 100% each. In comparison with FNAC/HPE, mammography has sensitivity 100%, specificity 98.71%, PPV 95.65%, NPV 100% and ultrasonography has 100%, 94.87%, 84.61% and 100% respectively. Combined USG and MMG was 100%, 94.87%, 84.61% and 100% respectively. All suspicious cases are taken as having disease for better diagnostic accuracy according to statistical analysis. The obtained p value is 0.0001 which is less than 0.05. Therefore, with 95% confidence levels this study highly statistically significant. The p value was obtained using Chi-square test.

Comparison of the present study with other recent studies

Table9:

	Taori et al	Tiwari et al	Malik et al	Alhamami et al	Shetty et al	Present study
Total no.	166	53	56	105	49	100
Study period	2 years	1 year	3 years	1 year	9 months	21 months
No. of malignancies	30	9	3	30	14	22
Age of max. malign.	41-49, >60	41-50, >60	40-49	40-49	40-49	51-60
Sn/Sp of MMG	87.9/78.6	77.7/97.7		76.6/86.6		100/98.71
Sn/Sp of USG	92.7/86.9	72.7/97.7		60/96		100/94.87
Sn/Sp of MMG+USG	98.9/97.6	98.2/97.7	91/92.4	74/94	100/80.1	100/94.87

The comparative table of this study with five other studies has been mentioned above.

In *Taori et al* study, a total of 166 patients were selected of whom 156 are female and 10 are male. The percentage of malignancies is 18.07% (i.e., 30/166), where as in this study it is 22%. The age at which maximum malignancies were seen was 41-59 years and above 60 years in Taori et al study. In this study it is 51-60 years. The sensitivity and specificity of mammography were 87.9% and 78.6%. The sensitivity and specificity of ultrasonography were 92.7% and 86.9%. The combined sensitivity and specificity were 98.8% and 97.6%. The sensitivity and specificity of ultrasonography and mammography separately and together were less than this study. In *Tiwari et al* study, the sample size was 53 of which 9 were malignancies i.e., 16.9%

compared to 22% in this study. The combined sensitivity and specificity were 98% and 97.7% compared to 100% and 94.87% in this study.   In *Malik et al* study, the sample size was 56 and found out to have 3 malignancies i.e., 5.3%. The combined sensitivity and specificity were 91% and 92.4% which is comparable lesser than this study. In *Alhamami et al* study, a total of 105 patients were selected, of whom, 30 were malignancies i.e., 28.57% which is slightly higher than this study. The combined sensitivity and specificity were 74% and 94%. The sensitivity of ultrasonography and mammography separately and together are way less than this study.

VIII.   Conclusion And Summary

Aim of the study was to identify breast lesions with ultrasonography and mammography and compare their sensitivity and specificity with respect to FNAC/HPE. This study was carried out so that early detection of malignancies non-invasively can be done and better treatment outcome can be expected. It is the area of concern as many young individuals are getting affected and overall survival of the vital age group is affected. So as to decrease the mortality and disease burden, ultrasound and mammography were chosen for early diagnosis. It is important to educate the young females about the screening procedures as there are good outcomes and therefore decrease the morbidity and mortality caused by breast cancers. Follow up is as essential as screening as many benign lesions may lead to malignancies and a few malignancies may mimic benignity keeping in mind the interobserver variance. Higher combined specificity of ultrasonography and mammography for detecting breast masses including malignancies. Ultrasonography could detect majority of the benign lesions and mammography could detect majority of malignant lesions. However it is better advised to undergo both the modalities for diagnostic accuracy. When affordability is a concern, and asked for a single modality of evaluation, then ultrasound is better for characterisation of lesions in young people and mammography in older individuals.

Acknowledgements

Conflict of interest
There is no conflict of interest to be declared.

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