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Combined Mammographic and Sonographic Evaluation of Palpable Breast Masses in Correlation With Histopathological Examination

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ABSTRACT

Aim & Objectives: *To evaluate the role of combined mammographic and sonographic imaging in patients with palpable masses of the breast. To correlate these findings with histopathological diagnosis (FNAC/ Biopsy). To provide systematic and practical approach to image evaluation of palpable breast masses and then evaluate its image characteristics which help in decision making by clinician as to go for biopsy or lesion follow up.*

Materials and Methods: *40 patients aged 30 or above with palpable abnormalities of breast underwent combined mammographic and sonographic evaluation.*

Results: *18 patients (45%) of the palpable abnormalities had benign result and 8 patients (20%) had malignant result. Imaging evaluation resulted in 14 (35%) patients as suspicious cases. All lesions categorized as suspicious underwent biopsy, among them 12 resulted in malignancy and 2 benign findings. The sensitivity and specificity of combined evaluation is 85.7% and 100% respectively. The positive predictive value and negative predictive value are 100% and 86.4% respectively. In this evaluation, NPV was 86.4%, a negative test result provides reassurance that the patient is unlikely to have cancer.*

Conclusion: *Combined mammography and sonography is appropriate to characterize the palpable breast lesion and avoids unnecessary interventions in which imaging findings are unequivocally benign. Negative findings on combined mammographic and sonographic imaging have very high specificity and are reassuring to the patient.*

Keywords: *Biopsy; breast; mammography; palpable lumps; sonography.*

INTRODUCTION

Breast cancer is the leading cause of non-preventable cancer deaths among women. Great strides in early detection and improved treatment have decreased breast cancer related deaths.

Breast disorder is a common clinical problem routinely encountered in out- patient departments. Most of the so-called lesions are of benign in nature, commonly seen at puberty, lactation, middle aged and elderly women. Majority of patients present with symptoms such as breast lump, pain and discharge from the nipple. Complaints related to breast generate anxiety to the patient. It is necessary to confirm the nature of the lesion at the earliest and suitable diagnostic work up, not only to treat the lesion but also to decrease the anxiety of the patient.

Mammography is still the only proven screening method for the breast as of date and is the only one imaging technique that has a significant impact on screening asymptomatic individuals for cancer and in diagnosis, staging and patient follow up[1].

The role of ultrasonography in breast imaging has evolved over the years. In most of the clinical practice, the use of breast ultrasonography has been restricted to differentiation of cysts versus solid masses. Today ultrasonography also plays an important role in guiding interventional procedures such as needle aspiration, core-needle biopsy and pre-biopsy needle localization. It is useful in the evaluation of palpable masses not visible in radiographically dense breast, abscesses, masses that are not completely evaluable with mammography, in evaluation of pregnant and lactating mothers and in young patients susceptible to radiation damage.

The combined mammography and ultrasonography has higher sensitivity rate than the sensitivity rate observed for either modality when performed all alone[2]. A prompt and accurate diagnosis is essential to minimize morbidity and mortality associated with breast masses, hence we decided in this study to correlate mammographic and sonographic findings as to arrive at accurate diagnosis

MATERIALS AND METHODS

This is a prospective study conducted in 40 patients of 40 years or above with palpable abnormalities of breast who underwent combined mammographic and sonographic evaluation in the department of Radio-diagnosis.

All patients underwent diagnostic mammography, which included cranio-caudal and medio-lateral oblique views. Later all the patients were subjected to sonography of breast.

Mammography: Film Screen grid mammography of breast was carried out prior to USG evaluation with ALLENGERS MAM-VENUS with KV range between 22-35 KvP and 400 mAs. A Molybdenum target tube in conjugation with 0.3 mm Molybdenum filter is used. Plastic compression plates were used. Two basic views were taken, the craino-caudal and 45^0 Medio-lateral oblique view. The cassette used for Mammography was Kodak MIN-R with single sided screen with ultra sensitive films with emulsion coated on a single side of size 8 x 10".

USG: Breast sonography was carried out with PHILIPS HD 11XE, PHILIPS HD 7 with linear transducer of frequency 7-10 MHZ was used to obtain images in various planes.

Evaluation of radiographic characteristic of mass was carried out using BI-RADS criteria and nature of mass was evaluated with USG assessment. Ultrasound machine with colour Doppler was used to determine the following sonographic findings under the following headings:

Location-Superior / inferior / medial / lateral quadrant, Margins – Regular / Irregular, Width / A.P diameter ratio: >1.4 / < 1.4, Echo texture: Homogeneous / Heterogeneous, Echogenicity - Hyperechoic/ Hypoechoic , Mixed echogenic / Anechoic, Posterior sound transmission: Enhancement / shadowing, Calcification, Pseudocapsule, Vascularity and Axillary lymphadenopathy

Results of the examination were interpreted on the basis of these findings and diagnosis was proposed after considering history and physical examination. Results were given as whether the lesion is benign or malignant and has solid or cystic characteristics.

Mammography was used to determine the following findings:

Location - Upper / lower / inner / outer quadrant, Appearance: Shape- Round/ Lobular / Irregular, Margins – Circumscribed/Microlobulated/ Indistinct or ill-defined/ spiculated, Density – High / Low density, Calcification, Surrounding Halo, Skin retraction / skin thickening, Architectural distortion and Axillary lymphadenopathy.

Results of the examination were interpreted on the basis of these findings and diagnosis was proposed after considering history and physical examination.

Mammographic Findings that raise the Possibility of Malignancy

Findings that should arouse suspicion- lesion with ill-defined margins, lesion with microlobulated margin, architectural Distortion, distorted parenchymal edge, density increasing over time, clustered microcalcifications and changing calcifications

Findings that support the possibility of malignancy - Asymmetric breast tissue, Asymmetric ducts, Asymmetric veins, Skin and trabecular thickening, Nipple retraction, deviation or inversion and Enlarged axillary lymph nodes

STATISTICAL ANALYSIS

Analytical Statistics like sensitivity, specificity, positive predictive value and negative predictive value are assessed.

Inclusion Criteria - Women referred to the department of Radio – Diagnosis with palpable breast masses.

Exclusion Criteria - Women below 40 years of age with palpable abnormalities of breast in whom malignancy is not suspected on preliminary examination. Patients already undergone surgery or received radiotherapy.

RESULTS AND ANALYSIS

There were 40 patients with palpable abnormalities of breast who underwent combined mammographic and sonographic evaluation. The palpable abnormalities were reported in 15 patients in the right breast and 24 patients in left breast and 1 patient in both breasts. In these 18 patients (45%) had benign result and 8 patients (20%) had malignant result. Imaging evaluation resulted in 14 (35%) patients as suspicious cases. All lesions categorized as suspicious underwent biopsy, among them 12 resulted in malignancy and 2 benign findings.

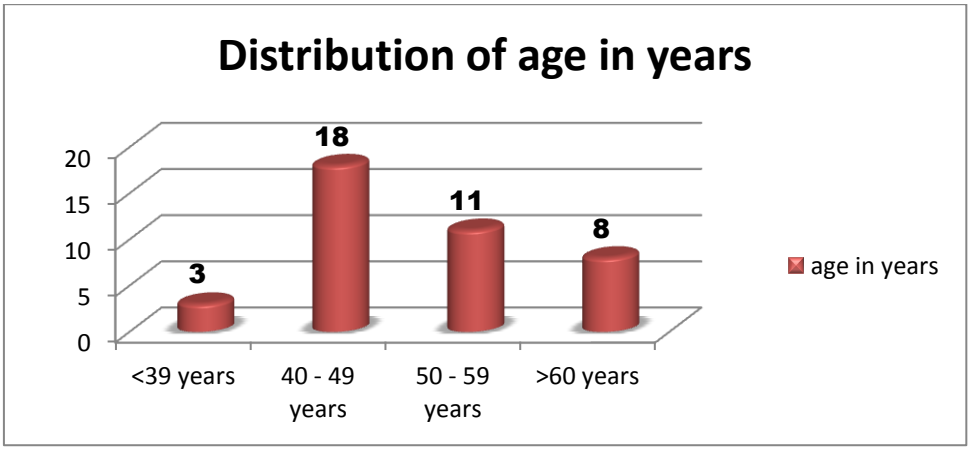
AGE DISTRIBUTION

Most of the patients were in the age group of 40-59 years.(72.5%). The range of the ages was from 35-75 years with a mean of 55 years.

Table 1: Age Distribution of patients

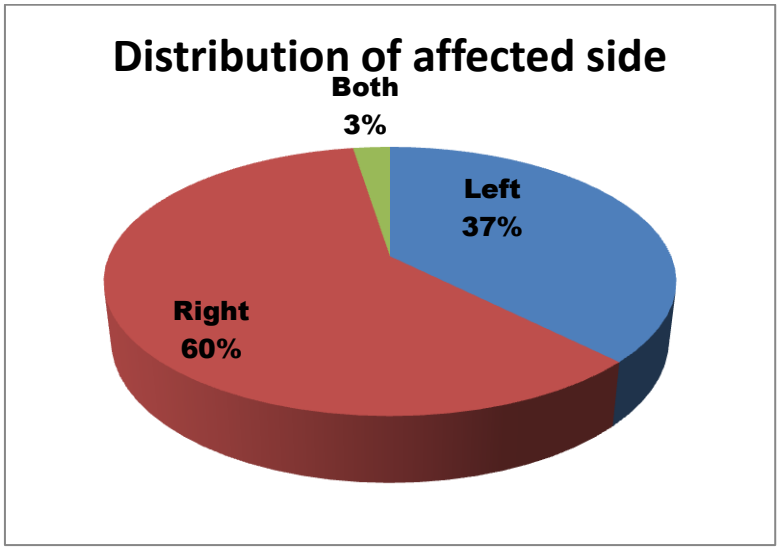
Patients age group	No. of palpable abnormalities
< 39	3
40 – 49	18
50 – 59	11
>60	8
Total	40

Graph 1: Age distribution of patients



DISTRIBUTION OF AFFECTED SIDE

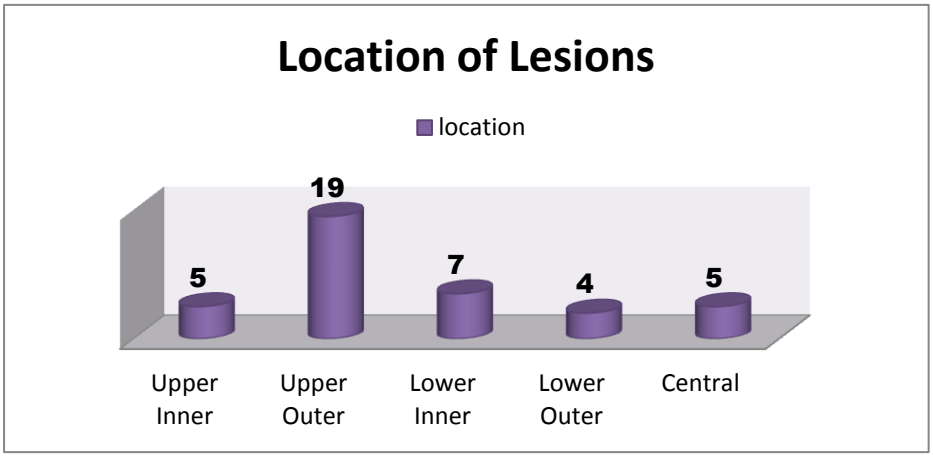
Graph 2: Distribution of affected side



LOCATION OF THE LESION:

Most of the lesions were located in upper and outer quadrant (47.5 %)

Graph 3: Location of lesions

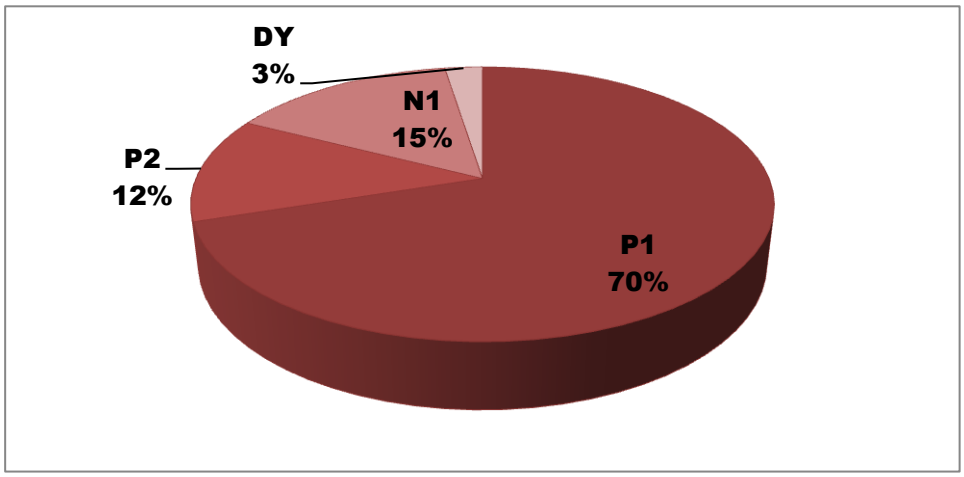


MAMMOGRAPHIC TISSUE DENSITY:

Breast parenchyma density	No of patients
N1	3
P1	28
P2	5
DY	1

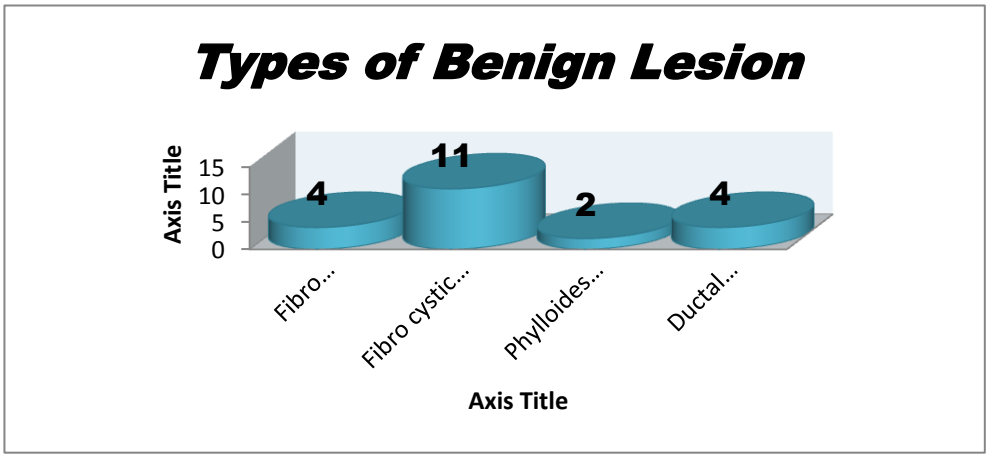
Table 2: Mammographic tissue density.

Graph 4: Showing mammographic tissue densities in patients



TYPES OF BENIGN LESIONS

Graph 5: Shows different types of benign lesions



BENIGN AND MALIGNANT LESIONS IN DIFFERENT MAMMOGRAPHIC TISSUE DENSITIES:

Maximum number of lesions are seen in P1 breast composition. 14 benign and 14 malignant lesions.

Table 3: No of benign and malignant lesions in different mammographic tissue densities

Mammographic Tissue densities	Benign lesions	Malignant lesions
N1	2	4
P1	14	14
P2	4	1
DY	1	0

Table 4: Types of benign lesions in different mammographic tissue densities

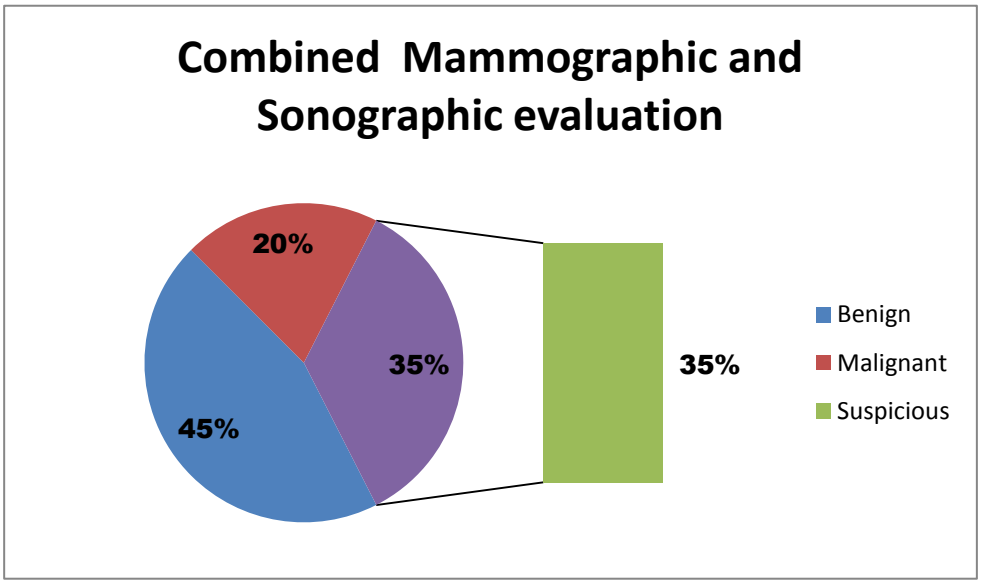
Mammographic tissue density	Fibrocystic disease	Fibroadenoma	Phylloides tumour	Ductal proliferation
N1	1	0	0	1
P1	7	3	2	2
P2	2	1	0	1
DY	1	0	0	0

FINAL ASSESSMENT AFTER COMBINED MAMMOGRAPHIC AND SONOGRAPHIC EVALUATION

Table 5: Final assessment after combined mammographic and sonographic evaluation

Imaging findings	No of palpable abnormalities
Benign	18
Malignant	8
Suspicious	14

Graph 6: Shows Combined mammographic and sonographic evaluation of palpable breast abnormalities.



TEST CHARACTERISTICS FOR COMBINED MAMMOGRAPHIC AND SONOGRAPHIC EVALUATION:

The sensitivity and specificity of combined evaluation is 85.7% and 100% respectively. The positive predictive value and negative predictive value are 100% and 86.4% respectively.

In this evaluation, NPV is 86.4%, a negative test result provides reassurance that the patient is unlikely to have cancer

Table 6: Test characteristics for combined mammographic and sonographic evaluation

CHARACTERISTICS	VALUES
Sensitivity	85.7%
Specificity	100%
Positive predictive value	100%
Negative predictive value	86.4 %

DISCUSSION

Mammography is considered the gold standard in the evaluation of the breast masses. Though various new techniques and methods have emerged, none have substituted mammography. It is still the only proven screening method for the breast as of date and is the only one imaging technique that has a significant impact on screening asymptomatic individuals for cancer diagnosis, staging and patient follow up[1]

The combined mammography and ultrasonography is said to have higher sensitivity rate than the sensitivity rate observed for either modality when performed all alone[2].

Because of the low sensitivity of the mammography in younger women due to dense breast tissue and also low incidence of breast carcinoma in women less than 30yrs [3].We have included women who are 30 years or above with palpable abnormalities of breast.

Breast carcinoma has been reported in only 4% of the patients with breast symptoms and even among palpable lesions undergoing biopsy, a large number of lesions turned out to be benign [4,5]. The role of mammography in patients with palpable breast lumps is to show a benign cause for palpable abnormality and to avoid further intervention, to support earlier intervention for a mass with malignant features, to screen rest of the ipsilateral and contralateral breast for additional lesions and to assess the extent of malignancy when cancer is diagnosed.

However the false negative rate of mammography for breast cancer in patients with palpable abnormalities of the breasts has being reported to be as high as 16.5% [6].Multiple studies have shown that the false negative rate for combined mammographic and sonographic evaluation varies from 0% to 2.6% [7,8].Additional imaging with sonography is appropriate in most instances, with the exception of lesions that are highly indicative of malignancy, in which sonographic imaging would not add any additional information. Sonography may obviate the need for intervention by showing benign causes of palpable abnormalities such as cysts, benign intramammary lymphnodes, extravasated silicone and superficial thrombophlebitis of Mondor disease of the breast.

Our study comprised of 40 patients aged 30 or above referred with brief clinical history, physical examination and provisional clinical diagnosis. All the patients were examined Sonographically and mammographically, the results were analyzed using various sonological, mammography parameters and the findings were subsequently correlated with FNAC and or biopsy confirmation.

In this study, 18 (45%) of the 40 lesions were categorized as benign after a combined mammographic and sonographic evaluation, clearly showing the value of imaging in helping avoiding unnecessary biopsies. 14 of the 40 patients showed suspicious features on combined imaging requiring biopsy, among them 12 resulted in malignancy and 2 had benign findings. 8 of 40 patients showed malignancy, 1 patient had ductal carcinoma with pagets disease of nipple in same breast rest all had ductal carcinoma.

Number of benign and malignant lesions in different mammographic tissue densities was

evaluated. Maximum lesions are seen in P1 type showing 14 malignant lesions and 14 benign lesions, N1 type shows 4 malignant and 2 benign lesions, P2 type shows 1 malignant and 4 benign lesions and DY type shows only 1 benign lesions.

Morris KT et al, 2002 , [9] have stated that the best clinical approach to the diagnosis and management of patients with a breast lesion is the combination of all three tests- physical examination, radiographic imaging and pathology (Biopsy / FNAC). This diagnostic triad is called TRIPLE TEST. Diagnostic accuracy with the combination of these three tests approaches to100% [10] .

In 18 cases of benign lesions, 6 lesions were diagnosed as benign solid lesions on mammography and rest of the lesions were diagnosed as cystic in nature on ultrasonography.

We encountered 4 cases of fibroadenomas. In our study USG was more sensitive compared to mammography in diagnosing fibroadenomas. In their series Lister D et al, 1998 [11],concluded USG is superior to mammography in diagnosing clinically benign palpable lesions. USG showed 97% accuracy compared to 87% accuracy of Mammography in clinically palpable lesions.

In our series, 18 (45%) of 40 lesions were categorized as benign after a combined mammographic and sonographic evaluation, clearly showing the value of imaging in helping avoid unnecessary biopsies. Sonography is also able to characterize palpable lesions obscured by dense tissue on mammograms. Moss et al [12] reported that sonography increased cancer detection by 14% in symptomatic patients who were evaluated with both mammography and sonography.

Kolb TM et al, 1998 [13], have studied 3626 women with dense breasts, normal mammograms. They found 11 cancers with screening US in women with dense breasts, use of screening US as a supplement to mammography resulted in increased cancer detection by 17%. They concluded that US plays an important role in the detection of mammographically and clinically occult carcinoma in dense breasts.

Sonography therefore is complementary to mammography in patients with palpable abnormalities; its superiority over mammography is in being able to show lesions obscured by dense breast tissue and in characterizing palpable lesions that are mammographically visible or occult. Mammography is complementary to sonography because of its ability to screen the remainder of the ipsilateral and contralateral breast for clinically occult lesions. It has been reported that the accuracy of sonography is comparable with that of mammography as a screening modality for breast cancer.

The value of combined mammographic and sonographic imaging in symptomatic patients has been studied previously. Moss et al reported sensitivity of 94.2% and specificity of 67.9% in 368%[12]. Shetty MK and shah YP reported a sensitivity of 100% and specificity of 80.1%[14]. Barlow et al reported a sensitivity of 87% ,a specificity of 88% and positive predictive value of 22% [15].

Their findings are comparable with present findings of sensitivity of 85.7% , specificity of 100%, positive predictive value of 100% and negative predictive value of 86.4% in patients with palpable breast lumps.

SUMMARY

This study was undertaken to evaluate the role of mammography and sonography in characterizing the palpable breast masses.

- The study includes 40 patients with palpable breast abnormalities.
- Out of 40 patients, 18(45%) patients had benign characters in both mammography and sonography.
- 14 patients had suspicious findings on combined evaluation and biopsy was advised and of these 12 patients showed malignancy and 2 showed benign findings.
- 8(20%) patients of 40 showed malignancy in this study.

- The positive predictive value of combined sonographic and sonographic evaluation was 100% and negative predictive value was 86.4%.

CONCLUSION

Combined mammography and sonography plays an important role in the management of palpable breast lesions. Combined mammography and sonography is appropriate to

- Characterizes the palpable breast lesion.
- Avoids unnecessary interventions in which imaging findings are unequivocally benign.
- Negative findings on combined mammographic and sonographic imaging have very high specificity and are reassuring to the patient.

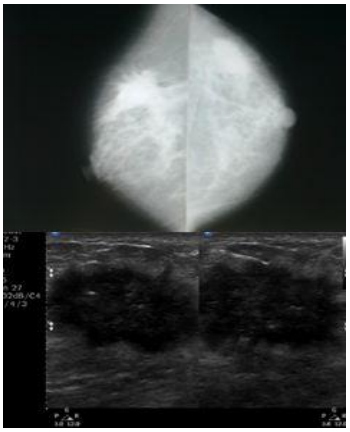


Figure 1: Conventional Mammogram and Ultrasonography image showing microlobulated mass with spiculations

Figure 2: Conventional Mammogram and ultrasonography image showing Fibroadenoma

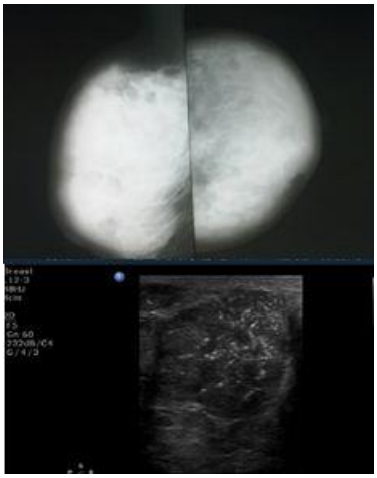


Figure 3: Conventional Mammogram and ultrasonography image shows mass with microcalcifications

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