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Correlation between Sonomammography and Mammography in the Evaluation of Breast Lesions

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Abstract*:*
Objectives*: 1. To evaluate the role of mammography and sonomammography independently and in combination and correlating with FNAC for early diagnosis of breast lesions. 2.Benign To study the characteristics of mammography and sonomammography in detecting breast lesions and differentiating from benign and malignant lesions.*
Methods*: 100 female patients attending Department of Radio diagnosis with breast lumps over a period of 24months were assessed using mammography, sonomammography and comparing with FNAC finding.*
Results*: In our study of 100 symptomatic patients 54 cases (54%) were benign in nature, 40% of the lesions were noted in upper outer quadrants of the breasts. Fibroadenoma was the commonest (33%)benign solid tumor in our study.Among 28 cases of breast carcinoma, on mammography 26 were read as suspicious or malignant and 2 cases were read as normal due to denser breasts. On Sonomammography 27 cases were read as suspicious / malignant and 1 case was read as benign.Sensitivity and specificity in diagnosing a malignant lesion by Sonomammography were 96.4% and 97.5% respectively and by Mammography were 92.8% and 94% respectively.Combined Sonomammography and mammography it increased to 100 % and 94% respectively in our study.*
Conclusion*: Combined imaging modalities of mammography and sonomammography play an important role in diagnosing palpable breast lesions.*

I. Introduction

Breast diseases are common in females. Breast lumps are one of the common complaints reported which requires early diagnosis, treatment and work up. There has been a significant increase in the incidence of breast cancer in India, both in rural and urban set up with an annual increase of 3.1% . Over a lakh new breast cancer cases are estimated to be diagnosed annually in India. Much concern is given to malignancy though benign lesions of the breast are far more frequent than malignant. With the use of mammography, sonomammography, and needle biopsies, the diagnosis of a benign disease can be accomplished without surgery in the majority of patients. As many of the benign lesions are not associated with an increased risk for breast cancer, unnecessary surgery should be avoided. Delay in the detection causes the malignancy to progress in advanced stage. Usually it comprises of inoperable masses, metastasis (bone, brain,lung) and eventually mortality.

Mammography is cost efficient and widely accepted technique to evaluate clinically suspected breast lesions and used for screening of breast cancer. High resolution Sonomammography is a useful adjunctive modality and helps characterizing a mammographically non-detected palpable abnormality, especially in dense breast. Sensitivity and specificity of sonomammography or mammography is higher if sonomammography and mammography are combined.

II. Materials And Methods

A prospective analysis of 100 symptomatic women with various breast problems who were referred to the Department of Radiodiagnosis from the Inpatient and Outpatient Departments between 2013 to 2014were included in study. All patients had routine Clinical examination, Mammography and Sonomammography of both the breasts.

Sonomammography was performed ,with a 7.5-10 MHz Linear array Tranducer . Both the breast were scan radially and by grid scanning technique. Patients were examined in supine position with arms extended and hands underneath the head and in the lateral positions with extended arms for examining the outer quadrant

and axillary tail of the left breast . A thorough ultrasound examination was performed in Saggital plane, Transverse plane, Radial plane. Nipples were scanned in the tangential plane.

Mammography was performed using a dedicated Mammography unit. A Kilovoltage Peak (kVp) setting of 26-29 is commonly used for breast of average size and density with focal spot of 0.4mm using a target and filter of Molybdenum. Cranio-caudal and Medio-lateral views of both the breasts were performed after adequate compression. Medio-lateral oblique views of both the breasts are performed when necessary.

Inclusion criteria : women above 25 years with palpable breast lumps, pain, nipple discharge.
Exclusion criteria: Women below 25 years of age, Women with advanced malignancy, fungating mass per breast, Pregnant women.
FNAC was performed under ultrasound guidance in the most suspicious lesions and at least two sites were taken. The results were analyzed and categorized according to BIRADS (Breast Imaging Reporting and Data System) score.

III. Observations And Results

A total of 100 female patients with symptomatic breast problems were included in the study. The analysis of observations were as follows:

Table -1: **AGE DISTRIBUTION :**

Sl. No	Age	No. of patients	Percentage
1	25-30	22	22%
2	31-40	29	29%
3	41-50	35	35%
4	51-60	12	12%
5	> 60	2	2%

All symptomatic women between 25-62 years were included in the study. The mean age of women in the present study was 40, with majority of patients 35(35%) belonging to 41-50 years age group. 86% of the cases were in the age group of less than 50 years .Only two patients above the age of 60 years were included in the study .

TABLE -2 : SYMPTOMS IN VARIOUS BREAST LESIONS

Sl.no	**Symptoms**	**No. of cases**	**No of lesions**	**% of lesions**
1	Mass /lump	64	61	95.3%
2	Pain / Mastalgia	30	23	76.7%
3	Nipple discharge	3	1	33.3%
4	Others	3	2	66.7%

A palpable mass was the commonest presenting complaint in 64 (64%) cases. Mastalgia/pain was present in 30(30%) cases. Nipple discharge was present in 3 (3%) cases. Other symptoms like eczema, Ulceration of the nipple, Upper limb swelling, were seen in 3 (3%) cases. Of the 64 cases which presented with a complaint of mass 61 cases(95.3%) presented with a palpable lesion. 23 (76.7%) cases out of 30 patients who presented with Mastalgia had positive lesions.

TABLE -3 LOCATION OF THE LESIONS

Sl.no	**Quadrant**	**Right side**	**Left side**	**No.of lesions**	**Percentage**
1	Upper outer	23	17	40	45.9%
2	Upper inner	7	6	13	14.9%
3	Lower outer	4	5	9	10.4%
4	Lower inner	3	5	8	9.2%
5	Retro-areolar	3	2	5	5.7%
6	>1 quadrant	6	6	12	13.9%

Majority of the lesions were present in upper outer quadrant of the right breast 23 ,followed by left upper outer quadrant in 17 cases. Majority of the lesions were present in upper outer quadrant 40 (45.9%)cases, followed by upper inner quadrant 13 (14.9%)cases and Lower outer quadrant in 9 (10.4%)cases. 12 (13.9%)

cases presented with lesions in more than one quadrant. 5 (5.7%) lesions were noted in the retro areolar region. 53 (60.9%)cases presented with lesions involving upper half of the breast . 13(13%) patients did not reveal any sonographic or mammographic abnormalities

Table -4 : INCIDENCE OF BREAST LESIONS WITH AGE

Sl.no	Lesion	21-30	31-40	41-50	>51	Total
1	Fibroadenoma	18	12	2	1	33
2	Solitary Breast Cyst	-	2	1	-	3
3	Fibrocystic changes	1	5	7	2	15
4	Duct ectasia	-	1	2	-	3
5	Abscess	2	-	-	-	2
6	Lipoma	-	1	-	-	1
7	Carcinoma	-	1	16	13	30

Fibroadenoma was the commonest breast lesion and accounted for 33 (33%) cases. Of the 33 cases of Fibroadenoma 7 patients have more than one lesion and 4 patients have lesions involving both the breasts .Carcinoma accounted for 30 (30%) cases and Fibrocystic changes accounted for 15 (15%) cases solitary Breast cyst and duct ectasia were found in 3 cases (3%) . Breast abscess was found in 2 cases. Lipoma of the breast was noted in one case.

Highest Incidence of Fibroadenoma was seen between 21-40 years in 30(91%)patients. Most of Fibroadenomas 18 (54.5%) occurred between 21-30 years. Only 3 cases (9%) of Fibroadenoma occurred after the age of 40 years. Breast carcinomas (Invasive Ductal and lobular carcinoma) showed peak incidence between 41-55 years. Most of the carcinomas 15 (53.6%) occurred between 41-50 years. Of the 15 lesions seen in patients above 50years 11 (73.3%)were carcinomas. Invasive duct cell carcinoma was the predominant carcinoma in 26 (92.3%) cases whereas invasive lobular carcinoma was seen in 2 cases (7.7%).Fibrocystic changes were seen mostly between the age of 41-50 years in 7 (46.7%) cases.

TABLE-5 : SHAPE OF INDIVIDUAL LESIONS ON SONOMAMMOGRAPHY :

Sl.no	Lesion	Round	Oval	Lobulated	Irregular	Total
1	Fibroadenoma	11	18	4	-	33
2	Breast Cyst	1	2	-	-	3
3	Fibrocystic changes	6	9	-	-	15
4	Duct ectasia	-	-	-	-	3
5	Abscess	-	1	-	1	2
6	Lipoma	-	1	-	-	1
7	Carcinoma	-	1	14	15	30
	Total	18	32	18	16	**87**

Oval lesions accounted for maximum number of 32(36.8%) of cases. Of the oval lesions 18(56.2%) were Fibroadenomas . 11 cases (33.3%) of Fibroadenoma were round and 4 cases (12.2%) of Fibroadenomas were lobulated . 29 cases of breast carcinomas were either lobulated or irregular in shape. Maximum cases 15(50%) of carcinoma are irregular, followed by lobulated shape in 14 (46.7%). No case of carcinoma was either round or oval . 2 cases(66.7%) of breast cysts had oval shape and one lesion was round .lesions of fibrocystic disease were either round or oval .13 cases did not reveal any abnormality on sonomammography.

TABLE-6 : MARGINS OF INDIVIDUAL LESIONS ON MAMMOGRAPHY

Sl.no	Lesion	Circumscribed	Lobulated	Spiculated
1	Fibroadenoma	25	4	-
2	Simple Breast Cyst	2	-	-
3	Fibrocystic changes	3	2	-
4	Duct ectasia	-	-	-
5	Abscess	2	-	-
6	Lipoma	1	-	-
7	Carcinoma	3	11	16

	Total	36	17	16

Well Circumscribed lesions are seen in 36 cases. In circumscribed lesions out of 36 cases 25 (61%) were Fibroadenomas. 91.6% (33) of cases show a well circumscribed margins on mammography. 17 (19.5%) of cases had lobulated margins . Of the lobulated lesions 11 (64.7%)cases were carcinomas. Maximum number of breast carcinomas had spiculated margins 16(100%). 27 cases (90%) of Breast carcinomas had either lobulated or spiculated margins. 3 cases of carcinoma show well circumscribed margins. None of the cases of Fibroadenoma,breast cyst, fibrocystic disease, duct ectasia, abscess,or a lipoma show spiculated margins. Mammographic findings were Negative in 31 patients .

TABLE -7 : SIZE OF VARIOUS LESIONS ON SONOMAMMOGRAPHY:

Sl.no	Lesion	<1.5cm	1.5 –2.5cm	> 2.5cm	Total
1	Fibroadenoma	4	8	21	33
2	Breast Cyst	1	1	1	3
3	Fibrocystic changes	12	3	-	15
4	Duct ectasia	1	1	-	3
5	Abscess	-	-	2	2
6	Lipoma	-	-	1	1
7	carcinoma	-	3	27	30

Majority of breast lesions 53(60.9%) measured more than 2.5cm at presentation . Only 14 (12.1%) of the lesions were detected at a size of less than 1.5 cm. Most of the carcinomas (90%) presented with a size more than 2.5 cm. Fibrocystic changes presented presented at a size of less than 1.5 cm in 80% of the cases. Ultrasound helped in accurate measurement of the masses than mammography.

TABLE -8 : RATIO OF TRANSVERSE TO AP DIAMETER OF VARIOUS LESIONS

Sl.No	Lesion	< 1.4	>1.4	Total
1	Fibroadenoma	8	25	33
2	Breast Cyst	-	3	3
3	Fibrocystic changes	-	15	15
4	Duct ectasia	-	2	3
5	Abscess	-	2	2
6	Lipoma	-	1	1
7	Carcinoma	21	9	2

The ratio of transverse diameter /length of a lesion on sonomammography to its anteroposterior diameter /height could be a factor in determining the nature of a lesion . Fibroadenomas showed a ratio of more than 1.4 in 25 cases (75.8%). However 8 (33.3%) breast carcinomas also had this ratio more than 1.4 . Total 29(33.3%) cases showed a ratio of less than 1.4 ,out of these 21 (72.4 %) cases were malignant and 8(27.6%) of cases were Fibroadenomas.

Malignant lesions of the breast appear as spiculated or a dense mass with illdefined or irregular margins. However few of the lesions are not apparent due to dense parenchyma .They are best visualized on sonomammography.Ultrasound guided FNAC of these lesions has proved the lesions as Invasive ductal carcinoma in 3 out of 7 cases which presented with dense breasts on mammography . Mammographic features of malignancy are inhomogeneous density, irregular shape spIculated borders & microcalcifications, were as for benign masses are homogenous density, round/oval shape with sharp/lobulated borders. Ultrasound features of malignancy were irregular shape, contour, extensive hypoechogenicity, surrounding halo and distortion of surrounding tissue were as round or ellipsoid shape with gentle lobulations, thin echogenic pseudo capsule are features of benign masses.

IV. Discussion

The present study was conducted on 100 symptomatic patients with various breast related symptoms between the age of 25-62 years, with a mean age of 40years. Most of the patients 35 (35%) were in the age group between 41-50. The presenting complaint in majority of the patients was a mass which was palpable on breast self examination in 64 (64%) of the patients, followed by mastalgia In one or both breasts in 30 (30%) cases.

Majority of lesions are noted in the right breast 46%,and in 41% of cases in the left breast. Bilateral breast disease is noted in 13% of the patients. Upper outer quadrant is involved in 40% of the cases, followed by upper inner quadrant in 13% of the patients .Predominant appearance of lesions in upper quadrant is due to increase fibroglandular tissue compared to other quadrants. This was in acceptance with the study conducted by Sickles etal concluded that Upper outer quadrant lesions are more common in 52% of the patients, followed by upper inner and retroareolar regions in 15 and 11% respectively.

Benign Lesions Of The Breast:

Fibroadenomas are the most common benign breast tumors in the younger females,which presents as a freely mobile mass(breast mouse). In our study of 33 Fibroadenomas, 2 cases could not be detected in Mammographically dense breasts, and 2 cases could not be detected because of their smaller size , in rest of the Mammograms 25 cases were read as benign and 4 cases as probably benign lesions due to their lobulated outlines. On Mammography, Fibroadenomas appear as well circumscribed, smoothly marginated, oval masses. Some Fibroadenomas may show ill-defined margins in adjacent dense parenchyma mimicking carcinoma Ultrasound helped in detection of all the Fibroadenomas as oval, round or lobulated masses with smooth contours especially where the smooth contours are hidden by adjacent dense tissue on Mammography (Figure:1) Multiple Fibroadenomas are detected on Mammography in 6 cases and in 1 case there was a lobulated apppearence due to overlap of the lesions .Sonomammography has detected all the lesions in 7 cases and the margins of all lesions could be separately identified. In 5 patients lesions were detected bilaterally with sonomammography characterizing all the lesions with precision(Figure:2) .

In the present study Fibroadenomas are detected in 18 patients between the age of 25-30,in 12 patients between the age of 31-40 , in 2 patients between 41-50 years and in 1 patient above the age of 50 years. Multiple lesions are detected in 5 patients between the age of 25-30 years and in 2 patients between the age of 31-40 years. Bilateral lesions were detected in 4 patients between the age of 21-30 and in 1 patient between the age of 31-40.In the present study Fibroadenomas are detected in 8 unmarried and 25 married women, of which 10 were nulliparous,11 were multiparous and 4 patients were uniparous . One patient had a history of usage of ovulation induction drugs for infertility. One patient had a past history of excision of a fibroadenoma in the opposite breast.

In the present study 25 (75.8%) of fibroadenomas showed a ratio of transverse to antero posterior diameter of more than 1.4 . Venta et al[1] in their study on 480 fibroadenomas found this ratio to be 80%. Cole beuglet[2] et al described that Fibroadenoma is the commonest benign tumor of the breast. In the present study 18 patients less than 30 years had Fibroadenoma with an incidence of 81.1%. Fornage[3] et al described that on sonomammography, fibroadenomas are homogenous and oval in 71% of the cases.

Cysts are a part of the spectrum of Fibrocystic changes which present as palpable lumps. On Mammography, a cyst reveals features of well circumscribed lump with smooth margins. Sometimes cysts are embedded in areas of dense fibrous tissue, which results in loss of definition of their margins. On Ultrasound, cysts as anechoic smooth walled, oval or round lesions with posterior acoustic enhancement. In our study 3 cases of simple cysts, 2 Mammograms showed features of benign lesions, where as 1 Mammogram was read as normal. Ultrasound helped in detection of all cysts (100%). Hence Ultrasound is the investigation of choice in differentiating solid and cystic lesions of the breast. It is superior to mammography because of its 100% sensitivity in differentiating cystic lesions of the breast. Stavros[4] et al has reported an incidence of 10% solitary breast cysts in his study of 750 breast lesions .Miachel[5] in his study of 1824 palpable breast masses described an incidence of 7%.

Fibrocystic disease with predominant cystic component appears on mammography as dense breast or ill-defined masses and few were read as normal , where as on Sonomammography multiple small cystic lesions each of less than 1.5cm were are seen and which on histopathological examination appeared as adenosis in 8 cases and sclerosing adenosis in 7 cases without any cellular atypia. According to Haagenson[6] et al Fibrocystic disease appears as dense breast tissue on mammogram where as Sonomammography showed only altered echotexture of parenchyma. And histo pathology is more diagnostic than imaging in cases of fibroadenosis .

Intraductal papilloma clinically presents as serous/bloody nipple discharge, on Mammogram it appears as well defined opacity beneath nipple. Sonomammography can demonstrate papilloma as a mass within the dilated ducts. In our study 3 cases of Duct ectasia were identified in 30- 50 years age group, and revealed dilated ducts with no obvious mass and revealed normal on mammography, which on histopathology did not

reveal any abnormality. In the study conducted by Buchberger[7] et al on 45 cases with nipple discharge only 2 cases showed a mass within the dilated ducts,which on histopathology revealed Intaductal papilloma. Kratochwil[8] et al in his study of 14 cases with duct ectasia nipple retraction was the most common presenting symptom as compared to nipple discharge with incidence of 10 and 4 cases respectively.

On Mammography a breast abscess appears as a well defined mass or a mass with speculated borders mimicking carcinoma. On Sonomammography most abscess have no definite shape, have irregular contours with weak internal echoes, most abscess may have moving echoes or fluid-debris level within. In our study, 2 abscesses were diagnosed in the age group of 21-30 years mammography of one of these revealed mass with ill-defined borders suggestive of malignancy, and other was a well defined mass. Hence in abscesses mimicking carcinoma or in dense breasts obscuring abscesses on mammogram ultrasound when used as an adjunct, yields definitive diagnosis

Lipomas appear as a radiolucent mass on mammography. Ultrasound could not detect a mass, as it was isoechoic to adjacent breast tissue. All fat containing radiolucent masses like lipomas or hamartomas on mammography are proven benign at histopathology according to Helvie[10] et al Similar is our experience where one case which appeared as a welldefined radiolucent mass on mammography and an isoechoic mass on sonomammography ,which proved to be a lipoma. Mendelson et al stated that lipomas are well defined masses with medium level echoes.

Malignant Lesions Of The Breast:

According to Stanley et al most of breast carcinomas are seen above age of 45 yrs. In our study carcinomas were seen above 40years(96.7%) and only one patient presented below age of 40 years.Rooney et al reviewed 1048 breast cancer patients and observed that bilateral synchronous malignancy occurred in 17% of cases. In our study two patients(6.7%) had bilateral malignancy. Of 28 carcinoma patients 10 had axillary lymphadenopathy (35.7%), whereas Rooney et al reported nearly similar incidence of 41% of axillary lymph node involvement in patients with palpable breast cancer in their series. With increase in size of carcinoma there is increased involvement of the axillary nodes.

Bratl et al observed that in tumors containing large amount of connective tissue, (invasive or scirrhous carcinoma) the sensitivity was 94% where as in tumors with little connective tissue (Medullary/Papillary carcinoma) the sensitivity decreased to 69%. In our study Mammographic sensitivity was 90% for invasive carcinoma. Sensitivity of Mammography to invasive carcinoma is more because of spiculated or irregular margins with early retraction of surrounding tissue, where as lobular cancer has a diffuse distribution and poor desmoplastic reaction in contrast to invasive carcinoma and hence the difference in sensitivity between these two groups.

Stomper et al used radiological and pathological correlation for invasive carcinomas and found that 80% of them showed irregular or indistinct margins on mammography. In our study 92.3% of invasive carcinomas appeared as irregular or indistinct masses, correlated well with histopathological findings similar to above study.

According to El.Rosen and Sickles[12] incidence of non-palpable malignancy in patients with palpable masses was 2.6% and median tumor size was 13.8mm. Simultaneous non palpable malignancy which was less than 2.5cm was Observed in two cases of palpable carcinoma , incidence 7.2% in our series. Hence in women with palpable breast mass it is important to screen remainder of both the breasts for non –palpable cancer by Mammography and Sonomammography.

According to Healey et al cancers with extensive intraductal component were more likely to show microcalcification with or without a mass compared to those without an extensive intraductal calcification (73% versus 27%). Another study by Dershaw[13] et al 14% cases presented as mass with calcifications, Micro calcifications are seen more in carcinoma insitu and early infiltrative carcinoma. In our study 6 cases of malignant mass showed calcification on mammography (21.4%).The incidence is low in our study because it included only palpable masses where incidence of micro calcification is low compared to asymptomatic group of the series by others mentioned above.

In our study dense breasts were seen predominantly in 25-40 years age group and only 2 cases belonged to 40-45 years age group. Hard et al found that women with radiologically dense breasts are at 4-6 times greater risk of breast cancer. W.Buchberg[17] et al , detected 0.7% of additional malignancies in patients with mammography dense breasts by sonomammography . In our study of the 7 patients with mammographically dense breasts, 3 (42.8%)cases were diagnosed as invasive ductal carcinoma on sono mammography ,which were confirmed Histopathologically. The use of high – resolution sonomammography as an adjunct to mammography in women with dense breasts has lead to increased detection of Malignancies .

Skaane[15,16] et al analyzed sonographic features in differentiating Fibroadenoma and Invasive carcinoma. Irregular shape, contour, extensive hypoechogenicity, surrounding halo and distortion of surrounding tissue associated with highest predictive valve for malignancy. A thin echogenic pseudocapsule was most

important sonographic finding predictive of bengin nature of solid mass . using these sonographic criteria negative predictive valve approached 100% .In our study of the 63 solid masses on sonography, 33 were diagnosed definitely benign, 2 cases as indeterminate and 28 cases as malignant.

Among the 28 cases of breast carcinoma, on Mammography 26 were read as suspicious or malignant(BIRADS category 4or 5) (Figure:3,4) and 2 cases were read as normal in the dense breast. On sonomammography 27 cases were read as suspicious / malignant and 1 case was read as benign. sonomammography also detected axillary lymph nodes in 10 cases which were not seen on mammography. In diagnosing malignant tumors by sonomammography alone the sensitivity and specificity were 92.9% and 97.5% respectively were as by mammography alone was 85.7% and 94.4% respectively, whereas by combined sonomammography and mammography the sensitivity and specificity in diagnosing malignant mass increased to 100% and 97.2% respectively . According to young et al sensitivity, specificity for sonomammography were 97% each, and for mammography were 82% and 94% respectively in diagnosing a malignant tumor which is similar to our study. Hence it can be concluded that Combined Mammography and High resolution sonomammography yields highest diagnostic accuracy in evaluating palpable breast lesions especially in relatively young patients.

Figure 1:Sonomammography& Mammography findings of a Fibroadenoma

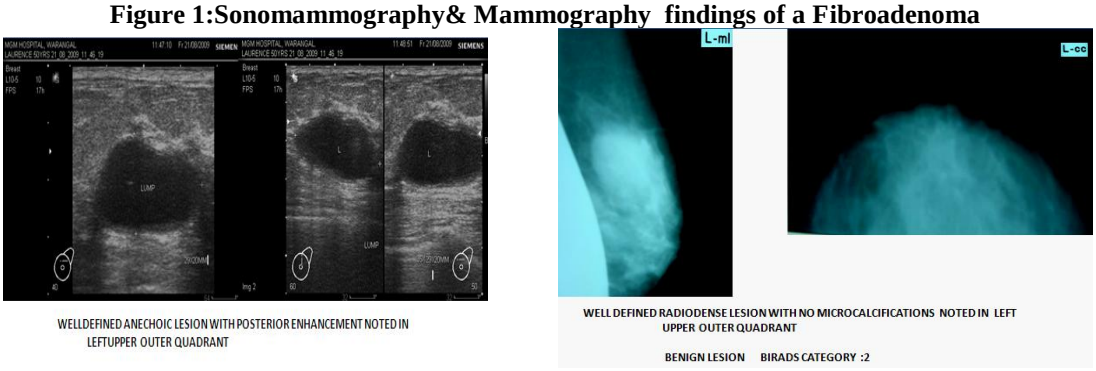


Figure 2: Sonomammography& Mammography findings of Multiple Fibroadenoma

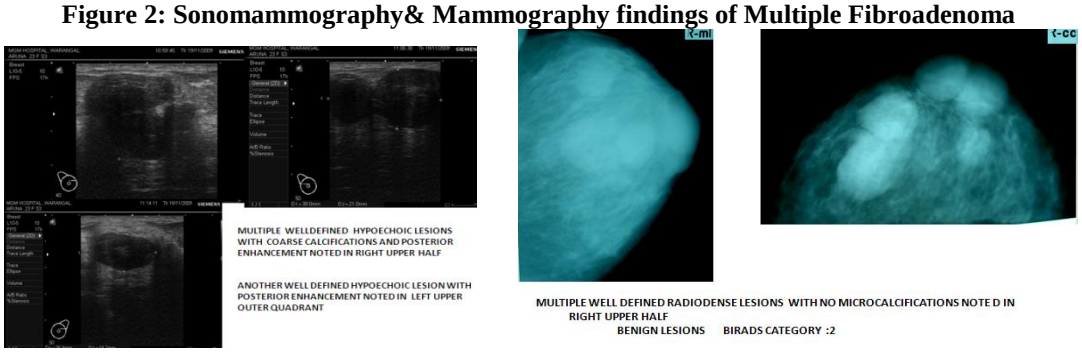


Figure 3: Sonomammography& Mammography findings of Duct cell carcinoma

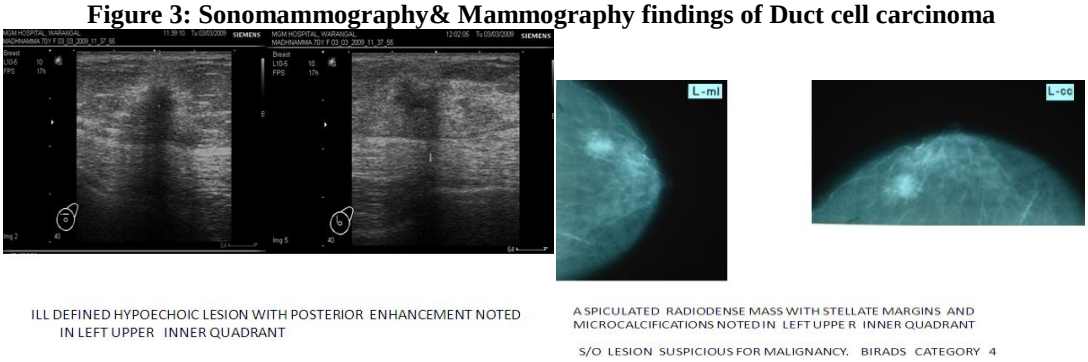
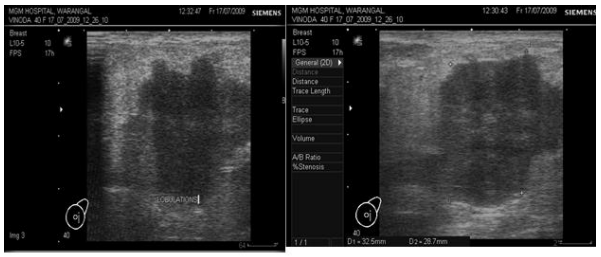
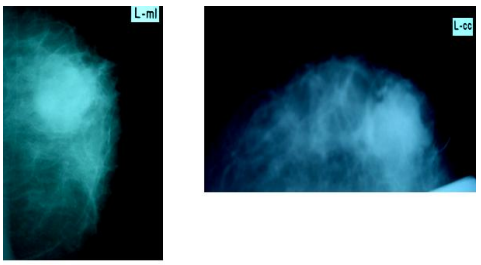


Figure 4: Sonomammography& Mammography findings of Duct cell carcinoma



ILLDEFINED LOBULATED HYPOECHOPIC LESION WITH POSTERIOR ENHANCEMENT NOTED IN LEFT UPPER OUTER QUADRANT



SPICULATED RADIODENSE LESION WITH STELLATE MARGINS AND ARCHITECTURAL DISTORTION NOTED IN LEFT UPPER OUTER QUADRANT

LESION HIGHLY SUSPICIOUS FOR MALIGNANCY BIRADS CATEGORY: 5

V. Conclusions

Our study confirms the higher combined specificity for ultrasonography and mammography for detection of breast masses including malignancies.Sonomammography is better in differentiating solid and cystic lesions, duct ectasia, infections, pregnanc, lactation ,dense breast evaluation, and real time image guidance where as mammography is better in detecting microcalcifications, spiculated masses for early detection of occult malignancies and for stereotactic biopsies. Sonomammography 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. No single investigation is 100% accurate but combination of mammography and ultrasonography can yield near 100% results.

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