

A Comparative Study of Mammography and Sonomammography with FNAC Correlation in Evaluating Palpable Breast Masses

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Abstract

Breast cancer is the most common cancer and the common cause of morbidity and mortality in women. Palpable lump requires appropriate evaluation, imaging and rule out malignancy. Mammography is the first line diagnostic imaging for evaluating breast lumps followed by high resolution sonography which additionally evaluates breast lesions and helps to characterize a mammographically non detected palpable abnormality in dense breast. An illustrated Breast Imaging Reporting And Data System (BIRADS) ultrasonographic lexicon was helpful in improving observer performance. So our objective is to evaluate the mammographic features and sonomammographic findings of the clinically palpable masses, to characterize the breast masses into benign and malignant based on mammographic and sonomammographic findings and to compare the categorized imaging findings with FNAC as a gold standard. This study was done over a period from June 2016 to August 2018 and includes 100 patients. Women above 30 years of age, clinically had palpable breast lump were included in the study. Mammography and sonomammography findings according to BIRADS were correlated with cytological examination. Majority of the cases were benign. Fibroadenoma prevailed among the cases. For BIRADS I,II,III & younger population sonomammography was better. For BIRADS IV,V & older population mammography was better. Mammography & sonomammography cannot replace each other. Combined mammography and sonomammography were more accurate in evaluation of palpable breast masses.

Keywords: Breast mass, Mammography, Sonomammography, FNAC, BIRADS

Introduction

A mammary gland is an exocrine gland in mammals. It produces milk to feed the newborn infant. Mammals get their name from Latin word "Mamma" which is the other name of breast. Breast lump is one of the commonest complaints in females worldwide. Breast cancer is the most common cancer in western countries and the common cause of death in women[1]. It is second commonest cancer in India after cancer cervix[2]. 'Lump' in breast is a cause of anxiety both to the patient and family members. The motive behind the evaluation of a palpable lump is

basically to rule out malignancy. Hence, a palpable lump requires proper evaluation and appropriate imaging[3].

In developing countries like India, females are unaware of breast pathologies. They are hesitant to reveal their problems. So they are usually detected in advanced stages. Breast diseases includes benign conditions such as fibroadenoma, breast abscess, cysts, duct ectasia, galactoceles, fibroadenosis and malignant conditions such as breast cancer. Some diseases such as traumatic fat necrosis, granulomatous mastitis, breast abscess may mimic cancer.

In symptomatic patients with palpable lump, mammography is useful in evaluating the nature and extent of the mass. It helps in demonstrating malignancy of the ipsilateral breast and detect lesions in contralateral breast. The etiology of mass is determined on the basis of clinical information; hence imaging procedure is not necessary. Now days, new diagnostic methods are available to the clinician, making it possible for the identification of occult tumor. The new methods have widened the diagnostic possibilities but they have been the source of false interpretation leading to consequent unnecessary surgery. Mammography is cost effective and is the first line diagnostic imaging for evaluation of clinically suspected breast lesions. It is also used for screening of breast cancer [4]. Mammography screening effectively reduces the overall breast cancer mortality within a range of 28 to 45 percent [5]. It is also confirmed that mammography screening significantly reduces breast cancer mortality in women aged 39 to 69 years [6]. It is recommended for a two yearly screening of mammography in the 50 to 75 years age group [7]. Gray scale sonography being a real time, non invasive and radiation free method is a valuable addition to the breast imaging modalities. High resolution sonography is a useful adjunctive that helps to additionally evaluate breast lesions and also helps to characterize a mammographically non detected palpable abnormality in dense breast [8]. In younger women with palpable breast lump and in acute inflammatory lesions of breast, sonomammography has been recommended as the initial imaging method. The low sensitivity of sonomammography limits its usefulness as a primary diagnostic modality in detection of solid masses smaller than one centimeter and micro invasive ductal carcinoma. The main indications of sonomammography is differentiation between cystic and solid lesions, evaluation of a mammographically dense breast, detection of any infective pathology like breast abscess, post surgery evaluation of breast, breast augmentation evaluation of axillary lymph nodes and guidance for interventional procedures[9]. An illustrated Breast Imaging Reporting And Data System (BIRADS) ultrasonographic lexicon may be helpful in improving observer performance[10]. The present study aims to compare mammography and sonomammography features in palpable breast masses with cytological correlation.

Breast Imaging Reporting And Data System(BIRADS)

BIRADS 0- Needs additional imaging evaluation

BIRADS I- Normal study

BIRADS II- Benign finding

BIRADS III- Probably benign

BIRADSIV- Suspicious abnormality
BIRADS V- Highly suggestive of malignancy
BIRADSVI- Biopsy proven malignancy

Materials & methods

Study design

Prospective Study. Duration of study from June 2016 to August 2018.

Inclusion criteria

Women above 30 years of age with palpable lump of breast.

Exclusion criteria

Previously diagnosed breast carcinoma. Pregnant, lactating women and women with bleeding diathesis. Mammography was done on Senographe DMR machine. CC and MLO views were taken. Sonomammography was done on Samsung Accuvix A30 machine with 7.5Mhz transducer. FNAC was done for comparison. SPSS software was used for statistical analysis.

Sample size

A total of 100 patients were included in the study.

Results and discussion

The present study was done to correlate the mammography, sonomammography and FNAC findings in palpable breast masses. A total of hundred cases of women above 30 years with palpable breast masses were included in the study. In my study maximum number of patients of about 54% were in the age group of 31-40 years. Maximum number of cases were fibroadenoma (29%) in the age group 31-40 years (Table 1).

Table 1: Distribution of lesions according to age

Lesions	Age in years				Total	Percentage
	31-40	41-50	51-60	61-70		
Fibroadenoma	29	4	1	-	34	34
Abscess	6	7	1	-	14	14
Cyst	8	4	-	-	12	12
Fibrocystic disease	-	2	-	-	2	2
Mastitis	3	2	-	-	5	5
Galactocoele	5	1	-	-	6	6
Lipoma	1	-	-	-	1	1

Duct ectasia	1	3	-	-	4	4
Phyllodes	-	2	-	-	2	2
Carcinoma	1	10	7	2	20	20

All patients presenting with palpable lump were taken for the study. Pain (29%), nipple retraction (10%), skin thickening (8%) and nipple discharge (5%) were other signs and symptoms. On sonomammography, maximum number of lesions were located in the upper outer quadrant (47%) out of which maximum number of cases were on the right side (30%) (Fig 1). On mammography, maximum number of patients had scattered fibroglandular density breast (39%) and heterogeneously dense breast (39%).

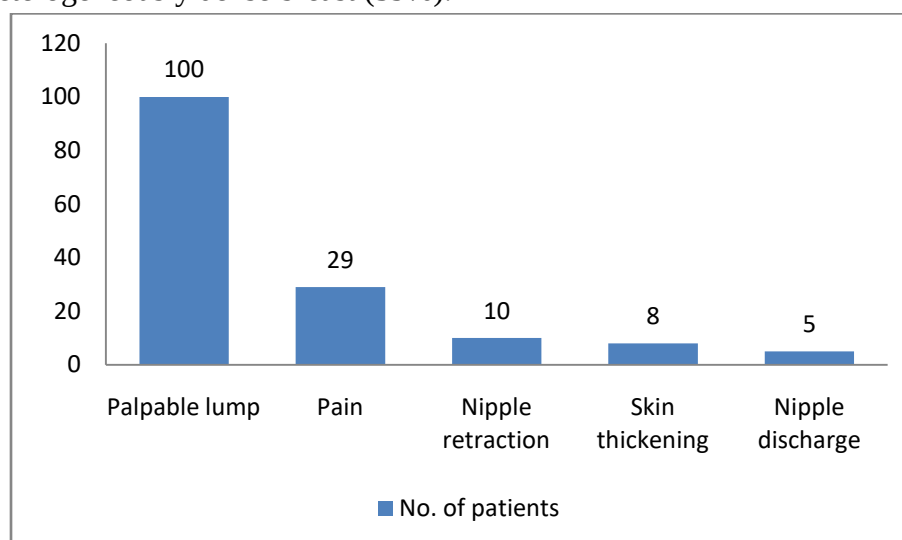


Fig 1: Signs and symptoms

On mammography, maximum number of lesions were single (71%), oval (33%), circumscribed (40%) and of high density (30%). On sonomammography, maximum number of lesions were single (88%), oval (41%), circumscribed (51%), heterogeneously hypoechoic (38%), posterior acoustic shadowing (66%) (Table 2).

Table 2: Distribution of lesions on mammography and sonomammography

Lesions	Mammography	Sonomammography
Fibroadenoma	28	31
Abscess	9	16
Cyst	7	12
Fibrocystic disease	-	2
Mastitis	2	4
Galactocele	4	6
Lipoma	2	1
Duct ectasia	3	4

Phyllodes	3	4
Carcinoma	22	17
Giant fibroadenoma	3	2

Fibroadenoma:

On mammography 25(80.6%)were oval, 3(9.7%)were round, 1(3.2%) were irregular in shape.25(80.6%) were circumscribed, 4(12.9%)were lobulated .1(3.2%) were of high density,24(77.4%)were of equal density,3(9.7%) were of low density (Fig 2).



Fig 2: Mammography CC and MLO view showing oval, circumscribed, equal density lesion in - Fibroadenoma (BIRADS II)

On sonomammography 25(75.8%) were oval,7(21.2%) were round,1(3%) were irregular in shape.30(90.9%) were circumscribed,3(9.1%) were lobulated.30(90.9%) were homogeneously hypoechoic,3(9.1%) were heterogeneously hypoechoic.31(93.9%) had features of posterior acoustic enhancement,2(6.1%) had features of posterior acoustic shadowing (Fig 3).



Fig 3: Sonomammography showing a showing a oval, lobulated homogeneously hypoechoic lesion in left lower outer quadrant - Fibroadenoma(US BIRADS III)

Cole beuglet et al described that fibroadenoma is the benign tumor of the breast[11].Fornage et al described that on sonomammographyfibroadenomas are homogenously hypoechoic and oval in 71% of cases[12].

Breast abscess:

On mammography 9(100%) were irregular in shape.9(100%)were lobulated.3(33.3%) were of high density 6(66.7%)were of low density.

On sonomammography 16(100%) were irregular in shape.11(68.8%) were lobulated and 5(31.3%)had spiculated margins.13(81.3%)were heterogeneously hypoechoic ,2(12.5%)were anechoic,1(6.3%)were homogenously hypoechoic.14(87.5%)had features of posterior acoustic enhancement ,2(12.5%)had features of posterior acoustic shadowing.

Table 3: Distribution of lesions according to birads on mammography ,sonomammography and combined mammography &sonomammography

BIRADS	Mammography	Sonomammography	Combined Mammography & Sonomammography
BIRADS 0	6	0	0
BIRADS I	11	1	1
BIRADS II	46	55	55
BIRADS III	13	22	21
BIRADS IV	21	15	16
BIRADS V	3	7	7

Breast cyst:

On mammography 6(85.7%)were round,1(14.3%)were oval in shape.7(100%)were circumscribed.5(71.4%)were of low density and 2(28.6%)were of equal density.On sonomammography 7(58.3%)were oval and 5(41.7%)were round in shape.12(100%)were circumscribed.9(75%)were anechoic,2(16.7%)had low level internal echoes and 1(8.3%)had internal septations.11(91.7%) had features of posterior acoustic enhancement ,1(8.3%)had features of posterior acoustic shadowing.9 cases were diagnosed as simple cysts and 2 cases were diagnosed as complicated cysts.Stavros et al has reported an incidence of 10% solitary breast cyst in his study of 750 breast lesions[13].

Fibrocystic disease:

On sonomammography 1(50%)was irregular in shape.2(100%) were hyperechoic and 2(100%) had features of posterior acoustic shadowing.According to Haagenson et al fibrocystic disease appear as dense breast tissue on mammogram[14].

Mastitis:

On mammography 2(100%) were irregular in shape, 2(100%) had indistinct margins. 2(100%) were of high density. On sonomammography 4(100%) were irregular in shape. 3(75%) were hyperechoic and 1(25%) were heterogeneously hypoechoic. 4(100%) had features of posterior acoustic enhancement. 3 cases had tubular extension.

Galactoceles:

On mammography 2(50%) were oval and 2(50%) were round in shape. 4(100%) were circumscribed. 3(75%) were of equal density and 1(25%) was high density.

On sonomammography 4(66.7%) were oval and 2(33.3%) were round in shape. 6(100%) were circumscribed. 5(83.3%) were homogeneously hypoechoic, 1(16.7%) was heterogeneously hypoechoic. 6(100%) had features of posterior acoustic shadowing.

Lipoma:

On mammography 1(50%) was oval and 1(50%) was round in shape. 2(100%) were circumscribed. 2(100%) were of high density. On sonomammography 1(100%) was round in shape and 1(100%) was circumscribed. 1(100%) was isoechoic and 1(100%) had no posterior acoustic features. All fat containing masses like lipomas on mammography are proven benign at FNAC according to Helvie et al [15].

Ductal ectasia:

On mammography 2(66.7%) had obscured margins and 2(66.7%) were of high density. On sonomammography 3(75%) had dilated duct with anechoic lumen and 1(25%) had dilated duct with hyperechoic lumen. 4(100%) had features of posterior acoustic shadowing.

Phyllodes tumor:

On mammography 2(66.7%) were oval and 1(33.3%) was round in shape, 1(33.3%) was circumscribed and 2(66.7%) had obscured margin. 3(100%) were of equal density (Fig 4). On sonomammography 3(75%) were oval and 1(25%) was irregular in shape. 3(75%) were lobulated and 1(25%) was circumscribed. 3(75%) were heterogeneously hypoechoic and 1(25%) was homogeneously hypoechoic. 3(75%) had features of posterior acoustic enhancement, 1(25%) had features of posterior acoustic shadowing (Fig 5).

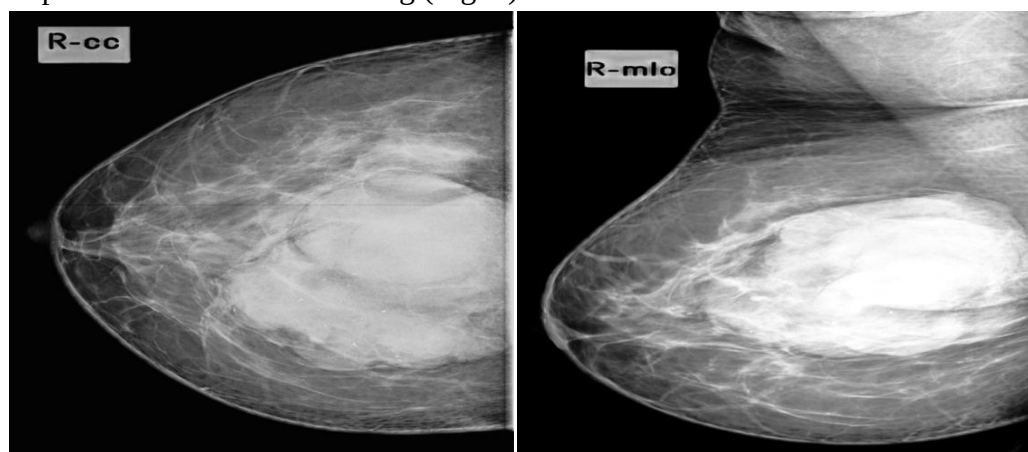


Fig 4: Mammography CC and MLO view showing a multilobulated, high density lesion - Phyllodes Tumor (BIRADS IV)

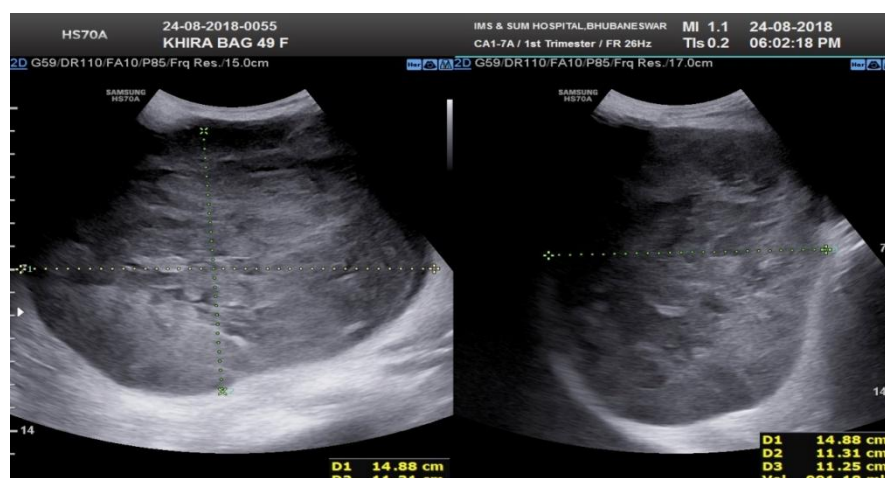


Fig 5: Sonomammography showing a large irregular, lobulated heterogeneously hypoechoic lesion in right upper outer and lower outer quadrant -Phyllodes Tumor (US BIRADS IV)

Carcinoma breast:

On mammography 20(90.9%) were irregular, 2(9.1%) were oval in shape. 1(4.5%) had indistinct, 2(9.1%) had obscured and 13(59.1%) had spiculated margins. 21(95.5%) were of high density and 1(4.5%) was of low density (Fig 6). On sonomammography 15(88.2%) were irregular and 2(11.8%) were oval in shape. 1(5.9%) was circumscribed, 6(35.3%) were lobulated, 8(47.1%) had spiculated, 1(5.9%) had indistinct and 1(5.9%) had angular margins. 17(100%) were heterogeneously hypoechoic. 3(17.6%) had features of posterior acoustic enhancement, 14(82.4%) had features of posterior acoustic shadowing (Fig 7)

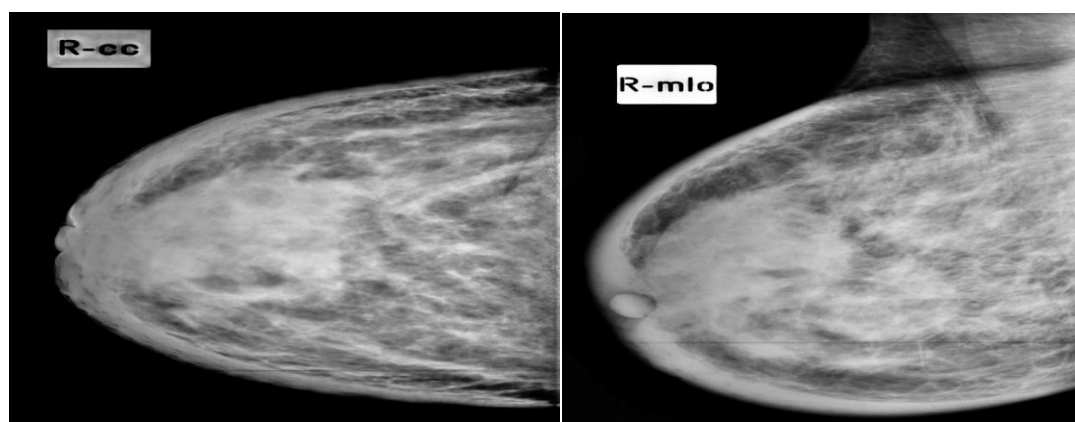


Fig 6: Mammography CC and MLO view showing a irregular, high density lesion with indistinct margin & skin thickening - Carcinoma Breast (BIRADS V)

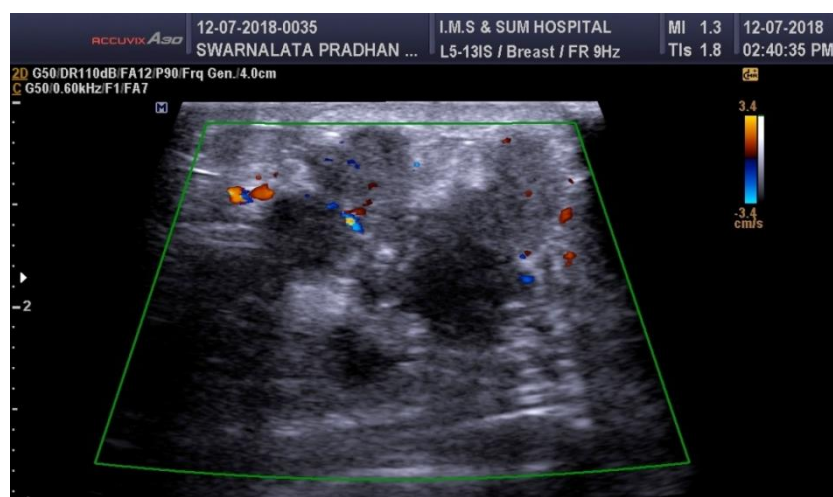


Fig 7: Sonomammography showing an irregular, lobulated heterogeneously hypoechoic lesion in right upper outer quadrant with foci of calcifications and increased vascularity- Carcinoma Breast(US BIRADS V)

According to Stanley et al most of the breast carcinomas were seen above age of 45 years[16]. Stomper et al used radiological and pathological correlation for invasive carcinomas and found that 80% of them showed irregular shape on mammography[17]. On mammography, 6 cases were BIRADS 0, 11 cases were BIRADS I, 46 cases were BIRADS II, 13 cases were BIRADS III, 21 cases were BIRADS IV & 3 cases were BIRADS V. On sonomammography, 0 cases were BIRADS 0, 1 case was BIRADS I, 55 cases were BIRADS II, 22 cases were BIRADS III, 15 cases were BIRADS IV & 7 cases were BIRADS V. For combined mammography & sonomammography, 0 cases were BIRADS 0, 1 case was BIRADS I, 55 cases were BIRADS II, 21 cases were BIRADS III, 16 cases were BIRADS IV & 7 cases were BIRADS V.

On mammography 58 cases were diagnosed as benign, 25 cases were diagnosed as malignant. On sonomammography 78 cases were diagnosed as benign and 21 cases were diagnosed as malignant. For combined mammography and sonomammography 76 cases were diagnosed as benign and 23 cases were diagnosed as malignant. On FNAC 78 cases were diagnosed as benign & 22 cases were diagnosed as malignant.

On comparison (Malignant v/s Benign)

Sensitivity 81.8%, Specificity 88.5%, Positive predictive value 72%, Negative predictive value 93.1% for mammography with FNAC. Sensitivity 81.8%, Specificity 96.1%, Positive predictive value 85.7%, Negative predictive value 94.8% for sonomammography with FNAC. Sensitivity 90.9%, Specificity 96.1%, Positive predictive value 85.7%, Negative predictive value 94.8% for combined mammography & sonomammography with FNAC (Table 3, 4)

Table 3: Correlation of mammography, sonomammography and combined mammography and sonomammography with FNAC diagnosis (malignant v/s benign)

	Mammography	Sonomammography	Combined Mammography	FNAC
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			and Sonomammography	
Malignant	25	21	23	22
Benign	58	78	76	78

Table 5: Statistical parameters for correlation of mammography , sonomammography and combined mammography and sonomammography with FNAC diagnosis (malignant v/s benign)

	Mammography with FNAC	Sonomammography with FNAC	Combined Mammography and Sonomammography with FNAC
Sensitivity	81.8%	81.8%	90.9%
Specificity	88.5%	96.1%	96.1%
PPV	72.0%	85.7%	86.9%
NPV	93.1%	94.8%	97.4%

Harmine M Zonderland et al performed mammograms &sonomammograms in 1103 patients,they found that sensitivity of mammography was 83% & specificity 90%.After combining with sonomammography sensitivity increased to 91% and specificity to 98%[18].

Conclusion

Evaluation of breast lump is important to rule out malignancy. Mammography, Sonomammography are imaging techniques and FNAC is a tissue diagnostic technique. Sonomammography is better in diagnosing cystic lesions, duct ectasia, mastitis, small fibroadenoma and dense breast evaluation. Sonomammography is better in differentiating solid & cystic lesions .Mammography is better in detecting microcalcifications, spiculated masses for early detection of malignancy.For BIRADS I,II,III& younger population sonomammography is better. For BIRADS IV,V& older population mammography is better. Hence, mammography & sonomammography cannot replace each other. Combined mammography and sonomammography are more accurate in evaluation of palpable breast masses

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