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A correlative Study of Mammography & Ultrasound breast findings with histopathology in palpable breast abnormality at tertiary care hospital

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Abstract

Objective

1. To evaluate the role of mammography and ultrasound independently and in correlation to evaluate the palpable breast abnormality.
2. To study the imaging characteristics of breast lesions on mammography and USG and differentiating benign from malignant lesions.
3. Correlation of imaging findings with histopathological diagnosis in cases given final BIRADS IV and above.

Study Period: January 2022 to June 2022 (6months)

Material and Methods: This descriptive cross-sectional analytic study was performed on 150 patients with palpable breast lump who undergone mammographic and sonographic evaluation of both breasts with histopathological diagnosis in cases given final BIRADS IV and above. A checklist containing patient's name, MRD number, age, mammography and USG imaging findings and final results as per BIRADS categorisation were evaluated. The results of ultra-sonography and mammography were compared with those of pathology, in cases with final BIRADS of IV and above.

Results: In our study, mean age of presentation was 42 yrs. As per final BIRADS category, out of 150 symptomatic patients 45 cases were BIRADS IV, 36cases BIRADS II, 35 BIRADS III, 16 cases were BIRADS V, 10 cases were BIRADS VI and 8 cases were BIRADS I.

Conclusion

1. Combined imaging modalities of mammography and USG play an important role in diagnosing palpable breast lesions and assigning the final BIRADS.

2. MMG and USG helpful for differentiating malignant from benign lesions.

3.BIRADS IV and above lesions those underwent biopsy/FNAC confirmed on histopathology reports

Keywords: Breast Lump, Ultrasound, Mammography, Comparison, Histopathology.

Introduction

Breast carcinoma is the most common malignancy and is the second cause of death in the adult females world-wide.

Influencing factors for the incidence of disease include Estrogen/progesterone, the age of menarche/menopause, age at first pregnancy [1]. Out of eight, one woman is affected with a lifetime risk of about 12.5%.[2] The early diagnosis, by a meticulous clinical examination, staging of the disease by radiology and histopathological analysis at the time of disease presentation play an important role in deciding type of surgery and fair outcome for these patients [3].The highest incidence rate in breast cancer reported in 40- to 49 year age group of adult women and remaining 23% of cases of breast cancer reported at ages lower than 40 [4]. Considering the high incidence of advanced breast cancer at young age group (between 40–49), early diagnosis and staging the disease before surgery are important in treatment plan. The two non-invasive radiological investigations; Ultrasonography and mammography are the important tools in early detection, prompt treatment and favourable outcome leading to increased survival rate in younger females [5,6].

However, mammography sensitivity is strongly affected by breast density as one encounter denser breast in early young females, sensitivity of mammography reduces as a result of increasing breast density that is 30% to 48% [5, 7].

Ultra-sonography and mammography are the two modalities that are available and affordable. Combined mammography and sonography have demonstrated higher sensitivity, specificity and a near 100% negative predictive value for palpable breast masses. Together these imaging modalities can be reassuring if follow-up is planned when the physical examination is not highly suspicious and unnecessary breast biopsy can be avoided. Hence, this study was carried out to provide a systematic and practical approach in evaluation of breast masses with an aim to evaluate mammographic and sonographic features of the clinically palpable breast masses, characterise the breast masses into benign and malignant based on imaging findings and to correlate with histopathology.

Sensitivity of ultra-sonography and mammography is different in various studies world-wide. The increasing incidence of breast cancer is a major healthcare problem, as well as its early diagnosis and treatment, can significantly affect in reducing the devastating outcome. Although there are ample studies assessing the frequency of breast cancer in other colleges, but very lesser has compared the mammography and ultra-sonography findings with pathology. Much concern is given to malignancy though benign lesions of the breast are far more frequent than malignant. With the combined use of mammography, USG, 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 to advanced stage.

Usually it comprises of inoperable masses, metastasis and eventually mortality. This study aimed to compare the mammography and ultra-sonography findings correlation, use of these modalities to differentiate malignant from benign lesions and correlation of imaging findings with histopathological results in patients with BIRADS IV and above.

Mammography

Mammography is recommended as the first imaging modality in the evaluation of palpable breast findings in women 30 years old and older. If mammography reveals a clearly benign cause of the palpable abnormality, such as a calcified involuting fibroadenoma, lymph node, lipoma, hamartoma, galactocele, or oil cyst, or if only fatty tissue is present in the area of concern, no further imaging is needed.

For all other mammographic findings, including masses with probably benign or suspicious features, further evaluation with targeted ultrasound is indicated. Normal mammographic findings are not sufficient to rule out malignancy in a nonfatty breast. If there is no mammographic finding at the site of the palpable lump, further workup with targeted ultrasound is required.

Approximately 13% of women with palpable breast cancer have normal mammographic findings. False reassurance from a normal mammogram can lead to a delay in cancer diagnosis.

Ultrasound

Historically, use of breast ultrasound waslimited to differentiating cysts from solidmasses. It was otherwise thought that ultrasound had little or no place in the evaluation of palpable breast masses. With technologic advances, ultrasound has become an essential part of managing palpable breast masses. It is the primary imaging modality for women younger than 30 years presenting with a palpable breast mass and is a critical adjunct to mammography for older patients.

A woman with a palpable lump corresponding to a clearly benign finding at targeted ultrasound, such as simple cyst, non-pathologic lymph node, lipoma, sebaceous cyst, clustered microcysts, or duct ectasia, can safely undergo clinical follow-up without short-interval imaging follow-up, needle aspiration, or biopsy. The addition of ultrasound to the evaluation of palpable breast lumps improves cancer detection

If combined imaging findings are negative and clinical breast examination findings are not highly suspicious, the patient may be reassured of the negative findings and safely undergo clinical follow-up with her health care provider.

However, any highly suspicious mass found at clinical examination should be biopsied, regardless of negative imaging findings, because of the extremely small but present risk of malignancy.

Palpable masses may have probably benign features at targeted ultrasound (solid mass with circumscribed margins, oval shape, and horizontal orientation).

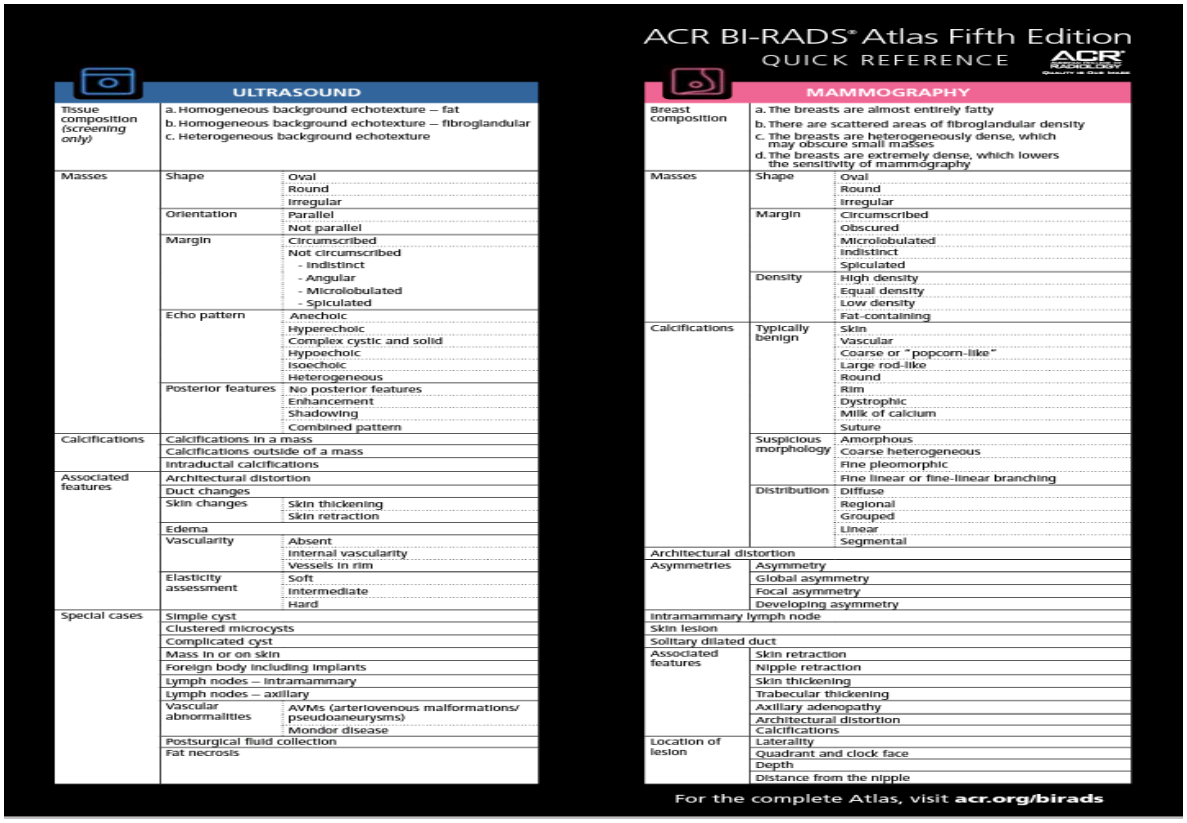
All patients had routine Clinical examination, Mammography and Sonography of both the breasts. FNAC/Biopsy was performed under ultrasound guidance in the lesions labelled as indeterminate and highly suspicious of malignancy (BIRADS IV and above).

The results were analysed and categorized according to BIRADS (Breast Imaging Reporting and Data System) score[8]

Table 1

Final Assessment Categories			
	Category	Management	Likelihood of cancer
0	Need additional imaging or prior examinations	Recall for additional imaging and/or await prior examinations	n/a
1	Negative	Routine screening	Essentially 0%
2	Benign	Routine screening	Essentially 0%
3	Probably Benign	Short interval-follow-up (6 month) or continued	>0 % but ≤ 2%
4	Suspicious	Tissue diagnosis	4a. low suspicion for malignancy (>2% to ≤ 10%) 4b. moderate suspicion for malignancy (>10% to ≤ 50%) 4c. high suspicion for malignancy (>50% to <95%)
5	Highly suggestive of malignancy	Tissue diagnosis	≥95%
6	Known biopsy-proven	Surgical excision when clinical appropriate	n/a

Table 2:



ACR BI-RADS® Atlas Fifth Edition
QUICK REFERENCE

ULTRASOUND

Tissue composition *(screening only)*	a. Homogeneous background echotexture — fat b. Homogeneous background echotexture — fibroglandular c. Heterogeneous background echotexture	
Masses	Shape	Oval Round Irregular
	Orientation	Parallel Not parallel
	Margin	Circumscribed Not circumscribed - Indistinct - Angular - Microlobulated - Spiculated
	Echo pattern	Anechoic Hyperechoic Complex cystic and solid Hypoechoic Isoechoic Heterogeneous
	Posterior features	No posterior features Enhancement Shadowing Combined pattern
Calcifications	Calcifications in a mass	
	Calcifications outside of a mass	
	Intraductal calcifications	
Associated features	Architectural distortion	
	Duct changes	
	Skin changes	Skin thickening Skin retraction
	Edema	
	Vascularity	Absent Internal vascularity Vessels in rim
	Elasticity assessment	Soft Intermediate Hard
Special cases	Simple cyst	
	Clustered microcysts	
	Complicated cyst	
	Mass in or on skin	
	Foreign body including implants	
	Lymph nodes — intramammary	
	Lymph nodes — axillary	
	Vascular abnormalities	AVMs (arteriovenous malformations/ pseudoaneurysms) Mondor disease
	Postsurgical fluid collection	
	Fat necrosis	

MAMMOGRAPHY

Breast composition	a. The breasts are almost entirely fatty b. There are scattered areas of fibroglandular density c. The breasts are heterogeneously dense, which may obscure small masses d. The breasts are extremely dense, which lowers the sensitivity of mammography	
Masses	Shape	Oval Round Irregular
	Margin	Circumscribed Obscured Microlobulated Indistinct Spiculated
	Density	High density Equal density Low density Fat-containing
Calcifications	Typically benign	Skin Vascular Coarse or "popcorn-like" Large rod-like Round Rim Dystrophic Milk of calcium Suture
	Suspicious morphology	Amorphous Coarse heterogeneous Fine pleomorphic Fine linear or fine-linear branching
	Distribution	Diffuse Regional Grouped Linear Segmental
Architectural distortion		
Asymmetries	Asymmetry	
	Global asymmetry	
	Focal asymmetry	
	Developing asymmetry	
Intramammary lymph node		
Skin lesion		
Solitary dilated duct		
Associated features	Skin retraction	
	Nipple retraction	
	Skin thickening	
	Trabecular thickening	
	Axillary adenopathy	
	Architectural distortion	
	Calcifications	
Location of lesion	Laterality	
	Quadrant and clock face	
	Depth	
	Distance from the nipple	

For the complete Atlas, visit **acr.org/birads**

Inclusion criteria

Patients above 30 years with palpable breast lumps undergoing mammography and ultrasound both, K/C/O carcinoma breast with mastectomy done on one side.

Exclusion criteria

Patients below 30 years of age, Pregnant women, women who didn't give consent for mammography, asymptomatic patients.

Materials and methods

This prospective study was performed for a duration of 6 months in the Department of Radiodiagnosis, BJMC & Sassoon General hospital, Pune. A well-informed written consent was obtained from patients. Histopathology follow-up was obtained from either core needle biopsy/ FNAC or post-operative tissue.

Machines

Diagnostic MMG was performed using Siemens Mammomat select and ultrasound was performed using a linear transducer with a 50-mm width and a frequency of 12 MHz, using Philips models affinity 30 and 50G.

A checklist containing patient's name, MRD number and age was obtained.

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.

Bilateral film screen mammography was performed using Cranio-caudal and Medio-lateral oblique views of both the breasts after adequate compression.

USG was performed, using a linear transducer with a 50-mm width and a frequency of 12 MHz, using Philips models affinity 30 and 50G. Both the breast were scanned radially and anti-radially. A thorough ultrasound examination was performed in Sagittal plane, Transverse plane, Radial plane. Nipples were scanned in the tangential plane. Final BIRADS was assigned to each case depending on imaging findings of MMG and sonography.

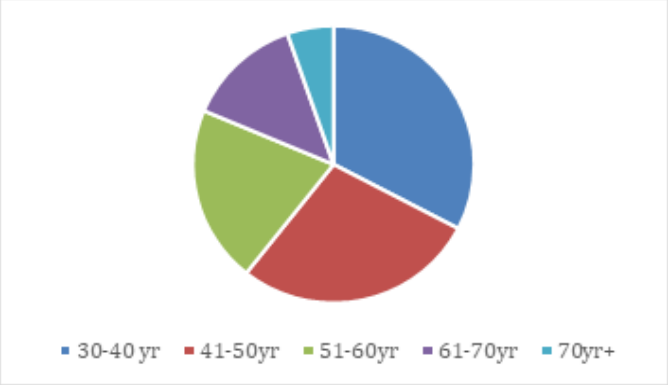
The results of ultra-sonography and mammography were compared with those of pathology, in cases with final BIRADS of IV and above.

Results

Majority of patients were female in our study (148/150) Only two male patient was included with symptom of tender palpable lump.

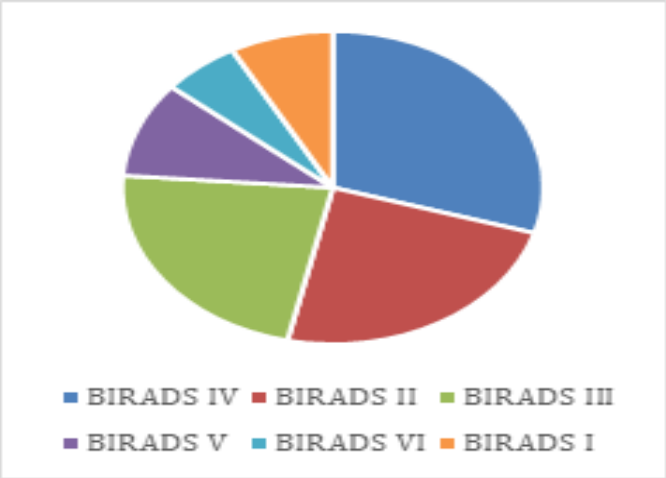
Patients from age 32 to 72 were included in our study. Age Distribution in our study 49 was patients from 30-40 years, 42 were from 41-50years, 31 patients were between 51-60,20 patients were between 61-70 years and 8 were above 70 years of age.

Graph 1:



Percentage of final BIRADS or 'BI-RADS stands for Breast Imaging Reporting and Data System in our study as follows: BIRADS I- 8 (5 %), BIRADS II- 36 (24 %), BIRADS III- 35 (23 %), BIRADS IV- 45 (30%), BIRADS V- 16 (10 %), BIRADS VI- 10 (6%)

Graph 2:



BIRADS on Mammography independently as follows- BIRADS I- 21 (14 %), BIRADS II- 33 (22%), BIRADS III- 31 (20%), BIRADS IV- 39 (26%), BIRADS V- 16 (10%), BIRADS VI- 10(6%)

BIRADS on USG alone as follows- BIRADS I- 12 (8 %), BIRADS II- 32 (21%), BIRADS III- 35 (23 %), BIRADS IV- 39(26 %), BIRADS V- 16 (10 %), BIRADS VI- 10 (6%)

71 patients were assigned final BIRADS of IV and above. Histopathology was done for 61 patients out of which 55 patients (77 %) turned out to be malignant. Remaining 16(26%) patients turn out be benign etiology.

Table 3: BIRADS, Area, Mammogram results, Calcification, Ultrasound, Lymph node and Pathology findings of examined cancer breast cases.

Mammographic findings		
	O (Incomplete)	0
	1(Negative)	21
	2(Benign findings)	33
	3(Probably benign)	31
	4(Suspicious abnormality)	
	4a	17
	4b	16
	4c	6
	5(Highly suspicious of malignancy)	16
	6.(Known biopsy with proven malignancy)	10
	Unclear (Equivocal)	0
	Anatomical area of breast involved	
	Retro areolar	51
	Upper Outer Quadrant	24
	Upper Inner Quadrant	3
	Lower Outer Quadrant	8
	Lower Inner Quadrant	10
	Central	26
	Retromammary region	13
	Undetected (Unable to pick)	-
	Lymphadenopathy	65
	Suspicious	36
	Benign/ Reactive	29
	Calcification	
	Malignant (pleomorphic/ coarse)	27
	Benign	15
	No calcification	108
	Suspicious	-
	Undetected (Unable to pick)	-
	Focal Asymmetry	21
	Asymmetry	3
	Global Asymmetry	4
	NAC Thickening and Nipple retraction	
	Architectural distortion	3

Masses	Shape	Oval	45
		Round	11
		Irregular	18
	Margin	Circumscribed	22
		Obscured	40
		Micro lobulated	06
		Indistinct	04
		Spiculated	08
	Density	High density	
		Equal density	32
		Low density	
Ultrasound			
	BIRADS IV (indeterminate/ suspicious)		45
	BIRADS V		16
	BIRADS VI		10
	BIRADS II (Benign)		32
	BIRADS III (Probable benign)		35
	BIRADS I (No sonographically detectable lesion)		12
	Masses		
	Shape	Oval	22
		Round	32
		Irregular	17
	Orientaion	Parallel	32
		Non parallel	08
	Posterior features	Shadowing	32
		Enhancement	26
	Intramammary lymph node		08
	Vascularity	Present	45
		Absent	17
	Echo pattern		
		Hypoechoic	85
		Anechoic	44
		Complex cystic & solid	14

Mammography and sonography correlation images.

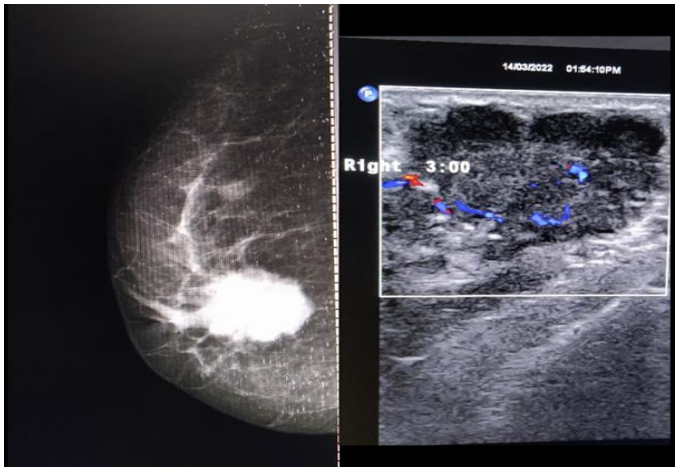


Image 1a: On mammography right MLO view an irregular high-density lesion with micro lobulated margins in inner central region at 3 o clock position with significant nipple retraction and skin thickening. (Cassette Artefacts ++)

Image 1b: On SONOGRAPHY The above-mentioned corresponds to irregular hypoechoic soft tissue lesion with micro lobulated margins at 3 0’ clock position on right side. Posterior acousting shadowing is seen.

The lesion shows mild internal vascularity on putting colour doppler on Combined Sonomammography and MMG correlation, lesion is highly suggestive of malignancy. (Final ACR BIRADS V)

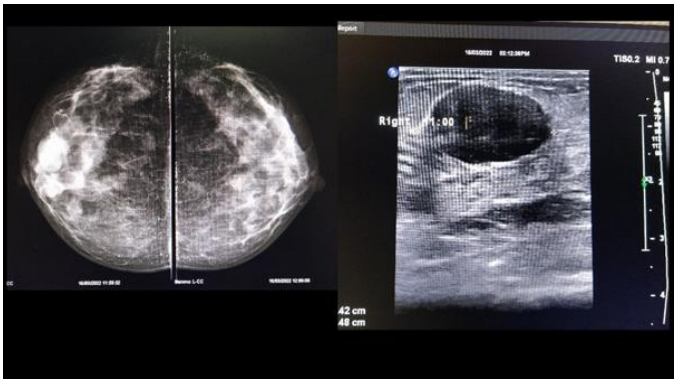


Image 2a: Right CC view shows multiple oval well circumscribed iso to high density lesions in outer and inner quadrant predominantly in retroarerolar location with partly circumscribed and partly obscured margins, on mammography BIRADS III was assigned. Focal asymmetry in central region is seen in left breast on mammography images which corresponded to normal breast parenchyma on USG correlation. (Cassette artefacts++) Image 2b: On USG largest high density lesions in mammography was corresponding to above shown well defined hypoechoic lobulated soft tissue lesion in parallel orientation with micro lobulated margins at few places at 11 o 'clock position- final BIRADS was assignend as indeterminate etiology -low suspicion for malignancy (BIRADS IVa)

Discussion

In our study , 71 patients were assigned final BIRADS of IV and above. Histopathology was done for 61 patients out of which 55 patients (77 %) turned out to be malignant. Remaining 16(26%) patients turn out be benign etiology. Fewer studies have been reported in India regarding comparison between the radiological investigations as ultrasound and mammogram correlation and confirmation to the tissue diagnosis (biopsy). According to our study, mammography and ultra-sonography results were correlated in the majority of patients with palpable breast abnormalities and these results were confirmed in histopathology reports who underwent biopsy. The obtained results in study of Farokh et al[9] showed that ultrasonography was a certain diagnostic test for detecting breast cancer in patients with high density breasts and mammography was more accurate than ultra-sonography in determination of the size of tumour before surgery. Disease extension better appreciated on MMG because microcalcifications extend beyond the lesion. In our study correlating the findings of MMG and sonography, we studied when we get mild haziness in retroaerolar region it is corresponding to prominent / dilated ducts, suspicious malignancy looking lump correlate on sonography as on sonography malignant lesion will show vascularity on colour doppler. We studied that mammography and USG were both complementary to each other in giving final BIRADS category.

Conclusion

Imaging has an important role in the management of palpable masses of the breast. USG is appropriate in most instances to better characterize palpable lesions and thus helps to reduce the patient anxiety and avoids unnecessary interventions in those cases in which imaging findings are unequivocally benign. Diagnostic accuracy of combined mammographic and sonographic imaging is very high and is reassuring to the patient.

Our study confirms the higher combined specificity of ultra-sonography and mammography for detection of palpable breast masses including malignancies. Combined imaging modalities of mammography and USG play an important role in diagnosing palpable breast lesions and assigning the final BIRADS. Correlation of findings on MMG and USG is in helpful for differentiating from malignant and benign lesions. USG is better in differentiating solid and cystic lesions,

duct ectasia, infections. USG and Mammography cannot replace each other but to suggest single modality, USG is preferred modality for evaluation palpable abnormalities of breast in pregnancy, lactation, dense breast. USG provides real time image guidance for USG detectable masses for FNAC and core needle biopsies whereas mammography is better in detecting microcalcifications, spiculated masses, detecting focal asymmetries, architectural distortion and for stereotactic biopsies. Even in sonographic ally detectable mass lesions of neoplastic etiology the total extent of the disease was better evaluated on mammography by determining malignant calcifications which extends beyond the mass lesion. No single investigation is 100% accurate but combination of mammography and ultrasonography can yield near 100% results. The management of breast disease relies heavily on breast imaging and tissue diagnosis either in the form of FNAC or core needle / stereotactic biopsy.

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