

Sonomammographic Evaluation of Breast Lesions & its Correlation with FNAC.

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Abstract : To find out sonomammographic features of benign and malignant masses, correlate sonographic findings with Fine Needle Aspiration Cytology and classify all breast lesions according to BIRADS. Prospective study of 150 patients of Breast lesions were classified as benign and malignant using sonography with respect to its location, size, shape, margins, echopattern, echotexture, retrotumoral acoustic phenomenon, microcalcification, lymphadenopathy and width/anterioposterior ratio. Doppler features were used to assess presence or absence of vascularity, location and shape of signals. Resistive Index and Pulsatility Index were evaluated. Sonographic classification were compared with FNAC results. Sensitivity, specificity, accuracy, Positive and Negative Predictive Values were evaluated. Ultrasonographic features that characterize masses as benign were ellipsoid shape (87/100), smooth margins (92/100), width/AP ratio >1.4 (67/100) and mildly hypoechoic (74/100). Features that characterize as malignant includes irregular shape (32/54), spiculated margins (24/54) and width/AP ratio <1.4 (35/54). On Doppler study color flow was more frequently seen both in central and peripheral areas of the lesion (28/54) with irregular branching pattern of signals (49/54) in malignant lesions. Benign masses frequently showed peripheral vascularity (78/98) and linear shape of signal (72/98). On FNAC 74/100 benign lesions were fibroadenoma, 14/100 were pyogenic abscess, 4/100 were cyst, 4/100 galactocoele and 2/100 tubercular abscess whereas 52/54 were ductal carcinomas. The RI and PI were significantly higher in malignancy ($P < 0.001$). Ability of sonography in differentiating benign from malignant lesions has accuracy 70.77%. **Conclusion:** Sonography along with Doppler can be used for accurately differentiating solid lesion into benign and malignant. PPV of sonomammography in differentiating benign from malignant masses is 55.17%

INTRODUCTION

Breast lumps are common presenting complaint in the female surgical OPD. Since Prognosis of benign and malignant masses varies hence it is very pertinent to differentiate them. Benign breast masses includes fibroadenoma, cyst, galactocoele and abscess^{1,2}. Malignant breast masses are mostly ductal cell carcinoma.

Mammographically occult cancers can be detected by Ultrasound depending on patient's breast density and age³⁻⁸. In our rural referral hospital we come across approximately 150 cases of breast masses every year.

Sonomammography is a promising investigation, being non-invasive and cost effective for mass screening. MRI is costly and available only at few centres. Positive predictive value of sonomammography and MRI for differentiating benign and malignant masses are 51% and 32%. Mammography has disadvantage of radiation, therefore ideal screening modality for young patients with breast mass is sonography.

Keeping in mind the advantage of sonomammography with Doppler, the present prospective study was planned.

MATERIAL AND METHODS

Breast sonography with prospective recording of the sonographic features of the lesions was performed for 150 patients having

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154 lesions of age group 11 to 70 years in the department of radiodiagnosis from October 2011 to August 2013, after approval from ethical committee. The inclusion criteria were, palpable breast lump presented to surgery OPD and Screening of high risk patients presented with lump. Patients with bleeding dyscrasias, fungating mass, extremely painful breast mass were excluded from the study.

Sonography was performed with 5-13 MHz hand held linear array real-time transducer (Siemen Acuson X300 Model number 10037409 and Philips enviser Model number mcmd-02AA sonography machine). Privacy of the patient during examination was ensured. The patients were examined in supine position with ipsilateral hand behind her head. Skin was covered with ultrasonic gel for good acoustic coupling. Radial and Antiradial scanning technique was used. The axilla was examined for lymphadenopathy in required case. Sonographic tumor description were recorded prospectively in terms of location, Size, Shape, Margins, Echopattern, Echotexture, Retrotumoral acoustic phenomenon, Microcalcification, Lymphadenopathy, width/ Anteroposterior ratio. Color Doppler was used to assess the following:- presence or absence of vascularity, Location of signals, shape of signals, spectral analysis was done and PI and RI were calculated. Sonographically guided FNAC was performed. The following statistical performance data were calculated for each of the diagnostic test: Sensitivity, specificity, PPV, NPV and accuracy. The finding with a P value of less than 0.05 was considered to be statistically significant. Statistical analysis was done with windows SPSS.

RESULT

The observation made in 150 patients with 154 breast lumps were

analyzed. The mean age of the patient was 26.89 years (currently menstruating) for benign lesions and 50.27 years (attainedmenopause) for malignant lesions. Benign lumps (95/100) were mobile whereas malignantlumps(46/54)) were fixed hard. Both benign and malignant lumps were located mostly in upper outer quadrant (74/154) followed by upper inner quadrant (48/154). USG features most predictive of a benign tissue diagnosis were absence of microcalcification (100% with this feature were benign), absence of lymphadenopathy (98 /100), smooth margins (92 /100), ellipsoid shape (87 /100), mildly hypoechoic(74/100), width/AP ratio> 1.4(67 /100), posterior enhancement+ bilateral lateral shadowing (38/100) and posterior enhancement (38 /100). The features most predictive of malignant tissue diagnosis were width/AP ratio <1.4 (35 /54), irregular shape(32/54), markedly hypoechoic (31/54), posterior shadowing(25 /54)), spiculated margins(24/54)). On Doppler presence of vascularity with central location(22 /54), central and peripheral location both (28/ 54) and irregular shape (49 / 54)suggest malignancy whereas presence of vascularity with peripheral location(78 /98), linear shape(72 /98) and absence of vascularity within a mass suggest benignancy. PI more than 1.38 and RI more than 0.72 suggest malignancy whereas PI less than 1.38 and RI less than 0.72 suggest benignity. On pathological diagnosis 74/ 100 benign lesions were fibroadenoma, 14 /100 lesions were pyogenic abscess, 4 /100 lesions were cyst, 4 /100 galactoceleand 2/ 100 tubercular abscess. On pathological diagnosis 52 /54 malignant lesions were ductal carcinoma. According to sonographic BIRADS classification 68 /154lesions were probably benign and 55 /154 were suspicious abnormalities. Ability of sonography in differentiating benign and malignant lesions depicted in (Table 1).

Table 1: Ability of sonography in differentiating benign and malignant lesions

USG Diagnosis	Final Diagnosis(FNAC)			2-value
	Malignant	Benign	Total	
Malignant	48	39	87	35.50 P<0.0001 Significant
Benign	6	61	67	
	95% CI			
Sensitivity	88.89%	77.36-95.78%		
Specificity	61%	50.73-70.60%		
PPV	55.17%	44.13-65.85%		
NPV	91.04%	81.51-96.62%		
Accuracy	70.77%			

Sensitivity, specificity, PPV, NPV and accuracy of benign sonographic versus benign pathological diagnosis (Table 2).

Comparison of malignantsonographic versus malignant pathological diagnosis (Table 3). Comparison of performance characteristic of different studies in differentiating benign from malignant breast lesions given in table 4.

Table 2: Benign sonographic versus benign pathological diagnosis

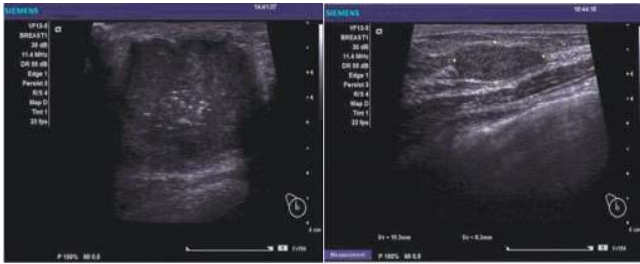
	Sensitivity	Specificity	PPV	NPV	Accuracy
EllipsoidShape	66.66%	77.27%	92.06%	36.95%	68.80%
Smooth Margin	63.04%	33.33%	93.54%	5.55%	61.22%
Wider thantaller	68.65%	73.68%	90.19%	40%	69.76%
MildHypoechoogenicity	59.45%	80.95%	91.66%	36.17%	64.21%
Posterior Enhancement andlateral Edge shadowing	89.47%		94.44%		85.00%

Table 3: Malignant sonographic versus malignant pathological diagnosis

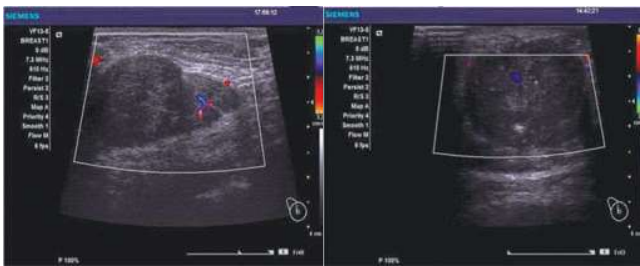
	Sensitivity	Specificity	PPV	NPV	Accuracy
Irregular Shape	96.87%	23.07%	75.62%	75.00%	75.55%
Spiculation/ anuglar/ microlobulation	95.88%	37.50%	90.19%	60.00%	90.74%
Taller thanwider	97.14%	45.45%	65.38%	93.75%	72.05%
Marked Hypoechoogenicity	96.77%	57.14%	83.33%	88.88%	84.44%
Posterior shadowing	100%		67%		65.57%
Posteriorenhancement	94.73%	50.00%	48.64%	95%	64.91%
MicroCalcification	100%	100%	100%	100%	100%
Axillary lymphadenopathy	81.81%	60.20%	40.90%	90.76%	65.64%

Table 4: Comparison of performance characteristics of different studies in benign from malignant breast lesions are as shown in the following table

STUDY	SENSITIVITY	SPECIFICITY	PPV	NPV	ACCURACY
StavrosATet al ¹¹	98.4%	67.8%	38%	99.5%	72.9%
Skaane et al ¹²	99.5%	29%	66%	98%	-
ChaoTC et al ¹³	86.1%	66.1%	44.1%	93.9%	70.8%
Korphranphongpet al ²⁶	98%	70.6%	51.1%	99%	76.3%
Present Study	88.89%	61%	55.17%	91.04%	70.77%



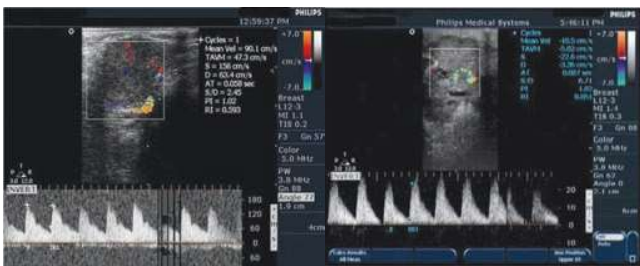
Malignant Mass Taller Than Wider, Benign Mass Wider Than Taller with smooth Margolobulations, Microcalcification and Margin and Posterior Enhancement Posterior Acoustic Shaving



Branching Flow Pattern

Doppler

Central dot flow pattern



Benign

Spectral Pattern

Malignant

DISCUSSION

Detection and evaluation of breast masses by USG, especially which are likely to be missed on mammography, is one of the most challenging and rewarded areas of Radiodiagnosis. USG plays integral part in the evaluation and treatment of breast masses. Recent advances in USG have broadened the actual and potential application of USG in breast disease. In the present study most benign lesions were seen in younger age group (1st-2nd decade) as compared to that of the malignant lesions (3rd-7th decade) similar to observation made by skaane P et al¹² and Naz Net al²⁵. We found benign lesions, common in patients with low parity (0-2) whereas malignant lesions were common in patients with higher parity (2-4) which is similar to the study by Mac Mohan B et al⁹. Most of the lesions (78/100) were located in upper outer quadrant same as observation made by Singh K et al²⁴. In the present study malignant lesions showed irregular shape (32/54) similar to the findings of Rahabar G et al¹⁴ and Chao TC et al¹⁵. 24/54 (44.4%). Malignant lesions showed spiculations with PPV 90.19% which is similar to the finding by Starvos AT et al¹¹, who reported PPV 91.8% for spiculation and Hong AS et al²² who found PPV of 86% for spiculation. Malignant lesions were taller than wider (35 out of 54). This finding is similar to Koprathong Petal²⁶ and Starvos et al¹¹. In the present study 31/54 (57.40%) of the malignant lesions were markedly hypoechoic similar to

findings of Chao TC et al¹³ and Hong et al²². Chao TC et al¹³ found 52.8% malignant lesions to have posterior shadowing and we found it in 25/54 (47.30%) of malignant lesions. Present study showed 26/54 (48%) lesions with microcalcification which closely resembles the observations made by Chao et al¹³. In the present study 87/100 (87%) benign lesions were ellipsoid in shape which is similar to the study by Rahabar G et al¹⁴. We noted smooth margins in 92/100 (92%) of benign lesions which is similar to Cole-Beuglet et al¹⁰. 67/100 (67%) benign lesions were wider than taller which is similar to Singh K et al²⁴. 74/100 (74%) benign lesions showed mild hypoechogenicity same as found by Chao TC et al¹³. Posterior enhancement with bilateral lateral shadowing was seen in 38/100 (38%) which is similar to study of the Chao. In the present study 92/100 (92%) benign and 54/54 (100%) of the malignant lesions showed presence of Doppler signals which is similar to that found by Sehgal CM et al¹⁷ and Cura et al²¹. In the present study out of 92 benign lesions with vascularity, 72 (78.2%) had linear vascularity, 16 (17.39%) had single dot vascularity, 4 (4.35%) showed linear branching vascularity and out of 54 malignant lesions, 46 (85.19%) showed presence of irregular vessels, 6 (11.11%) showed linear vessel and 2 (3.70%) showed single dot vessel, which is supporting Lee S et al¹⁹. In the present study high PI (Mean 1.65) and RI (Mean 0.82) were associated with malignancy whereas low PI (Mean 1.17) and RI (Mean 0.57) were associated with benign lesions. Similar to Tozaki M et al¹⁶ and Ozdemiretal¹⁸ that showed high RI and PI in malignancy and low RI and PI in benign lesions. Lymphadenopathy is a major prognostic indicator in patients with breast cancer. In the present study 21 (38.90%) malignant lesions were associated with axillary lymphadenopathy and out of 100 benign lesions 2% (inflammatory lymphadenopathy) were associated with axillary lymphadenopathy same as observed by LAM et al²⁰. In the present study the sonographic BI-RADS lexicon shows sensitivity, PPV and accuracy 100% for category 5 whereas category 4 shows sensitivity, specificity, NPV of 100% and PPV 30.30% which is supporting Constantini et al²³.

Further research on this subject should be encouraged to confirm role of sonography for differentiation between benign and malignant breast lesions.

CONCLUSION

In view of availability of various diagnostic modalities, we found sonomammography (grey scale and color Doppler) one of the most feasible and reliable investigation in detecting breast pathologies. Apart from its reliabilities it is also cost effective, easily available and radiation free. We found microcalcification and spiculation/angular/microlobulations as good predictors of malignancy. Doppler parameters are helpful adjunct to grey scale sonography in the evaluation of breast lesions. Sonography along with Doppler can be used accurately for differentiating solid lesion as benign or malignant allowing imaging as a modality for followup and guided FNAC as well.

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