

### **Role of ultrasonography in evaluation of breast lesions with histopathological correlation**

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#### **Abstract**

USG plays a key role in differentiating cystic and solid masses. It is useful in the evaluation of palpable masses not visible in radiographically dense breasts, abscesses, masses that are not completely evaluable with MG and in young patients susceptible to radiation damage. The present study was conducted at tertiary care centre to compare the diagnostic accuracy of ultrasonography of the breast in evaluation of breast lesions and to correlate with histopathological findings. The present study was conducted as hospital based prospective observational study on 50 patients attending general surgery OPD for breast lesions and later on came for breast ultrasound in the department of radio-diagnosis. We used MINDRAY DC-30 ultrasound and Colour Doppler system with Curvilinear (2-6MHz) and linear (5- 10MHz) ultrasound

probes. For obtaining histo-pathological sample we used a biopsy gun and cook’s biopsy needle. A total of 50 cases were included in our study with mean age of 39.28 years. On the basis of ultrasound, we categorized 31 out of 50 (62%) cases as benign and 19 out of 50 (38%) cases as malignant. 29 out of 34 benign breast lesions were correctly identified by ultrasound and 14 out of 16 malignant lesions were correctly identified by ultrasound. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of ultrasound in our study in differentiation of malignant breast lesions from benign lesions were 87.5%, 85.29%, 73.68%, 93.55% and 86% respectively. This study highlights the usefulness of ultrasound in the evaluation of breast lesions as an adjunct to clinical examination. The ultrasound features most predictive of benign tissue

diagnosis were oval or round shape, circumscribed margins and width to AP ratio  $>1.4$ . The features most predictive of malignant masses were speculated or micro lobulated mass, irregular shape, ill-defined margins and width to AP ratio  $<1.4$ . Therefore ultrasound should be used as a valuable adjunct with the clinical examination and since both the benign and malignant features overlap with each other it should not be used as a confirmatory final diagnosis for which histopathological FNAC or biopsy examination should be used as a confirmatory and gold standard test.

**Keywords:** USG, breast lesions, malignant, diagnostic accuracy, histopathology.

### Introduction

Breast diseases are common pathological condition affecting females of all age group. Breast diseases ranges from benign conditions such as fibroadenoma, galactocele, cysts, breast abscess, duct ectasia, fibro adenosis to malignant conditions such as breast cancer. The most common presentation in breast disease is breast lump which needs to be investigated and diagnosed as early as possible because of high incidence of breast cancer. Breast cancer is the more common cancer observed in women worldwide representing nearly a quarter (25%) of all cancers.[1] There is a significant increased incidence and cancer-associated morbidity and mortality in Indian subcontinent. [2,3,4] Currently the incidence of breast cancer has surpassed cervical cancer and is leading cause of cancer death among Indian women.[5]

Detection of breast cancer in its earliest possible stage is the ultimate goal in imaging the breast. Radiology chiefly includes MG (mammography) and USG (ultrasonography). [6,7] USG plays a key role in differentiating cystic and solid masses. It is useful in the

evaluation of palpable masses not visible in radiographically dense breasts, abscesses, masses that are not completely evaluable with MG and in young patients susceptible to radiation damage. [7,8]

The greater availability, low cost and low technical requirements have made ultrasonography to emerge as the most important and effective adjunct to mammography in patients with breast lumps and in normal or inconclusive mammographic findings.[9] The present study was conducted at tertiary care centre to compare the diagnostic accuracy of ultrasonography of the breast in evaluation of breast lesions and to correlate with histopathological findings.

### Materials and Methods

The present study was conducted as hospital based prospective observational study on 50 patients attending general surgery OPD for breast lesions and later on came for breast ultrasound in the department of radio-diagnosis, NSCB medical college and hospital Jabalpur Madhya Pradesh during 01 March 2019 to 31 August 2020. All females having clinically palpable breast lesion who were referred to our department for breast ultrasound and requiring subsequent biopsy and histopathological examination were included whereas asymptomatic women, with breast implants, old cases that came for follow-up, with inconclusive histopathological report and not willing to give consent for the study were excluded.

We used MINDRAY DC-30 ultrasound and Colour Doppler system with Curvilinear (2-6MHz) and linear (5-10MHz) ultrasound probes. For obtaining histopathological sample we used a biopsy gun and cook's biopsy needle.

With prior consent taken, the patient should be positioned supine with the arm on the side of interest relaxed up by

the side of the head. Both the breast was exposed and all quadrants were examined with sweeping the transducer in radial and anti-radial direction to see the abnormality. Both the axilla also examined for any mass extension or lymph node. Lesions were also examined under Colour Doppler ultrasound and results were noted. Patient's histopathological sample were taken from the lesion and results were obtained and compared with ultrasound findings. In case of bilateral lesions both the lesions were examined and considered as two lesions and sample from both lesions obtained. In case of multifocal lesions largest lesion were taken into consideration and sampling was done from largest lesion.

**Statistical analysis**

Data was compiled with the help of Microsoft excel and analysis was performed with the help of IBM SPSS software (Illinois Chicago) version 20. Categorical data was expressed as frequency and proportions whereas continuous data was expressed as mean. Diagnostic accuracy of USG diagnosis was calculated against FNAC diagnosis and expressed as percentage.

**Results**

A total of 50 cases were included in our study with mean age of 39.28 years. Based upon the histopathological examination, 34 out of 50 (68%) cases were benign with mean age 31.7 years whereas 16 out of 50 (32%) cases were malignant with mean age 52.8 years.

Table 1: Distribution according to type of lesion on Histopathology

Lesion		Number of cases (%)	Total (%)
Benign	Fibroadenoma	23 (67.6%)	34 (68%)
	Fibrocystic Disease	05 (14.7%)	
	Breast Abscess	04 (11.7%)	
	Duct Ectasia	02 (5.88%)	
Malignant	Ductal Carcinoma Insitu	16 (100%)	16 (32%)

Among 34 benign lesions 23 (67.6%) were Fibroadenoma, 05 (14.7%) were Fibro-cystic disease, 04 (11.7%) were breast abscess and 02 (5.88%) were duct ectasia. However, 16 out of 50 (32%) cases were of malignant nature and all of them turned out to be ductal carcinoma in situ. (Table 1)

In our study majority (94%) of the breast lesions were solitary and of them, two third were benign. Out of 48 unilateral cases 32 (66.66%) were found to be benign while 16 (33.33%) cases found to be malignant. Majority of the breast lesion (36%) involves upper and outer quadrant of either breast followed by lower and outer quadrant (20%). About 14% lesions were seen involving all the quadrants, of which 4 (57.14%) were malignant. About 66.66% of the lesions observed in retro areolar area were malignant. Majority (92%) of the cases were found to be hypoechoic in echo pattern, out of which 16 (34.78%) were found to be malignant. In our study 18 out of 50 (35%) lesions had heterogenous echotexture on ultrasound examination, of which 11 (61%) were malignant in nature.

About 71.42% of the lesions with irregular shape, 80% with ill-defined margin and 90% with speculated margins on ultrasound were malignant in nature. In our study, micro calcifications was present in 09 (18%) cases and of them, 07 (77.77%) lesions turned out to be malignant

in nature. Posterior wall shadowing was noted in 10 (20%) lesions, and 07 (70%) lesions were malignant. About 13 (26%) cases had penetrating vessels within the

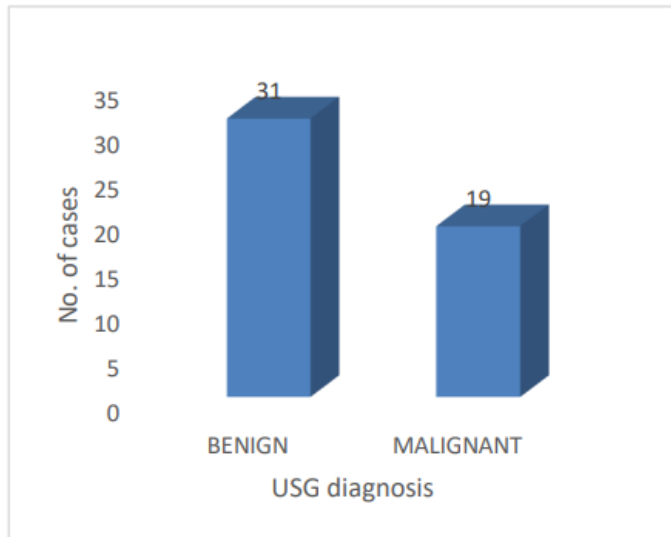
lesion, and majority of lesions with penetrating vessels were malignant in nature (84.6%). (Table 2)

Table 2: Distribution according to characteristic of lesion on USG

USG finding		Total (n=50)	Benign	Malignant
No. of lesions	Solitary	47 (95)	31(66)	16(34)
	Multifocal	3 (6)	3 (100)	0 (0)
Laterality	Unilateral	48 (96)	32 (66.7)	16 (33.3)
	Bilateral	02 (4)	02 (100)	00 (00)
Size	Mean	3.63x3.35 cm	3.8x3.56 cm	4.59x3.31cm
Quadrants involved	Upper Outer	18 (36)	12 (66.7)	06 (33.3)
	Lower Outer	10 (20)	08 (80)	02 (20)
	Upper Inner	07 (14)	06 (85.7)	01 (14.3)
	Lower Inner	05 (10)	04 (80)	01 (20)
	All Quadrants	07 (14)	03 (42.85)	04 (57.14)
	Retro Areolar	03 (6)	01 (33.33)	02 (66.66)
Echogenicity	Anechoic	03 (6)	03 (100)	00
	Hypoechoic	46 (92)	30 (65.2)	16 (34.78)
	Isoechoic	1 (2)	01 (100)	00
Echotexture	Homogenous	32 (65)	27 (84.3)	05 (15.6)
	Heterogenous	18 (35)	07 (38.8)	11 (61)
Shape	Round/Oval	36 (72)	30 (83.3)	06 (16.66)
	Irregular	14 (28)	04 (28.57)	10 (71.4)
Margin	Smooth	28 (56)	27 (96.4)	01 (3.57)
	Lobulated	07 (14)	05 (71.4)	02 (28.6)
	Ill Defined	05 (10)	01 (20)	04 (80)
	Spiculated	10 (20)	01 (10)	09(90)
Microcalcification		09 (18)	02(22.22)	07(77.77)
Posterior acoustic fetature	Enhancement	08 (16)	08 (100)	00 (0)
	Shadowing	10 (20)	03 (30)	07 (70)
	No Feature	32 (64)	23 (71.87)	09 (28.12)
Pseudocapsule		17 (34)	16 (94.11)	01 (5.88)
Orientation of lesions	Horizontal (Width to AP Ratio >1.4 )	31 (62)	28 (90.32%)	03 (9.67%)
	Vertical (Width to AP Ratio <1.4 )	19 (38)	06 (31.57%)	13 (68.42%)

Vascularity	Penetrating Vessels	13 (26)	02 (15.3)	11 (84.6)
	Peripheral Vessels	14 (28)	11 (78.5)	03 (21.4)
	No Vascularity	23 (46)	21 (91.3)	02 (8.7)

Figure 1: Distribution according to Usg Diagnosis



On the basis of ultrasound, we categorised 31 out of 50 (62%) cases as benign and 19 out of 50 (38%) cases as malignant.

Table 3: Diagnostic accuracy of USG for diagnosis of breast lesions

USG	Histopathology		
	Benign	Malignant	Total
Benign	29	2	31
Malignant	5	14	19
Total	34	16	50

In present study, 29 out of 34 benign breast lesions were correctly identified by ultrasound and 14 out of 16 malignant lesions were correctly identified by ultrasound. The sensitivity, specificity, positive predictive value, negative predictive value and accuracy of ultrasound in our study in differentiation of malignant breast lesions from benign lesions were 87.5%, 85.29%, 73.68%, 93.55% and 86 % respectively

### Discussions

This study is a cross sectional study conducted on 50 female patients who presented with the breast lumps in the surgery department and referred to the department of radio-diagnosis for the ultrasound examination of breast and subsequent histopathological examination. Majority of lesions were benign based upon histopathological examination (68%) and about 32% of the lesions were malignant. Most common benign lesion was fibroadenoma whereas all the malignant lesions were ductal carcinoma in situ. Our study findings were supported by findings of Chala et al, in which 77% were benign and 23% were malignant. Among benign lesion most common finding was fibroadenoma which consisted of 68.4% cases and among malignant cases most common finding was ductal carcinoma in situ (89%).[10] Shukla et al in his study of 1059 cases found 64.2% benign and 35.7% malignant cases. Among benign lesions fibroadenoma was the commonest finding seen in 79% of the cases<sup>[11]</sup> Our study observed that majority of the lesions (36%) involved the upper outer quadrant of the breast. Both benign and malignant pathology seen in upper outer quadrant more frequently. Kumar et al found 40% of the lesion in upper outer quadrant of the breast.<sup>[12]</sup> Majority of the breast lesions in our study are hypoechoic as compared to the surrounding fatty tissue in the breast. Anechoic and isoechoic echo pattern reduces the chances of malignancy. Among hypoechoic lesions there were 65.21% benign and 34.78% malignant lesions therefore we cannot take hypo echogenicity as a reliable predictor of benignity or malignancy. Stavros et al in their study

also found 84.3 % benign and 30.4% malignant lesions have echogenicity lower than surrounding fat.<sup>[13]</sup>

Shape and margins of lesions could be an important feature to predict the nature of the lesion as most of the malignant pathology acquire an irregular shape. In our study, majority of the malignant lesions had irregular shape and speculated margins. Rahbar et al also observed that among round/oval shaped lesions 94% were benign and 6% were malignant and among irregular shaped lesions 39 % were benign and 61% were malignant.<sup>[14]</sup> Chala et al observed that among lesions with speculated margins 92% were proved to be malignant and 08% were benign.<sup>[10]</sup>

In our study 14 out of 16 (87.5%) malignant and 29 out of 34 (85.29%) benign lesions were correctly identified by ultrasound while 5 benign lesions were wrongly characterized as malignant and 2 malignant lesions were wrongly classified as benign on ultrasound. The sensitivity and specificity of ultrasound in identifying the malignant lesion 87.5% and 85.29% respectively while PPV and NPV 73.68% and 93.55% respectively. Our results are comparable to those observed by Kumar et al in their study in which they found the sensitivity of ultrasound in characterizing malignant lesions 91.6%.<sup>[15]</sup> Malik et al in their study conducted from 2002 to 2005 that sensitivity of ultrasound in differentiating benign from malignant lesion was 92%. However, for malignant lesion it was slightly lower at 67%.<sup>[16]</sup> Kumar et al found sensitivity and specificity of ultrasound in differentiating between benign and malignant lesions 97.3 % and 92.3% respectively.<sup>[12]</sup>

### Conclusions

This study highlights the usefulness of ultrasound in the evaluation of breast lesions as an adjunct to clinical examination. Ultrasound is a technique which is easily

available, rapid, non-invasive, reliable, acceptable, economical and free from any harmful radiation. Ultrasound is also helpful in guiding the interventional procedures like drainage of abscess and taking biopsy samples with precision and evaluation of small non palpable lesions. Tissue characterization is not always possible accurately. It can help to differentiate benign from malignant lesions with some limitation because of overlapping of some features in both benign and malignant lesions like lobulated margins, microcalcification, and echogenicity. However some features like speculated margins, vertical orientation in comparison to normal breast tissue and presence of penetrating intratumoral vessels favours the diagnosis of a malignant lesion.

The ultrasound features most predictive of benign tissue diagnosis were oval or round shape, circumscribed margins and width to AP ratio >1.4. The features most predictive of malignant masses were speculated or micro lobulated mass, irregular shape, ill-defined margins and width to AP ratio <1.4 Therefore ultrasound should be used as a valuable adjunct with the clinical examination and since both the benign and malignant features overlap with each other it should not be used as a confirmatory final diagnosis for which histo pathological FNAC or biopsy examination should be used as a confirmatory and gold standard test.

### References

1. Fer lay J, Soerjomataram I, Dikshit R, Eser S, Mathers C, Rebelo M, Parkin DM, Forman D, Bray F. Cancer incidence and mortality worldwide: sources, methods and major patterns in GLOBOCAN 2012. International journal of cancer. 2015 Mar 1;136(5): E359-86.



2. Porter PL. Global trends in breast cancer incidence and mortality. *Salud publica de Mexico*. 2009 Jan;51: s141-6.
3. Babu GR, Lakshmi SB, Thiagarajan JA. Epidemiological correlates of breast cancer in South India. *Asian Pacific Journal of Cancer Prevention*. 2013; 14 (9): 5077- 83.
4. Ali I, Wani WA, Saleem K. Cancer scenario in India with future perspectives. *Cancer therapy*. 2011 Jan 1;8.
5. Malvia S, Bagadi SA, Dubey US, Saxena S. Epidemiology of breast cancer in Indian women. *Asia-Pacific Journal of Clinical Oncology*. 2017 Aug;13(4):289-95.
6. Morris KT, Vetto JT, Petty JK, Lum SS, Schmidt WA, Toth-Fejel S, Pommier RF. A new score for the evaluation of palpable breast masses in women under age 40. *The American journal of surgery*. 2002 Oct 1;184(4):346-7.
7. Berg WA, Gutierrez L, NessAiver MS, Carter WB, Bhargava M, Lewis RS, Ioffe OB. Diagnostic accuracy of mammography, clinical examination, US, and MR imaging in preoperative assessment of breast cancer. *Radiology*. 2004 Dec;233(3):830-49.
8. Kerlikowske K, Smith-Bindman R, Ljung BM, Grady D. Evaluation of abnormal mammography results and palpable breast abnormalities. *Annals of internal medicine*. 2003 Aug 19; 139 (4): 274-84.
9. Venta LA, Dudiak CM, Salomon CG, Flisak ME. Sonographic evaluation of the breast. *Radio graphics*. 1994 Jan;14(1):29-50.
10. Chala L, Endo E, Kim S, de Castro F, Moraes P, Cerri G, de Barros N. Gray-scale sonography of solid breast masses: Diagnosis of probably benign masses and reduction of the number of biopsies. *Journal of clinical ultrasound*. 2007 Jan;35(1):9-19.
11. Shukla HS, Kumar S. Benign breast disorders in nonwestern populations: Part II—benign breast disorders in India. *World journal of surgery*. 1989 Nov;13(6):746-9.
12. Kumar H, Mehrotra A, Kumar P, Parakh P, Tyagi S, Hans P. Comparative study of mammography and sonography in breast lump with fine needle aspiration cytology correlation. *Int J Basic Appl Med Res*. 2016;5(2):712-22.
13. Stavros AT, Thick man D, Rapp CL, Dennis MA, Parker SH, Sisney GA. Solid breast nodules: use of sonography to distinguish between benign and malignant lesions. *Radiology*. 1995 Jul;196(1):123-34.
14. Rahbar G, Sie AC, Hansen GC, Prince JS, Melany ML, Reynolds HE, Jackson VP, Sayre JW, Bassett LW. Benign versus malignant solid breast masses: US differentiation. *Radiology*. 1999 Dec;213(3):889- 94.
15. Kumar B, Kumar A. Ultrasound Evaluation of Breast Masses and Histopathology Correlation. *International Journal of Contemporary Medicine, Surgery and Radiology*. 2018 ;3 (2).
16. Malik G, Waqar F, Buledi GQ. Son mammography for evaluation of solid breast masses in young patients. *Journal of Ayyub Medical College Abbottabad*. 2006;18(2):34-7.