Evaluation of Breast Lumps by Ultrasound and Its Correlation with FNAC Findings in a Teaching Hospital in Telangana

Ravi Kumar Marri[1], Palleboina Sushmita[2]

[1]Department of Radiology, Maheshwara Medical College, Patancheru, Hyderabad, Telangana, India. [2]Department Obstetrics and Gynaecology, Maheshwara Medical College, Patancheru, Hyderabad, Telangana, India.

ABSTRACT

BACKGROUND

Ultrasonography (US) has become popular in the present day practice in the evaluation of breast lesions. The USG findings can be supplemented by fine needle aspiration cytology (FNAC) and correlation between the two diagnostic modalities can help improve the diagnosis. We wanted to study the ultrasonographic features of breast lumps and to correlate the findings with fine needle aspiration cytology.

METHODS

This was a prospective study done on 55 patients of breast lumps who attended the ultrasound at department of Radiology, Maheshwara Medical College, Patancheru, Hyderabad, Telangana over a period of eight months.

RESULTS

Majority of the cases were reported as Benign i.e., 81.8 % (45 / 55), 12.7 % (07 / 55) constituted Malignant cases. Suspicious of malignancy in 5.4 % (03 / 55) cases. Most of the benign lesions were noted in the 20 - 50 years age group while malignant lesions were observed between 41 years to more than 60 years of age. The sensitivity, specificity, PPV and NPV of ultrasonography and FNAC in diagnosing breast lesions were 87.5 %, 93.6 %, 70 %, and 97.7 % respectively.

CONCLUSIONS

Ultrasonography is a primary imaging technique for evaluation of breast lumps and has good sensitivity, specificity, PPV and NPV for diagnosing breast lesions. It is complementary to FNAC and when both modalities are used together they can diagnose majority of the lesions. This can reduce the radiation exposure and the more invasive and expensive breast biopsy procedure.

KEYWORDS

USG, Breast Lesions, FNAC, BIRADS

BACKGROUND

Palpable breast mass is a common clinical complaint for breast diseases that can be innocuous benign cysts to malignant tumours. The distinction of benign from malignant is of utmost importance for patient care and appropriate management.[1] Evaluation of breast lumps begins with a detailed history, clinical examination of both breasts, various imaging modalities and tissue diagnosis. Although the final diagnosis is based upon histopathological examination of the excised tissue, it would be irrational to excise all breast lesions due to the fact that almost 80 % of lumps are benign.[2]

Routine breast imaging by mammography is recommended in women age 40 upwards at regular intervals. In women under the age of 40 year, breast imaging is done to assess focal areas of clinical concern, such as palpable lumps or sites of pain. Only clinical breast examination alone is unreliable and insufficient to differentiate between benign and malignant lesions and hence, imaging is used for evaluation to better delineate the lesions.[3,4] Also younger women tend to have denser breast parenchyma and this increased density compromises the mammography and so for younger females USG becomes the imaging choice.[5] All detected breast lesions are not malignant and all the benign masses do not progress to cancer; nevertheless the precision of the final diagnosis can be greatly increased by radiological imaging (mammography, ultrasonography) and pathological diagnosis.[6] Breast cancer accounts for the most common cause of cancer related death in women. Incidence wise it comes after lung, stomach, liver and colon cancers.[7] Currently, palpation, mammography and ultrasonography (USG) are the common diagnostic tests performed to detect breast cancer, with varying degree of accuracy and predictive value.[8] Though clinical palpation is the easiest examination method, it has limited value due to poor sensitivity and limited accuracy. Often smaller and early stage cancers cannot be detected by clinical examination alone.

We wanted to study the ultrasonographic features of breast lumps and to correlate the findings with fine needle aspiration cytology.

METHODS

This was a prospective hospital-based observational study. It was done in the Department of Radiology and Obstetrics and Gynaecology, Maheshwara Medical College and Hospital, Patancheru, Telangana, from January 2020 to August 2020 for a period of eight months. The study had no ethical issues. Written informed consent was obtained from all the cases included in the study.

Inclusion Criteria
Patients willing to participate in the study.
Age group range from 20 years to 70 years.
Patients with breast lumps confirmed by USG.

Exclusion Criteria
Patients not willing to participate in the study.
Age less than 20 years.
Pregnant women were excluded.
Those patients who will be lost in follow-up.

Method of Collection of Data
A total of 55 cases were studied based on the inclusion and exclusion criteria. This was explained to the patients. Thorough clinical history was taken including present history, past history, family history and personal history. History of any previous USG done was obtained. A general and detailed clinical examination was done. The procedure of USG was explained to the patient.

Ultrasonography
Sonography was performed with a high-resolution ultrasound instrument (Toshiba USG machine) equipped with a 5 – 12 - MHz linear probe, in supine position. The high frequency linear probe (Transducer VF 10 - 5) was used to image the breast tissues clearly. Both the breasts were exposed, and the transducer was swept in radial and anti-radial direction to look for any abnormality. US findings were noted and evaluated based upon the American College of Radiology Breast Imaging Reporting and Data System (BI-RADS) classification for sonography.[8] The lesion or mass was assessed for margins, boundary zone, presence of internal echoes, posterior echoes and any other associated findings.

All the cases with breast lumps were sent for FNAC. FNAC was done in all the cases and reported by pathologist. The FNAC reports were noted and the USG and FNAC findings were correlated.

The data was entered into excel sheets and the percentages and ratios were calculated.

RESULTS

A total of 55 cases with breast lump confirmed on USG were included in the study. In the present study majority of the cases 45 (81.7 %) were in the fourth and fifth decades.

Age Distribution (in Years)	No. of Cases	Percentage (%)
20 - 30	05	9.0 %
31 - 40	30	54.5 %
41 - 50	15	27.2 %
51 - 60	03	5.45 %
61 - 70	02	3.6 %
Total	**55**	**100 %**
Lesions		
Benign	45	81.8 %
Suspicious of Malignancy	03	5.4 %
Malignant	07	12.7 %
Location of Lesion		
Upper Outer Quadrant	**35**	**63.6 %**
Upper inner quadrant	10	18.1 %
Lower outer quadrant	06	10.9 %
Lower inner quadrant	04	7.2 %
Table 1. Details of patient in study		

In the present study majority of the cases 45 (81.7 %) were reported as benign. Most of the benign lesions were noted in the 20 - 50 years age group while all malignant lesions were observed between 41 to 70 years.

In the present study most of the cases 35 (63.6 %) were located in the upper outer quadrant.

Figure 1. Irregular Heterogenous Lobulated Solid Mass with Low Resistance and Increased Vascularity, Suggestive of Malignancy

Sl. No.	USG Findings	Benign (N = 45)	Malignant (N = 10)	Total (N = 55)
1	Shape of lesion			
	Round	40 (72.7 %)	04 (7.27 %)	44 (80 %)
	Oval	05 (9.09 %)	06 (10.9 %)	11 (20 %)
2	Margins			
	Circumscribed	45 (81.8 %)	-	45 (81.8 %)
	Non-Circumscribed	-	10 (18.1 %)	10 (18.1 %)
3	Boundary zone (halo)			
	Halo (+)	45 (81.8 %)	-	45 (81.8 %)
	Halo (-)	-	10 (18.1 %)	10 (18.1 %)
4	Calcification	-	05 (9.09 %)	05 (9.09 %)
5	Necrosis	-	05 (9.09 %)	
6	Underlying muscle and chest wall	-	-	-
7	Overlying skin			
	Normal	45 (81.8 %)	02 (3.6 %)	47 (85.4 %)
	Skin retraction	-	08 (14.5 %)	08 (14.5 %)
8	Invasion	-	6 (10.9 %)	6 (10.9 %)
Table 2 Showing USG Findings				

In the present study 45 cases (81.8 %) were circumscribed masses and 10 cases (18.1 %) were not circumscribed masses. Calcification and necrosis were noted in 05 malignant cases i.e., 05 (9.0 %). Interrupted anterior and posterior borders of tumours were observed in 30 out of the 55 tumours.

Ultrasonography Grade of Lesion (BI-RADS)	No. of Cases	Percentage (%)
Benign (II)	45	81.8 %
Probably Benign (III)	-	-
Suspicious of Malignancy (IV)	03	5.4 %
Highly Suspicious Malignancy (V)	07	12.7 %
Total	**55**	**100 %**
Table 3. Distribution of Patients Based on Ultrasonography Grade of Lesion (BIRADS)		

In the present study based on ultrasonography grade of lesion (BI-RADS) 45 (81.8 %) lumps were reported as benign and 07 (12.7 %) as malignant and 3 (5.4 %) were reported as suspicious for malignancy. In the present study, FNAC reported 45 breast lumps as benign and 8 as malignant and 2 cases as Usual Ductal Hyperplasia (UDH).

USG Findings	FNAC Findings	Remarks
Benign Cases (45)	Fibroadenoma (37)	True negative
	Benign phyllodes tumor (01)	True negative
	Fibrocystic disease (02)	True negative
	Fibroadenoma with Fibrocystic changes (04)	True negative
	Carcinoma (01)	False negative
Suspicious of Malignancy (03)	Fiboadenoma (01)	False positive
	UDH (Usual ductal hyperplasia) (02)	False positive
Malignant Cases (07)	Carcinoma breast (07)	True positive
Table 4. Correlation of USG Findings and FNAC		

The sensitivity, specificity, PPV (Positive Predictive Value) and NPV (Negative Predictive Value) of ultrasonography and FNAC in diagnosing breast lesions were 87.5 %, 93.6 %, 70 %, and 97.7 % respectively.
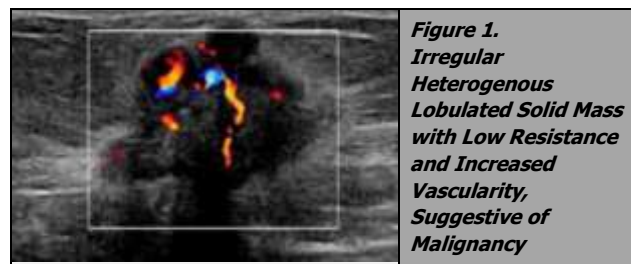
DISCUSSION

Many developed countries implement screening programs for breast cancer as it is very common in the West. The diagnosis is often done by a three pronged approach of "Triple Test" involving clinical examination, mammography and FNAC. Though the gold standard is by histopathological examination of the lesional tissue, aspiration cytology helps in the categorization of the disease.[9] The BIRADS terminology was introduced in 1993 so as to implement a uniform reporting format for mammographic findings. Same terminology is also applied to report the USG findings of breast masses.[10]

The sample size in the present study was 55 cases of USG confirmed breast lumps. Other authors like Chaddi S et al[11] and Takhellambam et al[12] had a sample size of 126 cases and 62 cases respectively.

Comparative Studies Based on Age Distribution
In our study, majority of the cases were among the fourth and fifth decades accounting for 45 (81.7 %) cases.

In the study by Chhadi S et al[11] majority (60 cases, 32.8 %) of the participants were also in the age group of 31 - 50 years and the mean age of participants was 41.9 years.

Comparative Studies Based on Quadrant Distribution Breast Lump
In our study, majority of the cases 63.6 % (35 / 55) were located in the upper outer followed by upper and inner quadrant ie, 18.1 % (10 / 55). Kumar et al study[13] in their study. The rate of detection of carcinoma extension by ultrasound was 86 % (43 out of the 50 tumours). In 71.4 % cases ie. in 5 of the 7 tumours, ultrasound was unable to detect extension of carcinoma, but it could pick up small, low-grade intraductal components that were about 1 mm in diameter. Among these seven cases, one was diagnosed finally as invasive lobular carcinoma with malignant cells having single cell Indian file pattern along with a small area of Lobular Carcinoma in Situ (LCIS).

Comparative Studies Based on Distribution of Lesions
In the present, majority of the cases were reported as benign ie, 81.8 % (45 / 55) and 12.7 % (7 / 55) constituted malignant cases. (Figure 1, Figure 2 and Figure 3) Suspicious of malignancy (BIRADS IV) in 5.4 % (3 / 55) cases. Most of

the malignant lesions were observed between 50 - 60 years of age; while most of the benign lesions were noted in the 20 - 50 years age group. In the study by Chhadi S et al study[11] there were 56 (48.3 %) malignant and 60 (51.7 %) benign lesions. Most of the malignant lesions were observed between 30 - 60 years of age; while most of the benign lesions were noted in the 20 - 50 years age group.

In the study by Takhellambam et al[12] 58 % (36 cases) were observed to be benign and 29 % (18 cases) were malignant. Indeterminate cases were 9.6 % (6 cases). The ultrasound failed to identify any breast lump in 3.2 % (2 cases).

BIRADS IV category has a wide range of probability for malignancy ranging from 2 % to 95 % and has a high rate of unnecessary biopsies. Chaitanya and Prabhala et al[14] in their study observed the positive predictive value for BIRADS 4 lesions for malignancy to be 49 %. They concluded that core biopsy for BIRADS IV lesions is a better method to diagnose malignancy in breast lesions and has high accuracy compared to ultrasound categorization using BIRADS score alone.

Sl. No.	USG Findings	Tamaki et al[15]	Vinod Kumar et al[13]	Present Study
1	Margins			
	• Circumscribed	26	9	45
	• Non circumscribed	128	41	10
2	Boundary zone (halo)			
	• Halo (+)	89	26	45
	• Halo (-)	65	21	10
3	Associated findings (Interrupted borders of mammary parenchyma)			
	• Interruption	112	36	30
	• Non-interruption	42	14	25
Table 5. Comparative Studies Showing USG Findings				

Margins
In the present study, 45 cases were circumscribed masses and 10 cases were not circumscribed masses. Tamaki et al[15] in their study observed 26 out of 154 masses were circumscribed. Vinod Kumar et al[13] reported 9 cases of their study had circumscribed masses and 41 were non-circumscribed.

Boundary Zone
In our study, 45 (81.8 %) cases were recognized with halo on USG and all turned out be of benign nature. Tamaki et al[15] recognized 89 cases with halo on USG.

Interruption of the Mammary Borders
In our study, interrupted anterior and posterior borders of the masses was detected in 30 out of the 55 cases. In Tamaki et al study[15] 112 out of the 153 tumours showed interrupted anterior and posterior borders. Similarly, in Vinod Kumar et al study[13] the anterior and posterior borders of the tumours revealed interruption in 36 tumours.

FNAC Findings
In our study, FNAC reported 46 lumps as benign and 07 as malignant. Sensitivity, specificity, PPV and NPV ultrasound

and FNAC in diagnosing breast lesions were 87.5, 93.6 %, 70 %, and 97.7 %.

In the study by Takhellambam et al[12] on FNAC, 42 lumps were benign and 19 were malignant and one case was indeterminate. Sensitivity, specificity, PPV and NPV of ultrasound and FNAC for detecting malignant breast lesions was 94.74 %, 100 %, 100 %, 97.22 % respectively.

In the study by Krithika et al[16] the ultrasound features which were more predictive for a benign lesion were oval shape, less than 3 smooth macro lobulations, circumscribed margins, presence of pseudo capsule and presence of edge refraction. 100 % of the lesions with round shape were benign but round shape was reported only in 5 % of cases only. The features predicting malignancy were presence of irregular shape and non-circumscription (spiculated, angular, indistinct, micro lobulated) margins.

Rahbar et al[17] in their study categorized benign and malignant lesions by ultrasound. They also observed certain features such as round / oval shape, well circumscribed margins, ratio of width to antero-posterior dimension more than 1.4 as the most reliable features to favour benign lesions. Whereas, the malignant masses had features of irregular shape, spiculated or micro lobulated margins.

CONCLUSIONS

Ultrasonography is a primary imaging technique for evaluation of breast lumps and has good sensitivity, specificity, PPV and NPV for diagnosing breast lesions. It is complementary to FNAC and when both modalities are used together they can diagnose majority of the lesions. This can reduce the radiation exposure and the more invasive and expensive breast biopsy procedure.

REFERENCES

[1] Baum M. Carcinoma of the Breast. In: Recent advances in surgery. London: Churchill Livingstone 1984: p. 241:258.

[2] Pruthi S. Detection and evaluation of a palpable breast mass. Mayo Clin Proc 2001;76(6):641-648.

[3] Rosner D, Blaird D. What ultrasonography can tell in breast masses that mammography and physical examination cannot? J Surg Oncol 1985;28(4):308-313.

[4] Boyd NF, Sutherland HJ, Fish EB, et al. Prospective evaluation of physical examination of the breast. Am J Surg 1981;142(3):331-334.

[5] Nandan FD, Alladin BA. The role of ultrasound as a diagnostic tool for breast cancer in the screening of younger women (age 25-38) in Guyana. J Med Diagn Meth 2018;7(3):273.

[6] Bukhari MH, Arshad M, Jamal S, et al. Use of fine-needle aspiration in the evaluation of breast lumps. Patholog Res Int 2011;2011:689621.

[7] World Health Organization. Fact sheet No. 297: Cancer. February 2006.

[8] Saarenma I, Salminem T, Geiger U, et al. The effect of age and density diagnostic by mammography and ultrasonography. Breast Cancer Res Treat 2001;67(2):117-123.

[9] Yalavarthi S, Tanikella R, Prabhala S, et al. Histopathological and cytological correlation of tumors of breast. Med J D Y Patil Univ 2014;7:326-31.

[10] Navya BN, Thomas S, Hiremath R. Comparison of diagnostic accuracy of BIRADS Score with pathological findings in breast lumps. Annals of Pathology and Laboratory Medicine 2017;4(3):236-240.

[11] Chhadi S, Chhadi T, Bagde K. Ultrasound elastography evaluation of breast masses with FNAC and/or histopathological correlation. Int J Res Med Sci 2018;6(12):4034-4038.

[12] Takhellambam YS, Lourembam SS, Sapam OS, et al. Comparison of ultrasonography and fine needle aspiration cytology in the diagnosis of malignant breast lesions. Journal of Clinical and Diagnostic Research 2013;7(12):2847-2850.

[13] VinodKumar B, RaviKumar A. Ultrasound evaluation of breast masses and histopathology correlation. IJCMSR 2018;3(2):B85-B88.

[14] Chaitanya INVL, Prabhala S, Annapurna S, et al. Comparison of histopathologic findings with BIRADS Score in trucut biopsies of breast lesions. Indian Journal of Pathology: Research and Practice 2020;9(Pt 1):35-41.

[15] Tamaki K, Sasano H, Ishida T, et al. The correlation between ultrasonographic findings and pathologic features in breast disorders. Jpn J Clin Oncol 2010;40(10)905-912.

[16] Krithika S, Ilangovan G, Balganesan H, et al. Ultrasound evaluation of palpable breast masses in correlation with fine needle aspiration cytology. International Journal of Contemporary Medicine Surgery and Radiology 2020;5(2):B27-B33.

[17] Rahbar G, Sie AC, Hansen GC, et al. Benign versus malignant solid breast masses: US differentiation. Radiology 1999;213(3):889-894.