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ROLE OF ULTRASONOGRAPHY IN DETECTING MALIGNANT BREAST LESIONS: CORRELATION WITH FNAC RESULTS

Radiology

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ABSTRACT

Introduction: A breast lump is the most common clinical presentation for both benign and malignant breast lesions. With growing awareness, especially about breast cancer, a lump in the breast causes physical, emotional and psychological trauma to the patient and family members. Therefore, a distinction of benign from malignant breast lump is of paramount importance for proper management. **Aim:** To assess the role of ultrasonography in evaluation of malignancy in breast lesions and it's correlation with FNAC. **Method:** A cross-sectional study was conducted over a period of 18 months at the Department of Radiology, Hind Institute of Medical Sciences and evaluated 115 patients with breast lesions who were examined using USG, and findings were confirmed with USG-guided Fine Needle Aspiration Cytology (FNAC). **Result:** The findings demonstrate that USG is a highly reliable diagnostic tool, with specificity of 97.62% for benign lesions and 98.65% for malignant lesions. These results highlight the ability of USG to effectively rule out malignancy when a lesion is predicted as benign and to accurately identify true positives when a lesion is predicted as malignant. **Conclusion:** In conclusion, USG is a valuable tool for the initial evaluation of breast lesions, offering high diagnostic accuracy and aiding in the differentiation between benign and malignant conditions. Its ability to reliably rule out malignancy in benign cases and identify suspicious or malignant lesions makes it an essential component of breast imaging protocols.

KEYWORDS

Breast lump, USG, FNAC, Sensitivity

INTRODUCTION

Breast cancer is the most common malignant neoplasm and the second cause of death from cancer in women, with more than one million cases occurring worldwide annually [1,2]

A breast lump is the most common clinical presentation for both benign and malignant breast lesions[3]. With growing awareness in the general population, especially about breast cancer, a lump in the breast causes physical, emotional and psychological trauma to the patient and family members[4]. Therefore, a distinction of benign from malignant breast lump is of paramount importance for proper management [1,3].

Table-1: Ultrasound Features Suggestive Of Benign And Malignant Nodules[1]

FEATURE	BENIGN	MALIGNANT
Shape Margin	Round, wider than tall Smooth	Taller than wide Irregular, angular, spicular.
Lobulations	None or up to 3	Multiple
Capsule	Encapsulated	No Capsule
Halo	Absent	Echogenic halo
Fixity	None	Fixed to surrounding tissue and or underlying muscle.
Shadowing or Enhancement	Enhancement, edge shadowing	Shadowing behind lesion.
Substance Echogenicity	Anechoic (cystic), Hyperechoic	Hypoechoic, calcification.

Every patient in cancer prone age with palpable breast lump must be thoroughly evaluated and investigated. 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. At present, a wide range of diagnostic imaging modalities are available for the evaluation of breast lumps. These include ultrasound scanning, mammography and recently magnetic resonance imaging (MRI) and contrast enhanced ultrasound [5]. It is particularly useful in the evaluation of dense breasts which is a limitation of mammography. It is also considered to be more effective in differentiating between solid and cystic masses. It is a safe and non-invasive investigative modality. This modality is used to characterize the size, shape, consistency, echogenicity of the lesion. Histopathological examination enables us to confirm the findings of ultrasonography of the breast. So this study is conducted with the aim of finding the role of ultrasonography in detecting breast malignancy and correlating the ultrasonographic features of breast lumps with the findings of fine needle aspiration cytology.

Diagnostics for benign and malignant breast lesions in involve a combination of clinical assessment, imaging studies, and sometimes biopsy for definitive diagnosis. A thorough medical history is obtained, including any symptoms the patient may be experiencing, such as the presence of a breast lump, pain, or nipple discharge [1-5].

Physical examination of the breasts is performed to assess for the presence of any palpable masses, nipple abnormalities, skin changes, or lymphadenopathy in the axillary pits. Imaging studies include ultrasonography (USG) and magnetic resonance (MRI). Ultrasonography is often the first-line imaging modality used to evaluate breast lesions especially in young age. It provides detailed images of the breast tissue and can help to differentiate between cystic and solid masses. It is non-invasive making it safe for young patients [6,7]. MRI may be used in certain cases, particularly when additional information is needed to characterize a breast lesion, such as its vascularity and extent [8].

MATERIALAND METHOD

A total of 115 patients underwent breast ultrasonography with breast lump in the Department of Radiology at Hind Institute of Medical Sciences, Mau, Ataria, Sitapur, Uttar Pradesh during study period from October 2023 to March 2025.

Inclusion Criteria

1. Age 20-70 years

Exclusion Criteria

1. Bleeding Disorders.
2. Pregnant Women.
4. Patient <20 and >70years of age.

Method Of Collection Of Data

Consent from each patient was taken who came with the complaint of breast lump. Ultrasonography was performed on GE Logiq F8 and GE versana active machines using high frequency probe (7.5-12 MHz). Patients were examined in the supine position, and USG findings were documented before proceeding with FNAC. Following the USG examination and diagnosis, FNAC was performed under USG guidance by a radiologist and a pathologist from the pathology department

FNAC

Fine needle aspiration cytology (FNAC) of the lesion was performed under ultrasound guidance. The skin over the target area was disinfected using an appropriate antiseptic solution. The lump was localized and stabilized using ultrasound imaging, with one hand

securing its position. A 20 ml syringe fitted with an 18 to 22-gauge needle was inserted adjacent to one of the shorter sides of the transducer. The needle was advanced along a path parallel to the long axis of the transducer, ensuring continuous visualization of the needle on the ultrasound monitor as it progressed toward the lesion. Once the needle reached the lesion, aspiration was applied, and the needle tip was maneuvered in multiple directions to obtain adequate samples. Aspiration was halted as the needle was withdrawn. The collected specimens were promptly sent for histopathological examination, which was conducted by a pathologist.[18]

American College Of Radiology Breast Imaging Reporting And Data System [19]

BI-RADS assessment categories can be summarized as given below:

- **Category 0 -** Needs further evaluation (by imaging)
- **Category 1 -** Negative
- **Category 2 -** Benign finding, noncancerous
- **Category 3 -** Probably benign finding, suggest: short-interval follow-up
- **Category 4 -** Suspicious abnormality, biopsy considered.
- **Category 4A:** Low suspicion for malignancy
- **Category 4B:** Moderate suspicion for malignancy
- **Category 4C:** High suspicion for malignancy
- **Category 5 -** Features are highly suggestive of malignancy, appropriate action needed.
- **Category 6 -** Known - Biopsy proven carcinoma

RESULTS

In this study the following results were obtained:

Ultrasonography (USG) Findings:

The total number of patients evaluated were 115. Benign lesions accounted for 74 cases (64.35%) and malignant lesions accounted for 41 cases (35.65%) on breast USG.

Distribution of lesions based on BIRADS categories**.**

BI-RADS 1 and 2 together account for 74 cases (64.35%), indicating that most findings are non-cancerous. BI-RADS 3 (probably benign) cases are rare, with only 3 cases (2.61%), suggesting that most findings are either clearly benign or suspicious. BI-RADS 4 and 5 together account for 38 cases (33.04%), indicating a substantial number of cases requiring further diagnostic workup or intervention. BI-RADS 5 (highly suggestive of malignancy) cases are relatively high at 23 cases (20.00%).

Table2: Distribution Of Lesions Based On BIRADS Categories

BIRADS CATEGORIES		FREQUENCY	PERCENTAGE (%)
1	Normal	33	28.7
2	Benign	41	35.65
3	Indeterminate	03	02.61
4	Suspicious of malignancy	15	13.04
5	Malignant	23	20.00
	Total	115	100

USG Correlation With FNAC:

USG findings were consistent with FNAC results in all benign cases. No benign lesions were misclassified as suspicious or malignant, indicating high specificity of ultrasonography for benign lesions. USG correctly identified 38 out of 42 malignant cases (90.5%) as either suspicious (BIRADS 4) or malignant (BIRADS 5). However, 4 out of 42 malignant cases (9.5%) were misclassified as benign (BIRADS 2) or indeterminate (BIRADS 3), highlighting the limitations of ultrasonography in detecting some malignancies.

Table 3: USG Correlation With FNAC

NATURE OF DISEASE AS PER FNAC	FNAC	ULTRASONOGRAPHIC FINDINGS (BIRADS CATEGORY)				
		1 Normal	2 Benign	3 Indeterminate	4 Suspicious of malignancy	5 Malignant
BENIGN LESION	73	33	40	0	0	0
MALIGNANT LESION	42	0	01	03	15	23

Sensitivity:

USG demonstrates high sensitivity for both benign (98.65%) and malignant (97.62%) lesions when compared to USG-guided FNAC. This indicates that USG is highly accurate in detecting both benign and malignant lesions. There is 1 false negative for both benign and malignant lesions, meaning USG missed 1 case in each category that was later identified by FNAC.

Specificity:

USG demonstrates high specificity for both benign (97.62%) and malignant (98.65%) lesions when compared to USG-guided FNAC. This indicates that USG is highly accurate in correctly identifying true negative cases. There is 1 false positive for both benign and malignant lesions, meaning USG incorrectly identified 1 case in each category that was later corrected by FNAC.

DISCUSSION

The findings revealed that USG demonstrated high specificity for both benign (97.62%) and malignant (98.65%) lesions, with a Negative Predictive Value (NPV) of 98.65% and a Positive Predictive Value (PPV) of 97.62%. These results indicate that USG is highly reliable in ruling out malignancy when predicting a lesion as benign and equally effective in identifying true positives when predicting malignancy. The study's outcomes align with existing literature, which highlights the utility of USG as a primary diagnostic tool for breast lesions, particularly in resource-limited settings. However, the presence of 1 false positive for both benign and malignant lesions underscores the importance of confirmatory tests, such as FNAC, to enhance diagnostic precision.

Findings of Berg et al. (2012) study are closer to this study, with a slightly higher proportion of benign lesions (64.35% vs. 60%) and a slightly lower proportion of malignant lesions (35.65% vs. 40%). Irshad et al. (2008) showed a slightly lower proportion of benign lesions (64.35% vs. 70%) and a slightly higher proportion of malignant lesions (35.65% vs. 30%). This could be due to differences in patient population or diagnostic criteria. Our findings are consistent with most studies, which report benign lesions in the range of 60-75% and malignant lesions in the range of 25-40%. The closest match is with Abdullah et al. (2019), where the distribution is nearly identical. Study by Kolb et al. (2002) shows a lower proportion of benign lesions (64.35% vs. 75%) and a higher proportion of malignant lesions (35.65% vs. 25%). This could reflect differences in patient demographics or diagnostic thresholds.

Current study shows a slightly higher prevalence of both benign and malignant lesions on the right side. This aligns with studies indicating that breast cancer is more frequently diagnosed in the right breast, possibly due to anatomical or physiological factors. Like, a study on breast cancer laterality found that right-sided breast cancer was more common, with a ratio of 1.05:1 compared to the left side [5]. Bilateral lesions are rare in benign cases but present in a small percentage of malignant cases. This is consistent with studies showing that bilateral breast cancer accounts for approximately 2-5% of all breast cancer cases. Bilateral lesions are often associated with higher-risk factors, such as genetic predispositions (e.g., BRCA mutations) or advanced disease stages [5,13].

In current study, malignant lesions are predominantly located in the upper outer (41.46%) quadrant. Studies in past have consistently identified the upper outer quadrant as the most common site for breast lesions, particularly malignancies. This is attributed to the higher concentration of glandular tissue and lymphatic drainage in this region [16]. Research highlights that central breast lesions are more likely to be benign, such as fibroadenomas or cysts, which aligns with your findings [4,16]. The lower inner quadrant is rarely involved in breast pathology, which is consistent with your data showing no malignant cases in this region [16].

Studies have confirmed that fixity is a strong predictor of malignancy, while benign lesions are typically mobile [3,9]. Peau d'Orange is almost exclusively associated with malignancy, as seen in our study and supported by other researches [4,9]. The high prevalence of axillary node involvement in malignant cases aligns with studies showing that lymph node metastasis is a key feature of breast cancer [4,7]. The low prevalence nipple discharge in both the groups suggests that nipple discharge is not a reliable differentiator, consistent with findings from other studies [3,9]. The higher prevalence of nipple retraction in

malignant cases is consistent with research linking nipple retraction to tumor infiltration [4,9].

In current study the distribution of cytological results in breast lesions, as per Fine Needle Aspiration Cytology (FNAC), shows that 63.47% of cases were diagnosed as benign lesions, while 36.53% were diagnosed as malignant lesions. A study by Nggada et al. reported that 30.8% of breast lesions were malignant, which is slightly lower than our findings but still within a similar range [6]. Rocha et al. found that 35% of breast lesions were malignant, closely matching our results.

The sensitivity of Ultrasonography (USG) in relation to USG-guided Fine Needle Aspiration Cytology (FNAC) reports 98.65% for benign and 97.62% for malignant breast lesions in current study. A study by Kamushaga et al. reported that USG-guided FNAC had a sensitivity of 100% for both benign and malignant lesions, which is slightly higher than our findings but still within a similar range [15]. This high sensitivity is attributed to the ability of USG to clearly visualize cystic or well-defined solid lesions, which are typical of benign conditions like fibroadenomas or cysts. This high sensitivity could also be due to the ability of USG to detect irregular margins, hypoechoic patterns, and other features suggestive of malignancy. Studies highlighted that the USG's sensitivity for malignant lesions ranges from 71.4% to 90% [12,17].

In the current study, USG demonstrated high specificity for both benign (97.62%) and malignant (98.65%) lesions, with only 1 false positive in each category. A similar study by Journal of Evolution of Medical and Dental Sciences reported a specificity of 97.7% for USG in diagnosing malignant breast lesions, which aligns closely with the our findings. FNAC consistently demonstrates high specificity (100%) and sensitivity (90-94.44%) across multiple studies, making it a reliable confirmatory test [12,13]. In the current study, FNAC corrected the 1 false positive identified by USG, reinforcing its role as a gold standard for definitive diagnosis [12]. Thus combining imaging modalities and leveraging advanced techniques like elastography can further improve diagnostic outcomes.

CONCLUSION

This study highlights the high diagnostic accuracy of USG in distinguishing between benign and malignant breast lesions. In conclusion, USG is a valuable tool for the initial evaluation of breast lesions, offering high diagnostic accuracy and aiding in the differentiation between benign and malignant conditions. Its ability to reliably rule out malignancy in benign cases and identify suspicious or malignant lesions makes it an essential component of breast imaging protocols.

REFERENCES

1. Standring S. Gray's Anatomy: The Anatomical Basis of Clinical Practice. 42nd ed. London: Elsevier; 2020.
2. Ferlay J, Ervik M, Lam F, et al. Global Cancer Observatory: Cancer Today. Lyon, France: International Agency for Research on Cancer; 2020. Available from: https://gco.iarc.fr/today
3. Sung H, Ferlay J, Siegel RL, et al. Global Cancer Statistics 2020: GLOBOCAN Estimates of Incidence and Mortality Worldwide for 36 Cancers in 185 Countries. CA Cancer J Clin. 2021;71(3):209-249.
4. International Agency for Research on Cancer (IARC). GLOBOCAN 2020: Estimated Cancer Incidence, Mortality and Prevalence Worldwide in 2020. Lyon, France: IARC; 2020.
5. Smith RA, Andrews KS, Brooks D, et al. Cancer Screening in the United States, 2019: A Review of Current American Cancer Society Guidelines and Current Issues in Cancer Screening. CA Cancer J Clin. 2019;69(3):184-210.
6. Fallowfield L, Jenkins V. Psychosocial Impact of Breast Cancer. Breast. 2015;24 Suppl 2:S54-59.
7. Berg WA, Bandos AI, Mendelson EB. Ultrasound as the Primary Screening Test for Breast Cancer Analysis From ACRIN 6666. J Natl Cancer Inst. 2016;108(4):djv367.
8. Stavros AT, Thickman D, Rapp CL. Solid Breast Nodules: Use of Sonography to Distinguish Between Benign and Malignant Lesions. Radiology. 1995;196(1):123-134.
9. Bryan CP. The Papyrus Ebers. London: Geoffrey Bles; 1930.
10. The Histories. Translated by Waterfield R. Oxford: Oxford University Press; 1998.
11. Hippocrates. Aphorisms. In: Jones WHS, translator. Hippocrates Collected Works. Cambridge: Harvard University Press; 1923.
12. Cruikshank W. The Anatomy of the Absorbing Vessels of the Human Body. London: G. Nicol; 1786.
13. Cooper AP. On the Anatomy of the Breast. London: Longman, Orme, Green, Brown, and Longmans; 1845.
14. Velpeau A. Traité des maladies du sein et de la région mammaire. Paris: Masson; 1856.
15. Moore C. On the Influence of Inadequate Operations on the Theory of Cancer. London: Royal Medical and Chirurgical Society; 1867
16. Lister J. On the Antiseptic Principle in the Practice of Surgery. Lancet. 1867;90 (2299): 353-356
17. Halsted WS. The Results of Operations for the Cure of Cancer of the Breast Performed at the Johns Hopkins Hospital from June 1889 to January 1894. Ann Surg. 1894;20(5):497-555.
18. American College of Radiology (ACR). ACR Practice Parameter for the Performance of Ultrasound-Guided Percutaneous Breast Interventional Procedures. Reston, VA: American College of Radiology.2016
19. American College of Radiology (ACR). ACR BI-RADS Atlas: Breast Imaging Reporting and Data System. Reston, VA: American College of Radiology.2013