DIAGNOSTIC ACCURACY OF ULTRASOUND IN PALPABLE BREAST LESIONS

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ABSTRACT

Introduction

Breast carcinoma is the second leading cause of cancer related mortality in females around the world. Ultrasound plays a key role in differentiating cystic and solid lesions and is a convenient and non-invasive diagnostic tool to differentiate between benign and malignant lesions.

Objectives

The aim of this study was to evaluate the diagnostic accuracy of ultrasound in palpable breast lesions.

Methodology

A prospective cross-sectional study was carried out in patients with palpable breast lesions who presented in Department of radio diagnosis and imaging of Nobel Medical college for a period of one-year from February 2019 to January 2020. A total of 60 patients were evaluated in the study. Sensitivity, specificity, positive predictive value, negative predictive value and accuracy were calculated.

Result

Out of 60 patients evaluated, ultrasound showed 46 (76.7%) cases to be benign and 14 (23.3%) cases to be malignant. FNAC revealed benign disease in 47 (78.3%) patients and malignant disease in 13 (21.7%) patients. The most common benign lesion was fibroadenoma. We found nearly 91.7% of the malignant lesions had spiculated margins and microcalcification. The sensitivity of ultrasound was 95.74% and specificity 92.3% with diagnostic accuracy 95%.

Conclusion

Ultrasound is a convenient and non-invasive diagnostic tool with good sensitivity, specificity, positive predictive value, negative predictive value and accuracy in palpable breast lesions.

KEYWORDS

Breast neoplasms, diagnosis, ultrasonography

INTRODUCTION

Breast lesions are common in female patients than in male. Usually in developing countries, patient present in advanced stage of disease due to lack of awareness and hesitant behavior of many females to reveal their illness. This leads to delay in detection of the disease with worse prognosis especially in cases of malignancy, where the disease progresses to advanced stage, surgically inoperable, usually metastasize and eventually leads to mortality. Various pathologies affect the breast and among them carcinoma is most often encountered and are the most dreaded.[1, 2] Breast carcinoma is the second leading cause of cancer related mortality in females around the world, out of which 6.6% are diagnosed at the age less than 40 years, 2.4% at less than 35 years, and 0.65% at less than 30 years of age.[3,4] Therefore the goal of ultrasound is to diagnose the malignant lesions early in patients presenting with a palpable breast lump. Breast cancer being the leading cause of mortality among the female population, it is crucial to identify an accurate diagnostic tool to manage the palpable breast lesions. Though most of the breast lesions are benign, malignancies need to be ruled out through efficient evaluation and prompt diagnosis. Ultrasound has a key role in differentiating cystic and solid masses. It also has a useful role in the evaluation of palpable masses not easily visible in radiographically dense breasts; abscesses and masses that cannot not be completely evaluated with mammography as well as in young patients susceptible to radiation damage.[6,7] Although mammography is known as the best screening test for breast cancer and has sensitivity of 85–95%; it can help in diagnosis of symptomatic or asymptomatic breast diseases.[8] But it has certain limitations such as the rate of false-negative mammograms and also in patients under age of 50 in whom breast tissues are dense, which can lower the sensitivity of mammography. Mammography has shown its proven effectiveness particularly in patients with non-palpable cancer and is used commonly in such cases.[9] Therefore, ultrasound is used as alternative modality with the advantage of being non-invasive and devoid of ionizing radiation.

METHODOLOGY

This was a prospective cross-sectional study conducted in Department of radio diagnosis and imaging of Nobel Medical college for a period of one year from February 2019 to January 2020. This study was conducted in 60 patients. All female patients irrespective of their ages that were referred for ultrasound evaluation from Surgery and Gynecology OPD with complains of palpable breast lumps were included in the study. Patient with recurrent lump after surgery, histopathology proven case and those unwilling to participate in the study were excluded from this study. Ethical clearance was taken from institutional review committee and informed consent was taken for the enrollment in this study.

Ultrasound was performed in Samsung HS 40 machine using 7.5MHz linear array transducer with color Doppler capability. Patients were kept in supine position. Patient privacy was maintained with door locked and female attendant was kept. Bilateral breasts were scanned in all the quadrants including nipple to the periphery up to axilla. Grey scale ultrasound was performed and were recorded as per the proforma. The sonographic findings were characterized on the basis of Breast Imaging Reporting and Data System (BIRADS). We classified the findings into benign and malignant groups. The differential diagnosis of each of the groups were recorded. The patients were then sent to pathology department for Fine needle aspiration cytology (FNAC). The findings given on ultrasound were then compared with FNAC reports. The data were collected and analyzed using Statistical Package for the Social Sciences version 25. Following parameters namely sensitivity, specificity, positive predictive value and negative predictive value and diagnostic accuracy were calculated.

RESULTS

In this study, patients ranged from 21-70 years (Mean age 38.67). Mean age for benign lesions was 36.22 years and for malignant lesions was 46.71 years. Ultrasound showed 46 (76.7%) cases to be benign and 14 (23.3%) cases to be malignant (Table 1). Out of which benign disease was found in 47(78.3%) patients and malignant disease in 13 (21.7%) patients, which was confirmed by FNAC taken as gold standard for pathological diagnosis. The sensitivity, specificity, positive predictive value and negative predictive value were 95.74%, 92.3%, 97.8% and 85.7% respectively with diagnostic accuracy of 95% (Table 2).

Table 1: Frequency of different sonographic features of benign and malignant lesions

USG Characteristics		Frequency	
		Benign	Malignant
Shapes	Oval	16(26.7%)	0
	Round	17(28.3%)	5(8.3%)
	Irregular	13(21.7%)	9(15%)
Consistency	Cystic	19(31.7%)	0
	Solid	27(45%)	14(23.3%)
Echogenicity	Echogenic	6(10%)	0
	Hypoechoic	35(58.3%)	4(6.7%)
	Heterogeneous	5(8.3%)	10(16.7%)
Margins	Well-defined	27(45%)	0
	Spiculated	1(1.7%)	11(18.3%)
	Lobulated	9(15%)	1(1.7%)
	Ill-defined	9(15%)	2(3.3%)
Posterior Acoustic Shadowing	Present	0	7(11.7%)
	Absent	46(88.6%)	7(13.2%)
Microcalcification	Present	0	12(20%)
	Absent	46(76.7%)	2(3.3%)

Table 2: Benign and malignant diagnosis on ultrasonography and FNAC

USG Classification	FNAC		Total
	Benign	Malignant	
Benign	45	1	46
Malignant	2	12	14
Total	47	13	60

Out of 47 benign cases, fibro-adenoma was most common lesion found in 19 (31.7%) cases followed by mastitis, abscess, fibrocystic disease and galactocele in 9 (15%),7(11.7%), 7(11.7%) and 5 (8.3%) cases respectively (Figure 1). All 13 malignant cases were intra-ductal carcinoma. The most common location of the lesions was upper inner quadrant, whereas 8 out of 13 malignant lesions were located in upper outer quadrant. Axillary lymph node was found in 11 out of 13 malignant cases. All well-defined lesions with oval shape were benign. (Figure 2, Figure 3). Out of 13 malignant lesions,11(91.7%)had spiculatedmargins, 11 (91.7%) had micro calcification and 6 (46.1%) had posterior acoustic shadowing (Figure 4). Sensitivity, specificity, positive predictive value, negative predictive value of micro calcification and posterior acoustic shadowing are shown in Table 3. Evaluated ultrasonographic features of benign and malignant lesions showed significant correlation with pathological diagnosis (p value <0.001). These sonographic features are described in table 1.

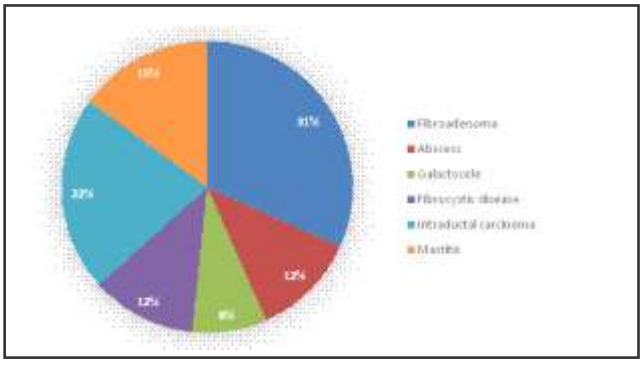

Figure 1: Pie chart showing final pathological diagnosis

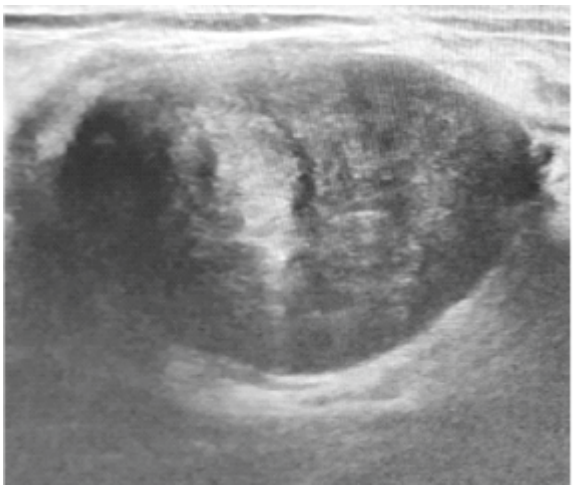

Figure 2: Fibroadenoma, Ultrasound showing well circumscribed oval shaped hypoechoic lesion with posterior acoustic enhancement

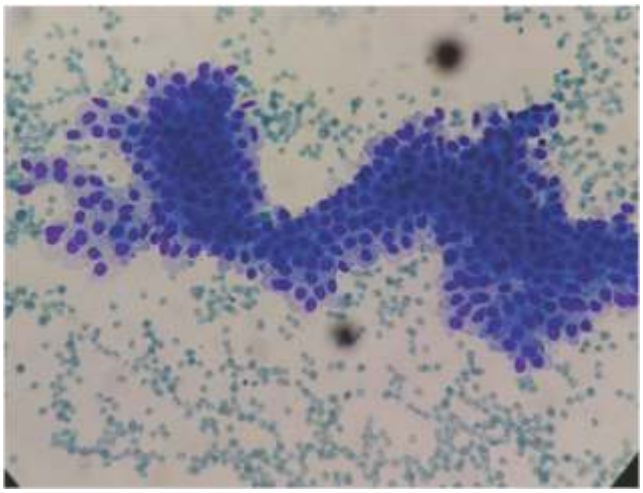

Figure 3: FNAC Fibroadenoma. The aspiration smear shows clusters of ductal epithelial cells with round to oval nuclei along with myoepithelial cells in the background consisting of benign looking bare nuclei.

Figure 4: Ultrasound showing malignant lesion with microcalcification

Table 3: Sensitivity(S), specificity (E), positive predictive value (PPV), negative predictive value (NPV), false positive (FP) and false negative (FN) value of micro calcification and posterior acoustic shadowing

	S	E	PPV	NPV	FP	FN
Microcalcification	84.6 %	97.8 %	91.6 %	95.8 %	2.1 %	15.3 %
Posterior Acoustic Shadowing	46.1%	97.8 %	85.7 %	86.7 %	2.1 %	13.4 %

DISCUSSION

Women under the age of 40 years account for nearly a quarter of all female breast cancers in Nepal, which is more as compared to the statistics of the world.[10] The overall five year survival rate of breast cancer has reached an excess of 90% in newly diagnosed patients especially if diagnosed

early.[11] Even though benign, 30 % of palpable breast lumps require treatment.[12] In our study also most of the lesions were benign 46 (76.7%). However, to avoid mental and emotional stress related to malignancy, ultrasound is a convenient non-invasive tool for diagnosis, with good sensitivity and specificity as seen in this study.

In this study, most of the malignant lesion were located in upper outer quadrant. This is similar to the study conducted by Pinero et al in which both benign and malignant lesions were located in upper outer quadrant.[13] In a study by Shahid et al, the sensitivity and specificity of ultrasound for the diagnosis of breast cancer were estimated at 95.24% and 68.75%, respectively.[14] The sensitivity mentioned in above study approximates to the one calculated in our study which was 95.74%; however the specificity of ultrasound was much higher in our study which was 92.3%. Similarly in other study done by Kuhl CK et al, the estimated sensitivity and specificity of ultrasound was 37% and 98% respectively in patients at high-risk for breast cancer and also, the estimated positive and negative predictive values were 36% and 98.9%, respectively.[15] These values approximates to the values of our study except for the sensitivity (95.74%) and positive predictive value (97.8%), which were much higher. The reason behind higher sensitivity in our study might be due to the patients presented in advanced stages of the disease. In our study, the reason for referral for ultrasound was a palpable mass in the breast similar to the previous studies.[14,16]

Kolb et al reported sensitivity of 78.6% whose patients were of younger age group (≤50 years) and had late stage of the disease.[17] In our study also, the patients were of the same age group (mean age 38.7) but the sensitivity (95.74%) was higher. In a study done by Stavros et alreported sensitivity was 98.4%, which was higher than our study and also the involved patients were in early stage of the disease.[18] They showed specific ultrasonographic characteristics of benign and malignant nature of lesions. Out of which benign nature lesions include hyperechogenicity, oval shape, gentle lobulations and well-defined margins. In our study all the lesions with well-defined margins i.e. 27 (45%) were benign. Malignant lesions include spiculated margins and shadowing.[18,19] In our study spiculated margins 11 (91.7%) and shadowing 6(46.1%) were present in most of the malignant cases. Similarly positive predictive value of our study was higher than reported by Pande et al 95.5% and 83.3% reported by Ngotho et al.[20,21]

Since both ultrasonography and mammography are easily available, relatively cheaper and fast diagnostic modalities, they complement each other perfectly. Ultrasound effectively differentiates solid lesions from cystic lesions which account for nearly 25% of breast lesions.[22] Initially, ultrasound was used only to differentiate solid from cystic lesions but now it is used to evaluate dense breasts usually below 35 years of age. Ultrasonography helps in the diagnosis and to decrease the number of surgical biopsies in those breasts where solid lesions and cysts are obscured in mammography due to the presence of dense fibro-glandular tissue. Since the complex cysts or cyst requiring repeated aspiration can harbor malignancy, it is imperative that they be evaluated by a non-invasive modality like ultrasonography.[22]

In the study, done by, Jha A et al, ultrasound showed about 46% of the cases to be benign, 35 % malignant and 18 % indeterminate while tissue diagnosis revealed 63% to be benign, 34% malignant.[23] They evaluated sonographic characteristics of the common lesions of each group. The most common benign lesion was Fibroadenoma. About 58% of the malignant lesions in their study had microlobulated margins. The sensitivity and specificity of ultrasound was 92.9% 97.5% respectively with diagnostic accuracy 94.8%. This result approximates to our study and we also found Fibroadenoma 19(31.7%) to be the commonest benign lesion.

Ultrasound has an additional advantage because it lacks radiation. One study implies that ultrasound can be used as a sole imaging modality in pregnant and lactating mothers as it lacks ionizing radiation and also can be used in patients with dense breast which may be a limiting factor for mammography.[24] This study also involved lactating mothers with breast lesion and revealed mastitis, galactocele and abscess.

CONCLUSION

Among all the palpable breast lesions included, most were benign in nature. Benign lesions were common in younger age group and malignant lesions were common in middle aged women. Fibroadenoma was the commonest benign lesion. Ultrasound is a convenient and non-invasive diagnostic tool lacking exposure to ionizing radiation with good sensitivity, specificity, positive predictive value, negative predictive and accuracy.

LIMITATION OF THE STUDY

1) There was lack of histopathological correlation.
2) The sample size was small.

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CONFLICT OF INTEREST

None

FINANCIAL DISCLOSURE

None

REFERENCES

1. Clarke D, Sudhakaran N, Gateley CA. Replace fine needle aspiration cytology with automated core biopsy in the triple assessment of breast cancer. Annals of the Royal College of Surgeons of England. 2001;83(2):110-2.PMID: 11320918
2. Schoonjans JM, Brem RF. Fourteen-gauge ultrasonographically guided large-core needle biopsy of breast masses. Journal of ultrasound in medicine : official journal of the American Institute of Ultrasound in Medicine. 2001;20(9):967-72.DOI: 10.7863/jum.2001.20.9.967
3. Anders CK, Johnson R, Litton J, Phillips M, Bleyer A. Breast cancer before age 40 years. Seminars in oncology. 2009;36(3):237-49.DOI: 10.1053/j.seminoncol.2009.03.001
4. Fredholm H, Eaker S, Frisell J, Holmberg L, Fredriksson I, Lindman H. Breast cancer in young women: poor survival despite intensive treatment. PLoS One. 2009;4(11):e7695.DOI: 10.1053/j.seminoncol.2009.03.001
5. Klein S. Evaluation of palpable breast masses. American family physician. 2005;71(9):1731-8.PMID: 15887452
6. Berg WA, Gutierrez L, NessAiver MS, Carter WB, Bhargavan M, Lewis RS, et al. Diagnostic Accuracy of Mammography, Clinical Examination, US, and MR Imaging in Preoperative Assessment of Breast Cancer. Radiology. 2004;233(3):830-49.DOI: 10.1148/radiol.2333031484
7. Kerlikowske K, Smith-Bindman R, Ljung BM, Grady D. Evaluation of abnormal mammography results and palpable breast abnormalities. Annals of internal medicine. 2003;139(4):274-84.DOI: 10.7326/0003-4819-139-4- 200308190-00010
8. Chakraborti K, Bahl P, Sahoo M, Ganguly S, Oberoi C. Magentic resonance imaging of breast masses: Comparison with mammography. Indian Journal of Radiology and Imaging. 2005;15(3):381-7. DOI: 10.4103/0971-3026.29160.
9. Ciatto S, Cataliotti L, Distante V. Nonpalpable lesions detected with mammography: review of 512 consecutive cases. Radiology. 1987;165(1):99-102.PMID 3628796.
10. Nepal B, Singh Y, Sayami P, Sayami G. An institutional review of tumour biology of breast cancer in young Nepalese women. Journal of Society of Surgeons of Nepal. 2015;18(2):16-9.DOI: https://doi.org/10.3126/jssn.v18i2.18569
11. Sharma GN, Dave R, Sanadya J, Sharma P, Sharma K. Various types and management of breast cancer: an overview. Journal of advanced pharmaceutical technology & research. 2010;1(2):109.PMID: 22247839
12. Selvakumaran S, Sangma MB. Study of various benign breast diseases. International Surgery Journal. 2016;4(1):339-43.DOI: http://dx.doi.org/10.18203/2349-2902.isj20164466
13. Piñero A, Reus M, Illana J, Durán I, Martínez-Barba E, Canteras M, et al. Palpable breast lesions: utility of Doppler sonography for diagnosis of malignancy. Breast (Edinburgh, Scotland). 2003;12(4):258-63.PMID: 14659310
14. Shahid R, Ghaffar A, Bhatti AM. Role of grey scale ultrasound in benign and malignant breast lesions. Journal of the College of Physicians and Surgeons--Pakistan : JCPSP. 2005;15(4):193-5.PMID: 15857587
15. Kuhl CK, Schrading S, Leutner CC, Morakkabati-Spitz N, Wardelmann E, Fimmers R, et al. Mammography, breast ultrasound, and magnetic resonance imaging for surveillance of women at high familial risk for breast cancer. Journal of clinical oncology : official journal of the American Society of Clinical Oncology. 2005;23(33):8469-76.PMID: 16293877
16. Georgian-Smith D, Taylor KJ, Madjar H, Goldberg B, Merritt CR, Bokobsa J, et al. Sonography of palpable breast cancer. Journal of clinical ultrasound.2000;28(5):211-6.https://doi.org/10.1002/(SICI)1097-0096(200006)28:5<211::AID-JCU1>3.0.CO;2-W
17. Kolb TM, Lichy J, Newhouse JH. Comparison of the performance of screening mammography, physical examination, and breast US and evaluation of factors that influence them: an analysis of 27,825 patient evaluations. Radiology. 2002;225(1):165-75.PMID: 12355001
18. Stavros AT, Thickman D, Rapp CL, Dennis MA, Parker SH, Sisney GA. Solid breast nodules: use of sonography to distinguish between benign and malignant lesions. Radiology. 1995;196(1):123-34.PMID: 7784555
19. Skaane P, Engedal K. Analysis of sonographic features in the differentiation of fibroadenoma and invasive ductal carcinoma. AJR American journal of roentgenology. 1998;170:109-14.doi:10.2214/ajr.170.1.9423610.
20. Pande A, Lohani B, Sayami P, Pradhan S. Predictive value of ultrasonography in the diagnosis of palpable breast lump. Kathmandu University medical journal (KUMJ). 2003;1(2):78-84.PMID: 16388202
21. Ngotho J, Githaiga J, Kaisha W. Palpable discrete breast masses in young women: two of the components of the modified triple test may be adequate. South African Journal of Surgery. 2013;51(2):58-60.PMID: 23725894
22. Berg WA, Campassi CI, Ioffe OB. Cystic lesions of the breast: sonographic-pathologic correlation. Radiology. 2003;227(1):183-91.doi:10.1148/radiol.2272020660.
23. Jha A, Lohani B. Sonography of Palpable Breast Lumps in a Tertiary Health Care Centre in Nepal. Journal of Nepal Health Research Council. 2019;16(41):396-400.DOI https://doi.org/ 10.33314/ jnhrc.1461.
24. Prasad SN, Houserkova D. A comparison of mammography and ultrasonography in the evaluation of breast masses. Biomedical papers.2007;151(2):315-22.DOI: 10.5507/bp.2007.054.