e-ISSN: 0975-1556, p-ISSN:2820-2643

Available online on www.ijpcr.com

International Journal of Pharmaceutical and Clinical Research 2023; 15(2); 1444-1450

Original Research Article

A Comparative Study on the Sonography Versus Mammography for the Early Diagnosis of Breast Cancer

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Received: 20-12-2022 / Revised: 15-01-2023 / Accepted: 28-02-2023
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Conflict of interest: Nil

Abstract

Objectives: This present study was to compare the accuracy of ultrasonography versus mammography for the early diagnosis of breast cancer in various age group of women.

Methods: A total of 100 breast lesions women who had examined by histopathological procedure were enrolled in this study. A complete history and physical examinations were performed. Mammography and ultrasonography were performed to all histological diagnosed cases of breast lesions.

Results: All 100 patients of breast lesions were with age group 25 to 65 years. Most of the patients 41(41%) were in age group of 51-65 years. 61 patients had benign and 39 patients had malignant lesions. In benign lesions, 21(47.73%) cases shown positive on mammography and 23(52.27%) cases shown positive on ultrasonography. In malignant lesion, 12(38.71%) cases shown positive on mammography and 19(61.29%) cases shown positive on ultrasonography. Ultrasonography had significantly higher sensitivity (71.79%) and specificity (86.88%) in breast lesion as compared to mammography sensitivity (51.28%) and specificity (70.49%) respectively.

Conclusions: Breast cancer was commonly seen in old age women. And ultrasonography had higher sensitivity and specificity for breast lesion as compared to mammography. Hence, ultrasonography is one of the best choices of investigative procedures for early detection of breast cancer.

Keywords: Breast cancer, Mammography, Ultrasonography.

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Introduction

According to the 2013 American College of Radiology BI-RADS lexicon classification of breast density, ACR C indicates that the breasts are heterogeneously dense, which may obscure small mass while ACR D indicates that the breast is extremely dense [1].

Breast cancer is the most common cancer in women (about 30% of all cancers). Breast cancer has emerged as the commonest cancer in urban Indian women [2]. Worldwide mortality due to breast cancer in the year of 2012 is 5.22 lakh and in India it is 70,000 for the same year. According to WHO, for the year 2012, an estimated

70218 women died in India due to breast cancer, more than any other country in the world (second: China - 47984 deaths and third: US - 43909 deaths) [3].

Breast density has been shown to be independently associated with increased risk of the incidence of and mortality attributable to breast cancer in younger women compared with older women,9,10 with increased risk of interval cancers between screening [4,5,6]. Multiple studies [4,5,7] have demonstrated that supplemental screening using ultrasonography generates an incremental cancer detection rate at the expense of lower specificity and lower positive predictive values. However, because most studies have focused on women at high risk [4] or those with dense breast tissue but negative mammography findings, [8,9] the performance of ultrasonography as an adjunct to mammography according to differences in breast density classification or among women at average risk remains unknown [5,7,10]. Consequently, the effect of supplemental screening on breast cancer outcomes is still unclear [11].

The most important reason being lack of awareness about breast cancer and screening of the same. More than 50% patients of breast cancer present in stage III or IV. Almost all Indian breast cancer patients self-detect their disease at a stage when it presents with a palpable lump or even at a stage when it has resulted in secondary changes such as local skin or chest wall changes or distant metastases [12]. Objective of our study was to compare the accuracy of sonography versus mammography for the early diagnosis of breast cancer in various age group of women.

Material & Methods

This present study was conducted in Department of Radiology, Patna Medical College & Hospital, Patna, Bihar during a period from January 2022 to November 2022.

Our study included all cases presenting to the surgical OPD with histologically diagnosed breast lesions who were admitted and evaluated by sonography and mammography.

Inclusion criteria: Inclusion criteria were patients of age group 25 to 65 years who presented with suspicious breast lump.

Exclusion criteria: Exclusion criteria were previous history of breast surgery for breast cancer, patients with diagnosed breast cancer who is on treatment like chemotherapy or radiotherapy.

Procedure:

A total of 100 breast lesions were examined by histopathological procedure with the co-ordination of Department of Pathology, PMCH. Histopathology results revealed the presence of 39 malignant lesions and 61 benign lesions.

A detailed history was taken including: Age at first childbearing, age at menarche, age at menopause, history of breastfeeding, number of children, history of hormone therapy, a history of premenopausal breast cancer for a mother and a sister, a personal history of breast cancer or benign proliferative breast disease, radiation, chemical exposure and smoking.

Physical examination

Clinical breast examination of the whole breasts and axillary's regions was performed with the patient in the sitting position with arms both lowered and raised. In an upright position, we visually inspects the breasts, noting asymmetry, nipple discharge, obvious masses, and skin changes, such as dimpling, inflammation, rashes, and unilateral nipple retraction or inversion. With the patient supine and one arm raised, we thoroughly palpates breast tissue, axillary's region and supraclavicular area, assessing the size, texture, and location of any masses. And after all the cases were undergone mammography and sonography procedure.

Mammography:

Conventional film-screen mammography was performed with at least two views per breast, medio-lateral oblique and cranio-caudal views. Additional views or spot compression views were obtained where appropriate. Mammograms were obtained with dedicated mammography units (Alpha RT Imaging, General Electric Medical Systems, Milwaukee).

Mammograms were interpreted according to the Breast Imaging Reporting and Data system (BI-RADS) diagnostic categories on a five-point scale, with BI-RADS 1 (negative), 2 (benign finding), 3 (probably benign), 4 (suspicious abnormality), and 5 (highly suggestive of malignancy).

Breast density grades were also determined according to the BI-RADS on a scale of 1–4, with 4 corresponding to a dense breast, 3 to a heterogeneous breast, 2 to scattered fibro glandular densities and 1 to an almost entirely fat breast [13].

Breast Ultrasonography:

The radiologist who had performed the physical examination and who had interpreted the mammograms of that patient performed breast ultrasound. Ultrasound examinations were performed using a high-resolution unit (Aloka SSD 620; Tokyo, Japanand Mindray DP1 100 Plus) with a linear array probe centred at 7,5MHz. All ultrasound examinations were performed with the patient in a supine position for the medial parts of the breast and in a contra lateral posterior oblique position with arms raised for the lateral parts of the breast. The whole breasts were scanned. Diagnoses were scored on a five-point scale identical to the mammographic BI-RADS categories [13].

Observations

In this present study, 100 patients of breast lesions with age group 25 to 65 years were enrolled. Most of the patients 41(41%) were in age group of 51-65 years. On histological diagnosis, out of 100 breast lesions patients, 61 patients were benign and 39 patients were malignant lesions.

Table 1: Number of subjects according to age and kind of lesions (N=100).

Age group (Years)	Benign	Malignant	Total
25-35	09	05	14(14%)
36-50	11	07	18(18%)
51-65	25	16	41(41%)
65	16	11	27(27%)
Total	61(61%)	39(39%)	100(100%)

When we compared the mammography and ultrasonography finding of benign breast lesions, total 44(72.13%) cases were seen positive. Among them, 21(47.73%) cases shown positive on mammography and 23(52.27%) cases shown positive on ultrasonography.

Table 2: Comparison of Mammography and ultrasound findings of benign lesions.

	Mammography	Ultrasound	Total
Positive	21(47.73%)	23(52.27%)	44(72.13%)
Negative	12	5	17(27.86%)
Total	33(54.09%)	28(45.90%)	61(100%)

Similarly, when we compared the mammography and ultrasonography finding of malign breast lesions, total 31(79.48%) cases were seen positive. Among them, 12(38.71%) cases shown positive on mammography and 19(61.29%) cases shown positive on ultrasonography.

Table 3: Comparison of Mammography and ultrasound findings of malignant lesions.

	Mammography	Ultrasound	Total
Positive	12(38.71%)	19(61.29%)	31(79.48%)
Negative	5(62.5%)	3(37.5%)	8(20.51%)
Total	17(43.58%)	22(56.41%)	39(100%)

When we compared the sensitivity of mammography and ultrasonography in different breast density of patients, 80% and 60% sensitivity of mammography and ultrasonography respectively was seen in predominantly fatty breast lesions. 70.59% and 82.35% sensitivity of mammography and ultrasonography respectively was seen in scattered fibro glandular density lesions. 30.77% and 61.54% sensitivity of mammography and ultrasonography respectively was seen in heterogeneously dense lesions. And 100% and 75% sensitivity of mammography and ultrasonography was seen in extremely dense lesions. And thus, out of 39 malignant breast lesions, sensitivity of mammography and ultrasonography was 51.28% and 71.79% respectively.

Table 4: Comparison of sensitivity of mammography and ultrasonography in different breast density patients.

Breast density	No. of subject	Mammography		Ultrasonography	
		No.	%	No.	%
Predominantly fatty	5	4	80%	3	60%
Scattered fibro glandular density	17	12	70.59%	14	82.35%
Heterogeneously dense	13	4	30.77%	8	61.54%
Extremely dense	4	0	00%	3	75%
Total	39	20	51.28%	28	71.79%

Similarly, when we compared the specificity of mammography and ultrasonography in different breast density of patients, 100% and 60% specificity of mammography and ultrasonography respectively was seen in predominantly fatty breast lesions. 95% and 90% specificity of mammography and ultrasonography respectively was seen in scattered fibro glandular density lesions. 69.23% and 92.30% specificity of mammography and ultrasonography respectively was seen in heterogeneously dense lesions. And 18.18% and 63.63% specificity of mammography and ultrasonography was seen in extremely dense lesions. And thus, out of 61 benign breast lesions, specificity of mammography and ultrasonography was 70.49% and 86.88% respectively.

Table 4: Comparison of specificity of mammography and ultrasonography in different breast density patients.

Breast density	No. of subject	Mammography		Ultrasonography	
		No.	%	No.	%
Predominantly fatty	4	4	100	4	100
Scattered fibro glandular density	20	19	95	18	90
Heterogeneously dense	26	18	69.23	24	92.30
Extremely dense	11	2	18.18	7	63.63
Total	61	43	70.49	53	86.88

Discussions

Breast cancer is a major health problem and a leading cause of death among women in Egypt. Early detection of breast cancer improves the outcomes and survival rate [14].

In this present study, 100 breast lesion women were enrolled. Majorities of cases (68%) were in age group of > 50 years. Out of total 100 patients, 61% patients had benign lesion and 39 patients had malignant lesions according to histopathological findings.

Emine Devolli Disha, et al. stated that all women are at risk for developing breast cancer. The older a women is, the greater her chances of developing breast cancer. Approximately 77% of breast cancer cases occur in women over 50 years of age [15]. Most important factor in reducing death from breast cancer is early detection. Early detection and treatment is a key to preventing breast cancer from spreading. Mammography and ultrasound are the standard imaging techniques for detection and evaluation of breast disease [16].

In this present study, when we compared the mammography and ultrasonography finding of benign breast lesions, most of the cases shown positive on ultrasonography 23(52.27%) as compared to mammography 21(47.73%). And in malignant lesion, most of the cases also shown positive on ultrasonography 19(61.29%) as compared to mammography 12(38.71%).

Breast density is used to reflect breast tissue composition and different x-ray attenuation characteristics of fat and glandular tissues. Women with heterogeneously or extremely dense breast tissue are considered to have high mammographic density [17]. Women with dense breasts encounter two major problems as increased breast density decreases the sensitivity and specificity of mammography and the dense breast itself is a risk factor for developing breast cancer [18]. Mammography is accused of having low sensitivity and specificity in dense breast parenchyma owing to a decrease in the contrast between a tumor and surrounding breast tissue, and superimposed breast tissues may obscure lesions [17].

In this present study, 80% and 60% sensitivity of mammography and ultrasonography respectively was seen in predominantly fatty breast lesions. 70.59% and 82.35% sensitivity of mammography and ultrasonography respectively was seen in scattered fibro glandular density lesions. 30.77% and 61.54% sensitivity of mammography and ultrasonography respectively was seen in heterogeneously dense lesions. And 100% and 75% sensitivity of mammography and ultrasonography was seen in extremely dense lesions. And over all, sensitivity of mammography and ultrasonography was 51.28% and 71.79% respectively. 100% and 60% specificity of mammography and ultrasonography respectively was seen in predominantly fatty breast lesions. 95% and 90% specificity of mammography and ultrasonography respectively was seen in scattered fibro glandular density lesions. 69.23% and 92.30% specificity of mammography and ultrasonography respectively was seen in heterogeneously dense lesions. And 18.18% and 63.63% specificity of mammography and ultrasonography was seen in extremely dense lesions. And over all, specificity of mammography and ultrasonography was 70.49% and 86.88% respectively. And thus, above discussions revealed that the ultrasonography had significantly higher sensitivity (71.79%) and specificity (86.88%) in breast lesion as compared to mammography sensitivity (51.28%) and specificity (70.49%) respectively.

Diagnostic mammography is more involved and time-consuming than screening mammography and is used to determine exact size and location of breast abnormalities and to image the surrounding tissue and lymph nodes. Mammography is known to a have a certain false-negative rates. According to data from the Breast Cancer Detection Demonstration Project, the false-negative rate of mammography is

approximately 8-10%. Approximately 1-3% of women with a clinically suspicious abnormality, a negative mammogram, and a negative sonogram may still have breast cancer. Possible causes for missed breast cancers include dense parenchyma obscuring a lesion, poor positioning or technique, perception error, incorrect interpretation of a suspect finding, subtle features of malignancy, and slow growth of a lesion [19]. Ultrasonography has been playing an increasingly important role in the evaluation of breast cancer. Breast ultrasound is the preferable method in the case of a symptomatic patient, after clinical examination. In the case of a patient without symptoms, breast ultrasound is ascribed a higher sensitivity for detecting breast cancer in women with dense breast tissue, women under the age of 50 and high-risk women. Many specific indications for breast ultrasound have been enumerated, including: evaluation of a palpable mass incompletely evaluated at mammography; differentiation of a cyst from a solid nodule; evaluation of palpable lesions with associated mammographic asymmetry, no mammographic findings, the presence of implants, or a history of lumpectomy or segmentectomy [20,21, 22].

Conclusions

This present study concluded that the breast cancer was commonly seen in old age women. And ultrasonography had higher sensitivity and specificity for breast lesion as compared to mammography. Hence, ultrasonography is one of the best choices of investigative procedures for early detection of breast cancer.

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