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Original Research Article

An Observational Study Evaluating Association between Mammographic and Sonographic Findings in Breast Cancer Screening

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Abstract

Aim: The aim of the present study was to assess the mammographic and sonographic findings in breast cancer screening.

Methods: The present study was conducted in the Department of Radiodiagnosis, Indira Gandhi Institute of Medical science, Patna, Bihar. Breast lesions were detected by clinical breast examination, mammography and ultrasound. A total of 100 breast lesions were examined by histological methodology.

Results: A total of 100 breast lesions were examined by histological method, revealing the presence of 48 invasive cancers, and 52 benign lesions. The mean age of the patient was 58 years, ranging from 32 to 80 years. Most of the patients belonged to 50-59 years. The histological types of cancer in patients were: invasive ductal, invasive lobular, mixed (ductal/lobular) tubular, medullary, mucinous. Mammography was false negative in 46 out of 52 invasive cancers; ultrasound was false negative in 38 out of 48 cancers. Mammography was false negative in 45 out of 51 patients without cancer; ultrasound was false negative in 37 out of 49 patients without cancer.

Conclusion: Breast ultrasound is more accurate than mammography in symptomatic women 45 years or younger, mammography has progressive improvement in sensitivity in women 60 years or older. The accuracy of mammograms increased as women's breasts became fattier and less dense. In young women and women with dense breasts, ultrasound appears superior to mammography, and may be an appropriate initial imaging test in those women.

Keywords: breast lesions, diagnostic methods, mammography, ultrasound

Introduction

The three strongest prognostic factors in invasive breast cancer are widely accepted to be lymph node stage, histological grade and the size of histologically invasive cancer. [1-4] Axillary lymph node stage is an important prognostic factor in invasive breast cancer: the prognosis progressively worsens with an increasing number of involved nodes. Although controversial, micro metastatic disease continues to have clinical significance. Most series have shown that nodal micrometastasis appears to have a more or less adverse effect on disease-free and overall survival. [5] The three strongest prognostic factors in invasive breast cancer provide more valuable information when taken into account altogether than when any single individual factor is used alone.

The Nottingham Prognostic Index (NPI) uses these three factors and has been externally validated by several studies. [2,6-8] In addition, histological grade, tumour size and oestrogen receptor (ER) status are usually used as significant factors in guiding adjuvant systemic chemotherapy in node-negative patients. [9] Lymphovascular invasion (LVI) shows a clear relationship with nodal status [10-13] and local recurrence. [12,13] LVI is also related to distant metastasis and overall survival in node- negative breast cancer. [14,15]

Lee et al [11] concluded that LVI was an independent prognostic factor in node-negative breast cancer and should be considered when making decisions regarding adjuvant treatment in this group of patients. Gajdos et al [16] carried out a study of 543 non-palpable breast cancers, and demonstrated that lymphatic invasion was more common in cancers

presenting as a mass with calcifications. In our study, mammographic types that were significantly associated with LVI were spiculated or non-spiculated masses with calcifications.

The aim of the present study was to assess the mammographic and sonographic findings in breast cancer screening.

Materials and Methods

The present study was conducted in the Department of Radiodiagnosis, Indira Gandhi Institute of Medical science, Patna, Bihar, India. Breast lesions were detected by clinical breast examination, mammography and ultrasound. A total of 100 breast lesions were examined by histological methodology. Final histologic diagnosis was obtained for all patients who underwent surgical biopsy, and all cases were verified by reviewing the histopathology report. Histopathology results revealed the presence of 48 invasive cancers and 52 benign lesions.

Methodology

To each patient, 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 pre-menopausal breast cancer for a mother and a sister, a personal history of breast cancer or benign proliferative breast disease, radiation, chemical exposure and smoking. The protocol of diagnosis consisted of clinical breast examination, ultrasound, mammography and histopathological examination.

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 palpate breast tissue, axillary's region and supraclavicular area, assessing the size, texture, and location of any masses. After the patient history is obtained and the clinical breast examination is performed, the next diagnostic step was mammography, ultrasound and biopsy.

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. Patient younger than 30 years was excluded because mammography was not performed in this age group. 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 (8).In this series, of 546 women, examinations were performed in 87 women (mean age: 74,1 years; SD, 3,5) with fatty breasts, in 203 women (mean age: 60,4 years; SD: 7,9) with scattered fibro glandular dense breast, in 197 women (mean age: 49,5 years, SD: 7,6) with heterogeneously dense breast and in 59 women with dense breast (mean age: 36,1 years, SD: 4,7).

Breast Ultrasound

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 with a linear array probe centred at 7. 5 MHz. 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. [17]

Histopathological examination

Treatment of patient with breast cancer was based on a multimodality approach combining surgery, radiation therapy hormonal therapy and/or chemotherapy. Treatment is tailored for an individual patient based on tumor size, axillary lymph node involvement, estrogens and progesterone status, histologic tumour type, standardized pathologic grade, and menopausal status. Lumpectomy or wide local excision was performed for patient with benign tumour.

Results

Table 1: Age distribution

Age groups in years	Benign	Malignant	Total	%
30-39	5	6	11	11
40-49	12	10	22	22
50-59	13	13	26	26
60-69	11	11	22	22
70-79	11	8	19	19
Total	52	48	100	100

A total of 100 breast lesions were examined by histological method, revealing the presence of 48 invasive cancers, and 52 benign lesions. The mean age of the patient was 58 years, ranging from 32 to 80 years. Most of the patients belonged to 50-59 years.

Table 2: Histological types of cancer

Histological types of cancer	N
Ductal carcinoma	52
Lobular carcinoma	22
Mixed ductal/lobular Carcinoma	20
Mucinous carcinoma	2
Medullary carcinoma	2
Tubular carcinoma	2
Total	100

The histological types of cancer in patients were: invasive ductal, invasive lobular, mixed (ductal/lobular) tubular, medullary, mucinous.

Table 3: Correlation between mammography and ultrasound for malignant and benign lesions

Malignant lesions	Ultrasound		Total
Mammography	Positive	Negative	
Positive	46	6	52
Negative	38	10	48
Benign lesions			
Mammography	Positive	Negative	
Positive	45	6	51
Negative	37	11	49

Mammography was false negative in 46 out of 52 invasive cancers; ultrasound was false negative in 38 out of 48 cancers. Mammography was false negative in 45 out of 51 patients without cancer; ultrasound was false negative in 37 out of 49 patients without cancer.

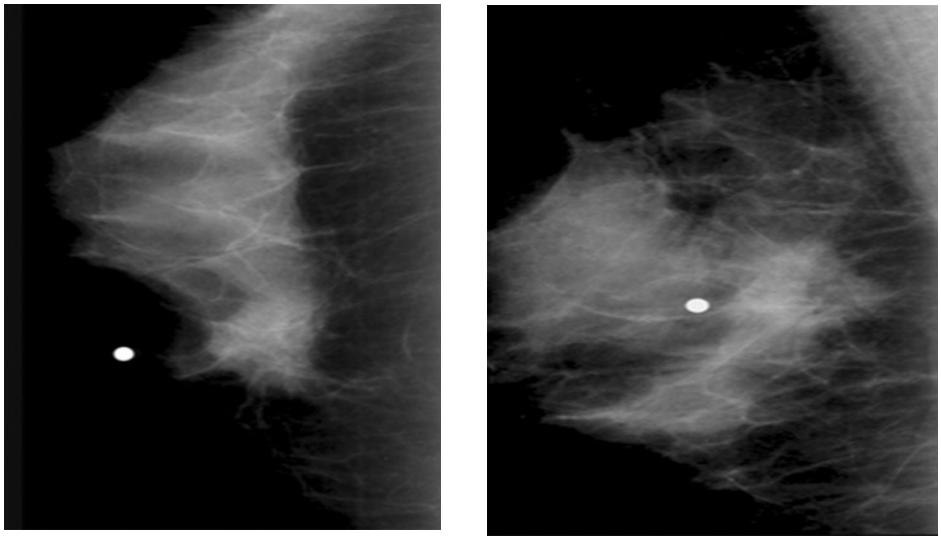

Figure 1: Mammograms show an irregularly shaped hyperdense mass with a spiculated margin in the left breast, which was not associated with calcifications

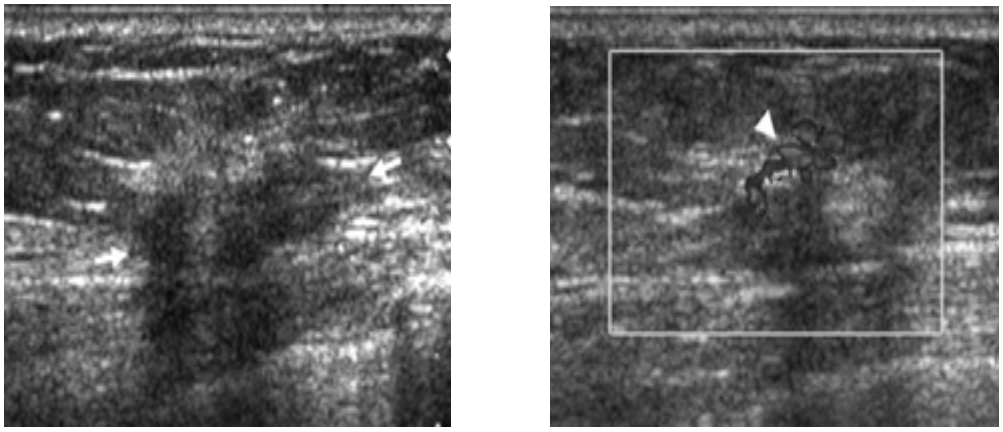

Figure 2: Sonograms show an irregularly shaped hypoechoic mass (arrows) with an indistinct margin and posterior shadowing.

The Doppler study shows a penetrating blood flow (arrowhead) in the periphery of this mass. Surgery confirmed an invasive ductal carcinoma with low histological grade and negative lymphovascular invasion and extensive introductal component. This mass was also associated with positive oestrogen receptor status and negative HER-2/neu status.

Discussion

Excluding cancers of the skin, breast cancer is the most common type of cancer in women today, accounting for 1 of every 3 cancers diagnosed. A woman's chance of developing invasive breast cancer at some time in her life is approximately 1 in 8 (12%). It is one of the leading causes of cancer mortality among women (1). Breast cancer is a heterogeneous disease with no single characterized cause. Epidemiological studies have identified many risk factors that increase the chance for a woman to develop breast cancer. Important risk factors for female breast cancer include early age at onset of menarche, late age at onset of menopause, a first full-term pregnancy after the age of 30 years, a history of premenopausal breast cancer for a mother and a sister, and a personal history of breast cancer or benign proliferative breast disease. Obesity, nulliparity, and urban residence have also been associated with an increased risk of breast cancer. Mam-mography plays a major role in early detection of breast cancers, detecting about 75% of cancers at least a year before they can be felt. There are 2 types of mammography examinations: screening and diagnostic. [18]

Screening mammography is done in asymptomatic women. Early detection of small breast cancers by screening mammography greatly improves a woman's chances for successful treatment. Screening mammography is recommended every 1-2 years for women once they reach 40 years of age and every year once they reach 50 years of age. In some instances, physicians may recommend beginning screening mammography before age 40 if the woman has a strong family history of breast cancer. Studies have shown that regular mammograms may decrease the risk of late-stage breast cancer in women 80 years of age and older. [19,20] A total of 100 breast lesions were examined by histological method, revealing the presence of 48 invasive cancers, and 52 benign lesions. The mean age of the patient was 58 years, ranging from 32 to 80 years. Most of the patients belonged to 50-59 years. [21]

Women who present with breast symptoms or who have palpable findings on clinical examination are usually investigated with breast imaging, which generally consists of mammography or breast ultrasound or both. The choice of primary breast imaging in examining women with symptoms is partly based on age. However, despite the importance of age in clinical practice, little evidence exists as to the appropriate age that delineates the choice of initial diagnostic breast imaging in symptomatic women. In the absence of evidence, experts suggest that women younger than 35 years be examined with ultrasound, and women 35 years and older be examined with mam- mography, as the primary breast imaging modality. Most of the patients belonged to 50-59 years. The histological types of cancer in patients were: invasive ductal, invasive lobular, mixed (ductal/lobular) tubular, medullary, mucinous. Mammography was false negative in 46 out of 52 invasive cancers; ultrasound was false negative in 38 out of 48 cancers. Mammography was false negative in 45 out of 51 patients without cancer; ultrasound was false negative in 37 out of 49 patients without cancer. However, in women 45 years or younger, ultrasound has a significantly greater sensitivity than mammography. Our study also shows that there is difference in the specificity of the two imaging tests, ultrasound has a significantly greater specificity than mammogr aphy. This fact may explain the different findings in published studies, with some reporting a greater specificity for ultrasound than for mammography. [22-24]

Conclusion

Breast ultrasound is more accurate than mammography in symptomatic women 45 years or younger, mammography has progressive improvement in sensitivity in women 60 years or older. The accuracy of mammograms increased as women's breasts became fattier and less dense. In young women and women with dense breasts, ultrasound appears superior to mammography, and may be an appropriate initial imaging test in those women.

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