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ORIGINAL ARTICLE

To determine the breast pain in women with mammography and ultrasound

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ABSTRACT:
Aim: To determine the breast pain in women with mammography and ultrasound. **Materials and methods:** This cross-sectional, prospective, hospital-based studywas conducted in the Department of Radiodiagnosis. Study participants were all women with palpable and nonpalpable breast lesions detected on clinical examination/self breast examination and referred for MG and women in high-risk groups (family history of breast cancer, previous history of breast cancer and disease such as fibrocystic disease, and excessive exposure to ionizing radiation, and history of endometrial, ovarian, or colonic carcinoma). A total of 53 patients were studied. Study tools were MG machine (Digital MG Novation DR. SIEMENS) and USG machine (WIPRO G E Healthcare Ultrasound LOGIC–P5). **Results:** The sensitivity, specificity, PPV, and negative predictive value (NPV) of MG in detecting carcinoma breast are 77.77%, 97.72%, 87.5%, and 95.55%, respectively. USG independently detected six patients as suspicious of breast carcinoma and missed four lesions, which were subsequently proved as carcinoma. USG falsely detected one patient as suspicious lesion, which proved benign in other studies. The sensitivity, specificity, PPV, and NPV of USG in detecting carcinoma breast are 55.55%, 97.72%, 83.33%, and 91.48%, respectively. Two malignant lesions which were occult in MG due to dense breast parenchyma and were detected in USG. The four cases of carcinoma breast which could not be picked up in USG were diagnosed by MG. The correlation coefficients of MG alone (0.792), USG alone (0.631), and MG and USG combination (0.884) with FNAC are all positive, and P values are significant of all the modalities, which signify that all are the effective diagnostic procedures of detecting breast malignancy, but among the three procedure, the combination of MG with ultrasonography shows the strongest correlation (correlation coefficient = 0.884) with the finding of FNAC. **Conclusion:** We therefore conclude that with the combination of two noninvasive procedures, MG and ultrasound; we can almost achieve the accuracy of the FNAC in detecting breast malignancy.
Keywords: Breast, Abnormalities, Mammography, Ultrasound, Cytology

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INTRODUCTION

Breast pain, also known as mastalgia, is a common complaint among women of various ages and is often a source of significant anxiety, particularly due to the association of breast symptoms with breast cancer. However, it is important to note that breast pain is rarely a symptom of breast cancer. The majority of cases of mastalgia are benign and are typically associated with hormonal fluctuations, particularly in premenopausal women. Despite this, the distress caused by breast pain, coupled with the fear of malignancy, often leads women to seek medical evaluation, where mammography and ultrasound play crucial roles in the diagnostic process.[1,2] Breast pain can be categorized into two main types: cyclical and non-cyclical. Cyclical breast pain is linked to the menstrual cycle and is often described as a dull, heavy pain that affects both breasts. It typically worsens in the luteal phase of the menstrual cycle and improves with the onset of menstruation. This type of pain is most common in younger, premenopausal women and is thought to be related to hormonal changes, particularly fluctuations in estrogen and progesterone levels.[3,4] Non-cyclical breast pain, on the other hand, is not related to the menstrual cycle and can occur at any time. It is often localized to one area of the breast and may be described as sharp, burning, or aching. Non-cyclical mastalgia is more common in postmenopausal women and can be caused by a variety of factors, including trauma, cysts, fibroadenomas, and, in rare cases, breast cancer. In some instances, non-cyclical pain may also be referred pain from other sources, such as musculoskeletal conditions.[5,6]

Given the potential for breast pain to cause significant distress and the widespread fear of breast cancer, imaging modalities such as mammography and ultrasound are frequently employed in the evaluation of women presenting with mastalgia. Mammography, a specialized breast imaging technique that uses low-dose X-rays, is the standard method for screening and evaluating breast abnormalities. It is particularly useful in detecting calcifications, masses, and architectural distortions within the breast tissue, which may not be palpable during a physical examination.[7] Mammography is often the first imaging study performed in women over the age of 40 who present with breast pain, especially if they are at higher risk

for breast cancer. The sensitivity of mammography in detecting breast cancer is relatively high, particularly in postmenopausal women, where breast tissue is less dense. However, in younger women with denser breast tissue, mammography may be less effective, as dense tissue can obscure the visibility of abnormalities. In such cases, ultrasound is often used as an adjunctive tool.[8]Breast ultrasound is a non-invasive imaging technique that uses high-frequency sound waves to create images of the breast tissue. It is particularly useful in evaluating breast pain in younger women, pregnant or lactating women, and those with dense breast tissue, where mammography may be less informative. Ultrasound is highly sensitive in detecting cystic and solid masses, and it can help differentiate between benign and suspicious lesions. Additionally, ultrasound can provide valuable information about the characteristics of a mass, such as its size, shape, and whether it is filled with fluid or solid.[9] One of the key advantages of ultrasound is its ability to guide biopsy procedures, allowing for precise sampling of suspicious areas for histopathological examination. This is especially important in cases where a mass is detected on mammography but requires further characterization to determine its nature. Ultrasound is also valuable in assessing the axillary lymph nodes, which can be involved in breast cancer.[10] In the context of breast pain, the primary role of mammography and ultrasound is to exclude malignancy and provide reassurance to the patient. Most women with breast pain have benign findings, such as fibrocystic changes, cysts, or fibroadenomas. In such cases, imaging results that are normal or show benign findings can alleviate anxiety and allow for conservative management of the pain, such as lifestyle modifications, pain relief medications, or hormonal therapy.[11,12] However, it is important to recognize that imaging alone cannot always provide a definitive diagnosis. In some cases, further investigation, such as a biopsy, may be necessary to rule out malignancy, particularly if the imaging findings are suspicious or if there is a palpable mass that does not correspond to the imaging results. Additionally, in women with persistent, unexplained breast pain despite normal imaging findings, further evaluation may be warranted to explore other potential causes, such as musculoskeletal issues or referred pain from the chest wall.

MATERIALS AND METHODS

This cross-sectional, prospective, hospital-based studywas conducted in the Department of Radiodiagnosis. Study participants were all women with palpable and nonpalpable breast lesions detected on clinical examination/self breast examination and referred for MG and women in high-risk groups (family history of breast cancer, previous history of breast cancer and disease such as fibrocystic disease, and excessive exposure to ionizing radiation, and history of endometrial, ovarian, or colonic carcinoma). Ulcerated and fungating breast growth was excluded because MG is not possible. Pregnant women, moribund patients and proven cases of malignancy, and male patients were also excluded from the study. A total of 53 patients were studied. Study tools were MG machine (Digital MG Novation DR. SIEMENS) and USG machine (WIPRO G E Healthcare Ultrasound LOGIC–P5). MG was performed in a stand type Siemens Novation, which is a radiographic stand to radiograph the patient in a standing or sitting position in combination with mammographic X-ray tube assembly with compression paddle. Mediolateral oblique and craniocaudal images were obtained and assessed carefully. USG was performed on a Logic P-5 (GE) real-time scanner with a hand-held linear electronic array transducer. The transducer could be operated in the frequency range of 7.5 MHz. Parameters studied were (a) On MG, the site of the lesion, margin of the lesion, surrounding halo, clustered microcalcification, surrounding parenchymal distortion, and thickening of the skin. (b) On USG, the size, shape, margins, echo texture, homogeneity of internal echoes, lateral shadowing, posterior effect, calcification, infiltration across tissue space, and surrounding fat were studied. Data were collected and statistically analyzed, and suitable test of significance was applied.

RESULTS

The study included 53 women, of which 45 were from Hindu, five from Muslim, and three from Christian. Among the patients, 25 patients complained of mobile breast lump, 12 patients suffered from breast pain, five patients felt lump, three patients complained of nipple discharge, and nipple retraction and lump with fever were the complaints of two patients each. Among the diagnosed cases of the carcinoma breast, age of one patient is between 30 and 40 years, three patients are within 41–50 years group, two patients are between 51 and 60 years group, and three patients belong to 61 and above group.Among the 53 patients, MG individually detected eight lesions and missed two lesions of carcinoma breast, which was subsequently detected in USG and conformed in FNAC. One of the 8 patients detected for suspicious lesions in MG, subsequently proved benign in USG and FNAC. The sensitivity, specificity, PPV, and negative predictive value (NPV) of MG in detecting carcinoma breast are 77.77%, 97.72%, 87.5%, and 95.55%, respectively. USG independently detected six patients as suspicious of breast carcinoma and missed four lesions, which were subsequently proved as carcinoma. USG falsely detected one patient as suspicious lesion, which proved benign in other studies. The sensitivity, specificity, PPV, and NPV of USG in detecting carcinoma breast are 55.55%, 97.72%, 83.33%, and 91.48%, respectively. Two malignant lesions which were occult in MG due to dense breast parenchyma and were detected in USG.

The four cases of carcinoma breast which could not be picked up in USG were diagnosed by MG.In 22 FNAC proven cases of fibrocystic diseases, MG alone detected 18 cases and USG alone detected 21 cases. Combined approach detected all the cases correctly. In 16 FNAC proven cases of fibroadenomas, MG alone detected 12 cases, USG alone detected five cases, and combined approach detected 15 cases. Of three benign cysts, MG detected two cases, however, USG detected all correctly. In two cases of infective pathology, MG detected one case correctly and one case was suspicious (false positive); however, USG correctly diagnosed those two cases. In our study population, 83.01% of breast lesions were benign, and of them, 77.27% were diagnosed by MG alone and 72.72% were diagnosed by USG alone. When these modalities were combined, 97.72% of the lesions were diagnosed.The correlation coefficients of MG alone (0.792), USG alone (0.631), and MG and USG combination (0.884) with FNAC are all positive, and P values are significant of all the modalities, which signify that all are the effective diagnostic procedures of detecting breast malignancy, but among the three procedure, the combination of MG with ultrasonography shows the strongest correlation (correlation coefficient = 0.884) with the finding of FNAC.

Table 1: Demographic and Religious Distribution of Patients

Characteristic	Number of Patients (n=53)	Percentage (%)
Gender		
Female	53	100
Religion		
Hindu	45	84.9
Muslim	5	9.4
Christian	3	5.7

Table 2: Patient Complaints

Complaint	Number of Patients (n=53)	Percentage (%)
Mobile breast lump	25	47.2
Breast pain	12	22.6
Felt lump	5	9.4
Nipple discharge	3	5.7
Nipple retraction	2	3.8
Lump with fever	2	3.8

Table 3: Age Distribution of Diagnosed Carcinoma Breast Cases

Age Group (Years)	Number of Patients (n=9)	Percentage (%)
30-40	1	11.1
41-50	3	33.3
51-60	2	22.2
61 and above	3	33.3

Table 4: Diagnostic Performance of MG and USG

Diagnostic Method	Sensitivity (%)	Specificity (%)	PPV (%)	NPV (%)
MG	77.77	97.72	87.5	95.55
USG	55.55	97.72	83.33	91.48

Table 5: Detection of Benign Lesions by MG and USG

Lesion Type	Number of Cases (FNAC Proven)	Detected by MG Alone	Detected by USG Alone	Detected by Combined Approach
Fibrocystic diseases	22	18	21	22
Fibroadenomas	16	12	5	15
Benign cysts	3	2	3	3
Infective pathology	2	1 (1 false positive)	2	2

Table 6: Correlation Coefficients with FNAC Findings

Diagnostic Method	Correlation Coefficient
MG alone	0.792
USG alone	0.631
MG and USG combination	0.884

DISCUSSION

Patients with palpable breast masses commonly present for imaging evaluation. Unfortunately, false-negative mammographic findings in the setting of a palpable breast mass have been estimated at between 4% and 12%.[10-12] Therefore, malignancy cannot be excluded when mammographic findings of a palpable mass are negative. USG is used as an adjunct to MG to further evaluate palpable masses, especially in women with mammographically dense breasts. USG often detects cysts or solid lesions that are obscured on the mammogram by the surrounding fibroglandular tissue and can reduce the number of surgical biopsies required when cysts are identified. It was found from the literatures that MG and USG are well-established diagnostic modalities for the breast. They have high diagnostic yield but is not 100% sensitive and specific.[13,14] MG when combined with USG can yield very significant improvement in sensitivity and specificity for diagnosing different breast lesions, and our study strongly supports this evidence.The value of combined mammographic and sonographic imaging in symptomatic patients has been studied previously. Moss et al.[15] reported a sensitivity of 94.2% in 368 patients. Shetty et al.[16] reported a sensitivity of 100%. Barlow et al.[17] reported a sensitivity of 87%. Their findings are comparable with present findings - sensitivity of 100% in case of malignant lesions and case detection rate of 97% in cases of benign lesions. In our study, we estimated correlation coefficient and P value using Spearman's Rho test, and this statistical finding leads us to the conclusion that with the use of the combination of the two noninvasive procedures (i.e., MG + ultrasound); we can almost achieve the accuracy FNAC in detecting breast malignancy.Although USG is not considered a screening test, it is more sensitive than MG in detecting lesions in women with dense breast tissue. Moss et al.[15] reported that sonography increased cancer detection by 14% in symptomatic patients who were evaluated with both MG and sonography. Georgian-Smith et al.[18] in a retrospective analysis of 293 palpable malignant lesions reported that sonography detected all cancers; 18 (6.1%) of these 293 cancers were mammographically occult. In this study, two patients (22.22%) of nine are diagnosed cancer in USG, which was occult in MG.

CONCLUSION

The MG and ultrasound are individually effective diagnostic modalities for detection of breast pathologies. In our study, detection of breast carcinoma is higher in MG in comparison to USG; however, the accuracy of detection of breast carcinoma significantly improves when MG was combined with USG. Our study also reveals that in comparison to MG, USG is better modality for detecting lesions in mammographically dense breast.This study confirms that the MG and ultrasound (USG) when combined have significantly higher sensitivity and NPV than observed for a single modality in detecting the both benign and malignant lesions of the breast.

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