ORIGINAL RESEARCH ARTICLE

A study of Ultrasound Elastographic Evaluation of Breast Masses and their Histopathological Correlation

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A B S T R A C T

Introduction: Currently, the most frequent diagnostic techniques used to identify breast cancer are palpation, mammography, and ultrasonography (USG), all of which have varied degrees of accuracy and predictive value. Clinical palpation is the simplest way of assessment, although it has limited utility owing to its low sensitivity and accuracy. Aim: To evaluate the diagnostic utility of sono-elastography in differentiating different breast masses (benign or malignant)

Material and methods: This Cross-sectional study with conducted on 60 patients referred from the general surgery department with swelling in the breast. Detailed clinical history and examination of patients were taken. Patients presenting with palpable breast lesions were assessed with conventional B-Mode USG. After confirming the presence of breast lesion patient was assessed with strain elastography using a 12-Mhz linear transducer. An elasticity scoring system was used to characterize the lesion

Results: 26 patients (43.3%) were diagnosed with Grade 3 breast masses followed by 19 (31.7%) in Grade 2 breast masses whereas 12 cases (20%) in Grade 4 and 3 cases (5%) in Grade 5 breast masses. 15 patients (25%) showed malignant features and 45 patients (75%) showed benign features according to sonoelastography score. Final histopathological diagnosis (HPE) when compared to Sonoelastography, sensitivity, specificity, accuracy rate, PPV and NPV of malignant and benign lesions were 72.22%, 95.24%, 88.33%, 86.67% and 88.33% respectively

Conclusion: Ultrasound elastography is a quick and easy way to increase the sensitivity and specificity of USG while also reducing the number of unwanted biopsies.

Keywords: Breast Mass, FNAC, Histopathology, Ultrasound Elastography

INTRODUCTION

Breast cancer is one of the most frequent illnesses among women of all ages. The clinical manifestation of many breast disorders, ranging from benign cysts to malignant tumours, is referred to as a breast lump. The ability to distinguish between malignant and benign tumours is critical for proper patient care and treatment. Fibroadenomas are the most common benign lesions, whereas invasive ductal carcinomas are the most common malignant lesions.[1]

According to NICPR (National institute of cancer prevention and research), the most common cancer in India in women is breast cancer which accounts for 27% of all cancers in women.[2,3]

The peak occurrence rate is at ages 50-64 years in India which begins to rise in the early thirties [4]. During her lifetime one in every twenty-two women suffers breast cancer in urban areas as compared to one in sixty women suffers breast cancer in rural areas during her lifetime[5]. There are up to 1.2 million number cases of breast cancer in the world.[6]

Early diagnosis of cancer is important as the mortality for breast carcinoma varies according to the stage. Stage 0 has a 5-year survival rate of 99%, stage 1 has a survival rate of 92%, stage 2a about 82%, 2b about 65%, stage 3a about 47% whereas stage 3b and 4 have a 5-year survival rate of about 44% and 14% respectively. This indicates the importance of early diagnosis as this will result in early treatment and better survival rates. Also, the treatment modalities vary depending upon the stage. The imaging modalities, which help in the assessment of breast tissue include Ultrasonography, Mammography, and Magnetic Resonance Imaging.[7]

As the incidence of breast cancer is high and it has a slow evolution before diagnosis, research for newer diagnostic techniques began. In recent years, the development of elastography has increased the specificity of ultrasound and resulted in earlier diagnosis of breast cancer. In cases with equivocal Stavros criteria (stages 3 and 4 BIRADS) using quantitative elastography with strain ratio (SR) improves diagnostic correctness.[8]

Ultrasound elastography (SE) distinguishes between malignant and benign lesions by measuring the flexibility of the breast tissue. The elasticity of benign lesions is related to the elasticity of surrounding tissues, but malignant lesions have lower elasticity and are thus harder than surrounding tissues. Due to the presence of nearby desmoplastic reactions, they have bigger dimensions on elastography, whereas benign lesions have a lower diameter on elastography than on B mode ultrasonography. [8]

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Aim

To evaluate the diagnostic utility of sono-elastography in differentiating different breast masses (benign or malignant)

MATEIRAL AND METHODS

This cross sectional study was conducted in department of radiology at tertiary care medical college hospital in patients from the general surgery department referred for swelling in the breast. Institutional ethical committee approval was obtained. 60 patients were selected during the study period 18 months. Inclusion Criteria: All-female patients present with breast swelling which is confirmed by USG and incidentally detected lesions on mammography. Exclusion Criteria: Patients not consenting for USG, FNAC or Histopathology, lesion positioned closed to skin or the rib cage, anechoic lesion (clearly cystic). Detailed clinical history and examination of patients was taken. Patients presenting with palpable breast lesions will be assessed with conventional B-mode USG. After confirming the presence of breast lesion patient will be assessed with strain elastography using 12-Mhz linear transducer elastography will be correlated with clinical examination, USG, histopathology. Patient has undergo FNAC of the breast lesion. HPE/biopsy was taken if FNAC is inconclusive. Elasticity scoring system is used to characterise the lesion. This is to be correlated with FNAC/HPE finding. The patient will receive appropriate treatment as per the clinicopathological diagnosis. Data are presented as percentages and the number of cases. Sensitivity and specificity were calculated for the outcome variables Significance were defined by P values less than 0.05 using a two-tailed test. Data analysis was performed using IBM-SPSS version 21.0 (IBM-SPSS Science Inc., Chicago, IL).

RESULTS

Out of 60 patients, most of the patients were from age group 31-40 years (36.7%). Out of 60 patients, 27 patients (45 %) presented with lesions on the right side. 26 patients (43.3%) were diagnosed with Grade 3 breast masses followed by 19 (31.7%) in Grade 2 breast masses whereas 12 cases (20%) in Grade 4 and 3 cases (5%) in Grade 5 breast masses. 15 patients (25%) showed malignant features and 45 patients (75%) showed benign features according to sonoelastography score. 18 patients (30%) showed malignant features and 42 patients (70%) showed benign features according to the final histopathological diagnosis (HPE). 18 patients were

Patients characteristics		Frequency	Percent
Age group	<30	13	21.7%
	31-40	22	36.7%
	41-50	13	21.7%
	51-60	10	16.7%
	>61	2	3.3%
Side	Left	23	38.3%
	Right	27	45.0%
	Both	10	16.7%
USG Elastogram grade	2	19	31.7%
	3	26	43.3%
	4	12	20.0%
	5	3	5.0%

Table-1 Patients characteristics

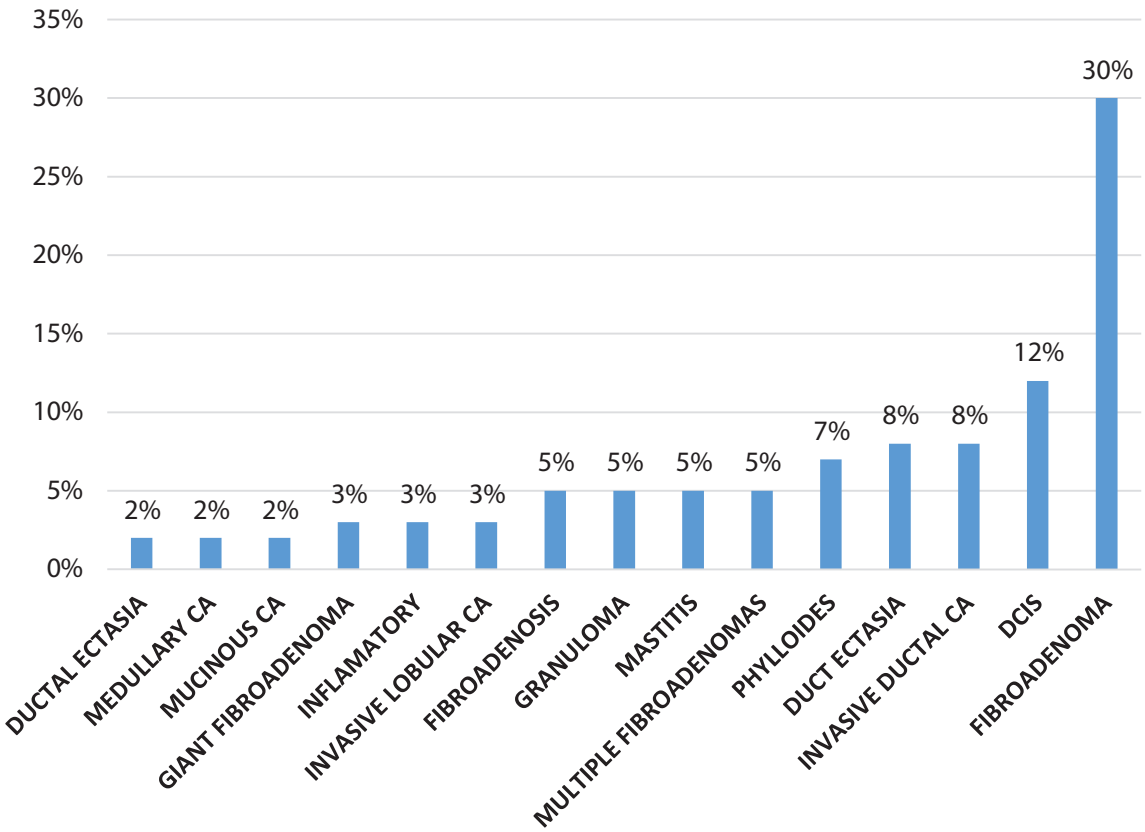

Figure-1: HPE distribution in the study population (N=60)

diagnosed with malignant lesions out of which, 7 patients (12%) had ductal carcinoma in situ (DCIS), 5 patients (8%) had invasive ductal carcinoma. Inflammatory carcinoma and Invasive lobular carcinoma was found in 2 patients (3%) each, whereas one patient (2%) each had shown medullary carcinoma and mucinous carcinoma. Final histopathological diagnosis (HPE) when compared to Sonoelastography, sensitivity, specificity, accuracy rate, PPV and NPV of malignant and benign lesions were 72.22%, 95.24%, 88.33%, 86.67% and 88.33% respectively.

DISCUSSION

Out of 60 patients, 18 patients were diagnosed with malignant lesions out of which, 7 patients (12%) had ductal carcinoma in situ (DCIS), 5 patients (8%) had invasive ductal carcinoma. Inflammatory carcinoma and Invasive lobular carcinoma was found in 2 patients (3%) each, whereas one patient (2%) each had shown medullary carcinoma and mucinous carcinoma. According to Schoonjans JM et al, the most frequent benign breast tumour is a fibroadenoma, while the most common malignant breast mass is Invasive Ductal Carcinoma. [9].

Delille JP et al and Dean KI et al investigated the degree of changes in parenchymal enhancements in relation to the patient's menstrual period. [10,11.] The effects of age, hormone replacement treatment, and oral contraceptives were investigated in a study by Marklund M et al.[12] Our research does not look into the hormonal impacts on contrast enhancement.

Based on the final histopathological diagnosis (HPE), 18 patients (30%) showed malignant features, and the sonoelastography score performed on these patients showed 15 patients (83.33%) with malignant features. Comparing the sonoelastography and corresponding histopathological diagnosis of these 60 patients, accuracy rate, specificity, sensitivity, PPV and NPV of final histopathological diagnosis for the detection of malignant lesions were 72.22%, 95.24%, 88.33%, 86.67% and 88.33% respectively.

Of the 60 patients, based on final histopathological diagnosis (HPE), 42 patients (70%) showed benign features. Sonoelastography done on these patients showed all 42 patients (100%) with malignant features. Comparing sonoelastography and corresponding final histopathological diagnosis (HPE) accuracy rate, specificity, sensitivity, PPV and NPV of final histopathological diagnosis for the detection of malignant lesions were 72.22%, 95.24%, 88.33%, 86.67% and 88.33% respectively. This supports the conclusion that, in addition to sonoelastography, the use of final histopathological diagnosis (HPE) may be useful for the characterization and detection of breast masses. These are very similar to the findings of Itoh et al. [13] In none of our cases that turned out to be malignant, the score 1 or 2 indicated by homogenous strain distribution suggestive of soft benign lesions on sonoelastography was detected. It saves time and money by avoiding invasive histological examinations of these lesions. Elastosonography has a sensitivity of 90.5 percent and a specificity of 93.2 percent, according to Bojanic et al [14.] Raza et al [15] found that 84 % of malignant lesions had elasticity ratings of 4 or 5. In our research, 68.4% of malignant tumours had elasticity values of 4 or 5, while 92.3 percent of benign lesions exhibited elasticity scores of 2 or 3.

Sonoelastography's sensitivity ranged from 67 percent to 83 percent in investigations by Lee JH et al [16], while its specificity ranged from 86.7 percent to 90 percent. According to studies, adding elastographic findings to standard B mode USG can enhance sensitivity and specificity.

The elasticity score's sensitivity, specificity, positive predictive value, negative predictive value, and accuracy in the diagnosis of solid breast masses were %, 88 percent, 83.3 %, 100 %, and 92.5 %, according to Khamis et al [17]. Gheonea et al [8] found that the elasticity score had a sensitivity of 86.7 percent and a specificity of 92.9 percent, which is similar to our findings. The findings of this investigation are also in line with those of Thomas A et al [18], who found that elastography has 81 percent sensitivity and 89 percent specificity. The small discrepancies might be related to the various occurrences of breast cancer in different locations, variable patient selection criteria, interobserver variability, the different number of examined lesions, and equipment differences.

We discovered that depending on the firmness of lesions, ultrasound elastography may distinguish between benign and malignant lesions. Similar findings have been reported in other investigations. According to Barr et al, elasticity imaging offers high sensitivity (96.7-100%) for detecting malignant lesions in the breast [19]. Wojcinski et al found that using Sonoelastography in addition to mammography increased breast diagnostic performance[20.] Burnside et colleagues discovered that using strain imaging can help distinguish between benign and malignant solid breast tumours [21.]

When compared to B-sonography, some investigations have concluded that elastography does not influence performance. In terms of sensitivity, specificity, positive and negative predictive values, and the area under the ROC curve, Sohn et al found no statistically significant difference between elasticity imaging and B-mode.[22] Cho et al found that radiologists' abilities to differentiate solid breast masses using B-mode sonography and elastography were not significantly different.[23]

CONCLUSION

Non- invasive diagnosis of breast cancer remains a challenge to the medical fraternity. The most sensitive investigations for identifying breast cancer are now mammography and sonography. Breast elastography has lately received a lot of interest since it has been shown to have good specificity and a high negative predictive value when used in conjunction with ultrasound. To summarise, ultrasonic elastography is a simple and quick procedure for improving the sensitivity and specificity of USG and reducing the number of needless biopsies.

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