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Role of Sonoelastography in Differentiating Malignant and Benign Lesions of the Breast

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ABSTRACT

Maximum of the study participants were in the age group of 31-40 years (37.8%). The mean age of the study participants was observed to be 35.2 ± 11.9 years. Maximum of the study participants lesions had circumscribed margin (48.9%) followed by sipculated (22.2%), indistinct (11.1%) and angular (11.1%). Round is the most common shape of the lesions (35.6%) followed by irregular (31.1%) and oval shape (24.4%). Sixty percent of the lesions had parallel orientation while the rest 40% of the lesions had anti-parallel orientation. Majority of the lesions had echogenic halo boundary (62.2%) while the rest had abrupt interface boundary (37.8%). Fibroadenoma (53.3%) is the most common histopathological findings among the study participants followed by ductal carcinoma in situ (13.3) and intralobular carcinoma (11.1%). The specificity and sensitivity of VTI score between 4 and 5 is 6.90% and 87.5% respectively. The positive and negative predictive value is 34.15% and 50% respectively.

Key words: Intralobular, Fibroadenoma, VTI score

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INTRODUCTION

Breast ultrasonography (US) has is actually a less valuable tool of imaging the biopsy especially in detecting women with dense breast. Technological improvements in transducer resolution and signal processing have enabled sensitivity of to almost 75-85%. Elasticity is an important property of biologic tissues and it changes with age and in the presence of any pathology. It is defined as the elongation (stretching) of tissue under strain [1,3]. Currently, two basic techniques are used in Sonoelastography of the mammary glands: static elastography, also called strain imaging, and dynamic elastography, also called shear wave elastography (SWE). The elastogram presents the stiffness color map and numerical values of the Young's modulus for the assessed tissue, expressed in kPa. Additionally, SWE reports quantitative values for the region of interest on the screen. In literature many studies have shown that detection of breast cancer at an early stage can improve the chances of successful treatment [4,5]. The soloelastography can be used as a very important non-invasive tool for early diagnosis of breast diseases. The purpose of the present study is to determine the role of Sonoelastography in differentiating being n and malignant lesions of the breast and also to determine the role of sonoelastography in differentiating benign and malignant lesions of the breast, to obviate the need for follow up of very low suspicion masses (BIRADS – 3) and the biopsy of low suspicion masses (BIRADS–4a)To identify the <2% of lumps under BIRADS 3 that are malignant.

METHODOLOGY

Study setting

The study was conducted in the Department of Radio Diagnosis and Imaging, Sree Balaji Medical College and Hospital, Chennai.

Study population

This study was done among patients who are presenting with breast lumps and lesions based on the clinical data or other imaging modality to Department of Radio-Diagnosis, Chromepet.

Study design

This study was taken as an observational descriptive study.

Study sample

Patients with breast lumps and lesions referred to the department of Radio-diagnosis was included in the study after a written informed consent.

Sample size estimation

The study conducted among 45 participants.

Sampling technique

Convenience sampling technique was used to select study participants from all the patients who are eligible to participate in the study.

Study period

The study was under taken during the period of December 2018 to September 2020.

Inclusion criteria

- All age groups.
- Both sexes.
- Patients presenting with breast lumps /lesions by conventional sonography and sonoelastography and subsequently proved by histopathology.

Exclusion criteria

- Patients who did not give consent for the study were excluded from the study.
- Virtual touch quantification(VTQ) and histopathology examinations were performed on the chosen patients.

RESULTS

VTI scoring of 1 - 3 is considered as benign and 4 - 5 is considered as malignant. Based on the classification majority of the lesions (64.4%) were found to be benign based on VTI scoring and 35.6% of the lesions were found to be malignant. The mean VTI score of the study participants was observed to be 2.6 ± 1.01. The entire malignant lesion had anti- parallel orientation (100%) and 93.1% of the benign lesion had parallel orientation. The association was found to be statistically significant (p value<0.00). The specificity and sensitivity of VTQ ≥ 2.4 m/s is 20.69% and 100% respectively. The positive and negative predictive value are 41.03% and 100% respectively (Tables 1 to Table 5) and (Figures 1 to Figure 3).

Table 1: Distribution of study participants based on Hormone replacement therapy (n=45).

HRT	Frequency	Percent
Yes	4	8.9
No	41	91.1
Total	45	100

Table 2: Distribution of lesion based on margin (n=45).

Margins	Frequency	Percent
Indistinct	5	11.1
Circumscribed	22	48.9
Microlobulated	3	6.7
Sipculated	10	22.2
Angular	5	11.1
Total	45	100

Table 3: Distribution of lesion based on boundary (n=45).

Boundary	Frequency	Percent
Abrupt interface	17	37.8
Echogenic halo	28	62.2
Total	45	100

Table 4: Distribution of study participants based on histopathological findings (n=45).

Histopathological findings	Frequency	Percent
Fibroadenoma	24	53.3
Adenosis	2	4.4
Inflammatory	3	6.7
Intraductal carcinoma	4	8.9
Intralobular carcinoma	5	11.1
Ductal carcinoma in situ	6	13.3
Mucinous carcinoma	1	2.2
Total	45	100

Table 5: Association between VTI score and BIRADS (n=45).

Birads	VTI score		Total n (%)	p value*
	Benign n (%)	Malignant n (%)		
III	25 (86.2)	0 (0)	25 (55.6)	< 0.00
IVA	2 (6.9)	0 (0)	2 (4.4)	
IVB	0 (0)	1 (6.3)	1 (2.2)	
IVC	1 (3.4)	4 (25)	5 (11.1)	
V	1 (3.4)	11 (68.8)	12 (26.7)	
Total	29 (100)	16 (100)	45 (100)	

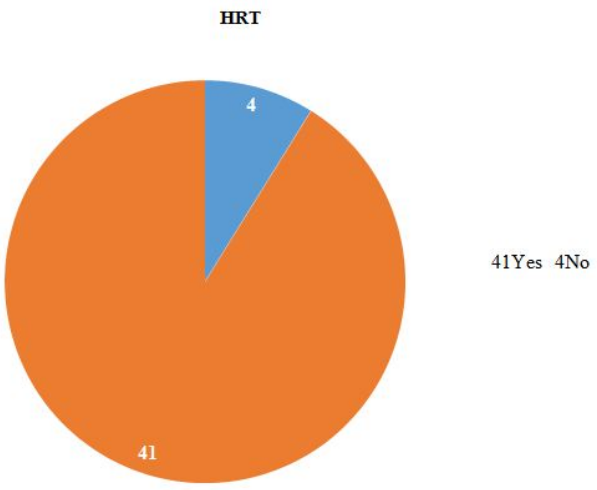

Figure 1: Distribution of study participants based on HRT (n=45).

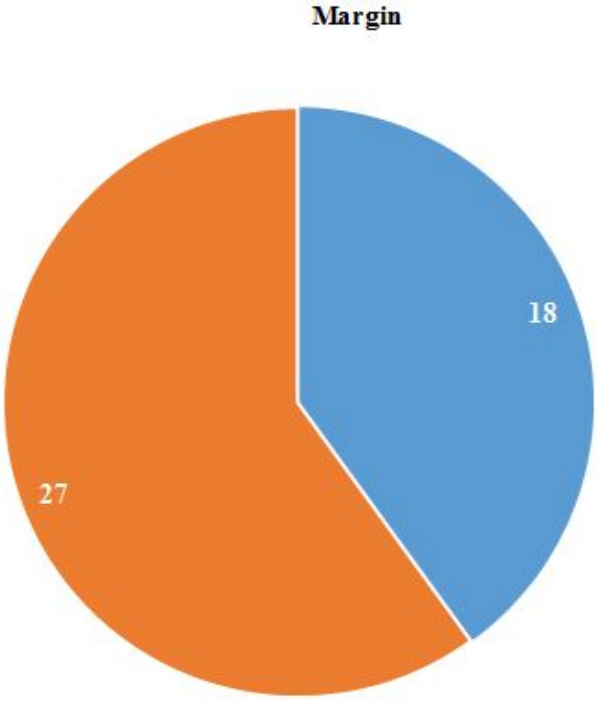

Figure 2: Distribution of lesion based on palpation (n=45).

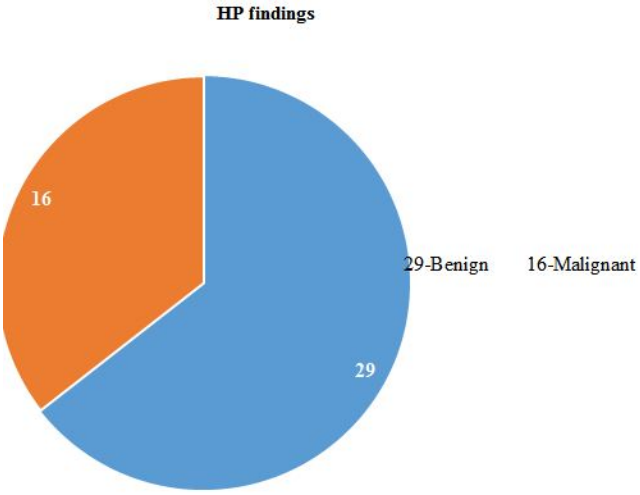

Figure 3: Distribution of lesion based on histopathological examination (n=45).

DISCUSSION

Maximum of the study participants were in the age group of 31-40 years (37.8%). The mean age of the study participants was observed to be 35.2 ± 11.9 years. Prospective study of 215 cases with histopathological correlation. The average age of all patients was 46.6 (20–85years). Similar results were seen in a study done by [5-10] correlating the diffusion-tensor MR Imaging of the breast and hormonal regulation. In their study 8 out of 45 patients (17.7%) were on HRT which is similar to findings of our study. The study concluded that modulations in diffusion parameters due to HRT and lactation should be taken into account in DTI evaluation as it changes different properties of breast tissue. In the present study Fibroadenoma (53.3%) is the most common histopathological findings among the study participants followed by ductal carcinoma in situ (13.3) and Intralobular carcinoma (11.1%). Most common neoplasm was invasive ductal carcinoma followed by lobular, cribriform, mixed, tubular and other carcinomas. Four patients had bifocal lesions: 2 ductal carcinomas, 1 cribriform carcinoma and 1 lobular carcinoma. In the group of benign lesions, the most common lesion was fibrocystic dysplasia, followed by fibro adenoma, benign phyllodes tumor, papilloma and adipose tissue necrosis. Majority of the lesion did not show any calcification (77.8%) whereas; micro calcification was seen in 15.6% of the lesion and micro calcification in 6.7% of the lesions. Calcification of the lesion was not found in majority of the benign (89.7%) and malignant (56.3) tumours, while 37.5% of the malignant lesions showed micro calcification and 6.3% of the lesions showed macro calcification. The association was found to be not statistically significant (p value - 0.11). Maximum of the study participants lesions had circumscribed margin (48.9%) followed by speculated (22.2%), indistinct (11.1%) and angular (11.1%). Round is the most common shape of the lesions (35.6%) followed by irregular (31.1%) and oval shape (24.4%). Sixty percent of the lesions had parallel orientation while the rest 40% of the lesions had anti-parallel orientation. About 76% of the benign tumours classified according to VTI scores had circumscribed margin and 56% of the malignant tumours had speculated margin. The association was found to be significant (p value<0.00).

In a study of 91 breast lesions reported a sensitivity of 79% and a specificity of 89%. However, when only lesions up to 2 cm were analysed, the values increased to 86% and 100%, respectively. Ueno and co-authors in their case series of 111 breast lesions measuring up to 3 cm, all cyto/histologically confirmed, reported a sensitivity of 86.5%, a specificity of 89.8% for SE as compared with correspondent values of 96.2% and 62.7% for conventional US when the malignancy cut-off point was set between BIRADS category 3 and 4.

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