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COMPARATIVE ANALYSIS OF BREAST LUMP HISTOPATHOLOGY AND ELASTOGRAPHY RESULTS AT A TERTIARY HOSPITAL

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ABSTRACT

Background: In the majority of India's urban populations, breast cancer has become the most common type of cancer. A non-invasive imaging method called breast sono-elastography can reveal information about breast lesions.

Aims & objectives: In the current study, we compared the diagnostic efficacy of elastography and histopathology findings of breast lumps.

Material and Methods: The current study involved female patients with solid breast lesions that were sonographically visible and less than 3 cm in size. These lesions were classified as BI RADS 3 and 4 lesions.

Results: 252 female patients had USG elastography during the study period, followed by biopsy or surgery, and histopathology results were made accessible. Histopathologically, 104 (41.72%) of the samples were benign and the remaining 148 (58.73%) were malignant. Age, BIRADS, Elastography Score, and Strain Ratio were all statistically substantially higher in malignant cases compared to benign cases (p 0.001). The majority of benign lesions, according to histopathological diagnosis, were fibroadenomas (77.03%), followed by fibrocystic disease (9.46%), benign fibroepithelial lesions (6.76%), abscesses (5.41%), and sclerosing adenosis (1.35%). While invasive ductal carcinoma (67.31%), invasive mucinous carcinoma (13.46%), invasive poorly differentiated carcinoma (5.77%), ILC (5.77%), medullary carcinoma (1.92%), papillary carcinoma (1.92%), and phylloids (1.92%) made up the bulk of malignant cases.

Combining the Ultrasound Score, Elastography Score, and Strain Ratio resulted in excellent results, with sensitivity, specificity, diagnostic accuracy, NPV, and PPV of 96.00%, 96.05%, 96.03%, 94.12%, and 97.33%, respectively.

Conclusion: The ability to distinguish between benign and malignant breast masses using ultrasound elastography, strain elastography, and ultrasound score has high sensitivity, specificity, and diagnostic accuracy.

Keywords: breast lump, breast malignancy, elastography, histopathology

Introduction

In the majority of India's metropolitan populations, breast cancer has become the most common type of cancer. It is quickly overtaking cervical cancer as the most significant primary location of cancer in women[1]. The aetiology of disease is thought to be influenced by a number of etiological factors, including age, genetics, family history, nutrition, alcohol, obesity, lifestyle, physical inactivity, and endocrine factors. The "gold standard" method for finding breast lumps is a biopsy, but this procedure is invasive and expensive to diagnose. Elastography has gained popularity as an additional technique to ultrasonography for noninvasive breast cancer screening in recent years. Real-time elastography is used in addition to traditional US, increasing the diagnostic precision. A non-invasive imaging method called breast sono-elastography can reveal information about breast lesions[2-4]. It

measures a breast lesion's hardness in proportion to the tissue around it, making a distinction between benign and cancerous tissue possible. Strain (compression based) and shear wave elastography are two methods that can currently be used in clinical settings. The Sonoelastogram's colour scale is used to quantify the lesions. The Tsukuba elasticity score is one of the several scoring systems used in elastography and is also the most well-known[5-7]. In the current study, we examined the diagnostic efficacy of elastography and histopathological findings of breast lumps.

MATERIAL AND METHODS

The current investigation was a prospective observational study carried out in a medical college in central India's department of radiodiagnosis. The research was done between June 2019 and June 2020. (1 year). The ethical committee at the institution gave its blessing.

Female patients with solid breast lesions that are sonographically evident and less than 3 cm in size and are BI RADS 3 or 4 are required to meet the inclusion criteria.

Exclusion standards: Solid lesions with cysts that fall with BIRADS categories 2 or 5 Those that are close to the skin's surface, the chest wall, or No cytologic or histopathologic diagnosis for the lesions.

Before being a part of the study, each participant provided a signed, informed consent. One of the two radiologists with 8 and 10 years of experience in breast ultrasounds and training in elastography performed real-time ultrasound followed by SE on a Samsung RS80A unit (Samsung Medison BLDG., 42 Teheran ro 108 gil, Gangnam gu, Seoul 135 851, South Korea) using a 3-12 MHz linear array transducer.

The demographic information, prior history, and clinical examination results were recorded. The lesions were initially evaluated by conventional B mode ultrasonography with patients lying supine and a radial scanning pattern. Using common ultrasound features like shape, echotexture, margin, orientation, and posterior acoustic characteristics, each lesion was given a BI RADS category. Following it was elastography. The Elastography score (ES) was established using the Itoh et al.-proposed five-point Tsukuba classification. Lesions with an ES of 1-3 were regarded as benign, while lesions with an ES of 4 or 5 were thought to be cancerous. The region of interest (ROI) was first placed in the target lesion and the region of interest (ROI) was then placed in lateral subcutaneous fat tissue that was similar in size and depth to the target lesion. The reference standard for comparing the findings of conventional ultrasound and elastography was the histopathological results obtained for biopsy or surgical specimens. The Mann-Whitney U test was used to compare the sonographic and elastographic characteristics for benign and malignant lesions in relation to the histological diagnosis. A P value of 0.05 was used to determine the degree of significance.

RESULTS

252 female patients had USG elastography during the study period, followed by biopsy or surgery, and histopathology results were made accessible. Histopathologically, 104 (41.72%) of the samples were benign and the remaining 148 (58.73%) were malignant. Age, BIRADS, Elastography Score, and Strain Ratio were all statistically substantially higher in malignant cases compared to benign cases (p 0.001).

Table 1: Mean values of variables with respect to histopathological diagnosis

Variants	Benign	Malignant	P
Age	39.49 ± 10.42	55.44 ± 14.35	<0.001
BIRADS	3.19 ± 0.25	4.33 ± 0.33	<0.001
Elastography Score	2.21 ± 0.31	4.34 ± 0.31	<0.001
Strain Ratio	1.41 ± 0.43	4.34 ± 1.16	<0.001

The majority of benign lesions, according to histopathological diagnosis, were fibroadenomas (77.03%), followed by fibrocystic disease (9.46%), benign fibroepithelial lesions (6.76%), abscesses (5.41%), and sclerosing adenosis (1.35%). While invasive ductal carcinoma (67.31%), invasive mucinous carcinoma (13.46%), invasive poorly differentiated carcinoma (5.77%), ILC (5.77%), medullary carcinoma (1.92%), papillary carcinoma (1.92%), and phylloids (1.92%) made up the bulk of malignant cases,

Table 3: Histopathological diagnosis amongst malignant and benign lesions

HPE RESULTS	Number Of Cases	Percentage (%)
Benign (n=148)		
Fibroadenoma	114	77.03%
Fibrocystic disease	14	9.46%
Benign fibroepithelial lesion	10	6.76%
Abscess (ABS)	8	5.41%
Sclerosing adenosis	2	1.35%
Malignant (n=52)		
Invasive ductal carcinoma	70	67.31%
Invasive mucinous carcinoma	14	13.46%
Invasive poorly differentiated carcinoma	8	7.69%
ILC	6	5.77%
Medullary Ca	2	1.92%
Papillary Ca	2	1.92%
Phylloids	2	1.92%

Though scores were good, excellent scores were noted with the combination of Ultrasound Score + Elastography Score + Strain Ratio as sensitivity, specificity, diagnostic accuracy, NPV, and PPV of 96.00%, 96.05%, 96.03%, 94.12%, and 97.33%, respectively. We compared sensitivity, specificity, diagnostic accuracy, NPV, and PPV for elastography score, strain ratio, ultrasound score, combined elastography score and strain ratio.

Table 4: Comparison of sensitivity, specificity, diagnostic accuracy, NPV, and PPV for elastography score, strain ratio, ultrasound score, combined elastography score and strain ratio, and combined scores

Parameter	Elastography Score	Strain Ratio	Ultrasound Score	Elastography Score + Strain Ratio	Ultrasound Score + Elastography Score + Strain Ratio
Sensitivity (%)	83.72	86.05	88.64	93.88	96.00
Specificity (%)	92.77	93.98	92.68	94.81	96.05
Positive Predictive Value (%)	85.71	88.10	86.67	92.00	94.12
Negative Predictive Value (%)	91.67	92.86	93.83	96.05	97.33
Accuracy (%)	89.68	91.27	91.27	94.44	96.03

DISCUSSION

In addition to the standard B-mode Ultrasonogram, the sophisticated sonographic technique known as sonoelastography is employed in the evaluation of suspicious breast masses. By applying pressure to the tissues, sonoelastography measures their elasticity. According to research by Thomas A et al. and Lee JH et al., sonoelastography has a sensitivity range of 67% to 83% and a specificity range of 86.7% to 90%. According to studies, elastographic data can be added to traditional B mode USG to increase sensitivity and specificity. Sonoelastography had a sensitivity of 84% for BIRADS III and above categories lesions in the study by ElSaid NAet al., while dynamic MR mammography had a sensitivity of 88%[8-10]. Sonoelastography and MR mammography specificities in the study were 84% and 80%, respectively. In line with other earlier investigations, the combined use of ultrasonic characteristics and elastography parameters (ES and SR) produced superior outcomes than each measure used alone in each category. Out of 90 individuals in the study by Kumar AMS et al., 46 lesions were benign and 44 were malignant. B-mode USG's sensitivity, specificity, and diagnostic accuracy were calculated to be 71.74%, 90.91%, and 81.11%, respectively, while elastography's values were 95.65%, 68.18%, and 82.22%. They came to the conclusion that elastography could supplement

traditional B-mode USG and enhance diagnostic performance. Similar results were seen in the current investigation[11-14]. When a cutoff value of 3 was utilised for the elasticity score in Sinha R et alstudy .'s of 120 breast lump patients, sensitivity of 97.0% and specificity of 86.7% were noted. When a cut off of 3.8 was utilised for strain ratio, a specificity of 95.5% and a sensitivity of 93.3% were noted (SR). In every instance, the ultrasound elastography examination's predictions of the pathology's scope, its local or contiguous dissemination, and its vascular involvement were in good agreement with the cytological findings. Jishan.Ahmed examined 106 individuals, and HPE revealed 31 malignant tumours and 74 benign lesions, or 70.48 percent each. In order to diagnose a malignant breast lump, the USE and FNAC tests' sensitivity, specificity, positive and negative predictive values were 88%, 98.57%, 95.65%, 95.79%, and 89.28%, 100%, 100%, 96.05%, respectively[15-17]. Similar results were seen in the current investigation. The ultrasonic elastography approach is one of the best diagnostic modalities for finding breast cancer. Ultrasound elastography revealed sensitivities of 0.9907 and 0.9 in comparison to biopsies, respectively. When the classical ultrasound BIRADS score was upgraded or downgraded based on both qualitative and semiquantitative elastographic data ("BIRADS TM"), the AUC value of breast cancer ultrasound screening increased from 0.77 for classical ultrasound to 0.86. Quantitative elastography with SR demonstrates improved USG specificity, enables early detection of breast cancer in the subcentimeter range, and reduces the need for biopsies. In a clinical setting, strain elastography is helpful in determining whether to intervene or follow patients with imaging[18-21].

CONCLUSION

The ability to distinguish between benign and malignant breast masses using ultrasound elastography, strain elastography, and ultrasound score has good sensitivity, specificity, and diagnostic accuracy. Elastography has limitations since the degree of tissue compression affects the results. Light pressure should be maintained for tissue diagnosis because strong pressure can cause misdiagnosis. The elasticity score may be impacted by large malignant lesions that have necrosis, hemorrhage, or sarcomatous components.

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