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Efficacy of dynamic MR mammogram versus Sonoelastography for BI-RADS III and above breast lesions

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Abstract
Introduction: Globally, breast cancer is the leading cause of cancer-related mortality for women and the most common malignancy in terms of diagnoses. Early detection of breast cancer is key to its optimum management and control. Noninvasive imaging methods for the diagnosis of breast lesions include MR mammography and sonoelastography. Determining the efficacy of dynamic MR mammography and sonoelastography in assessing breast masses with BIRADS-III or higher lesion categories was the aim of this study.
Materials and Methods: Forty-eight female patients with breast cancer older than 28 years old, clinically and histopathologically diagnosed, were included. Each subject underwent a typical B mode ultrasonography. Sonoelastography was employed to assess patients with lesion types BIRADS-III and above, and dynamic contrast enhances MR mammography. A 1.5 Tesla GE MRI was utilized to perform MR mammography. Axial and sagittal T1 and T2 WI, DWI, and axial STIR sequences were used.
Results: Histopathological examination showed benign lesion in 62.5% and malignant in 37.5% of cases. The predictive validity of MRI curve category exhibited the sensitivity, specificity, PPV, NPV and Diagnostic accuracy was 92.4%, 96.1%, 98.3%, 94%, and 95.7% respectively. Whereas for sonoelastrography grading, the sensitivity, specificity, PPV, NPV and Diagnostic accuracy was 80.9%, 92.8%, 90.2%, 84.31% and 82.6%.
Conclusion: sonoelastography and MR mammography are good diagnostic methods for breast lesions, according to the results, while MR mammography has higher diagnostic accuracy, sensitivity, and specificity.

Keywords: Breast lesions, birads, sonoelastography, histopathological examination, MR mammogram, diagnostic accuracy

Introduction
Breast masses have a variety of etiologies, benign and malignant. Most breast masses are benign, breast cancer is the most common cancer and the second leading cause of cancer deaths in women in rural India and globally [1, 2].
There are several diagnostic methods available for breast cancer early diagnosis. A small number of methods were used to screen for conditions, a few to diagnose sickness severity, and a few in addition to evaluation. Adjunctive diagnostic techniques provide additional corroborating data to physicians when diagnosing illnesses [3]. Commonly utilized methods for screening and diagnosing breast cancer include optical imaging, computed tomography (CT), magnetic resonance imaging (MRI), mammography, thermography, and positron emission tomography (PET) [4].
A non-invasive method of imaging the breast, magnetic resonance imaging (MR mammography) yields high-quality images with an intermediate specificity (72%) and a greater sensitivity (around 90%) for differentiating between benign and malignant breast lesions [5-7]. Tumor size is more accurately detected by contrast-enhanced magnetic resonance imaging (MRI) than by ultrasonography and mammography [8]. Sonoelastography is an imaging technique that measures tissue elasticity objectively using ultrasound. Sonoelastography has been shown in many clinical studies to be useful in differentiating benign from malignant breast lesions, with a sensitivity of 78.0-100% and a specificity of 91.0-98.5% [9–11].

Ultrasonography provides greater sensitivity but lower specificity. In order to tackle these problems, the United States developed elastrography. US elastography is a non-invasive imaging technique used to diagnose breast lesions. It assesses tissue deformation by measuring elasticity [12]. The objective of this study was to assess the efficacy of sonoelastography and dynamic MR mammography in the evaluation of breast masses classified as BIRADS-III and above.

Materials and Methods

The present longitudinal study was conducted at MNR Medical College and Hospital's Department of Radiodiagnosis from January 2023 to June 2024. We included 48 female patients over the age of 28 who had been diagnosed with breast cancer using clinical and histological techniques. Following a preliminary clinical examination and local palpation of the breast mass, a Real-time conventional B-mode ultrasonography examination was performed to identify lesions classified as BIRADS III or above. Only patients with BIRADS III or higher lesion classifications, mammary gland lesions greater than 5mm, and cases who agreed to participate in the study were included. The study excluded cases that fell into the BIRDS I and II lesion categories, cases with non-solid breast lesions, and scenarios in which patients declined to participate. All research participants gave informed consent, and the study process was authorized by the institutional ethics committee. All subjects received sonoelastography and strain wave elastography using a linear array transducer. A mammogram was performed using a 1.5 Tesla GE MRI machine. The following procedures were used: axial and sagittal T1 weighted imaging (T1 WI), T2 weighted imaging (T2 WI), diffusion-weighted imaging (DWI), and axial short tau inversion recovery (STIR). The statistical analysis relevant to the study was carried out using the SPSS version 23.0 software. Descriptive statistics were employed to represent demographic and clinical characteristics in terms of frequency and percentages.

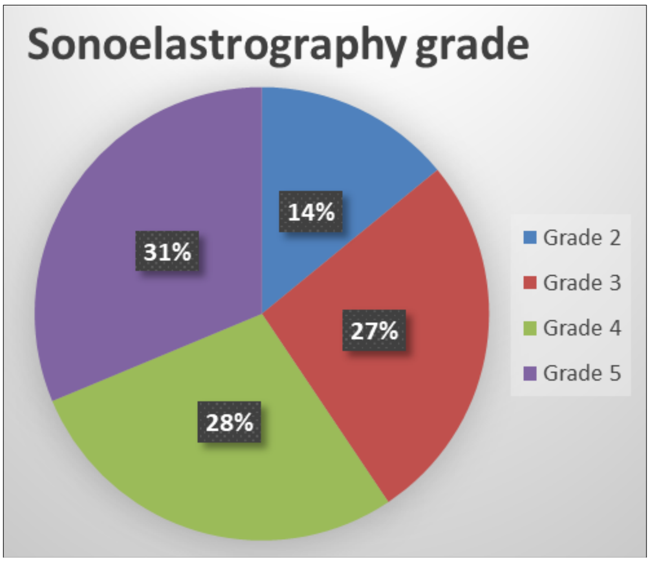
Results

Table 1: Age wise distribution of study participants

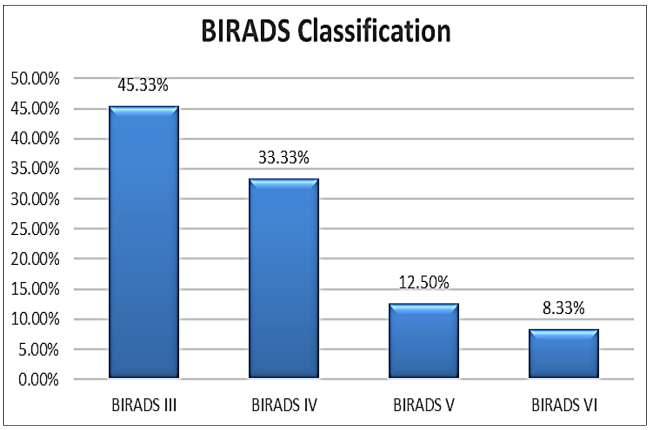
Demographic details	Total no of cases (n=48)	
	Frequency	Percentage
28-40	15	31.25%
41-50	21	43.75%
51-60	09	18.75%
>60	03	6.25%
Laterality of Lesion		
Unilateral right	05	10.41%
Unilateral left	03	6.25%
Bilateral	40	83.33%

Table 2: Histopathological and radiological findings in the study participants

Findings	Total cases (n=48)	
	Frequency	Percentage
Histopathological examination		
Malignant	18	37.5%
Benign	30	62.5%
MRI curve type		
Type 1	22	45.83%
Type 2	09	18.75%
Type 3	17	35.47%



Graph 1: Sonoelastrography grading of lesions among study participants.



Graph 2: BIRADS classification of lesions

Table 3: Comparison of radiological findings with histopathological findings.

HPE findings	MRI curve category		Sonoelastography grading	
	Malignant	benign	Malignant	Benign
Malignant	16	02	15	03
Benign	02	28	05	25
P value	0.0362*		0.0418*	

Table 4: Outcome comparison of radiological assessment with HPE findings

Predictive validity	MRI curve category	Sonoelastography grading
Sensitivity	92.4%	80.9%
Specificity	96.1%	92.8%
Positive predictive value	98.3%	90.2%
Negative predictive value	94%	84.31%
Diagnostic accuracy	95.7%	82.6%

Discussion

Majority participants were between 41-50 years (43.75%), followed by 28-40 years (31.25%). Bilateral lesions were commonly reported in 83.33% of cases, followed by unilateral right side in 10.41% and unilateral left side in 6.25% of cases (Table 1). Based on histopathological examination, 62.5% of cases showed benign lesions and 37.5% of cases had malignant lesions. Type 1 MRI curve was observed in 45.83%, type 2 curve in 18.75% and type 3 curve in 35.47% (Table 2). According to sonoelastrography grading, grad2 lesion were ssen in 14%, grade 3 in 27%, grade 4 in 28% and grade 5 lesion in 31% of cases (Graph 1). Based on BIRADS classification, 45.33% showed BIRADS III, 33.33% had BIRAD IV, 12.50% had BIRAD V and 8.33% had BIRAD VI type (Graph 2).

A study by Kim EK *et al*, reported that the clinical application of BI-RADS final assessment to breast sonography was successful as a predictor of malignancy [13]. Mostafa M. Shakweer *et al* discovered that magnetic resonance spectroscopy and sonoelastography are effective non-invasive diagnostic procedures for identifying early-stage breast cancer [14]. A study by Ghada A. Elmoneam *et al* on 63 cases with breast lesions characterized as BIRADS-IV category. The HPE findings showed that 41.3% had benign lesion and 58.7% cases had malignant lesions. Study found the sensitivity (100%), specificity (92.3%) and diagnostic accuracy (96.8%) for DC-MRI curve [15]. Architectural aspects that may be used to diagnosis lesions in high-spatial resolution, contrast-enhanced MR imaging investigations have not been extensively studied. Architectural features that indicate malignancy include a tumor with irregular or speculated borders, a mass with peripheral enhancement, and ductal enhancement [16, 17].

A study by Ghazala S *et al* mammographic findings showed BIRADS-III category in 12 cases (probably benign-6, proved benign-5, malignant-1), BIRADS-IV category in 21 lesions (Malignant-19, benign-2) and BIRADS-V category in 3 lesion which are malignant in nature. HPE showed that 19.4% cases had benign lesions and 77.5% cases had malignant lesions. It was also found a total of 66.7% sensitivity, specificity of 91.5%, 95.4% positive predictive value, 53.3% negative, and 73.1% overall. In ultrasonography, 86.7% specificity, 87.8% positive predictive value, negative predictive value, and accuracy of 94.6%, 66.8%, and 85.2% [18]. Similarly in present study for MRI curve category the sensitivity, specificity, PPV, NPV and Diagnostic accuracy was 92.4%, 96.1%, 98.3%, 94%, and 95.7% respectively. Whereas for sonoelastrography grading, the sensitivity, specificity, PPV, NPV and Diagnostic accuracy was 80.9%, 92.8%, 90.2%, 84.31% and 82.6%.

Conclusion

While both MR mammography and sonoelastography are useful in distinguishing breast lesions, sonoelastography is more specific, more affordable, and enhances the diagnostic efficacy of breast lesions. Breast lesions may be found early with the use of dynamic contrast MRI. Morphological and kinetic curve analysis were included, which improved the MR mammography's sensitivity and specificity. Both sonoelastography and MR mammography are good diagnostic methods for breast lesions, according to the current research, while MR mammography has higher diagnostic accuracy, sensitivity, and specificity.

References

1. American Cancer Society. Cancer facts and figures 2003. Accessed online October 14, 2004.
2. Agarwal G, Ramakant P. Breast cancer care in India: the current scenario and the challenges for the future. Breast Care. 2008;3:21-27.
3. Skaane P. Ultrasonography as adjunct to mammography in the evaluation of breast tumors. Acta Radiologica. 1999;420:1-47.
4. Flobbe K, Nelemans PJ, Kessels AG, Beets GL, von Meyenfeldt MF, van Engelshoven JM. The role of sonography as an adjunct to mammography in the detection of breast cancer: a systematic review. European Journal of Cancer. 2002;38:1044-1050.
5. Agarwal G, Ramakant P. Breast cancer care in India: the current scenario and the challenges for the future. Breast Care. 2008;3:21-27.
6. Santoro F, Podo F, Sardanelli F. MRI screening of women with hereditary predisposition to breast cancer: diagnostic performance and survival analysis. Breast Cancer Research and Treatment. 2014;147:685-687.
7. Sree SV, Ng EY, Acharya RU, Faust O. Breast imaging: a survey. World Journal of Clinical Oncology. 2011;2(4):171-178.
8. Agarwal G, Ramakant P. Breast cancer care in India: the current scenario and the challenges for the future. Breast Care. 2008;3:21-27.
9. Hall TJ, Zhu Y, Spalding CS. *In vivo* real-time freehand palpation imaging. Ultrasound in Medicine & Biology. 2003;29:427-435.
10. Regner DM, Hesley GK, Hangiandreou NJ, *et al* Breast lesions: evaluation with US strain imaging – clinical experience of multiple observers. Radiology. 2006;238:425-437.
11. Urnside ES, Hall TJ, Sommer AM, *et al* Differentiating benign from malignant solid breast masses with US strain imaging. Radiology. 2007;245:401-410.
12. Hall TJ. AAPM/RSNA physics tutorial for residents. Topics in US: beyond the basics – elasticity imaging with US. Radiographics. 2003;23:1657-1671.
13. Kim EK, Ko KH, Oh KK, *et al* Clinical application of the BI-RADS final assessment to breast sonography in conjunction with mammography. American Journal of Roentgenology. 2008;190(5):1209-1215.
14. Shakweer MM, AwadAllah AA, Sayed MM, Mostafa AM. Role of sonoelastography and MR spectroscopy in diagnosis of solid breast lesions with histopathological correlation. The Egyptian Journal of Radiology and Nuclear Medicine. 2015;46:1301-1311.
15. Elmoneam GA, Almolla RM, Ahmed AF, Al Ekrashy MA. Supersonic shear waves quantitative elastography and kinetic magnetic resonance dynamic curve in discriminating BI-RADS 4 breast masses: a comparative study. The Egyptian Journal of Radiology and Nuclear Medicine. 2016;47:1773-1782.
16. Kuhl CK, Bieling HB, Gieske J, *et al* Healthy premenopausal breast parenchyma in dynamic contrast-enhanced MR imaging of the breast: normal contrast medium enhancement and cyclical-phase dependency. Radiology. 1997;203:137-144.
17. Orel SG. Differentiating benign from malignant enhancing lesions identified at MR imaging of the breast: are time-signal intensity curves an accurate predictor? Radiology. 1999;211:5-7.
18. Ghazala S, Elgohary M, Zidan D, Yaftah M. Characterization of suspicious breast lesions with dynamic contrast-enhanced MRI in comparison to conventional mammography and ultrasonography. Journal of Cancer Prevention & Current Research. 2016;4(3):00121.