

ORIGINAL RESEARCH

Ultrasonography for the evaluation of hyperechoic breast lesions: a clinical and radiologic investigation

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ABSTRACT

Aim: Ultrasonography for the evaluation of hyperechoic breast lesions.

Material and methods: The retrospective clinical study was conducted, after ethical permission from the institution. An ultrasonographically guided core needle biopsy was performed on 980 of 1000 subjects, with 51 percent (n=510) of lesions being benign, 41 percent (n=410) being malignant, and 8 percent (n=80) being high risk. A single radiologist with expertise in the field performed the ultrasonographically guided core needle biopsy, ultrasonographic imaging, and associated interpretation. Two orthogonal views were captured for documentation. Clinical and mammography parameters and clinical aspects, as well as additional radiologic imaging reports, were evaluated for all research individuals.

Results: A total of 1000 ultrasonographically guided core needle biopsy were performed on 980 participants, with 51 percent of lesions (n=510) benign, 41 percent (n=410) malignant, and 8 percent (n=80) high risk. After examining the picture, the study results revealed that 1 percent (n=10) of the 1000 lesions examined were hyperechoic in 10 females. 1.47 percent (n=6) of 410 malignant lesions were hyperechoic. When the sonographic aspects of hyperechoic malignant lesions were evaluated, it was discovered that vascularity, hypoechoic lesions, shape, and posterior acoustic features were non-significant among benign and malignant hyperechoic lesions, whereas circumscribed margins were seen in 66.67 percent (n=4) and non-circumscribed by 33.33 percent (n=2) study subjects with benign lesions, and by 100% (n=4) study subjects with malignant lesions. With a p-value of 0.06, this difference was statistically significant. In terms of morphology, 100 (n=4) of the malignant lesions had irregular and lobular edges, whereas 83.33 (n=5) of the benign lesions had irregular/lobular margins. With p=0.003, this difference was statistically significant.

Conclusion: The current study reveals that hyperechoic breast lesions on ultrasonography have a low prevalence of 1% (n=10) lesions. As a result, hyperechoic breast lesions are less common on sonography. However, the possibility of cancer should not be ruled out anytime these hyperechoic lesions are seen.

Keywords: Ultrasonography, hyperechoic breast lesions

INTRODUCTION

The significance of breast cancer screening cannot be overstated. Early identification of cancer decreases mortality and frequently allows for breast-conserving surgery. Although mammography is the gold standard for general population breast cancer screening, dense breast composition may make breast cancer more difficult to detect. Because of its capacity to detect a hidden malignancy in women with negative mammography findings, ultrasonography (US) has been widely utilised in the screening of breast cancer in addition to mammography. 1

Many studies have demonstrated that using US as an addition to mammography improves screening sensitivity in women with thick breasts. In women at high risk of breast cancer, adding whole-breast US to screening mammography boosts cancer detection by 4.2 cancers per 1,000 women. 1 Furthermore, whole-breast screening in the United States aids in the diagnosis of more women with nonpalpable invasive tumours, particularly when no additional malignancies are discovered in them using other screening modalities. Asian women's breasts are smaller and denser than Western women's fatter, bigger breasts. 2,3 and screening in the United States has become the standard routine screening method for individuals with dense breasts.

According to the American College of Radiology (ACR) Breast Imaging Reporting and Data System (BI-RADS), one of the most serious concerns is the unacceptably high prevalence of category 3 lesions diagnosed in asymptomatic individuals in the United States. Previous research has found that the frequency of presumably benign lesions in bilateral whole-breast screening in the United States can be as high as 36.9 percent and 33.6 percent in the general population. 4,5 We have been suggesting short-term US follow-up for all patients with these benign-appearing lesions, although this significantly raises treatment costs and false-positive rates. Despite the growing frequency of whole-breast screening US tests and screening US-detected category 3 lesions, only a few studies have looked at the outcome and risk of category 3 lesions discovered using screening US. 6,7 One recent paper based on the results of the American College of Radiology Imaging Network 6666 trial documented the outcome of screening US-detected category 3 lesions, but the study was conducted in women with an increased risk of breast cancer and dense breasts. 8

MATERIAL AND METHODS

The retrospective clinical study was conducted, after ethical permission from the institution. An ultrasonographically guided core needle biopsy was performed on 980 of 1000 subjects, with 51 percent (n=510) of lesions being benign, 41 percent (n=410) being malignant, and 8 percent (n=80) being high risk. A single radiologist with expertise in the field performed the ultrasonographically guided core needle biopsy, ultrasonographic imaging, and associated interpretation. Two orthogonal views were captured for documentation. Clinical and mammography parameters and clinical aspects, as well as additional radiologic imaging reports, were evaluated for all research individuals. Whole-breast ultrasonography was performed on all study subjects using linear transducers with frequencies of 5-12, 5-17, or 10-13 MHz. The current study used whole-breast ultrasound rather than targeted whole-breast ultrasound. Core needle biopsies guided ultrasonographically were performed on all lesions using an automated biopsy gun and a 14-gauge needle. The mean was calculated for each lesion. Follow-up was done at 6 months and 1 year for lesions that were proven to be benign. Full-field mammography was performed in the craniocaudal and oblique planes. A 1.0-T system was used for mammography, while a 1.0-T system was used for MRI.

The photos were independently examined by two radiology professionals with over 8 years of expertise. The BI-RADS lexicon was used to evaluate the ultrasonography findings, which define orientation as nonparallel and parallel, posterior acoustic features as shadowing,

enhancement, or normal, shape as lobular or irregular versus round or oval, vascularity as absent or present, and margins as non-circumscribed versus circumscribed. The nodule's echotexture was classified as hypoechoic when there was less echogenicity in the subcutaneous fat, hyperechoic when there was more echogenicity in the subcutaneous fat, and mixed when there was a combination of hypoechoic and hyperechoic lesions. Hypoechoic regions in hyperechoic identified lesions were analysed and characterised as hypoechoic localised areas displaying 305 of the lesion. Any disagreement between two experts on hypoechoic region, echotexture, and sonographic characteristics was resolved by reaching a single consensus. The pathology results and follow-up of core needle biopsy served as a reference for benign lesions, while the surgical pathology results served as a reference for malignant and high-risk lesions.

RESULTS

The current retrospective clinical study was carried out to evaluate the clinical presentation, frequency, and related imaging findings of hyperechoic malignant breast lesions in cases with core needle biopsies guided ultrasonographically, as well as to evaluate ultrasonographic features that aid in the prediction of the hyperechoic lesion being malignant. A total of 1000 ultrasonographically guided core needle biopsy were performed on 980 participants, with 51 percent of lesions (n=510) benign, 41 percent (n=410) malignant, and 8 percent (n=80) high risk. After examining the picture, the study results revealed that 1 percent (n=10) of the 1000 lesions examined were hyperechoic in 10 females. 1.47 percent (n=6) of 410 malignant lesions were hyperechoic. Low-grade intraductal papillary carcinoma, infiltrating ductal carcinoma with neuroendocrine differentiation-grade I, Grade II infiltrating ductal carcinoma with mucinous differentiation, infiltrating ductal carcinoma not-otherwise-specified-Grade III, infiltrating ductal carcinoma not-otherwise-specified-Grade II, and invasive lobular carcinoma-Grade II were found in 1, 1, 1, 1 and 2 cases, respectively. In the current investigation, 1.96 percent (n=10) of 510 benign lesions were determined to be hyperechoic. Chronic inflammation, hamartoma, fat necrosis, hibernoma, hemangioma, lymph nodes, fibro adenomas, lipomas, angioliomas, and localised fibrosis were found in 1, 1, 1, 1, 1, 1, 2, and 2 individuals, respectively. At the one-year follow-up, no changes in imaging were seen. There were no hyperechoic high-risk lesions among the 80 lesions studied.

The current study additionally evaluated radiographic data and clinical photos of the lesion (Table 2). Clinical findings revealed that among 10, 40 percent (n=4) of females had a palpable nodule in the breast, while 60 percent (n=6) had no symptoms. Sonography was performed on four of the six asymptomatic participants during breast cancer screening, and one subject was followed up on for a previously detected breast tumour. Mammograms were also performed on eight of the research individuals. MRI of the breast was performed on four study females due to preoperative breast cancer evaluation in three subjects, breast cancer screening in two subjects, and assessing surgical scar in one patient. When the sonographic aspects of hyperechoic malignant lesions were evaluated, it was discovered that vascularity, hypoechoic lesions, shape, and posterior acoustic features were non-significant among benign and malignant hyperechoic lesions, whereas circumscribed margins were seen in 66.67 percent (n=4) and non-circumscribed by 33.33 percent (n=2) study subjects with benign lesions, and by 100% (n=4) study subjects with malignant lesions. With a p-value of 0.06, this difference was statistically significant. In terms of morphology, 100 (n=4) of the malignant lesions had irregular and lobular edges, whereas 83.33 (n=5) of the benign lesions had irregular/lobular margins. With p=0.003, this difference was statistically significant (Table 3).

Table 1: Gender and age distribution of the patients

Gender	Number	Percentage
Male	525	52.5
Female	475	47.5
Age		
Below 30	210	21
30-40	355	35.5
40-50	285	28.5
Above 50	150	15

Table 2: Characteristics of hyperechoic malignant tumours based on clinical and radiographic examination

Palpability	Breast cancer history	MRI Correlation	Mammography Correlation	Size	Vascularity	Sonographic Features
No	No		no	12	yes	Non-Parallel, non-circumscribed, hyperechoic
yes	yes	No	yes	8	yes	Parallel, circumscribed, hyperechoic
No	No	yes	yes	14	No	Non-Parallel, non-circumscribed, no hyperechoic lesion
yes	yes		No	11	yes	Non-Parallel, no circumscribed, hyperechoic
No	yes	yes	yes	10	yes	Non-Parallel, no circumscribed, hyperechoic
yes	No			9	yes	Non-Parallel, no circumscribed, no hyperechoic lesion

Table 3: Ultrasonographic findings of hyperechoic lesions

Features	Benign % (n=6)	Malignant % (n=4)	p-value
Posterior acoustic features			
Absent	66.67 (4)	25 (1)	0.88
Shadowing	33.33 (2)	75 (3)	
Vascularity			
Present	66.67 (4)	75(3)	0.74
Absent	33.33 (2)	25 (1)	
Shape			
Round/oval	83.33 (1)	0	0.55
Irregular/lobular	16.67 (5)	100 (4)	
Hypoechoic areas			
Present	33.33 (2)	(0)	0.76
Absent	66.67 (4)	100 (4)	
Margins			
Circumscribed	66.67 (4)	(0)	0.006

Non-circumscribed	33.33 (2)	100 (4)	
Orientation			
Parallel	83.33 (5)	25(1)	0.003
Non-parallel	16.67(1)	75(3)	

DISCUSSION

Ultrasonography (US) has evolved into a vital technique in breast imaging. Breast US was initially presented in the 1950s, utilising radar technology derived from the United States Navy. Over the following few decades, US was predominantly employed in breast imaging to identify cystic from solid tumours. This was clinically significant since a simple breast cyst is a benign discovery that does not necessitate further investigation. However, because US proved insufficiently specific in distinguishing benign from malignant solid breast masses, the majority of solid breast tumours remained ambiguous and required biopsy. Recent developments in US technology, on the other hand, have permitted for enhanced characterisation of solid masses. The current retrospective clinical study was carried out to evaluate the clinical presentation, frequency, and related imaging findings of hyperechoic malignant breast lesions in cases with core needle biopsies guided ultrasonographically, as well as to evaluate ultrasonographic features that aid in the prediction of the hyperechoic lesion being malignant.

A total of 1000 ultrasonographically guided core needle biopsy were performed on 980 participants, with 51 percent of lesions (n=510) benign, 41 percent (n=410) malignant, and 8 percent (n=80) high risk. After examining the picture, the study results revealed that 1 percent (n=10) of the 1000 lesions examined were hyperechoic in 10 females. 1.47 percent (n=6) of 410 malignant lesions were hyperechoic. Chronic inflammation, hamartoma, fat necrosis, hibernoma, hemangioma, lymph nodes, fibro adenomas, lipomas, angioliomas, and localised fibrosis were found in 1, 1, 1, 1, 1, 1, 2, and 2 individuals, respectively. At the one-year follow-up, no changes in imaging were seen. There were no hyperechoic high-risk lesions among the 80 lesions studied. These findings were congruent with those of Vaidya T et al.⁹ in 2018 and Linda A et al.¹⁰ in 2011, in which the authors demonstrated a comparable distribution of hyperechoic breast lesions.

The current study's findings revealed that, based on clinical findings, 40 percent (n=4) of females had a palpable nodule in the breast, whereas 60 percent (n=6) had no symptoms. Sonography was performed on four of the six asymptomatic participants during breast cancer screening, and one subject was followed up on for a previously detected breast tumour. MRI of the breast was performed on four study females due to preoperative breast cancer evaluation in three subjects, breast cancer screening in two subjects, and assessing surgical scar in one patient. The study findings revealed that of 6 hyperechoic malignant lesions, 1 person had synchronous invasive carcinoma in the opposite breast, whereas 1 subject had metachronous invasive carcinoma in the opposite breast.

Sonography revealed that no patient had a pure lesion. 3 lesions were palpable, 3 participants had a history of breast cancer, 2 subjects had MRI correlation, 3 subjects had mammography correlation, and 5 lesions exhibited vascularity. These findings were consistent with those of Adrada B et al.¹¹ in 2013 and Nassar L et al.¹² in 2016, who conducted clinical evaluations of hyperechoic breast lesions and obtained comparable results as the current study. The current study additionally looked at the sonographic features of hyperechoic malignant lesions. When the sonographic aspects of hyperechoic malignant lesions were evaluated, it was discovered that vascularity, hypoechoic lesions, shape, and posterior acoustic features were non-significant among benign and malignant hyperechoic lesions, whereas circumscribed margins were seen in 66.67 percent (n=4) and non-circumscribed by 33.33 percent (n=2) study subjects with benign lesions, and by 100% (n=4) study subjects with

malignant lesions. With a p-value of 0.06, this difference was statistically significant. In terms of morphology, 100 (n=4) of the malignant lesions had irregular and lobular edges, whereas 83.33 (n=5) of the benign lesions had irregular/lobular margins. With a p-value of 0.003, this difference was statistically significant. With p=0.002, this difference was statistically significant. These findings were analogous to the findings of Yeh ED et al.¹³ in 2013 and Bhatia M, et al.¹⁴ in 2015, in which authors demonstrated more irregular margins and non-circumscribed form of the malignant hyperechoic lesions.

CONCLUSION

The current study reveals that hyperechoic breast lesions on ultrasonography have a low prevalence of 1% (n=10) lesions. As a result, hyperechoic breast lesions are less common on sonography. However, the possibility of cancer should not be ruled out anytime these hyperechoic lesions are seen. Correlating suspected sonographic lesions to other clinical, histopathologic, and imaging modalities might help to avoid misdiagnosis in suspicious hyperechoic lesions.

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