

Objective Evaluation of Fibrocystic Breast Disease by Sonoelastography

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Abstract

Background: Fibrocystic breast disease is a common benign disease of young women associated with significant anxiety as it presents not only with pain but also with palpable firm areas in breast. High resolution ultrasonography of breast may reveal nonspecific findings in a significant proportion of these patients. Sonoelastography is relatively a newer technique utilized primarily in differentiation of the benign from malignant diseases in breast. Hence, we planned a study to evaluate this new sonoelastography technique as an objective tool in fibrocystic breast disease.

Material/Method: Fifty breasts with clinical disease were evaluated by ARFI to obtain VTTQ value in m/sec within the superolateral quadrant & axillary tail in 20-35years females. The data thus obtained was compared with values in clinically normal breasts of similar age controls and with the final diagnosis which was either clinical follow-up or fine-needle aspiration cytology or biopsy (FNAC/FNAB). Sensitivity, specificity and accuracy of sonoelastography was then calculated.

Results: Though using the cut-off value of 2.5m/sec there were few false positives and false negative results with sonoelastography but still the sensitivity, specificity and accuracy of sonoelastography for detecting fibrocystic breast disease in our study was 92%, 84% and 88% respectively.

Conclusions: Sonoelastography may be used as an objective imaging tool for diagnosis of fibrocystic breast. It is not only invasive but may also obviate the need for tissue diagnosis which is invasive.

Keywords: Sonoelastography, fibrocystic breast disease

Introduction

Fibrocystic breast disease (FBD), also referred to as fibroadenosis is a benign disease of breast [1]. It is characterized clinically by mastalgia, firm palpable regions in the breast and at times a suspicious palpable lump requiring further imaging or tissue diagnosis [1].

Mastalgia occurring in FBD is characteristically premenstrual and is partially or completely relieved with menstrual flow associated with decreased firmness of breast tissue [1].

Elastography is a newer imaging technique that utilizes alterations in the elastic properties of the involved tissues for detection of various pathologies. Combination of high-resolution ultrasonography (HRUS) with elastography is

referred to as sonoelastography (SE). Sonoelastography can be performed by utilizing strain (compression wave) or shear-wave method, latter being more reproducible and objective. Shear-wave elastography can be performed by continuous or point methodology, with latter being faster, more accurate, and more reproducible. Point shear wave elastography can be performed by a technique known as *acoustic radiation forced impulse (ARFI)* where the elasticity of evaluated tissue is objectively represented by velocities in m/sec through virtual-touch tissue quantification (VTTQ).

Pathologically, FBD is seen as a benign cystic alteration in the terminal ductal lobular unit of the breast associated with variable degrees of nonspecific inflammation and fibrosis.

Though imaging by HRUS may reveal altered echogenicity of fibroglandular tissue with coarsened echopattern with or without cystic lesions especially in the areas of palpable lump/tenderness in a significant proportion of patients but majority are interpreted as normal on imaging.

For long, HRUS along with sonoelastography is being utilized for differentiating benign from malignant breast

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diseases [2,3]. Since sonoelastography is a recent technique being evaluated for its various applications in breast imaging, hence we designed a study to evaluate sonoelastography as a probable objective tool in patients fibrocystic breast disease.

Aims & Objectives

- To evaluate role of Sonoelastography in evaluation of fibrocystic breast disease.
- To evaluate objective role of ARFI using VTTQ in differentiating normal from fibrocystic breast parenchyma

Material & Methods

This hospital-based, comparative, case-control study was performed in our institution. Equal number (50 each) of age-matched controls, normal subjects with no breast complaints and those with pathological breasts, with clinical fibrocystic disease in females of 20-35 years were evaluated by sonoelastography using a high resolution, linear array transducer (5-9MHz) in premenstrual phase of monthly cycle. Patients with coexisting lesions other than simple cysts and fibroadenoma were excluded from the study group (simple cysts and fibroadenoma form the spectrum of fibrocystic breast disease and hence may coexist).

Virtual touch tissue quantification (VTTQ) data was collected from fibroglandular parenchyma in the region of axillary tail and superolateral quadrant of breast in both normal and clinical disease groups due to high proportion of fibroglandular tissue & prevalence of FBD in these areas of breast. Data thus obtained was compared with clinicopathological diagnosis, either clinical follow-up or FNAC/FNAB for statistical evaluation.

Observations

Table 1 shows that equal number of age-matched normal and diseased breasts were evaluated in our study. Disease group is formed by patients with clinical or pathological diagnosis of FBD and without any abnormality other than simple cyst or fibroadenosis. Clinical diagnosis was confirmed by reversal of signs & symptoms of disease with treatment

Table 1: Distribution of breasts based on normal and clinically suspected fibroadenosis

	Normal	Clinically Suspected
No. of Breast	50	50

Table 2 & 3 show distribution of VTTQ values in superolateral quadrant (SLQ) & axillary tail of normal

breasts. It is evident that nearly 42/50 normal breasts revealed VTTQ value more than 2.5m/sec in either SLQ or axillary tail with only 8/50 (16%) having values less than 2.5m/sec (Image 1). All breasts with VTTQ <2.5m/sec in SLQ were also a part of axillary tail group.

Table 2: Control Distribution based on VTTQ values in SLQ of Normal breast

	>2.5m/sec	<2.5m/sec
No. of Breast	42	8

Table 3: Control Distribution based on VTTQ values in Axillary tail of Normal breast

	>2.5m/sec	<2.5m/sec
No. of Breast	40	10

Table 4 & 5 show distribution of VTTQ values in superolateral quadrant (SLQ) & axillary tail of diseased breasts. It is evident that nearly 46/50 diseased breasts revealed VTTQ value less than 2.5m/sec in either SLQ or axillary tail with only 4/50 (8%) having values more than 2.5m/sec (Image 2). All breasts with VTTQ <2.5m/sec in SLQ were also a part of axillary tail group.

Table 4: Patient Distribution based on VTTQ values in SLQ of diseased breast

	>2.5m/sec	<2.5m/sec
No. of Breast	5	45

Table 5: Patient Distribution based on VTTQ values in Axillary tail of diseased breast

	>2.5m/sec	<2.5m/sec
No. of Breast	4	46

Using the cut-off value 2.5m/sec on VTTQ which is a recommended for normal breast tissue, the sensitivity, specificity and accuracy for sonoelastography in patients with fibrocystic breast disease in our study was 92%, 84% and 88% respectively.

Discussion

Technique of elastography is based on measuring the speed of sound within tissues which is maximum in solids and minimum in gases. Any increase in water content of the tissues thus decreases the velocity or travel speed of sound.

Fibrocystic breast disease (FBD), also referred to as fibroadenosis is a non-infectious inflammatory disease of fibroglandular tissue of breast resulting in an increase in water content of breast parenchyma relative to normal with consequent reduction in elasticity and VTTQ values [1].

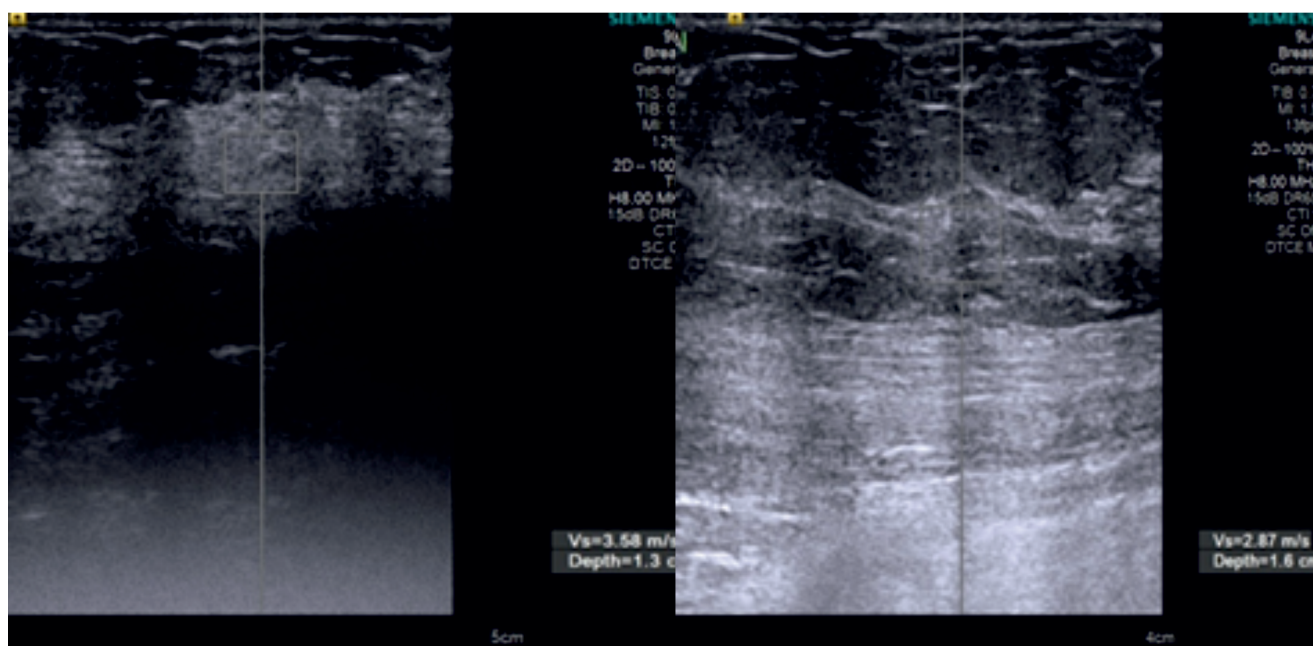


Image 1: Sonoelastography images through SLQ & Axillary tail of normal breast show VTTQ values >2.5 m/sec

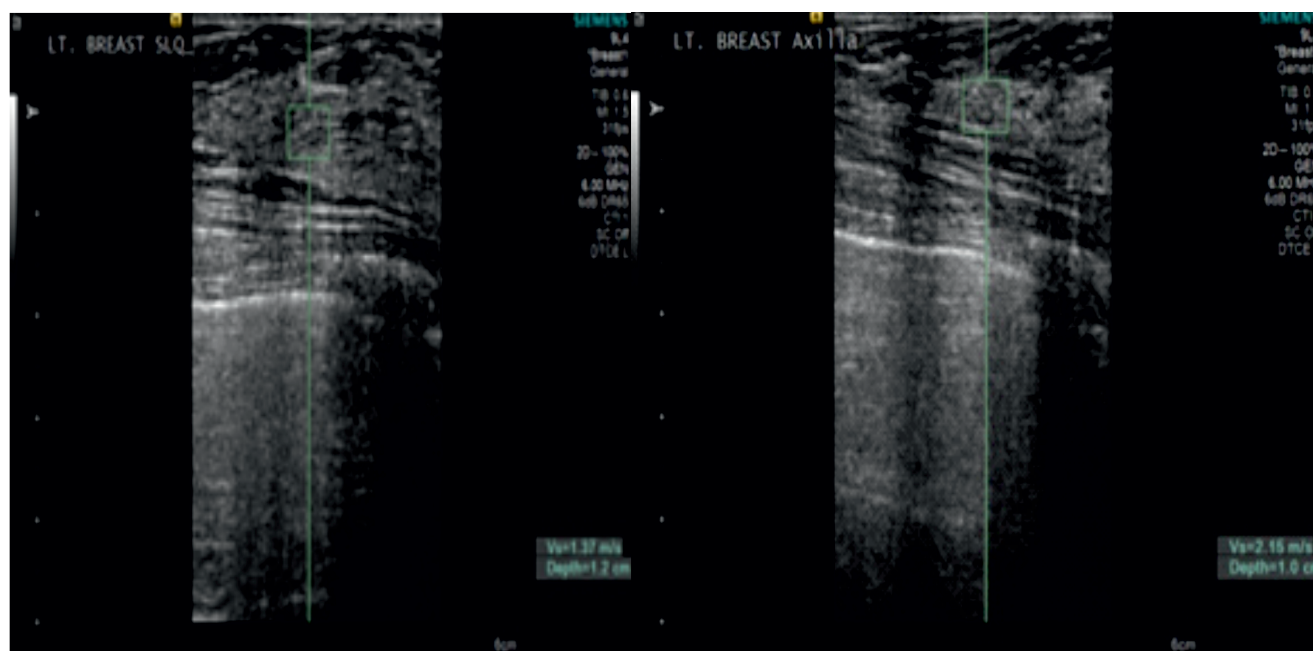


Image 2: Sonoelastography Images through SLQ & Axillary tail of diseased breast show VTTQ values <2.5 m/sec

Mesurole et al. [4] clearly stated that though sonoelastography is considered unreliable & time-consuming but like any new technology, the users usually have a long learning curve. Though acquisition of VTTQ is user dependent requiring skill but it's continuous use in daily practice not only decreases intra & interobserver variability but provides more objective, reproducible and reliable values.

Though multiple studies including that of Balcik A et al. [5] and Rahmat Shamla et al. [6] had proved high accuracy of

sonoelastography in differentiating benign from malignant breast masses compared to conventional ultrasound but its role in fibrocystic breast disease still has not been well described in literature. Probably our study is unique to the best of our knowledge in evaluating the role of sonoelastography in fibrocystic breast disease.

Limitations of the study

- Low sample volume may not allow extrapolation of our results to a larger proportion of population.

- Follow-up sonoelastography was not performed in patient with clinical follow-up.

Conclusions

- VTTQ values from ARFI in fibroglandular parenchyma of axillary tail and superolateral quadrant of breast with fibrocystic disease showed lower values (1-2m/sec) in comparison to normal breast
- Fibrocystic breast disease was commoner in superolateral quadrant than axillary tail region.
- VTTQ values can be used as a reliable investigation for fibrocystic breast disease thus obviating the need of tissue biopsy.

Summary

Sonoelastography is superior to routine high-resolution ultrasonography in evaluation of fibrocystic disease of breast as it provides an objective method of not only assessment & diagnosis of fibrocystic breast disease but may also aid in follow up of these patients. Utilisation of sonoelastography may thus obviate the need of tissue biopsy.

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References

- Guray M, Sahin AA. Benign breast diseases: classification, diagnosis, and management. *Oncologist*. 2006;11(5):435-49.
- Kumm TR, Szabunio MM. Elastography for the characterization of breast lesions: initial clinical experience. *Cancer Control*. 2010;17(3):156-61.
- Barr R. The role of sonoelastography in Breast Lesions. *Semin Ultrasound CT MR*. 2018;39(1):98-105.
- Mesurole B, El Khoury M, Chammings F, Zhang M, Sun S. Breast sonoelastography: Now and in the future. *Diagn Interv Imaging*. 2019 Oct;100(10):567-577. doi: 10.1016/j.diii.2019.03.009. Epub 2019 Mar 29.
- Balcik A, Polat AV, Bayrak IK, Polat AK. Efficacy of Sonoelastography in distinguishing benign from malignant breast masses. *J Breast Health*. 2016;12(1):37-43.
- Rahmat Shamla KP, Brahmadathan MN, Thomas S, Puthussery PV. Diagnostic Accuracy of Ultrasonographic Strain Elastography in Differentiating Benign and Malignant Breast Lesions. *JMSCR*. 2019;7(5):854-57.

