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SONOELASTOGRAPHIC CHARACTERIZATION OF BREAST MASSES

General Surgery

Dr Puneet K Agarwal * Associate Professor Dept of Surgery AIIMS Bhopal *Corresponding Author

Dr Rajesh Malik Professor & Head Dept of Radiodiagnosis AIIMS Bhopal

Dr Richa Medical officer Dept of Radiodiagnosis AIIMS Bhopal

ABSTRACT

Background: Sonoelastography imaging technique is a newer modality for evaluation of breast lesions. Tissue elasticity imaging technology is based on the fact that hardness is a characteristic of tissue which is affected by disease such as cancer.

Aim: To assess the Significance of Sonoelastography in the evaluation of breast lesions.

Patients and method: We included in this prospective study, 60 patients diagnosed with breast lesions and B mode ultrasound image was displayed alongside the elastography strain image. The elastography strain images were scored according to the Tsukuba elasticity score and tissue diagnosis was established by aspiration cytology.

Results: For assessment of sonoelastography role in evaluation of breast lesions, we obtained a sensitivity of 87.7%, and a specificity of 91.9% (p=0.0001).

Conclusions: Elastography is a fast, simple method, which can facilitate the conventional Ultra Sonography. With future improvements in the technology, this method may prove to of value in addition to conventional imaging system.

KEYWORDS

Ultrasound, Elastography, Breast

Introduction

Sonoelastography imaging technique is a newer modality for evaluation of breast lesions. Tissue elasticity imaging technology is based on the fact that hardness is a tissue characteristic which is affected by tissue disease such as cancer. Several approaches of elasticity imaging have been explored, for developing a practical system [1,2,3]. Sonoelastography (SE) operates on the theory that benign and malignant lesions have innate differences in firmness.

Strain images display the relative firmness of lesions compared with the firmness of surrounding tissue. Stiffer areas deform less easily than do their surroundings and are depicted as dark on strain images, whereas less stiff areas deform more easily and are depicted as light. (4,5)

Materials and methods

In this study, a prospective trial was conducted in which patients presenting with breast lesions were assessed with conventional B mode ultrasound. Patients confirmed to have breast lesions were assessed also with elastography after an informed consent was obtained. B mode ultrasound image was displayed along side the elastography stain image to ensure that the assessment was made in the same area of interest. A slight, rhythmic compression-decompression movement is applied, holding the scan plane always perpendicular on the skin surface, the anterior margin of the lesion and the chest wall.

Images were acquired and the elastography strain images scored according to the elasticity score. Elastography strain images were scored according to the Tsukuba elasticity score developed by Itoh and Ueno (10). Score 1 (predominantly green) is used for lesions which present similar deformability to the surrounding breast parenchyma, score 2 lesions are those with an inhomogeneous deformability, the overall appearance being a mosaic pattern of green and blue. Score 3 is attributed to lesions with elastic (green) periphery and stiff (blue) core. Score 4 is used for rigid (blue) nodules, not including the echoic halo. Score 5 is reserved for cases with no tissue displacement secondary to compression, within the lesion itself and also within the adjacent tissues (echoic halo included) which appear blue on the elasticity image. Tissue diagnosis of all the nodules was established with Fine needle aspiration cytology (FNAC).

Results

In this study 60 patients were investigated breast lesions was confirmed on ultrasound. The average age of the women was 37 years. In the study group total 58 benign (96.66%) and 2 malignant lesions (3.33%) were found. The most common cytologies of the benign disease were fibroadenoma (38), cysts (2) and fibroadenosis (18). The most common malignant lesion was infiltrative ductal carcinoma. Fibroadenomas appeared softer or with the same elasticity as adjacent glandular tissue with elasticity score of 1 or 2. Sometimes they look more rigid, receiving 3 or 4 elasticity scores. Breast cysts had a characteristic three layer aspect: blue-green-red (BGR), blue being the superficial colour and red the deep one, with an elasticity score of 1. The fibroadenomas had an elasticity aspect similar to surrounding parenchyma. Breast carcinomas had high elasticity scores of 4 or 5 and their appearance was larger on the elastography image as compared to the gray scale, due to better visualization of the surrounding desmoplastic and microscopically invaded tissue. To calculate the sensitivity and specificity of elastography, lesions with elasticity scores 1-3 were classified as benign, while those with scores of 4 or 5 were classified as malignant. For assessment of sonoelastography role in evaluation of breast lesions, we obtained a sensitivity of 87.7%, and a specificity of 91.9% (p=0.0001).

Discussion

Assessment of breast lesions on routine (B mode) ultrasound (US) is centered on anatomical concepts. So further ultra sonological standards were established to expand the precision of sonographic imaging [6,7). Since the last period, there has been a concern in imaging the elasticity of living tissues as a adjuant to customary morphological imaging.

Sonoelastography may help in the discrimination of benign from malignant solid breast lesions. This skill is based on the concept that that benign and malignant breast lesions have inherent differences in firmness.

The first clinical results of sonoelastography (SE) were broadcasted in 1997– 2001 [8], but first in 2003–2004 the development of USG equipment with committed software for real time processing enabled SE utilization concurrently with regular US examinations [9]. For characterization of breast lesion, two elasticity scores are recommended: Tsukuba score developed by Itoh and Ueno (10] and a second one designed by the Italian Research Group after Locatelli M, Rizzatto G et al. [6].

In present study, we described that a cutoff point of 3 was taken, on the use of real-time ultrasound elastography. Itoh et al. [10], reported high sensitivity of 89.3% and 83.3% and specificity of 93.1% and 86.7% in the first and second stages of their study of 111 lesions. Zhi et al. [11] recently reported even better results: ultrasound elastography was found to be the most specific (95.7%) and had the lowest false-positive rate (4.3%). Thomas et al. [12] described sensitivity of 77.6% and

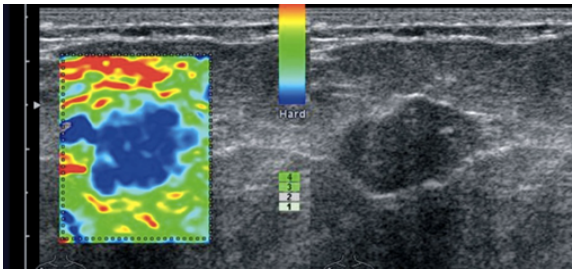
79.6% and specificity of 91.5% and 84.5%, respectively, relating to two examiners evaluating 108 breast lesions.

Elastography scores convey supplementary information to that afforded by B-mode images. Ultrasound identifies many nonpalpable lesions, and it is less specific when used for breast screening. Elastography may be supportive to obtain add-on information based on which we can decide whether further examination is required.

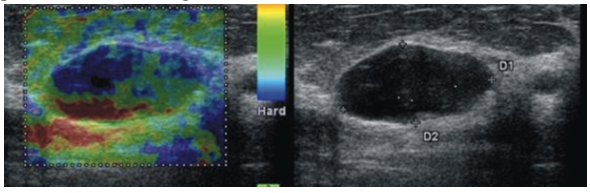
Use of elastography is restricted in very dense, fibrous parenchyma, and in case of hematomas or breast implants [13]. Also Ultrasound elastography is less sensitive than standard USG for non-focal anomalies and is not indicated for the assessment of postoperative changes, diffuse lesions or large ones, which exceed the probe length or its area of interest. [14,15].

1 2 3 4 5 Blue-Green-Red

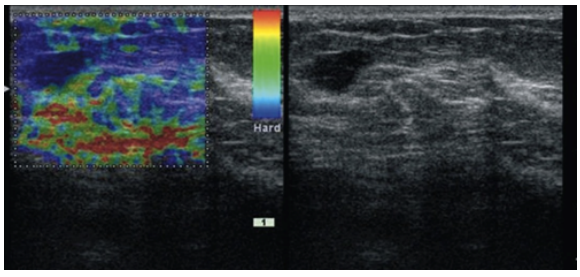
Elastography strain images scores



Predominantly blue on elastography with an elasticity score of 3 in a patient which was diagnosed fibroadenoma.



Elastographic appearance (blue, green, red) of a cyst



Invasive ductal carcinoma elasticity image, the lesion and the surrounding tissue were coloured blue, with an elasticity score of 5.

References

1. Ophir J, Cespedes I, Ponnekanti H, et al., Elastography: a quantitative method for imaging the elasticity of biological tissues. Ultrason Imaging 1991, 13:111-134.
2. Klauser AS, Faschingbauer R, Jaschke WR. Is sonoelastography of value in assessing tendons? Semin Musculoskelet Radiol. 2010;14:323-33
3. Krouskop TA, Wheeler TM, Kallel F, et al., Elastic moduli of breast and prostate tissues under compression. Ultrason Imaging 1998, 20:260-274.
4. HongAS,RosenEL,SooMS,etal.BIRADSforsonography:positiveand negative values of sonographic features. AJR Am JRoentogenol 2005; 184: 1260–1265.
5. E.Ueno,T.Shiina,M.Kubota,K.Sawai(Eds.).ResearchandDevelopment in Breast Ultrasound. In Springer-Verlag (eds). In Vivo Breast Examination by Real-Time Freehand Elasticity Imaging System, Tokyo, 2005, 7-16.
6. Rizzatto G. Real-time elastography of the breast in clinical practice - the italian experience. Medix Hitachi Supplement 2007: 12-15.
7. Itoh A. Review of the techniques and diagnostic criteria of breast ultrasound elastography. Medix Hitachi Supplement 2007: 8-11.
8. Garra BS, Cespedes EI, Ophir J, Spratt SR, Zuurbier RA, Magnant CM, Pennanen MF Elastography of breast lesions: initial clinical results. Radiology 1997, 202:79–86.
9. Konofagou EE. Quo vadis elasticity imaging? Ultrasonics 2004, 42: 331– 336.
10. Itoh A, Ueno E, Tohno E, et al. Breast Disease: Clinical Application of US Elastography for Diagnosis. Radiology 2006; 239: 341-350.
11. Zhi H, Ou B, Luo BM, et al. Comparison of ultrasound elastography, mammography, and sonography in the diagnosis ofsolid breast lesions. J Ultrasound Med 2007; 26: 807–815.
12. Thomas A, Fischer T, Frey H, et al. Real-time elastography—an advanced method of ultrasound: first results in 108 patients with breast lesions. Ultrasound Obstet Gynecol 2006; 28: 335–340.
13. Giuseppetti GM, Martegani A, Di Cioccio B, Baldassarre S. Elastosonography in the diagnosis of the nodular breast lesions: preliminary report. Radiol Med 2005; 110: 69-76.
14. Scaperrotta G, Ferranti C, Costa C, et al. Role of sonoelastography in non-palpable breast lesions. Eur Radiol. 2008;18:2381-2389
15. Thomas A, Kummel S, Fritzsche F, et al. Real-time sonoelastography performed in addition to B-mode ultrasound and mammography: improved differentiation of breast lesions? Acad Radiol 2006; 13: 1496-1504.