Original Contribution

SEMII-QUANTITATIVE AND QUALITATIVE ASSESSMENT OF BREAST ULTRASOUND ELASTOGRAPHY IN DIFFERENTIATING BETWEEN MALIGNANT AND BENIGN LESIONS

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(Received 8 May 2012; revised 24 October 2012; in final form 28 October 2012)

Abstract—The purpose of this study was to evaluate the diagnostic value of qualitative and semi-quantitative assessment of ultrasound elastography in differentiating between benign and malignant breast lesions. This prospective study was conducted in two tertiary medical centers. Consecutive B-mode ultrasound and real-time elastographic images were obtained for 67 malignant and 101 benign breast lesions in 168 women. Four experienced radiologists analyzed B-mode ultrasound alone and B-mode ultrasound combined with elastography independently. Conventional ultrasound findings were classified according to the American College of Radiology Breast Imaging Reporting and Data System classification. The elastographic assessment was based on qualitative and semi-quantitative parameters (i.e., strain pattern, width ratio, strain ratio). The sensitivity and specificity of combined elastography and conventional ultrasound were significantly higher than that of conventional ultrasound alone. The sensitivity, specificity, positive predictive value and negative value was 97%, 61.4%, 62.5% and 96.8%, respectively, for conventional ultrasound and 100%, 93%, 99% and 90%, respectively, for combined technique. The semi-quantitative assessment with strain ratio and width ratio in elastography were the most useful parameters in differentiating between benign and malignant breast lesions. Cut-off point values for width ratio of more than 1.1 and strain ratio of more than 5.6 showed a high predictive value of malignancy with specificities of 84% and 76%, respectively (p < 0.001). This combined technique also had the best results in detecting carcinoma and could reduce the need of unnecessary biopsy for benign lesions with indeterminate or equivocal features.

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Key Words: Elastography, Breast, Ultrasound, Carcinoma, Imaging.

INTRODUCTION

Breast carcinomas are usually harder in consistency compared with benign nodules on palpation; however, palpation is limited to superficial lesions. Conventional ultrasound (US) can distinguish between malignant breast lesions based on the appearance of the lesion (i.e., margin, shape, echogenicity, shadowing; Berg et al. 2006; Stavros et al. 1995). Compressibility has also been used to assess a lesion; however, this may be subjective and operator dependent (Rizatto 2008; Schaefer et al. 2009).

Elastography is a new noninvasive medical imaging technique that can differentiate tumors based on their stiffness. The software that is added on to US equipment and has been available since the 1990s. The U.S. Food and Drug Administration has approved this technique for clinical use and research since 2006. The most common type of elastography uses US imaging to compare before and after it is compressed slightly. Malignant lesions tend to be significantly stiffer than normal tissue (Leong et al. 2010; Rizatto 2008). In principle, the elastography images demonstrate variable degrees of tissue stiffness, which are displayed as gray scale or color map (Sim 2009).