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EDITORIAL

Breast ultrasound elastography

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Breast cancer is one of the most common malignant diseases among women worldwide. In China, the morbidity and mortality rate from breast cancer has increased significantly in recent years. Early diagnosis is crucial to ensure the best possible prognosis. Biopsy is an invasive technique and not recommended for screening. Palpation on the other hand, can detect superficial masses, but may miss small masses or masses deep beneath the skin. Mammography is the most frequently used screening method for detecting breast cancer; however, it has poor specificity, and its efficacy is limited in patients with dense breast tissue. Ultrasonography may overcome these limitations, and it has become the most important adjunct tool for breast cancer screening. It is also routinely used for guidance in breast mass biopsy.

Ultrasound elastography is the most amazing new ultrasound technique for screening breast lesions in recent years [1]. Normal breast tissue is softer than cancerous tissue, and this feature is often used to differentiate benign and malignant breast masses. According to the recently published World Federation for Ultrasound in Medicine and Biology (WFUMB) guidelines and recommendations on the clinical use of ultrasound elastography [1], elastographic techniques used in breast cancer diagnosis can be classified into three groups: strain imaging, acoustic radiation force impulse (ARFI) displacement, and shear wave speed (SWS) measurement and imaging. Strain imaging is based on the principle that hard tissue is not as easily compressed as soft tissue. Strain imaging measures the strain response of tissue to manual compression. The stiffness of the tissue is demonstrated by its strain response, which is displayed as a color map overlaying the grey scale image [2]. Cancerous tissue, which is harder than normal tissue, will show a lower strain response. Both ARFI and SWS imaging are shear wave based techniques. Shear wave travels faster through hard tissue than it does through soft tissue. New advanced ultrasound systems can measure the speed, and display it as a color map or a definite value of m/s or Kpa with Young's modulus, to reflect the tissue elasticity.

Strain elastography analyzes the tissue stiffness with both qualitative and semi-quantitative methods. Qualitative methods analyze the color pattern within a region of interest. Semi-quantitative methods include strain ratio (measuring the relative strain between two areas) and strain histograms (computing the strain values of elemental areas). Strain elastography using both qualitative and semi-quantitative methods is able to differentiate benign from malignant masses with a high sensitivity and specificity. Similar to strain elastography,

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shear wave based elastography is also able to increase diagnostic confidence in the differential diagnosis of benign and malignant lesions. Moreover, ultrasound elastography is useful in re-grading benign appearing lesions which are hard and take biopsy into consideration, and to improve the specificity of ultrasound to rule out biopsy for lesions categorized as BI-RADS category 3 or 4A [1, 3]. Both strain elastography and shear wave based elastography yield similar performance, and there is no evidence to suggest that one technique is superior to another[1].

In conclusion, ultrasound elastography is a new technique that improves the specificity and sensitivity in differentiating malignant and benign breast lesions. Clinicians should be aware of the different types of ultrasound elastography, since it varies across different manufacturers. Elastography features, such as lesion stiffness, homogeneity and size ratios may be helpful in characterizing focal lesions seen on conventional breast ultrasound images. Ultrasound elastography has the potential to be used in the identification of malignant axillary lymph nodes and in targeting the most suspicious portions of a mass for biopsy [4].

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