Evaluation of Palpation Imaging in Breast Lesion Diagnosis

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Purpose

The Palpation imaging (PI) that closely mimics manual palpation but with enhanced sensitivity and specificity might be considered as a branch of elasticity imaging or elastography. The PI probe with a force sensor array mounted on its tip acts similarly to human fingers during clinical examination. PI translates the tissue's elastic properties into a digital map and provides quantitative characterization of the detected mass using the data obtained by the sensor array pressed against the examined site. The changes in the surface stress patterns as a function of displacement, applied load and time provide information about the elastic composition and geometry of the underlying tissue structures. The objective of this study is the clinical evaluation of palpation imaging (PI) for breast lesion diagnosis.

Methods and Materials

From June 2010 to December 2011, 169 patients with 195 breast lesions, of which 125 were breast cancers and 70 were benign lesions verified by surgical pathology, were examined by PI, physical examination, mammography and ultrasound in cancer hospital, Chinese Academy of Medical Sciences. The hardness, shape, homogeneity, and mobility of the lesion extracted from PI were used for lesion characterization. To compare diagnostic performance of a test for the features characterizing the lesion, we use the receiver operating characteristics (ROC) curve analysis and evaluate PI for differentiation between benign and malignant lesions. Additional diagnostic information provided by other diagnostic modalities was collected and used for the analysis of the potential of diagnosis of breast lesion by PI. The diagnostic sensitivity and specificity of the four examinations were compared.In addition, the sensitivity and specificity of PI for patients with different breast composition on mammography were calculated.

Results

The area under the receiver operating characteristics curve(AUC) characterizing benign and malignant lesion discrimination was 0.884 (95%CI: 0.836#0.932, *P*<0.001) for PI#see Fig.1). The sensitivity of PI was 82.4%, which was significantly higher than that of physical examination (48%, *P*=0.000) but lower than that of either mammography (93.6%, *P*=0.003) or ultrasound (95.5%, *P*=0.000). The specificity of PI (80.0%) was significantly better than that of mammography (55.7%, *P*=0.002) and ultrasound (62.3%, *P*=0.023), and similar to that of physical examination (91.4%, *P*=0.096) (see Table 1 and Table 2). For patients with different breast composition on mammography, PI had similar sensitivity (87.3% for <50% glandular#77.4% for >50% glandular#*P*=0.166) and specificity (85.7% for <50% glandular#79.4% for >50% glandular#*P*=1.000).

Images for this section:

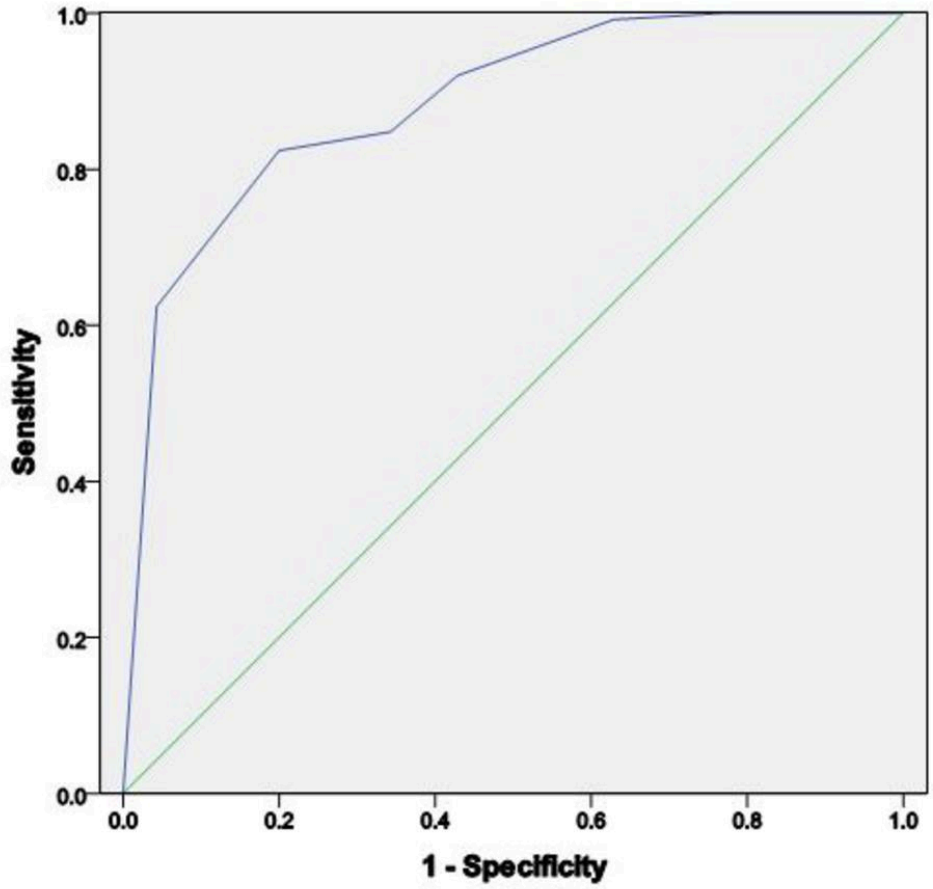

Fig. 1: Fig 1. ROC curve for performance of discrimination between benign an malignant lesions for PI

	Malignant	Sensitivity	P
PI	103/125	82.4%	—
Mammography	117/125	93.6%	0.003
US	105/110	95.5%	0.000
CBE	60/125	48%	0.000

Fig. 2: Table 1 The sensitivity of PI#mammography#ultrasound and CBE

	Benign	Specificity	P
PI	56/70	80.0%	—
Mammography	39/70	55.7%	0.002
US	38/61	62.3%	0.023
CBE	64/70	91.4%	0.096

Fig. 3: Table 2 The specificity of PI#mammography#ultrasound and CBE

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Conclusion

PI has the capability for differentiation of benign and malignant breast lesions, and may serve as an adjunct to physical examination, mammography and ultrasound in the diagnosis of breast diseases.

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