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Effects of BI-RADS combined with breast contrast-enhanced ultrasound (CEUS) prediction model on biopsy rate and assessing risk of malignancy of breast lesions

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Objective: To evaluate whether the combination of Breast Imaging Report and Data System (BI-RADS) and CEUS prediction models can optimize BI-RADS 4 and 5 lesions by reducing unnecessary needle biopsy.

Method: 1197 breast lesions provided by 8 centers were examined by conventional ultrasound (CUS) and CEUS before core needle biopsy or surgery. The enrolled BI-RADS 4 and 5 lesions were evaluated and categorized by two independent physicians groups which included the examination group and the reading group in each center using 6 prediction models. The malignant lesions and precancerous lesions were defined as biopsy lesions while benign lesions were defined as follow-up lesions according to histopathological results. The diagnostic efficacy of the categories given by each group was compared. The BI-RADS 4A lesions were combined with the prediction model alone to observe its diagnostic value for biopsy lesions.

Results: The category given by examination group achieved the highest diagnostic performance and its area under the curve (AUC) was 0.84 in predicting biopsy lesions. Within all 4A lesions, some were redefined as follow-up category when they were consistent with benign models while others were redefined as biopsy category when they were consistent with malignant models. Then 80.17% of specificity and 94.50% of NPV in predicting biopsy lesions were achieved and the unnecessary biopsy rate was reduced (from 81.09% to 51.52%) on a base of lower risk of malignancy (from 18.91% to 5.5%).

Conclusions: Multicenter studies have confirmed CEUS prediction model can assist BI-RADS to improve its diagnostic value and reduce the unnecessary biopsy rate.

Key words: BI-RADS, Contrast-enhanced ultrasound, Prediction model, Biopsy rate, Breast cancer.

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