Evaluation of Radiomics Analysis as a Tool in Differentiating Benign and Malignant Breast Masses Compared to Conventional Magnetic Resonance Imaging

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Breast cancer is one of the most common cancers among women globally. Therefore, we investigated the diagnostic feasibility of feature parameters derived from Radiomics analysis and conventional Magnetic Resonance Imaging (MRI) to differentiate benign and malignant breast masses. T1W Dynamic Contrast-Enhanced (DCE) breast MR axial images of 151 (benign (79) and malignant (72)) patients were chosen. Regions of interest were selected using both manual delineation and semi-automatic segmentation methods from each lesion. 382 Radiomic features were computed in the selected regions. A random forest model was employed to detect the most important Radiomic features that can differentiate benign and malignant breast masses. The ten most important Radiomic features obtained from manual delineation and semi-automatic segmentation based on the Gini index were applied to train a support vector machine. MATLAB and IBM SPSS Statistics Subscription software were used for statistical analysis. The accuracy of the model built from the 10 most significant Radiomic features obtained from manual delineation was 0.815, and sensitivity was 0.84. The accuracy of the model built from the 10 most significant features obtained from semi-automatic segmentation was 0.821, and sensitivity 0.87. All the top 10 Radiomic features obtained from manual delineation and semi-automatic segmentation showed a significant difference ($P<0.05$) between benign and malignant breast lesions. This Radiomics analysis implemented based on DCE-BMRI revealed distinct Radiomic features to differentiate benign and malignant breast masses. Therefore, Radiomics analysis can be used as a supporting tool in detecting breast MRI lesions.

Keywords*: Dynamic Contrast-Enhanced breast MRI, manual delineation, semi-automatic segmentation, radiomic features, radiomics analysis.*