Breast Imaging

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Magnetic Resonance Imaging Texture Analysis of Breast Cancer

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Objective: Application of texture-based radiomics to breast magnetic resonance images (MRI) for predicting and diagnosing breast cancer.

Materials & Methods: 84 lesions with histopathologically confirmed primary breast cancer were retrospectively evaluated. 3D volumetric breast lesions were segmented from subtracted dynamic contrast-enhanced (DCE) images. The segmented 3D mask (region of interest) was applied to different MRI sequences (T1-weighted, T2-weighted, STIR, DCE Phase 2, subtracted Phase 2) for texture analysis (TA) of the lesion using MATLAB software. TA of contralateral normal breast tissues were also performed for comparison. The texture features were used to analyze and classify immunohistochemical subtypes, histopathological grades and MRI kinetic curves using Kruskal-Wallis test and Random Forest classification. Validation of radiomics model was carried out using leave-one-out-cross-validation.

Results: 215 texture parameters were analyzed. 177 textures features showed statistically significant differences between malignant lesions and normal breast tissues, with phase 2 DCE and subtracted images being the most useful sequences. The number of statistically significant texture features differentiating IHC subtypes, DCE curves and histopathological grades were 25, 9 and 150 respectively. The most useful sequences were T1W to classify IHC, DCE phase 2 for DCE curve, and T2W for histopathological grades. The test accuracies were 71.6% for IHC subtypes, 51.2% for DCE curves and 65.4% for histopathological grades using Random Forest classification.

Conclusion: MRI based TA radiomics is feasible to diagnose and classify breast cancer. Prospective validation studies with more data are needed to determine the potential usage of TA on breast cancer MRI in daily clinical practice.