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MRI 磁共振成像

CIGONGZHEN CHENGXIANG

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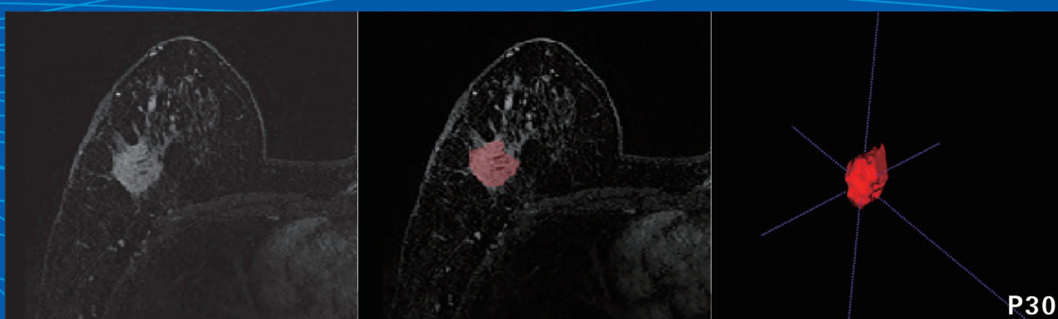

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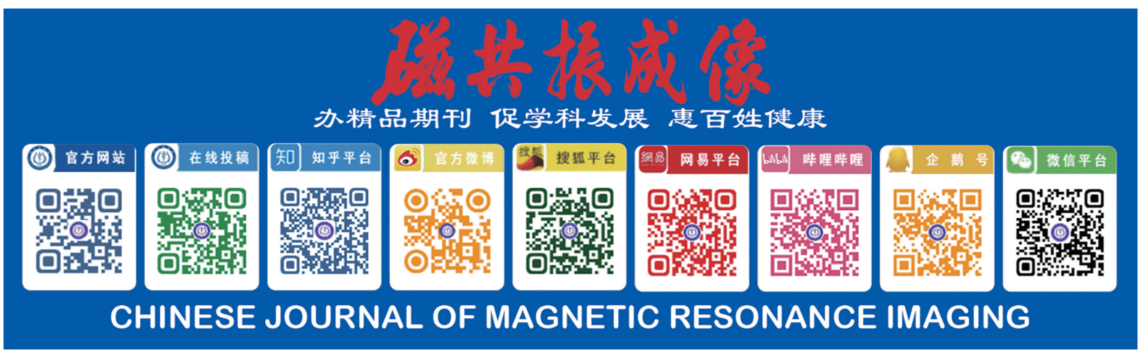
女性乳腺癌是全球最常见的癌症，危害女性的身心健康。新辅助化疗（neoadjuvant chemotherapy, NAC）已广泛应用于局部进展期乳腺癌患者，特别是在三阴型和人表皮生长因子受体2（human epidermal growth factor receptor 2, HER-2）阳性的乳腺癌。NAC的主要优势为可术前将乳腺肿瘤缩小降期，从而提高保乳手术（breast-conserving surgery, BCS）的可能性。然而，保乳手术率的提高可能导致较高的局部复发率。

乳腺肿瘤NAC后会呈现不同的退缩模式，可分为向心性退缩和非向心性退缩。根据美国国家综合癌症网络（National Comprehensive Cancer Network, NCCN）指南，NAC后肿瘤缓解程度和退缩模式将会影响手术方案的选择。获得阴性切缘是BCS成功的关键，若NAC后肿瘤呈现非向心性退缩则切缘可能出现假阴性，这可能是导致BCS后乳腺局部复发风险较高的原因。因此，治疗前预测乳腺癌新辅助化疗后肿瘤退缩模式有助于协助临床医师制订个体化手术方案。然而，目前临床上没有标准的方法或特异的生物标志物来预测NAC后肿瘤退缩模式。

影像组学是一种图像定量分析方法，可以高通量地从医学图像中获取人肉眼无法识别的高维定量影像特征，并深度挖掘其所蕴含的生物学信息，以期协助临床诊断、疗效评估和预后预测等。

本研究分析了NAC前乳腺动态增强MRI图像，在第2期增强图像中对原发灶进行感兴趣区勾画并提取影像组学特征。采用两独立样本 t 检验或Mann-Whitney U 检验、相关性分析及最小绝对收缩和选择算子-logistic回归分析对影像组学特征进行降维筛选，然后基于人工神经网络建立影像组学标签。通过单因素、多因素logistic回归分析筛选显著相关的临床病理特征建立临床预测模型，并联合定性影像征象、临床病理特征和影像组学标签构建联合预测模型。使用受试者工作特征（receiver operating characteristic, ROC）曲线和校准曲线评估模型性能，并使用决策曲线分析（decision curve analysis, DCA）评价预测模型的临床实用性。为方便临床应用，我们进一步将联合模型可视化为列线图。研究结果显示模型具有良好的预测效能，有望协助临床早期识别可降期保乳的患者，以优化个体化诊疗方案，改善患者预后。详见内文第28页。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CASE REPORTS

About the cover

Female breast cancer is the most common cancer globally, endangering women's physical and mental health. Neoadjuvant chemotherapy (NAC) has become more commonly used in patients with locally advanced breast cancer, especially in triple negative and human epidermal growth factor receptor 2 (HER-2) positive breast cancer. The primary benefit of NAC is to preoperatively downstage the breast tumor and increase the likelihood of breast-conserving surgery (BCS). However, the increased rate of breast conservation may lead to a higher rate of local recurrence.

There are various regression patterns of breast tumor after NAC, which can be classified into the concentric shrinkage and the non-concentric shrinkage pattern. According to the National Comprehensive Cancer Network (NCCN) guidelines, the degree of tumor remission and regression pattern after NAC would affect the choice of the surgical approach. A negative margin is a crucial indicator for the success of BCS, while it could be false negative in patients with a non-concentric shrinkage pattern after NAC, which may account for a higher risk of local recurrence for BCS in the post-NAC setting. Therefore, pretreatment prediction of tumor regression pattern can assist the clinicians to develop an individualized strategy of breast surgery. However, there is no standard method or specific biomarker for prediction of breast tumor regression pattern after NAC in current clinical practice.

Radiomics is a method of quantitative image analysis, which can extract high-dimensional quantitative features that are difficult to quantitatively identify by the human eye from medical images in a high-throughput manner and dig deeper into the biological information it contains, in order to assist in clinical diagnosis, prediction of response to treatment, assessment of prognosis.

This study analyzed the pretreatment dynamic contrast-enhanced MRI of breast by delineating the regions of interest (ROIs) and subsequently extracting the radiomics features in the 2nd phase images. The two independent -samples *t* test or Mann-Whitney *U* test, correlation analysis, least absolute shrinkage and selection operator (LASSO) -logistic regression were used for dimension reduction of radiomics features, and the artificial neural networks were used to establish a radiomics signature. The clinical prediction models were constructed by screening the significant clinicopathological features by univariate and multivariate logistic regression analysis. In addition, a predictive model combining qualitative image features, clinicopathologic features and radiomics signatures was constructed. The performance of the model was assessed using the receiver operating characteristic (ROC) curves and calibration curves. The decision curve analysis (DCA) was conducted to assess the clinical use of these predictive models. To facilitate clinical applications, we visualized the combined predictive model as a nomogram. Finally, the result showed that the model had a good predictive power, which could assist in selecting patients who can benefit from NAC for de-escalation of breast surgery, in order to optimize the individualized diagnosis as well as treatment plans, and improve the outcome of patients. Please see page 28.

REVIEWS