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Magnetic resonance imaging based radiomics signature for the preoperative discrimination of stage I-II and III-IV head and neck squamous cell carcinoma

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Purpose: This study aimed to investigate the predictive ability of magnetic resonance imaging (MRI) based radiomics signature for the preoperative staging in HNSCC.

Methods: This study involved127 consecutive patients (training cohort: n=85; testing cohort, n=42) with stage I-IV HNSCC. A total of 970 radiomics features were extracted from T2-weighted (T2W) (n=485) and contrast-enhanced T1-weighted (ceT1W) (n=485) MRI for each case. Radiomics signatures were constructed with least absolute shrinkage and selection operator (LASSO) logistic regression. Associations between radiomics signatures and HNSCC staging were explored. Areas under the receiver operating characteristic curve (AUC) and classification performance of radiomics signatures were determined and compared with those of the visual assessment.

Results: Ten features from T2W images, six from ceT1W images, and six from combined T2W and ceT1W images were selected by LASSO logistic regression. The three radiomics signatures of stage III-IV HNSCC were significantly higher than that for stage I-II in both cohorts (all $P<0.05$). The radiomics signatures from ceT1W and combined images performed well in the discrimination of stage I-II and III-IV HNSCC, with AUCs of 0.828 and 0.850 in the training cohort, and AUCs of 0.853 and 0.849 in the testing cohort. Based on the cut-off value of the training cohort, the radiomics signature from combined images achieved best classification performance in both cohorts, with accuracies of 0.788 and 0.857, sensitivities of 0.836 and 0.885, and specificities of 0.700 and 0.813. Significant differences in accuracy and