Non-enhancing margin and pial invasion in MRI can predict IDH status in glioma patients

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Abstract

Background: The presence of isocitrate dehydrogenase (IDH) mutations and 1p/19q codeletion significantly influences the diagnosis and prognosis of patients with lower-grade gliomas (LGGs). The ability to predict these molecular signatures preoperatively can inform surgical strategies. This study sought to establish an interpretable imaging feature set for predicting molecular signatures and overall survival in LGGs.

Methods: A cohort of 113 patients with grade 2 or 3 glioma (66 with mutated IDH and 47 with wild-type IDH) was analyzed. The feature set, chief complaints, and onset symptoms were integrated into a logistic regression model to predict IDH mutation and 1p/19q codeletion statuses. Receiver operator characteristic (ROC) and area under the curve (AUC) analyses were performed. The predictive model was externally validated using a public database from The Cancer Genome Atlas (TCGA).

Results: Smooth non-enhancing margin and pial invasion were significant predictors of IDH mutation, with odds ratio (OR) values of 3.55 (P = 0.03) and 7.89 (P = 1.0×10^{-3}), respectively. Using the Visually Accessible Rembrandt Images (VASARI) feature set alone to predict IDH mutation status yielded an AUC value of 0.83, which increased to 0.85 and 0.87 when incorporating clinical information and onset symptoms for predicting IDH mutation and 1p/19q codeletion, respectively.

Conclusions: Gliomas with IDH mutations were more likely to exhibit smooth non-enhancing margins and pial invasion. In clinical practice, imaging prediction allows for the assessment of IDH mutation to shift from a postoperative outcome to a preoperative guidance indicator, facilitating more precise treatment for patients with LGGs.

Keywords: Chief complaints; Glioma; Isocitrate dehydrogenase; Onset symptoms; VASARI.

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