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Intratumoral calcification: not only a diagnostic but also a prognostic indicator in oligodendrogliomas

Qinghui Zhu¹, Haihui Jiang², Yong Cui¹, Xiaohui Ren¹, Mingxiao Li¹, Xiaokang Zhang¹, Haoyi Li¹, Shaoping Shen¹, Ming Li¹, Song Lin^{3 4}

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Abstract

Objective: Calcification is a hallmark characteristic of oligodendroglioma (ODG) that may be used as a diagnostic factor, but its prognostic implications remain unclear. This study aimed to investigate the features of calcified ODGs and to evaluate the differences in survival between patients with calcified and noncalcified ODGs.

Methods: We retrospectively reviewed the records of 305 consecutive patients who were diagnosed with IDH-mutant, 1p/19q codeleted ODG at our institution from July 2009 to August 2020. Patients with intratumoral calcification were identified. The clinical, radiologic, and molecular features of the patients in the calcified group and noncalcified group were recorded. Univariate and multivariate analyses were performed to identify prognostic factors.

Results: Of the 305 patients, 112 (36.7%) were confirmed to have intratumoral calcification. Compared to ODGs without calcification, ODGs with calcifications had a larger tumor diameter; lower degree of resection; higher tumor grade; higher MGMT methylation level; higher Ki-67 index; and higher rates of midline crossing, enhancement, cyst, and 1q/19p copolysomy, and patients with calcification were more likely to receive chemoradiotherapy. ODGs with T2 hypointense calcification had a higher Hounsfield unit (HU) value on CT scans, and a lower degree of resection. Patients with T2 hypointense calcification ODGs had a shorter survival than those with non-hypointense calcification ODGs. ODGs with calcification and cysts showed a higher Ki-67 index, tumor grade, and enhanced rate, and the patients had an unfavorable overall survival (OS). Calcification was found to be a negative prognostic factor for both progression-free survival (PFS) and OS by univariate analysis, which was confirmed by the Cox proportional hazard model.

Conclusions: Calcification is a useful negative prognostic factor for PFS and OS in patients with ODGs and could therefore be helpful in guiding personalized treatment and predicting patient prognosis.

Clinical relevance statement: Calcification can serve as an independent prognostic factor for patients with oligodendroglioma and shows a vital role in guiding individualized treatment.

Key points: • Intratumoral calcification is an independent negative prognostic risk factor for progression-free survival and overall survival in oligodendroglioma patients. • Calcifications in oligodendroglioma can be divided into hypointense and non-hypointense subtypes based on T2-weighted imaging, and patients with T2-hypointense calcification oligodendrogliomas have worse prognosis. • Calcification concurrent with cysts indicates a more aggressive phenotype of oligodendrogliomas and a significantly reduced survival rate.

Keywords: Calcification; Cysts; Neuroimaging; Oligodendrogliomas; Prognosis.

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