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# The T1/T2 Ratio is Associated With Resectability in Patients With Isocitrate Dehydrogenase–Mutant Astrocytomas Central Nervous System World Health Organization Grades 2 and 3

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## Abstract

**Background and objectives:** Isocitrate dehydrogenase (IDH)-mutant astrocytomas central nervous system World Health Organization grade 2 and 3 show heterogeneous appearance on MRI. In the pre-molecular era, the discrepancy between T1 hypointense and T2 hyperintense tumor volume in absolute values has been proposed as a marker for diffuse tumor growth. We set out to investigate if a ratio of T1 to T2 tumor volume (T1/T2 ratio) is associated with resectability and overall survival (OS) in patients with IDH-mutant astrocytomas.

**Methods:** Patient data from 2 centers (Sahlgrenska University Hospital, Center A; LMU University Hospital, Center B) were collected retrospectively. Inclusion criteria were as follows: pre and postoperative MRI scans available for volumetric analysis (I), diagnosis of an IDH-mutant astrocytoma between 2003 and 2021 (II), and tumor resection at initial diagnosis (III). Tumor volumes were manually segmented. The T1/T2 ratio was calculated and correlated with extent of resection, residual T2 tumor volume, and OS.

**Results:** The study comprised 134 patients with 65 patients included from Center A and 69 patients from Center B. The median OS was 134 months and did not differ between the cohorts ( $P = .29$ ). Overall, the median T1/T2 ratio was 0.79 (range 0.15-1.0). Tumors displaying a T1/T2 ratio of 0.33 or lower showed significantly larger residual tumor volumes postoperatively (median 17.9 cm<sup>3</sup> vs 4.6 cm<sup>3</sup>,  $P = .03$ ). The median extent of resection in these patients was 65% vs 90% ( $P = .03$ ). The ratio itself did not correlate with OS. In multivariable analyses, larger postoperative tumor volumes were associated with shorter survival times (hazard ratio 1.02, 95% CI 1.01-1.03,  $P < .01$ ).

**Conclusion:** The T1/T2 ratio might be a good indicator for diffuse tumor growth on MRI and is associated with resectability in patients with IDH-mutant astrocytoma. This ratio might aid to identify patients in which an oncologically relevant tumor volume reduction cannot be safely achieved.

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