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Visualizing the association between the location and prognosis of isocitrate dehydrogenase wild-type glioblastoma: a voxel-wise Cox regression analysis with open-source datasets

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Abstract

Purpose: This study examined the correlation between tumor location and prognosis in patients with glioblastoma using magnetic resonance images of various isocitrate dehydrogenase (IDH) wild-type glioblastomas from The Cancer Imaging Archive (TCIA). The relationship between tumor location and prognosis was visualized using voxel-wise Cox regression analysis.

Methods: Participants with IDH wild-type glioblastoma were selected, and their survival and demographic data and tumor characteristics were collected from TCIA datasets. Post-contrast-enhanced T1-weighted imaging, T2-fluid attenuated inversion recovery imaging, and tumor segmentation data were also compiled. Following affine registration of each image and tumor segmentation region of interest to the MNI standard space, a voxel-wise Cox regression analysis was conducted. This analysis determined the association of the presence or absence of the tumor with the prognosis in each voxel after adjusting for the covariates.

Results: The study included 769 participants of 464 men and 305 women (mean age, 63 years \pm 12 [standard deviation]). The hazard ratio map indicated that tumors in the medial frontobasal region and around the third and fourth ventricles were associated with poorer prognoses, underscoring the challenges of complete resection and treatment accessibility in these areas regardless of the tumor volume. Conversely, tumors located in the right temporal and occipital lobes had favorable prognoses.

Conclusion: This study showed an association between tumor location and prognosis. These findings may assist clinicians in developing more precise and effective treatment plans for patients with glioblastoma to improve their management.

Keywords: Brain atlas; Glioblastoma; Magnetic resonance imaging; Survival analysis; Tumor location.

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