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## Relationship between apparent diffusion coefficient and survival as a function of distance from gross tumor volume on radiation planning MRI in newly diagnosed glioblastoma

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## Abstract

**Purpose:** To investigate the changes in apparent diffusion coefficient (ADC) within incrementallyincreased margins beyond the gross tumor volume (GTV) on post-operative radiation planning MRI and their prognostic utility in glioblastoma.

**Methods:** Radiation planning MRIs of adult patients with newly diagnosed glioblastoma from 2017 to 2020 were assessed. The ADC values were normalized to contralateral normal white matter (nADC). Using 1 mm isotropic incremental margin increases from the GTV, the nADC values were calculated at each increment. Age, ECOG performance status, extent of resection and MGMT promoter methylation status were obtained from medical records. Using univariate and multivariable Cox regression analysis, association of nADC to progression-free and overall survival (PFS, OS) was assessed at each increment.

**Results:** Seventy consecutive patients with mean age of 53.6  $\pm$  10.3 years, were evaluated. The MGMT promoter was methylated in 31 (44.3%), unmethylated in 36 (51.6%) and unknown in 3 (4.3%) patients. 11 (16%) underwent biopsy, 41 (44%) subtotal resection and 18 (26%) gross total resection. For each 1 mm increase in distance from GTV, the nADC decreased by 0.16% (p < 0.0001). At 1-5 mm increment, the nADC was associated with OS (p < 0.01). From 6 to 11 mm increment the nADC was associated with OS with the p-value gradually increasing from 0.018 to 0.046. nADC was not associated with PFS.

**Conclusion:** The nADC values at 1-11 mm increments from the GTV margin were associated with OS. Future prospective multicenter studies are needed to validate the findings and to pave the way for the utilization of ADC for margin reduction in radiation planning.

**Keywords:** Apparent diffusion coefficient; Diffusion weighted imaging; Glioblastoma; Overall survival; Progression free survival.

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