AJNR Am J Neuroradiol. 2024 Apr 29:ajnr.A8319. doi: 10.3174/ajnr.A8319. Online ahead of print.

Sex-specific Differences in IDH1-Wildtype Glioblastoma patients in the ReSPOND Consortium

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PMID: 38684319 DOI: 10.3174/ajnr.A8319

Abstract

Background: Understanding sex-based differences in glioblastoma patients is necessary for accurate personalized treatment planning to improve patient outcomes.

Purpose: To investigate sex-specific differences in molecular, clinical and radiological tumor parameters, as well as survival outcomes in glioblastoma, isocitrate dehydrogenase-1 wildtype (IDH1-WT), grade 4 patients.

Methods: Retrospective data of 1832 glioblastoma, IDH1-WT patients with comprehensive information on tumor parameters was acquired from the Radiomics Signatures for Precision Oncology in Glioblastoma (ReSPOND) consortium. Data imputation was performed for missing values. Sex-based differences in tumor parameters, such as, age, molecular parameters, pre-operative KPS score, tumor volumes, epicenter and laterality were assessed through non-parametric tests. Spatial atlases were generated using pre-operative MRI maps to visualize tumor characteristics. Survival time analysis was performed through log-rank tests and Cox proportional hazard analyses.

Results: GBM was diagnosed at a median age of 64 years in females compared to 61.9 years in males (FDR = 0.003). Males had a higher Karnofsky Performance Score (above 80) as compared to females (60.4% females Vs 69.7% males, FDR = 0.044). Females had lower tumor volumes in enhancing (16.7 cm^3 Vs. 20.6 cm^3 in males, FDR = 0.001), necrotic core (6.18 cm^3 Vs. 7.76 cm^3 in males, FDR = 0.001) and edema regions (46.9 cm^3 Vs. 59.2 cm^3 in males, FDR = 0.0001). Right temporal region was the most common tumor epicenter in the overall population. Right as well as left temporal lobes were more frequently involved in males. There were no significant differences in survival outcomes and mortality ratios. Higher age, unmethylated O6-methylguanine-DNAmethyltransferase (MGMT) promoter and undergoing subtotal resection increased the mortality risk in both males and females.

Conclusions: Our study demonstrates significant sex-based differences in clinical and radiological tumor parameters of glioblastoma, IDH1-WT, grade 4 patients. Sex is not an independent prognostic factor for survival outcomes and the tumor parameters influencing patient outcomes are identical for males and females.

Abbreviations: IDH1-WT = isocitrate dehydrogenase-1 wildtype; MGMTp = O6-methylguanine-DNA-methyltransferase promoter; KPS = Karnofsky performance score; EOR = extent of resection; WHO = world health organization; FDR = false discovery rate.