The impact of adjuvant radiation therapy for high-grade gliomas by histology in the United States population.

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Abstract

PURPOSE: To compare the survival impact of adjuvant external beam radiation therapy (RT) for malignant gliomas of glioblastoma (GBM), anaplastic astrocytoma (AA), anaplastic oligodendroglioma (AO), and mixed anaplastic oligoastrocytoma (AOA) histology.

METHODS AND MATERIALS: The Surveillance, Epidemiology, and End Results (SEER) database was queried from 1998 to 2007 for patients aged ≥18 years with high-grade gliomas managed with upfront surgical resection, treated with and without adjuvant RT.

RESULTS: The primary analysis totaled 14,461 patients, with 12,115 cases of GBM (83.8%), 1312 AA (9.1%), 718 AO (4.9%), and 316 AOA (2.2%). On univariate analyses, adjuvant RT was associated with significantly improved overall survival (OS) for GBMs (2-year OS, 17% vs 7%, p<.001), AAs (5-year OS, 38% vs 24%, p<.001), and AOA (5-year OS, 55% vs 44%, p=.026). No significant differences in OS were observed for AOs (5-year OS, with RT 50% vs 56% without RT, p=.277). In multivariate Cox proportional hazards models accounting for extent of resection, age, sex, race, year, marital status, and tumor registry, RT was associated with significantly improved OS for both GBMs (HR, 0.52; 95% CI, 0.50-0.55; P<.001) and AAs (HR, 0.57; 95% CI, 0.48-0.68; P<.001) but only a trend toward improved OS for AOA (HR, 0.70; 95% CI, 0.45-1.09; P=.110). Due to the observation of nonproportional hazards, Cox regressions were not performed for AOs. A significant interaction was observed between the survival impact of RT and histology overall (interaction P<.001) and in a model limited to the anaplastic (WHO grade 3) histologies (interaction P=.024), characterizing histology as a significant predictive factor for the impact of RT. Subgroup analyses demonstrated greater hazard reductions with RT among patients older than median age for both GBMs and AAs (all interaction P≤.001). No significant interactions were observed between RT and extent of resection. Identical patterns of significance were observed for cause-specific survival and OS across analyses.

CONCLUSIONS: In this large population-based cohort, glioma histology represented a significant predictor for the survival impact of RT. Adjuvant RT was associated with improved survival for AAs, with benefits comparable to those observed for GBMs over the same 10-year interval. No survival advantage was observed with adjuvant RT for AOs.

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