

Neurologic Sequelae in Brain Tumor Survivors in the Childhood Cancer Survivor Study (CCSS)

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Introduction: Survivors of childhood brain tumors experience a high rate of treatment-related morbidity; however longitudinal changes in the prevalence of neurologic sequelae have not been well described.

Methods: In the CCSS cohort, neurologic adverse events were evaluated longitudinally in 5 year brain tumor survivors (n=1876) and compared to siblings. Multivariable regression models determined risk for late onset neurologic sequelae, with hazard ratios (HR) and 95% confidence intervals (CI).

Results: Cumulative incidence for mortality was 25%, second malignant neoplasm (SMN) 4% and recurrence 21% at 30 years from diagnosis. From 5 years to 30 years, headaches increased from 38% to 53%, seizures 27% to 41%, coordination problems 50% to 61%, weakness 21% to 35%, hearing loss 9% to 23%, and blindness 14% to 17%. Compared to siblings, survivors had elevated risk for seizures HR 27.2 (CI 15.9-46.5) for ages 5-14 and 8.8 (CI 6.4-11.9) for 15+; coordination HR 24.3 (CI 16.4-35.9) for ages 5-19 and 4.4 (CI 3.2-6.2) for 20+; motor weakness HR 31.6 (CI 18.0-55.5) for ages 5-19 and 3.9 (CI 2.8-5.3) for 20+. Significant risk factors for coordination problems were any radiation 1-49 Gy HR 1.9 (CI 1.2-3.1) and >49Gy 1.9 (CI 1.2-2.8), recurrence 2.9 (CI 1.9-4.4), and second malignancy 4.4 (CI 1.8-11.2). Risk factors for weakness were frontal radiation >49Gy HR 2.0 (CI 1.2- 3.4), temporal > 49Gy HR 1.6 (CI 1.0-2.5), and recurrence HR 3.0 (CI 2.1- 4.4). Stroke was associated with a 7-fold increase (CI 4.3-11.0) in later onset coordination problems and a 15-fold increase (CI 10.6-21.7) in weakness.

Conclusions: Adult survivors of childhood CNS tumors continue to experience new onset of neurologic conditions as they age and remain at higher risk than those without cancer. Late onset stroke, SMN and primary tumor recurrence are independently associated with risk for a new neurologic condition.