Changes to memory structures in children treated for posterior fossa tumors.


Abstract
Children treated for medulloblastoma (MB) exhibit long-term impairments in declarative memory, but the pathophysiology underlying this is unclear. Previous studies report declines in global white matter volume, but have failed to link this to declines in memory performance. We examined the effects of treatment on measures of global brain structure (i.e., total white and gray matter volume) and specific memory structures (i.e., hippocampus and uncinate fasciculus). We used volumetric MRI and diffusion tensor imaging in pediatric survivors of MB and one survivor of astrocytoma treated with cranial-spinal radiation (n = 20), and healthy controls (n = 13). Compared to controls, the survivor group exhibited reduced white matter volume, damage to the uncinate fasciculus, and a smaller right hippocampus. Critically, reduced hippocampal volume was not related to differences in brain volume, suggesting that the hippocampus may be especially vulnerable to treatment effects. A subset of the survivors (n = 10) also underwent memory testing using the Children's Memory Scale (CMS). Performance on the general index of the CMS was significantly correlated with measures of hippocampal volume and uncinate fasciculus. The examination of treatment effects on specific brain regions provides a better understanding of long-term cognitive outcome in children with brain tumors, particularly medulloblastoma.

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