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Pediatric Posterior Fossa Tumor Treatment Affects Thalamic Volume, Memory, and Processing Speed (S27.004)

Brandon Shin, Sharon O'Neil, Sofia Dhanani, and Mary Baron Nelson | AUTHORS INFO & AFFILIATIONS

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Abstract

Objective:

We investigated changes in brain volume in the putamen, thalamus, and hippocampus amongst patients who received surgery and patients treated with surgery, chemotherapy, and cranial irradiation (SC-CRT) compared to healthy sibling controls. Neuropsychological assessments determined cognitive outcomes associated with the different treatment modalities.

Background:

Survivors of childhood brain tumors, the most common type of cancer in children, have the poorest quality of life compared to those surviving other cancers. Cognitive deficits related to brain injury from the tumor and treatment may cause difficulty with memory, attention, processing speed and social skills.

Design/Methods:

Thirty-six children, aged 6 to 17, with a history of posterior fossa tumor (17 treated with surgery; 19 with SC-CRT) underwent neuroimaging and neuropsychological assessment at least 1 year post-treatment, along with 15 healthy sibling controls. All had magnetic resonance imaging (MRI) with diffusion tensor imaging (DTI) and neuropsychological evaluation done (n=51). The putamen, thalamus, and hippocampus were manually segmented on each participant's MRI and in the radiation treatment group, the radiation dose for each structure was calculated.

Results:

Block Design scores of both patient groups were lower than those of the controls, with the group who underwent SC-CRT scoring lowest ($p<0.001$). Scores on Memory for Designs content were lower in the patient surgery group than the SC-CRT group ($p=0.03$), and Symbol Search scores were lower in the SC-CRT group than in the surgery group ($p=0.01$). Patients who

underwent SC-CRT had the lowest thalamic volumes when controlled for age (p=0.02). DTI values did not reflect microstructural brain injury in patient groups compared to controls.

Conclusions:

Posterior fossa tumor treatment alters thalamic volume - patients who received SC-CRT had the greatest affected volume. Neuropsychological assessments demonstrated decreased processing speed, visuoconstruction, and visual learning scores between patient groups and in all patients compared to healthy sibling controls.

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