

Helical Tomotherapy for Pediatric CNS Tumors: A Single-Center Experience from an LMIC

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abstract



Helical Tomotherapy for Pediatric CNS Tumors: A Single-Center Experience from an LMIC

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Introduction: Helical Tomotherapy (HT) is a radiation delivery technique capable of generating highly conformal dose distributions around the target volume, making it suitable for treating pediatric central nervous system (CNS) tumors. Our center provides cost-free precision radiotherapy (RT) to all patients. We present our experience of pediatric patients treated with CNS-directed HT, analyzing treatment outcomes, and survival.

Methodology: A retrospective review was conducted of 44 pediatric patients (≤ 19 years) treated from Jan 2021 to March 2025 at the CyberKnife and Tomotherapy Center, Jinnah Postgraduate Medical Centre. Data was reviewed for demographics, tumor type, surgery status, chemotherapy, treatment response, and survival. Descriptive analysis was performed.

Results: A total of 44 patients received CNS

radiotherapy with HT; 29 (66%) were male, with a mean age of 11.2 years (SD 4.5). The most common histological types were brainstem glioma (34%), glioma (31%), ependymoma (20%), and medulloblastoma (9%). Surgery was performed in 30 patients (68%). The median RT dose was 54 Gy (range 39–60). Six patients (14%) were irradiated under general anesthesia and 13 (30%) received chemotherapy with RT. Overall, 75% completed radiotherapy, while 14% died during treatment and 11% discontinued. Post-RT MRI showed regression in 26%, stable disease in 58%, and progression in 16%. At evaluation, 50% were alive, 41% had died, and 9% were lost to follow-up. Median disease-free survival was 25 months for patients treated with surgery + RT versus 10.5 months for RT alone.

Conclusions: The study demonstrates the feasibility of cost-free CNS-directed radiotherapy using Helical Tomotherapy in our limited-resource setting. Early outcomes are promising, but larger

studies with long-term follow-up are needed to evaluate late toxicities and treatment effectiveness.

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