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The role of preoperative chemotherapy in pediatric neuro-oncology: a single-center experience and a systematic review of the literature

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Abstract

Objective: Brain tumors in infants and young children may constitute a challenge to achieve a grosstotal resection (GTR) due to their large size, high vascularity, and patient's low vascular reserve. Preoperative (neoadjuvant) chemotherapy has been reported to increase rates of GTR, reduce complications, and improve long-term tumor-free survival outcomes by decreasing tumor size and vascularity. This study evaluates the role of preoperative chemotherapy in pediatric patients with brain tumors through a systematic review and a single tertiary center experience.

Methods: A systematic review was conducted using three databases (i.e., MEDLINE, Embase, and Web of Science) to identify reported cases of pediatric brain tumor treated with preoperative chemotherapy. Furthermore, the records of 6 pediatric brain tumor patients treated with preoperative chemotherapy at Texas Children's Hospital between 2018 and 2023 were reviewed. Descriptive characteristics and clinical outcomes were assessed in compliance with the local ethics committee protocol.

Results: Twenty-one studies with 124 patients were included in the systematic review. The mean age at presentation was 32 months (range 0.17-144 months), with a male predominance (n = 73, 58.9%). The mean age of the current single-center cohort was 50.3 months (range 2-180 months), with a mean follow-up of 45 months (range 4-45 months). Within the systematic review, 10 different tumor pathologies were identified, the most common being medulloblastoma (n = 61), followed by choroid plexus carcinoma (n = 26). Overall, 82.3% (102/124) of the patients showed any radiographic tumor reduction after chemotherapy in the literature review versus 50% (3/6) in the current case series. GTR after preoperative chemotherapy was achieved in 78.2% (97/124) of the patients, similar to the current patient series experience in which GTR was achieved in 80% (4/5). No complications from preoperative chemotherapy that impacted the surgery or the immediate postoperative course were identified.

Conclusions: Preoperative chemotherapy is a safe and effective strategy to increase maximum and safe resection rates in children and infants with pediatric brain tumors.

Keywords: childhood brain tumor; neoadjuvant; neuro-oncology; oncology; pediatric brain tumor; preoperative chemotherapy.

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