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# Predictors of postoperative complications and functional outcomes in pediatric patients with surgically treated fourth ventricle tumors

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## Abstract

**Background:** Tumors of the fourth ventricle are frequently treated pathologies in pediatric neurosurgery. Data regarding predictors for permanent neurological deficits, long-term functional outcomes, cerebellar mutism (CM), the extent of resection (EOR), and oncological outcomes are scarce. We attempt to contribute to this topic with an analysis of our institutional cohort.

**Methods:** A retrospective single-center study of patients aged  $\leq 19$  years who underwent primary surgical resection of a fourth ventricular tumor over a 15-year period (2006-2021). Predictors analyzed included age, gender, surgical approach, anatomical pattern, tumor grade, EOR, tumor volume, and others as appropriate.

**Results:** One hundred six patients were included (64 males, mean age 7.3 years). The rate of permanent neurological deficit was 24.2%; lateral tumor extension ( $p = 0.036$ ) and tumor volume greater than  $38 \text{ cm}^3$  ( $p = 0.020$ ) were significant predictors. The presence of a deficit was the only significant predictor of reduced (less than 90) Lansky score ( $p = 0.005$ ). CM occurred in 20.8% of patients and was influenced by medulloblastoma histology ( $p = 0.011$ ), lateral tumor extension ( $p = 0.017$ ), and male gender ( $p = 0.021$ ). No significant difference between the transvermian and telovelar approach in the development of CM was detected ( $p = 0.478$ ). No significant predictor was found for the EOR. EOR was not found to be a significant predictor of overall survival for both low-grade and high-grade tumors; however, gross total resection (GTR) was protective against tumor recurrence compared to near-total or subtotal resection ( $p < 0.001$ ). In addition, survival was found to be better in older patients ( $\geq 7.0$  years,  $p = 0.019$ ).

**Conclusion:** The overall rate of postoperative complications remains high due to the eloquent localization. Older patients ( $> 7$  years) have been found to have better outcomes and prognosis. Achieving GTR whenever feasible and safe has been shown to be critical for tumor recurrence. CM was more common in patients with medulloblastoma and in patients with tumors extending through the foramen of Luschka. The telovelar approach uses a safe and anatomically sparing corridor; however, it has not been associated with a lower incidence of CM and neurological sequelae in our series, showing that each case should be assessed on an individual basis.

**Keywords:** Cerebellar mutism; Childhood tumor; Fourth ventricle tumors; Overall survival;

Postoperative complications.

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