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National multicentered retrospective review of clinical and intraoperative factors associated with the development of cerebellar mutism after pediatric posterior fossa tumor resection

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Abstract

Background: Cerebellar mutism (CM) is characterized by a significant loss of speech in children following posterior fossa (PF) surgery. The biological origin of CM remains unclear and is the subject of ongoing debate. Significant recovery from CM is less likely than previously described despite rigorous multidisciplinary neuro-rehabilitational efforts.

Methods: A national multi-centered retrospective review of all children undergoing PF resection in four midsized Canadian academic pediatric institutions was undertaken. Patient, tumor and surgical factors associated with the post-operative development of CM were reviewed. Retrospective identification of PF surgery patients including those developing and those that did not (internal control).

Results: The study identified 258 patients across the 4 centers between 2010 and 2020 (mean age 6.73 years; 42.2% female). Overall, CM was experienced in 19.5% of patients (N = 50). Amongst children who developed CM histopathology included medulloblastoma (35.7%), pilocytic astrocytoma (32.6%) and ependymoma (17.1%). Intraoperative impression of adherence to the floor of the 4th ventricle was positive in 36.8%. Intraoperative abrupt changes in blood pressure and/or heart rate were identified in 19.4% and 17.8% of cases. The clinical resolution of CM was rated to be complete, significant resolution, slight improvement, no improvement and deterioration in 56.0%, 8.0%, 20.0%, 14.0% and 2.0%, respectively. In the cohort of children who experienced post-operative CM as compared to their no-CM counterpart, proportionally more tumors were felt to be adherent to the floor of the 4th ventricle (56.0% vs 49.5%), intraoperative extent of resection was a GTR (74% vs 68.8%) and changes in heart rate were noted (≥ 20% from baseline) (26.0% vs 15.9%). However, a multiple regression analysis identified only abrupt changes in HR (OR 5.97, CI (1.53, 23.1), p = 0.01) to be significantly associated with the development of post-operative CM.

Conclusion: As a devastating surgical complication after posterior fossa tumor surgery with variable clinical course, identifying and understanding the operative cues and revising intraoperative plans that optimizes the child's neurooncological and clinical outcome are essential.

Keywords: Cerebellar mutism; Cerebellar mutism syndrome; Medulloblastoma; Pediatric posterior fossa surgery; Posterior fossa syndrome.