

# Postoperative Care of Pediatric Brain Tumors: Let's Work Together

Mullai Baalaji<sup>1B</sup>

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Brain tumors are the most common solid tumors in children and are one of the leading causes of cancer-related mortality in this population. With an incidence ranging from 1.15 to 5.14 cases per 100,000 children, it is second only to leukemia among pediatric malignancies.<sup>1,2</sup> Surgical resection remains the mainstay of treatment and is often the first step in the multidisciplinary treatment, consisting of additional radiotherapy and chemotherapy.<sup>3</sup> Pediatric brain tumor surgeries are intrinsically high risk due to higher incidence of large tumors, posterior fossa lesions, complex midline tumors, and sellar tumors. Various technological advances in neurosurgery, such as operating microscopy, neuro endoscopy, intraoperative imaging and neurophysiological monitoring, and neuronavigation, have allowed surgeons to use minimally invasive approaches to safely achieve wider resection with lesser neuro deficits.<sup>4</sup> Perioperative complications following tumor surgery have been widely estimated between 10 and 50%, and some of them can be life-threatening and need the expertise to address the unique and specific requirements of this population.<sup>5</sup> They are usually admitted for observation in an intensive care facility and discharged following satisfactory clinical recovery and postoperative brain imaging.

Postoperative care requirements vary greatly and depend on age, tumor location, approach, and size to name a few, and some of these can be anticipated preoperatively. Elective postoperative admission into an intensive care unit (ICU) facility is the norm in many centers following surgery. Elective postoperative ventilation might be warranted in some clinical scenarios, such as brain stem handling in posterior fossa tumors. Cerebral edema is yet another complication that will necessitate elective ventilation in the postoperative period. New-onset neurological deficits in the form of limb weakness, lower cranial nerve palsies, mutism, etc., can be present in the postoperative period.<sup>6</sup> Sodium and water disturbances are also common in the postoperative period, especially following surgeries for craniopharyngioma and pituitary tumors, and require careful monitoring of fluid balance and serum sodium levels.<sup>7,8</sup> Postoperative pulmonary complications manifesting as atelectasis, pneumonia, and respiratory failure are common, especially with infratentorial neoplasms, and are usually associated with lower cranial nerve palsies.<sup>9</sup> Meningitis, commonly due to shunt infection, is a dreaded though uncommon complication observed in these patients. Some postoperative concerns such as persistent hydrocephalus, shunt malfunction, and need for CSF diversion procedures might necessitate a

Department of Pediatric Critical Care, Kovai Medical Center and Hospital, Coimbatore, Tamil Nadu, India

**Corresponding Author:** Mullai Baalaji, Department of Pediatric Critical Care, Kovai Medical Center and Hospital, Coimbatore, Tamil Nadu, India, Phone: +91 9855050822, e-mail: drmullaibaalaji@gmail.com

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second surgical procedure in the same admission in some of these children.<sup>10</sup>

Anticipation of the potential complications and timely intervention improves mortality and morbidity in the immediate postoperative setting and underlines the importance of close monitoring. The postoperative monitoring practices vary widely and happen in specialized pediatric intensive care units (PICU), neurosurgical ICU, or high-dependency intermediary care/postoperative acute care units. Such varied practices necessitate better characterization of postoperative needs and interventions in this group of children in order to tailor nursing care as well as optimize existing resources. The authors in this study have looked at the factors associated with prolonged ICU stay, defined as more than 1 day of ICU stay, and also the postoperative complications and outcomes following craniotomy for intracranial tumors in children.<sup>11</sup>

The study has several strengths in that it is a focussed review on craniotomy for pediatric brain tumors and enhances our understanding of the postoperative course in these children. Prolonged operative time, presence of external ventricular drain (EVD), and endotracheal tube (ET) at the time of ICU admission were the variables that independently predicted prolonged postoperative ICU stay as defined as more than 24 hours, for this study purpose. The overall incidence of postoperative complications was 55.4% comparable to existing data.<sup>5</sup> Another interesting observation in this study is that the majority of children (62%) needed only a one-day ICU stay, mostly overnight observation, and could be safely discharged to the ward. The location of tumors, size of tumors, and intraoperative events were not associated with the

need for prolonged ICU stay in the multivariate model. The findings of the study are very relevant to the setups dealing with these complex problems and could also serve as a model for counseling families about the anticipated course in a given child.

One of the often-asked questions is whether to electively admit all children undergoing craniotomy for brain tumor to an ICU facility for postoperative care.<sup>12</sup> The answer to this simple question is complex, as many factors apart from disease biology affect the decision to shift these children to specified locations for postoperative care. There are important regional differences among the units that are equipped to take care of these complex patients, such as PICUs, neurosurgical ICUs, and postoperative care units, and they have different staffing patterns, including resident doctors, nurses, and other allied paramedical workers. Availability of high-dependency or step-down units, trained staff in wards, and robust monitoring facilities outside ICUs are some of the other factors that influence the decision and are difficult to be accounted for. Also, ICU admission and discharge criteria, availability of beds and resources, and running costs vary within different hospitals as well as regions and will be taken into consideration by the treating team to optimize postoperative care. It is quite practical to monitor children undergoing simpler procedures such as biopsy or resection of superficial lesions in wards, but framing uniform “fitting all” guidelines will be difficult, and it has to be guided by the local needs, and the decision is best taken by the operating neurosurgeon along with the anesthesiologist.

Irrespective of the place of monitoring, understanding the specific postoperative requirements in a given patient is important in order to anticipate potential problems, thereby improving care and optimizing the available resources. So, rather than answering the question of whether elective ICU admission is warranted, such studies highlight the complexities of postoperative care in this cohort of patients and help us to advance our knowledge in this regard. This will definitely go a long way in making informed decisions and help us be better prepared for postoperative care planning.

## ORCID

Mullai Baalaji  <https://orcid.org/0000-0003-1746-1586>

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