Syntax Literate: Jurnal Ilmiah Indonesia p–ISSN: 2541-0849
e-ISSN: 2548-1398
Vol. 9, No. 11, November 2024

ANESTHESIA MANAGEMENT OF SPACE-OCCUPYING LESION IN THE PONTINE REGION DUE TO BRAINSTEM GLIOMA IN A PEDIATRIC PATIENT: A CASE REPORT

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Abstract

A space-occupying lesion (SOL) in the pontine region of the medulla oblongata, often suspected as a brainstem glioma, poses a complex diagnostic challenge. Brainstem gliomas, primarily diffuse intrinsic, afflict all age groups with a median survival of about 12 months, influenced by tumor characteristics. Comprehensive preoperative evaluation is essential to assess the patient's health status and identify potential complications, guiding optimal anesthesia management. This case report aimed to describe the author's anesthesia technique for managing patients with SOL in the pontine region of the medulla oblongata, focusing on those with suspected brainstem gliomas. A four-year-old girl weighing 20 kilograms presented with sudden left-sided weakness, difficulty swallowing, headaches, and speech difficulties. Examination revealed right cranial nerve paresis and decreased left extremity strength. MRI showed a pontine glioma. Surgery preparation included fasting, fluid calculation, and medication readiness. Anesthesia induction involved midazolam premedication, propofol induction, and remifentanil for intubation. Monitoring included $EtCO_2$ and oxygen saturation maintenance. Intraoperatively, target-controlled infusion (TCI) propofol and compressed air sustained oxygenation. Paracetamol and tranexamic acid were administered. The surgery lasted five hours in the left lateral decubitus position. Postoperative analgesia included fentanyl and oral paracetamol. The patient spent seven days in the PICU on a ventilator before discharge on the eighth day. In summary, the case of the four-year-old girl with left-sided weakness and difficulty swallowing, diagnosed with pontine glioma, showcases the intricate multidisciplinary approach essential in pediatric neurosurgery.

Keywords: anesthesia, brainstem glioma, case report, pediatric, space-occupying lesion.

Introduction

Brainstem glioma in children is a rare case. These gliomas, either diffuse intrinsic or focal, primarily affect the pons but can also occur in the medulla or midbrain. Brainstem gliomas are relatively more prevalent among children compared to adults, constituting approximately 10-20% of all central nervous system (CNS) tumors in pediatric populations (Albright et al., 1983; Garzón et al., 2013; Grimm & Chamberlain, 2013). They predominantly affect young children, with the highest incidence observed in those aged 1-9 years. The median age at diagnosis typically centers around 6.5 years, reflecting the pediatric nature of this condition and its impact on younger age groups (Patil et al., 2021).

Brainstem gliomas in children are unique due to their rarity and location in the pontine region, crucial for vital functions like breathing and motor control (Hargrave et

How to cite: Yustisia, et al. (2024). Anesthesia Management of Space-Occupying Lesion in the Pontine Region due to Brainstem Glioma in a Pediatric Patient: a Case Report. *Syntax Literate. (9)11.* http://dx.doi.org/10.36418/syntax-literate.v9i11
E-ISSN: 2548-1398

al., 2006; Laigle-Donadey et al., 2008). This poses challenges in treatment and management. Symptoms such as sudden left-sided weakness, difficulty swallowing, headaches, and speech issues highlight its aggressive nature and diagnostic difficulties. Anesthesia management requires careful planning to mitigate risks like arrhythmias and hypotension during surgery. Preoperative assessment, including medical history, physical examination, and laboratory tests, is crucial for evaluating patients with suspected brainstem gliomas. This comprehensive approach aims to assess overall health and determine the severity of the condition, ensuring optimal perioperative care and treatment planning (Dib & Ramos, 2023; Wing-hay & Chun-kwong, 2019). Evaluating the patient's airway, breathing, and circulation (ABCs) is crucial to identify potential complications (Ius et al., 2023; Zhang et al., 2023). This case report aimed to describe the author's anesthesia technique for managing patients with SOL in the pontine region of the medulla oblongata, focusing on those with suspected brainstem gliomas.

Case Presentation

A four-year-old girl weighing 20 kilograms was admitted with complaints of left-sided body weakness for the past month. The symptoms appeared suddenly and were accompanied by difficulty swallowing. She also experienced intermittent headaches and had trouble speaking. There was no history of progressive weight loss, head trauma, loss of consciousness, or seizures. The patient had no known food or drug allergies and had never undergone surgery.

Physical examination revealed a pulse rate of 107 beats per minute with a single heart sound, without murmur or gallop, a respiration rate of 20 breaths per minute, and an oxygen saturation of 97% on room air. The patient exhibited paresis of the right cranial nerves VI, VII, and XII, along with decreased motor strength in the left extremities. Complete blood count, coagulation profile, and clinical chemistry tests were normal. MRI imaging showed a heterogeneous solid mass with cystic components in the intra-axial infratentorial region, spanning the right and left pons and extending to the right midbrain. This mass compressed the cerebellum posteriorly and narrowed the fourth ventricle, indicating a pontine glioma.

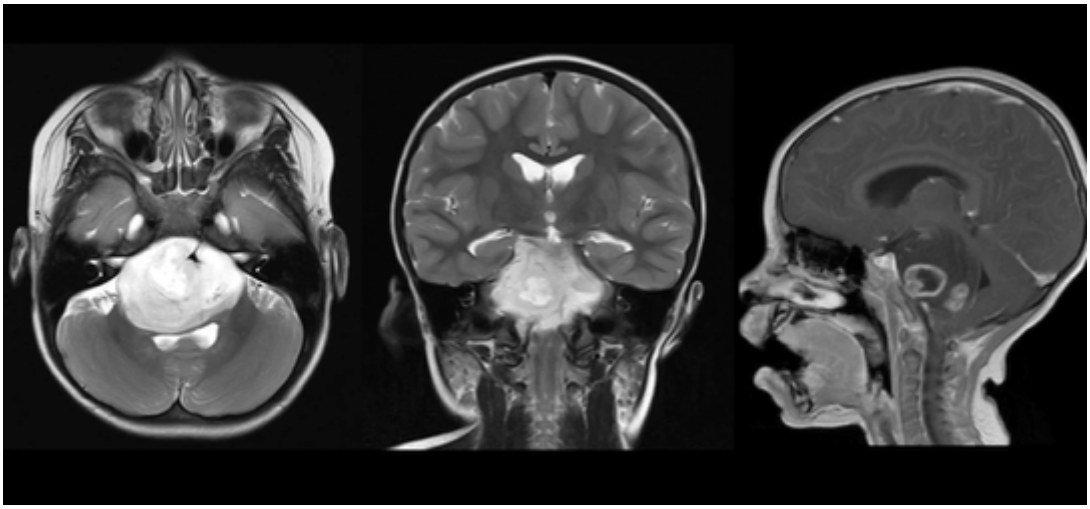

Figure 1. MRI imaging of the patient.

Surgery preparation involved ensuring the patient fasted from solid food for at least six hours before anesthesia, along with standard monitoring. The anesthesia

procedure began with premedication using 1.5 mg of midazolam intravenously, followed by preoxygenation with 100% oxygen for five minutes and administration of 15 mg of rocuronium intravenously. Anesthesia was induced using propofol in TCI mode with a target effect of 3 µg/mL. Remifentanil at 1 µg/kg was given over 30-60 seconds before intubation with a McGrath videolaryngoscope with a size 2 blade. An arterial line was placed after an Allen test and local infiltration with 2% lidocaine. Intubation was performed using a 4.5-cuffed non-kinking endotracheal tube (ETT), with placement confirmed by bilateral symmetric auscultation. After confirmation, the ETT was secured, an esophageal temperature probe was placed, and packing was applied. A 5 Fr central venous catheter (CVC) was inserted into the right internal jugular vein.

During the operation, monitoring included maintaining oxygenation with compressed air and propofol in TCI mode with a target effect of 2-3 µg/mL. Standard monitoring ensured EtCO2 levels were within 30-45 cmH2O and oxygen saturation was between 96-100%. Additional medications administered included 200 mg of paracetamol and 300 mg of tranexamic acid intravenously. The surgical procedure lasted five hours and was performed in the left lateral decubitus position. Postoperative analgesia was managed with 120 micrograms of fentanyl in 10 milliliters of 0.9% NaCl at a titration rate of 0.4 ml/hour and 100 mg of oral paracetamol every eight hours. After surgery, the patient was monitored in the pediatric intensive care unit (PICU) with a ventilator for seven days and was discharged on the eighth postoperative day.

Results and Discussion

A four-year-old girl was admitted with left-sided body weakness and difficulty swallowing for a month, alongside intermittent headaches and trouble speaking. MRI revealed a heterogeneous mass in the intra-axial infratentorial region, extending to the right midbrain and compressing the cerebellum, indicating a pontine glioma. Anesthesia involved midazolam, rocuronium, and propofol. Intubation was confirmed and secured, with a central venous catheter placed. Oxygenation and propofol were maintained during surgery, and medications like paracetamol and tranexamic acid were given. The five-hour surgery was followed by postoperative PICU monitoring, and the patient was discharged on the eighth day.

Anesthesia management for pediatric patients with brainstem gliomas focuses on ensuring effective sedation and pain relief while maintaining stable vital functions, particularly respiratory function. The brainstem's role in regulating breathing underscores the need for vigilant monitoring to prevent respiratory compromise. In this case, the absence of central brainstem dysfunction such as respiratory or cardiovascular issues simplified the anesthesia approach. However, the patient exhibited signs of increased intracranial pressure, manifesting as intermittent headaches and left-sided body weakness, consistent with clinical findings in brainstem glioma diagnoses reported by (Dang et al., 2023; Reisz et al., 2023). Although this case did not involve decreased consciousness, it confirms typical symptoms associated with pontine gliomas, influencing anesthesia management strategies. Agents used must preserve respiratory drive while achieving optimal unconsciousness levels. Management also entails carefully regulating blood pressure and heart rate due to the brainstem's autonomic control. The tumor's proximity to critical brainstem structures complicates surgical procedures, necessitating precise physiological control to minimize surgical risks (Bajwa et al., 2023; Davidson et al., 2023; Nimmo et al., 2019)

The case of a four-year-old girl with a pontine brainstem glioma is notable for its rarity in young children, posing challenges due to their developmental and anatomical characteristics. The tumor's location in the pontine region, vital for functions like breathing and motor control, complicates treatment and necessitates careful management. Symptoms such as sudden left-sided weakness, difficulty swallowing, intermittent headaches, and speech issues underscore the tumor's aggressive nature, hampering early diagnosis. MRI revealed a complex mass with cystic components, adding complexity to surgical and therapeutic approaches. Anesthetic management employed TIVA with propofol and fentanyl to maintain stable vital signs. Induction included midazolam, rocuronium, and remifentanil to ensure smooth intubation. The pain was managed with intravenous medications, complemented by TIVA for effective anesthesia.

Managing this case presented significant challenges, including delayed diagnosis due to unrecognized symptoms such as left-sided weakness and difficulty swallowing, necessitating improved pediatric neurological screenings and caregiver education. The tumor's location in the pontine region complicated surgical and anesthetic approaches, requiring careful management near critical brainstem structures. Advanced imaging like functional MRI could enhance preoperative planning by mapping crucial pathways. Anesthesia management for pediatric brainstem tumors, with risks to respiratory and cardiovascular stability, demanded rigorous intraoperative neurophysiological monitoring for prompt complication detection. A seven-day PICU stay with ventilation highlighted the need for intensive monitoring. Tailored protocols for brainstem glioma patients, focusing on ventilation strategies and early mobilization, could optimize recovery. Coordinating care among specialists was challenging, emphasizing the advantages of dedicated pediatric neuro-oncology teams. Effective pain management, using multimodal and non-pharmacological interventions, remains pivotal for minimizing opioids and improving overall outcomes.

Conclusion

In conclusion, the case of the four-year-old girl with left-sided body weakness and difficulty swallowing, ultimately diagnosed with pontine glioma, exemplifies the intricate multidisciplinary approach required in pediatric neurosurgery. From meticulous preoperative preparation to precise intraoperative management and comprehensive postoperative care, every step is crucial in ensuring optimal outcomes for patients facing such complex conditions. The integration of advanced anesthesia techniques, neuromonitoring, and vigilant perioperative monitoring underscores the dedication of healthcare professionals to providing the highest standard of care. This case serves as a testament to the collaborative efforts of the medical team and highlights the importance of individualized care in pediatric neurosurgical interventions.

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