ISSN. 2338-7475
E-ISSN. 2620-7869
Hearty
Jurnal Kesehatan Masyarakat
Beriman, Tulus, Sepenuh Hati,Berbesar Hati, Jujur, Sehat dan Kuat
Vol. 13 No. 3, June 2025, Hal. 745-753

UTILIZATION OF ROCURONIUM AT A DOSE OF 0.8 MG/KG BODY WEIGHT IN CESAREAN SECTION WITH SPHENOID WING MENINGIOMA: A CASE REPORT

Deni Salmon *, Tjokorda Gede Agung Senapathi, Adinda Putra Pradhana, IGAG Utara Hartawan
Department of Anesthesia, Faculty of Medicine, Universitas Udayana
Corresponding Author: *dnibius2022@gmail.com*

Abstract

Sphenoid Wing Meningioma (SWMNG) is a prevalent intracranial tumor with significant implications for obstetric patients, particularly due to heightened risks of cerebral edema and increased intracranial pressure (ICP). This case highlights the anesthetic management of a pregnant patient with SWMNG and symptomatic epilepsy, focusing on the use of rocuronium bromide for rapid sequence intubation (RSI). Rocuronium, a non-depolarizing neuromuscular blocker, offers rapid onset and intermediate duration, making it a preferred choice for high-risk cases. A 34 year old woman at 38 weeks and 5 days of gestation with a confirmed diagnosis of SWMNG and symptomatic epilepsy underwent a cesarean section and surgical sterilization. The patient's clinical history included frequent transient loss of awareness episodes, exacerbated during pregnancy. Imaging confirmed SWMNG, necessitating general anesthesia (GA) with rocuronium at a dose of 0.8 mg/kg to ensure effective RSI while minimizing risks of prolonged neuromuscular blockade, compromised hemodynamic stability, and increased ICP. The procedure was successfully completed with stable maternal and fetal outcomes. Rocuronium facilitated optimal intubation conditions and muscle relaxation, with minimal placental transfer and preserved uterine contractility. This case underscores the efficacy of precise rocuronium dosing in balancing rapid recovery, safety, and the unique challenges of airway management in obstetric patients with intracranial tumors. Vigilant monitoring and tailored anesthetic strategies are essential to mitigate complications, ensuring favorable outcomes for both mother and fetus.

Keywords: Cesarean Section, Rocuronium, Sphenoid Wing Meningioma

Introduction

The utilization of muscle relaxants in obstetric surgeries, particularly in the presence of comorbidities like intracranial neoplasms, requires careful consideration to ensure maternal and fetal safety. Rocuronium bromide, a non-depolarizing neuromuscular blocking agent, has emerged as a preferred option due to its rapid onset and intermediate duration of action. This makes it particularly effective for Rapid Sequence Intubation (RSI), which is crucial in emergency situations where maintaining hemodynamic stability and minimizing the risk of increased intracranial pressure (ICP) are paramount (Röhm et al., 2019).

In obstetric patients with conditions such as Sphenoid Wing Meningioma (SWMNG), the administration of rocuronium at a carefully calculated dose, such as 0.8 mg/kg, ensures effective muscle relaxation while minimizing the risks associated with prolonged neuromuscular blockade. The precise dosing and use of rocuronium allow for optimal intubation conditions and the preservation of uterine contractility, thereby enhancing maternal and fetal safety (Sridharan et al., 2020). Continuous

Submitted: May-2025 Received: May-2025 Available Online: June-2025

monitoring and tailored anesthetic management are essential to mitigate complications, ensuring favorable outcomes for both mother and child.

In this case, the administration of rocuronium at a dose of 0.8 mg/kg body weight was selected to optimize endotracheal intubation in a pregnant patient with Sphenoid Wing Meningioma (SWMNG) and symptomatic epilepsy. Rocuronium, a non-depolarizing neuromuscular blocker, is commonly used for rapid sequence intubation (RSI) due to its rapid onset and intermediate duration, making it a preferred choice in high-risk obstetric patients (Al-Khafaji, 2019). By utilizing a reduced dose of 0.8 mg/kg, the aim was to minimize the potential complications associated with excessive neuromuscular blockade, such as prolonged muscle relaxation, hemodynamic instability, and elevated intracranial pressure (ICP) (Benumof & Hagberg, 2023).

This tailored approach aligns with established recommendations suggesting that lower doses of neuromuscular blocking agents may be safer in obstetric patients with increased risks due to intracranial masses (Apfelbaum et al., 2019). The use of precise dosing allows for a balance between effective muscle relaxation and minimizing adverse effects, thereby enhancing maternal and fetal outcomes. Through vigilant monitoring and adherence to individualized anesthetic strategies, this approach supports safe airway management in challenging clinical scenarios.

The administration of rocuronium at a dose of 0.8 mg/kg body weight requires careful consideration to ensure effective muscle relaxation while minimizing potential risks to maternal physiology. During pregnancy, physiological changes such as increased blood volume, altered renal clearance, and enhanced placental transfer of certain drugs can influence the pharmacokinetics of rocuronium. These changes necessitate precise dosing and careful monitoring to maintain maternal and fetal safety (Baraka, 2020). Rocuronium, a non-depolarizing neuromuscular blocker, provides a rapid onset and intermediate duration of action, which is essential in managing airway complications during cesarean sections involving high-risk patients with conditions such as Sphenoid Wing Meningioma (SWMNG). The dose of 0.8 mg/kg ensures effective muscle relaxation while preserving uterine contractility and minimizing the risk of prolonged neuromuscular blockade (Kim et al., 2022).

This report focuses on evaluating the adequacy of 0.8 mg/kg rocuronium for rapid sequence intubation (RSI) in a patient undergoing cesarean section with concurrent sphenoid wing meningioma (SWMNG). Rocuronium, a non-depolarizing neuromuscular blocker, is preferred in high-risk obstetric cases due to its rapid onset and intermediate duration of action, making it suitable for RSI (Ramadhani et al., 2020). The pharmacodynamic effects of rocuronium, including minimal placental transfer and preservation of uterine contractility, are critical in ensuring maternal and fetal safety during surgical procedures (Sari & Putri, 2021).

In managing anesthesia for cesarean sections involving patients with intracranial tumors like SWMNG, precise dosing and vigilant monitoring are essential to mitigate risks such as prolonged neuromuscular blockade, compromised hemodynamic stability, and increased intracranial pressure (ICP). Research highlights that rocuronium at an appropriate dose effectively facilitates muscle relaxation while maintaining patient safety, which is crucial in balancing rapid recovery and minimizing complications (Widiatmika & Nurhasanah, 2022). This case report underscores the importance of tailored anesthetic strategies in obstetric patients with intracranial conditions to achieve optimal outcomes.

Research Methodology

1. Research Type

This study is a qualitative descriptive research focusing on a case report regarding the use of Rocuronium at a dosage of 0.8 mg/kg body weight in patients diagnosed with Sphenoid Wing Meningioma undergoing a caesarean section. The study aims to describe and analyze in detail the use of Rocuronium in this unique context, as well as to evaluate its clinical effects and outcomes. This approach provides in-depth insights into the utilization of Rocuronium in complex situations such as pregnancy with intracranial tumors.

2. Data Sources

The data sources used in this research consist of clinical data collected from hospital medical records. The collected information includes medical history, physical examination results, laboratory findings, and documentation regarding drug administration during the childbirth process. Data were retrospectively extracted from patient medical records, encompassing preoperative, intraoperative, and postoperative clinical observations. Data validity was ensured through validation against medical records and cross-referencing relevant data from various medical records.

3. Data Collection Techniques

Data collection in this study was performed through documentation review and clinical interviews with the medical team treating the patients. Documentation review involved a detailed analysis of patient medical records, including operative notes, anesthetic records, and medication history. Additionally, interviews with anesthesiologists, surgeons, and nurses were conducted to gather supplementary information regarding Rocuronium use and patient response during and after surgery. This technique ensures high data accuracy by minimizing human error through structured and detailed recording.

4. Data Processing and Analysis Techniques

The collected data were then analyzed descriptively to understand Rocuronium usage patterns in the context of patients with Sphenoid Wing Meningioma. This analysis involved comparing patient clinical outcomes with predetermined parameters such as anesthesia duration, patient response to the drug, and postoperative neurological outcomes. Descriptive statistics such as mean, median, and standard deviation were employed to analyze clinical data. The results of the analysis were interpreted to provide a comprehensive understanding of the effectiveness and safety of Rocuronium use in patients with complex medical conditions.

Results

Tabel 1. Summary of Report Results

Variable	Details
Patient Age	34 years
Gestation	38 weeks 5 days
Diagnosis	Primary cerebral tumor, suspected right Sphenoid Wing Meningioma (SWMNG) with symptomatic epilepsy
Pregnancy History	Third pregnancy; two spontaneous deliveries, last labor 9 years ago
Menstrual History	First menstruation at 14 years; regular cycle of 28 days, lasts 5 days, total volume ~60 cc
Seizure Episodes	Before pregnancy: 2-3 episodes/week; During pregnancy: worsened symptoms with last seizure 3 days prior to visit
Physical Examination	Fully alert, GCS 15, blood pressure 100/80 mmHg, heart rate 78 bpm, respiratory rate 20/min, oxygen saturation 97% on room air
BMI	25.3 kg/m²
Fetal Presentation	Vertex
CT Scan Findings	Isodense lesion, 2.1 cm, at right sphenoid wing with signs of edema and bone hyperostosis
MRI Findings	Solid contrast enhanced mass with perifocal edema and dural tail suggesting right sphenoid wing meningioma
EEG Findings	Abnormal generalized intermittent slow activity indicative of epileptogenic wave
Anesthesia & Surgery	Elective cesarean section and surgical sterilization; Induction with propofol, fentanyl, rocuronium
Operation Duration	45 minutes
Blood Loss	300 mL
Fluid Administration	500 mL lactated ringer fluid
Urine Output	200 mL
Recovery	Extubation at 8 minutes post-anesthesia discontinuation; Aldrete score 8/10, Bromage score 2; Pain management in ICU with Fentanyl, Ibuprofen, Paracetamol
ICU Stay	3 days
Follow-Up	Outpatient follow-up scheduled for 1 month post-surgery

1. Case Description

This study analyzes the case of a 34-year-old woman who underwent a cesarean section with a diagnosis of Sphenoid Wing Meningioma (SWMNG). The patient presented at the hospital at 38 weeks and 5 days of gestation with a primary complaint of epilepsy. Previously, the patient had experienced two spontaneous deliveries and had a history of worsening seizures during pregnancy. Diagnostic investigations, including CT scan, MRI, and EEG, confirmed the diagnosis of SWMNG with a tumor size of 2.1 cm located on the right sphenoid wing. These findings formed the basis for designing and implementing a safe and effective surgical procedure for the patient. The cesarean section was performed considering the patient's complex neurological condition. The patient had neurological complications, including epilepsy, which necessitated careful management of intracranial pressure during the procedure. The procedure involved premedication with dexamethasone and diphenhydramine to reduce the risk of increased intracranial pressure. Additionally, deep anesthesia with rocuronium and fentanyl was administered to maintain the patient's condition stability throughout the operation.

Anesthesia management during the operation involved strict hemodynamic monitoring, including blood pressure, heart rate, and respiration. Adequate anesthetic maintenance allowed the patient to undergo the procedure without significant complications. The operation lasted 45 minutes with close monitoring of blood loss and appropriate fluid administration, ensuring patient safety throughout all stages of the surgery. The patient was closely monitored in the recovery room and ICU post-operatively to ensure stability and optimal recovery. Aldrete and Bromage scores indicated that the patient remained stable with minimal symptoms. After 3 days of hospitalization, the patient was discharged with good neurological condition and no significant complaints.

2. Physical and Clinical Conditions

The findings of this study indicate that the physical condition of the patient is highly stable for undergoing a cesarean procedure. The Glasgow Coma Scale (GCS) score of the patient was recorded as 15, indicating full consciousness and good neurological stability. Additionally, the patient's blood pressure was 100/80 mmHg, heart rate was 78 beats per minute, and oxygen saturation reached 97% in room air, demonstrating optimal hemodynamic stability.

Physical examination did not reveal any abnormalities in the chest, abdomen, or extremities, indicating that the patient's physical condition is excellent and ready for surgery. Furthermore, supportive investigations such as ultrasound showed that the fetus is in a healthy state with vertex presentation, ensuring fetal well-being during the surgical procedure. These data strengthen the conclusion that the patient is in optimal condition to undergo a cesarean procedure with controlled risks. Therefore, all medical parameters indicate the patient's readiness to undergo a cesarean operation with a high level of safety.

3. Operating Procedure

Before the surgical procedure begins, the initial step taken is to provide premedication to reduce the risk of increased intracranial pressure. This premedication is done by administering dexamethasone 10 mg and diphenhydramine 10 mg, which function to control inflammation and reduce the potential for cerebral edema during surgery. After that, anesthesia induction is carried out using propofol at a dose of 2-3 mg/kg which is given intravenously. This propofol provides optimal conditions for intubation, ensuring that the patient is safe during the process of installing the breathing aid. Intubation is performed with rocuronium 50 mg, which successfully achieves intubation conditions within 60 seconds, keeping the patient's airway safe during the procedure. Thus, these steps ensure effective anesthesia management for patient safety and comfort during surgery.

This study evaluated the anesthetic techniques used to ensure patient safety and comfort during the procedure. Propofol was used as the primary agent to maintain anesthesia, with dose titration adjusted to meet individual patient needs. Additionally, fentanyl was administered at a dose of 0.25 mcg/kg/min to manage pain and maintain hemodynamic stability during surgery. This combination was shown to be effective in reducing pain without compromising the patient's respiratory function. Patient safety was maintained, with the patient remaining conscious but stable throughout the procedure. The use of fentanyl provided the added benefit of maintaining a balance between patient comfort and optimal pain control, ensuring positive outcomes at every stage of the surgery.

4. Intracranial Management and Anesthesia

During the procedure, intracranial pressure management is a primary focus to maintain head pressure stability and prevent excessive increases in intracranial pressure. Within 45 minutes of surgery, a total blood loss of 300 mL was observed, necessitating the replacement of lost bodily fluids. In response to this loss, 500 mL of lactated Ringer's solution was administered to compensate for the lost fluids. This fluid and electrolyte management aims to ensure hemodynamic stability

throughout the procedure. By maintaining optimal fluid balance, it is anticipated that complications related to fluctuations in intracranial pressure can be minimized, thereby enhancing patient safety during surgery.

During the recovery phase of anesthesia, the administration of an additional 25 mcg of fentanyl five minutes prior to extubation plays a critical role in minimizing postoperative pain and maintaining patient stability. This strategy is aimed at reducing discomfort and ensuring that the patient's condition is optimized before being disconnected from mechanical ventilation. The decision to perform extubation is made only after a thorough assessment, with vital signs such as blood pressure, heart rate, and oxygen saturation being closely monitored to remain within normal ranges. This careful management supports the patient's ability to handle postoperative transitions without experiencing significant fluctuations in intracranial pressure, which could pose risks to their overall recovery. By prioritizing stable vital signs and controlled medication use, the risk of complications is minimized, leading to a smoother recovery process.

5. Post-operative Recovery and Care

Post-operative recovery and care are crucial phases following surgery to ensure patients regain stability and return to optimal health. In this study, patients demonstrated significant progress with an Aldrete score of 8/10 and a Bromage score of 2, reflecting good recovery progress and motor function. The stability of vital parameters such as blood pressure, heart rate, respiration, and oxygen saturation supports the overall well-being of patients, indicating minimal risk of complications. To manage pain effectively, patients are admitted to the ICU, where continuous intravenous administration of fentanyl is complemented by supportive medications like ibuprofen and paracetamol. These interventions play a vital role in maintaining patient comfort and promoting a smooth recovery process.

Post-operative recovery and care are critical phases in ensuring a patient’s well-being after surgery. In this case, the protocol focused on patient comfort and meticulous monitoring of treatment responses. Following a thorough evaluation, the patient was discharged three days post-surgery with a normal postoperative neurological status and no significant complaints. This indicates the success of the recovery process and the effectiveness of the medical interventions applied during hospitalization. Throughout the post-operative period, careful attention was given to minimizing potential complications. The absence of complications demonstrates the efficacy of the surgical procedures and the adherence to established medical standards for patient care. Additionally, the patient’s ability to recover according to the planned medical strategy reflects the comprehensive approach taken by the healthcare team.

Monitoring during the recovery phase involved regular assessments of vital signs, pain management, and psychological well-being. These measures ensured that the patient experienced a smooth transition from hospital care to home recovery. The consistency of positive outcomes suggests that the implemented post-operative care plan was well-structured and responsive to the patient’s needs. Overall, the post-operative recovery was smooth, supported by a structured care protocol that addressed both physical and emotional aspects of recovery. The successful discharge after three days reflects the competence of the healthcare team and the effectiveness of the medical treatment, contributing to a positive patient experience.

Discussion

Pregnancy induces significant physiological changes that profoundly influence the pharmacokinetics and pharmacodynamics of anesthetic agents, including muscle relaxants. During pregnancy, increased cardiac output and blood volume alter drug distribution, while decreased functional residual capacity (FRC) accelerates desaturation during apnea. These changes necessitate careful anesthetic planning to ensure maternal and fetal safety. Progesterone-mediated relaxation of the lower esophageal sphincter increases the risk of gastric acid regurgitation, highlighting the importance of prophylactic antiemetics and preoperative fasting. Additionally, airway edema and mucosal swelling complicate intubation, making rapid sequence intubation (RSI) with muscle relaxants like rocuronium a preferred choice in high-risk cases (Dogan et al., 2018).

Sphenoid wing meningioma (SWMNG) is one of the three most common types of intracranial meningioma tumors. It occurs most frequently in the fourth decade of life and more often reported in females. The most common symptoms of SWMNG include headache, seizures, and visual complaints (Magill et al., 2020). Meanwhile, during the intraoperative period, pregnant patients with brain tumors are at a higher risk of cerebral edema due to increased intracranial pressure and brainstem compression. A sudden decrease in extracranial pressure may result in tentorial herniation through the foramen magnum. Therefore, the cesarean section (CS) method is more preferable method of delivery in this kind of cases due to its relatively lower morbidity and mortality rates, minimal risk of increased intracranial pressure, and lower volume of blood loss (Refai, 2013). In this article, we reported a 34-year-old pregnant female at 38 weeks and 5 days gestation with a sphenoid wing meningioma that is planned to undergo a cesarean section and surgical sterilization.

Most of the times, spinal anesthesia is the preferred method for cesarean section. However, in this case, general anesthesia (GA) is indicated due to the intracranial tumor and also the neurological deficits related to it (Refai, 2013: Khurana et al., 2014). On head CT scan, the intracranial tumor was observed compressing nearby structures, further risking increased intracranial pressure when spinal anesthesia is performed. A ten-year survey of obstetrics anesthesia practice in the United States reported a decline in the use of GA for CS from 35% in 1981 to less than 25% in 2011, with the majority of cases associated with emergency procedures. The most feared complication of GA is failed tracheal intubation and the risk of aspiration. Mortality rates associated with GA in obstetrics have decreased by nearly 60% from 1979-1990 to 1991-2002, but overall reports of deaths associated with difficult intubation continue to be found. Maternal airway-related mortality during obstetric GA is approximately 2.3 per 100,000 GA cases for CS compared to one per 180,000 GA in the general population, while mortality following failed intubation is 1% in parturients. The consequences of failed intubation in obstetric patients do not only affect the mother, but also the fetus (Kinsella et al., 2015: Refai, 2013).

Rocuronium, a non-depolarizing neuromuscular blocking agent, offers unique advantages in obstetric anesthesia. Its rapid onset and intermediate duration make it ideal for RSI, especially in pregnant patients where swift airway management is critical to prevent hypoxia. In this case, a 34-year-old pregnant woman with Sphenoid Wing Meningioma (SWMNG) and symptomatic epilepsy required a cesarean section under general anesthesia (GA). The choice of GA was dictated by the patient's neurological condition, to fully control of cerebral hemodynamics, as spinal or epidural anesthesia risked exacerbating intracranial pressure (ICP). The administration of rocuronium at a dose of 0.8 mg/kg facilitated smooth intubation and effective muscle relaxation while minimizing prolonged neuromuscular blockade (Tang et al., 2022). The use of a rocuronium dose of 0.8 mg/kgBW is optimal in stabilizing relaxation conditions during the duration of the 45-minute operation in this patient. It was reported in a study using a rocuronium dose of 0.3; 0.6; 0.9 mg/kgBW, showing neuromotor activity at 71.9; 70.9; and 71.6 minutes.[11] This patient did not report any motor activity events that occurred during the operation with the use of rocuronium 0.8

mg/kgBW. With a smaller dose reduction than the optimal dose, the half-life of rocuronium will be maintained within 1.4-2.4 hours. However, with the use of this small dose, the clinical duration can be reduced, with a dose comparison of 0.6 mg/kg, approximately 30-40 minutes (Lanj-J et al., 2023).

The dose of 0.8 mg/kg rocuronium, slightly below the standard RSI dose of 1.2 mg/kg, proved sufficient for achieving optimal intubation conditions in this patient. This dosing strategy balanced effective airway management with reduced risk of prolonged neuromuscular blockade, particularly critical in obstetric patients where rapid recovery of muscle function is essential. The patient's stable physiological status, absence of a difficult airway, and adequate preparation further supported the efficacy of this dosing approach. Monitoring and managing the neuromuscular blockade were facilitated by the availability of reversal agents like sugammadex, ensuring safety if emergent reversal was needed (Hwang et al., 2024).

Skeletal muscle relaxation induced by rocuronium not only aids intubation but also enhances surgical conditions by improving abdominal wall relaxation. In this case, the relaxed musculature provided optimal exposure for the surgical team, ensuring a safer and more efficient cesarean section (Dogan et al., 2018: Hwang et al., 2024). The onset time for rocuronium at doses around 1.2 mg/kg is typically about 60 seconds. Specific data for 0.8 mg/kg are less frequently reported. Several studies and case reports have used doses between 0.9–1.2 mg/kgBW to achieve excellent intubation success rates of 85%. One study reported success with doses of 0.6; 0.9; 1.2 mg/kgBW with excellent intubation rates of 60%; 85%; and 100%. This suggests that the higher the dose given, the higher the level of intubation success desired. Rocuronium in doses of 0.9 and 1.2 mg/kgBW can provide a duration of 60 seconds for endotracheal intubation and 0.6 mg/kgBW rocuronium has a higher potential for failure in adults for 60-second intubation duration (Kapdi & Patel, 2020). The success of intubation can be affected by the depth of neuromuscular blockade achieved. Studies indicate that higher doses (≥1.2 mg/kg) correlate with better first-attempt intubation success rates. At 0.8 mg/kg, the neuromuscular blockade may not be profound enough to ensure optimal relaxation. While 0.8 mg/kg may provide some degree of relaxation, it may not achieve the same level of paralysis as higher doses, potentially leading to increased resistance during the procedure. The consideration for administering small doses to these patients is to prevent prolonged neuromuscular blockade does not occur, resulting in hemodynamic instability, thereby increasing intracranial pressure (Tang-L et al., 2022: Moriwaki et al., 2019).

The use of muscle relaxants in cesarean sections under GA offers distinct advantages compared to conducting the procedure without them. Muscle relaxants significantly improve intubation conditions, reduce the risk of airway complications, and enhance surgical exposure. However, they also present challenges, including the potential for prolonged neuromuscular blockade, necessitating vigilant monitoring and the availability of reversal agents. In contrast, GA without muscle relaxants avoids these risks but may result in suboptimal intubation and surgical conditions, increasing the likelihood of maternal and fetal complications. The broader use of muscle relaxants, such as rocuronium, in obstetric anesthesia reflects their safety and efficacy when used appropriately. Non-depolarizing agents like rocuronium have largely replaced depolarizing agents such as succinylcholine due to their more favorable safety profile. Rocuronium’s reversibility with sugammadex offers an additional safety margin, allowing for rapid recovery of neuromuscular function if required (Tang-L et al., 2022).

Managing obstetric patients with intracranial pathology presents significant challenges, particularly concerning the elevation of intracranial pressure (ICP). In this case, SWMNG increased the patient's risk for elevated ICP, necessitating a meticulous balance between anesthetic depth and hemodynamic stability. Propofol was chosen as the induction agent due to its minimal impact on ICP and its ability to maintain hemodynamic stability effectively. The rapid onset of rocuronium further facilitated smooth intubation. The use of general anesthesia (GA) was pivotal in preventing ICP

exacerbation, especially in comparison to neuraxial anesthesia. While both propofol and thiopental are commonly used for anesthetic induction, propofol has gained preference due to its cost-effectiveness and widespread availability. Although thiopental is more stable with maternal cardiac physiology during surgery, its use has become less frequent in modern practice. Additionally, studies indicate that propofol does not present more adverse effects on neonates compared to thiopental, supporting its continued use in obstetric anesthesia.

Conclusion

Anesthesia management of obstetric patients with intracranial tumors is a challenge where multispecialty expertise should be involved. In this case report, a 34-year-old woman at 38 weeks and 5 days of gestation with Primary Cerebral Tumor ec suspected Right Sphenoid Wing Meningioma and Symptomatic Epilepsy came with a planned delivery with CS and MOW. GA was indicated because the patient came with an intracranial tumor and still had neurological symptoms that increased the risk of increased ICP. The administration of rocuronium at 0.8 mg/kg in this case provided a balance between effective airway management and patient safety. The physiological changes of pregnancy, the unique challenges posed by the intracranial tumor, and the need for optimal surgical conditions all underscore the critical role of precise anesthetic planning and the judicious use of muscle relaxants in obstetric anesthesia.

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