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CASE REPORT

Anaesthetic Management of a Parturient with Meningioma and an Obstructive Hydrocephalus

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Summary

A 40-year-old Gravida 4, Para 3 Hb AA patient with a history of one previous caesarean delivery presented at 30 weeks + 1 day of gestation with a CT scan confirmed diagnosis of meningioma with obstructive hydrocephalus. She had caesarean delivery under general anaesthesia. Taming of suxamethonium was done for endotracheal intubation, and the pain was managed with a transversus abdominis plane block. This study highlights anaesthetic management and the role of combining different techniques in managing meningioma in a resource-poor environment. The challenges to be highlighted include intubating a patient with a raised intracranial pressure, anaesthetic management of delivering a foetus without compromising the neurophysiological state of the mother and maintaining a stable haemodynamic state as there is a shift in autoregulation.

Keywords: Anaesthetic Management, Caesarean Section, Hydrocephalus, Meningioma, Prematurity.

Introduction

Meningiomas account for more than one-third of all intracranial tumours. They are primarily observed in women between the ages of 60 and 70 years, with a female-to-male ratio of 3:2. Gestational meningioma is a rare, life-threatening pathology with an incidence of about 5 to 6 cases per 100,000 pregnancies. [1]

Pregnancy is associated with numerous physiological changes involving the cardiovascular, respiratory and renal systems. These changes aim to accommodate the foetus and facilitate its normal development. When pathologies like meningioma coexist with pregnancy, the presentation may differ from that in non-pregnant women. [2] Progesterone, human placental lactogen (hPL), and prolactin-stimulating hormone increase the growth of

meningiomas, with a significant associated increase in tumour size in the second and third trimesters due to the elevated synthesis of these hormones. [3]

Although the size of the tumour may decrease after childbirth, it could increase again during the next pregnancy; this suggests a reversible underlying mechanism.[4] Safe management requires the close collaboration of the neurosurgeon, gynaecologist, and anaesthesiologist. [5] Anaesthesia in this group of patients may be challenging, considering the interplay between the physiological changes in pregnancy and the pathology of the intracranial tumour. This includes the choice of technique, drugs for preventing preterm labour, foetal lung maturation, and neuroprotection for the foetus.

The management must balance obstetric anaesthesia's goals and neuro-anaesthesia's principles. In this case report, we present the successful anaesthetic management of a 40-year-old pregnant woman who had a meningioma with obstructive hydrocephalus and underwent an elective caesarean delivery. The objective of this study is to describe the challenges in the anaesthetic management of a pregnant woman who has an intracranial tumour with elevated intracranial pressure.

Case Description

A 40-year-old Gravida 4, Para 3 woman, with HbAA haemoglobin genotype presented at 30 weeks + 1 day of gestation with sudden onset of left-sided upper and lower limbs weakness and difficulty in walking with associated slurred speech. Two days before this presentation, she fell into a gutter and sustained an injury to the left ankle; history did not suggest trauma to the head, and there were no obvious neurological deficits afterwards.

At presentation, she was conscious and well-oriented regarding time, place, and person. The pupils were of equal size, and both were reactive to light. The muscle power in the right upper and lower limbs was 4/5 in each limb. On the left side, however, she had a power of 0/5 in the upper extremity and 3/5 in the lower extremity. She had hypotonia on the left upper and lower limbs with brisk reflexes bilaterally. The symphysio-fundal height was consistent with the estimated gestational age, and the foetal heart rate was normal.

On Computerized Tomographic-(CT) brain scan with contrast [with shielding of the developing foetus], a large, iso-dense, avidly enhancing, extra-axial mass in the right supratentorial region with extensive vasogenic oedema, mass effect, significant right to left midline shift (1.8 cm) and compression of the ipsilateral lateral ventricle with trapping of CSF in the contralateral lateral ventricle, were seen. The lesion showed non-enhancing areas suggestive of necrosis or haemorrhage and measured 6.2 × 5.6 × 5.3 cm. There was midbrain compression with effacement of the right ambient and quadrigeminal and suprasellar cisterns. The lesion also showed cerebrospinal fluid (CSF) cleft and overlying vessels. These features were reported to be consistent with a meningioma with an obstructive hydrocephalus and inferior transtentorial and subfalcine herniations (Figure 1).

The woman received a course of steroids and magnesium sulphate for foetal lung maturation and neuroprotection, respectively, in anticipation of preterm delivery. Muscle power in the left upper limb improved to 1/5 following initiation of steroid therapy.
She was counselled for surgery based on the findings of the CT scan and a probable rapid increase in the size of the tumour with worsening symptoms and the definitive management of the condition. She was also informed about the

survival rates of preterm neonates using institutional data: 91.6% for 34 weeks, 84% at 33 weeks, 76% at 32 weeks and 47% at 28 weeks.

Figure 1: CT scan of the brain showing the iso-dense left-sided lesion

Steroid therapy was continued in tapering doses for five days, and physiotherapy was initiated. After discussing with her relatives, she decided she did not want the pregnancy to progress any further and opted for caesarean delivery at the current gestational age.

The anesthesiologist assessed the woman; consent was obtained, and the surgery was scheduled. The Zuspan protocol for magnesium sulphate therapy was started about 12 hours prior to delivery for foetal neuroprotection. On the morning of surgery, the woman was drowsy with a Richmond Agitation and Sedation Score of -1. She was transferred to the theatre after the cockpit drill. Standard monitors were attached. The patient's initial blood pressure (BP) was 90/55 mmHg, and she was started on 500 mL of gelofusine. She was preoxygenated for 5 minutes. During preoxygenation, suxamethonium was tamed with an initial 0.1 mg/kg (5 mg) to prevent fasciculations and its attending complications. Intravenous lidocaine at a dose of 1.5 mg/kg was also given to obtund laryngopressor response to intubation. Induction of anaesthesia was done with intravenous propofol 3mg/kg, followed by the application of cricoid pressure. Intravenous suxamethonium 1mg/kg (50 mg) was administered, and endotracheal intubation was done. Cormack and Lehane assessment of the airway was Grade II. Endotracheal intubation was performed with a size 6.5mm cuffed endotracheal tube (ETT) at the first attempt without complications. Correct tube placement was confirmed, cricoid pressure was removed, and the tube was secured.

A live male neonate was delivered with a birthweight of 1.75 kg and an APGAR score of 6/10 in the first minute and 8/10 in the fifth minute, respectively. Intravenous oxytocin was administered at the delivery of the baby, as 10iu of oxytocin bolus and 20iu added to 500mls of normal saline to run over four hours. Intravenous 50 mcg of fentanyl was also administered after the delivery of the infant. Anaesthesia was maintained with sevoflurane in Oxygen at a minimal alveolar concentration (MAC) of 1%. A bilateral ultrasound-guided transversus abdominis plane (TAP) block with plain bupivacaine 20mls of 0.25% was injected into each side at the end of the surgical procedure.

The total operation time was 32 minutes; the estimated blood loss was 400mls, which was acceptable. The patient was successfully extubated in the operating room. Immediate postoperative vital signs were recorded as blood pressure -130/89 mmHg, heart rate - 85 bpm, respiratory rate - 28 cycles/minute, SPO_2 - 98% on a simple face mask. The patient was then sent to the recovery ward for monitoring. Oxygen supplementation was done with a simple face mask at 6 L/min while the neonate was hospitalized at the Neonatal Intensive Care Unit (NICU) for further care and monitoring.

The postoperative period was uneventful. The woman was discharged home on the third postoperative day on pain medications, antibiotics, haematinics, oral phenytoin - 300 mg

nocte and oral dexamethasone 2 mg 8 hourly. The neonate was also discharged from the NICU after two weeks with a discharge body weight of 1.8kg. On review in the third week after delivery, the mother and the baby were clinically well. The woman, at this review, was ambulant with minimal assistance. She was regular on her follow-up care with the obstetricians and the neurosurgeons.

Discussion

This case describes an uncomplicated caesarean section in a woman who had meningioma with obstructive hydrocephalus coexisting with pregnancy in a low-resource setting. The pregnancy was considered high-risk due to the obstructive hydrocephalus, which made a subarachnoid block for the caesarean section a challenge.

The growth of meningiomas is faster during pregnancy. Gupta *et al.* suggested that there is a close relationship between sex hormones and the rapidity of tumour growth in meningioma, as it accelerates during the luteal phase of the menstrual cycle and pregnancy. [6] Due to the rarity of meningioma in pregnancy, there are no established evidence-based management protocols. Recommendations in the literature for the timing of delivery and neurosurgical intervention are also varied. Neurosurgical intervention can be carried out during pregnancy, at delivery, or deferred until after delivery. Continuation of pregnancy until term is also a reasonable alternative if close monitoring of the mother and the foetus can be carried out. Foetal maturity and maternal status, however, are key considerations in determining the timing of interventions. [5] Often, arriving at a decision is a balancing act between prematurity and its attendant complications and the maternal condition. Neonatal outcomes improve with each additional week of pregnancy prolongation.[7] In one literature review, all patients with diagnoses made at 34 weeks or later were delivered within one week. This was followed with definitive management for the tumour. [8] It is noteworthy that maternal life, or health, is not sacrificed to improve neonatal outcomes. Therefore, where deterioration is observed, pregnancy is usually terminated, and necessary interventions are undertaken. Although facilities to test foetal lung maturity were lacking, antenatal steroids for lung maturation were administered in anticipation of preterm delivery in this woman.

Other parameters necessary for consideration to achieve optimal results are the physiological effects of pregnancy on tumour size, maternal cerebral circulation, autoregulation, and cerebral perfusion pressure. However, these were not assessed in this case because the facility lacked the required resources.

This patient opted for a caesarean delivery with a later craniotomy for tumour resection. Caesarean delivery followed by a craniotomy can be performed in pregnancies above 32 weeks. This decision is based on the consideration that the risk to the baby due to preterm birth at 32 weeks gestational age is lower than the risk to the mother associated with surgical procedures, such as controlled hypotension techniques, osmotic diuresis, and mechanical hyperventilation. [9]

In the index case, taming of suxamethonium was done to achieve rapid sequence induction and prevent regurgitation and aspiration without fasciculations, hence raised intracranial pressure. Taming of suxamethonium is a technique in anaesthesia used to prevent fasciculations and its associated complications, one of which is raised intracranial pressure as seen in the index case. In doing this, 10% of the total dose of suxamethonium is given minutes before the induction of anaesthesia on the anaesthesia table when the remaining 90% is given. Opioid was administered after the delivery of the foetus to

prevent foetal respiratory depression. In our facility, we only have access to suxamethonium and vecuronium, the latter being an intermediate-acting muscle relaxant. Consequently, at the delivery of the baby, muscle paralysis was not induced, and the surgery was completed with sevoflurane at MAC of 2.0 in oxygen. The procedure duration was 32 minutes, shorter than the 45-minute duration of action of vecuronium. Postoperative analgesia was provided with a transversus abdominis plane block. This was done to avoid potential delayed respiratory depression, which may occur following opioid therapy in a patient with an already obtunded level of consciousness.

A few days after surgery (caesarean delivery), the patient's level of consciousness improved. Neurological symptoms regressed, and the patient regained full motor function. This observation is supported by the findings of Cushing *et al.* [4], which stated that there could be tumour regression following caesarean delivery. However, due to limited funds, a repeat CT scan was not done to corroborate this assumption.

Limitation

A repeat CT scan of the brain would have supported our findings, but there was lack of funds for this.

Conclusion

This case reveals that caesarean delivery can be performed in a parturient with a coexisting intracranial tumour, with ultrasound-guided TAP block used for postoperative analgesia.

Declaration: Permission was obtained from the patient for the use of her data in this research.

Authors' Contributions: EOE conceived the study and drafted the manuscript. AJK and BMK participated in manuscript drafting while AEK revised the draft for sound intellectual content. All the authors approved the final version of the manuscript.

Conflicts of Interest: None.

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