

Anesthesia management of a parturient with meningioma underwent elective Cesarean section



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ABSTRACT

The occurrence of primary intracranial tumors in pregnancy is an extremely rare event. Symptoms of a brain tumor include nausea, vomiting, headache, visual disturbances and seizures which mimic symptoms of pregnancy-related hyperemesis or eclampsia. It is a well-established fact today that the technique of choice for elective cesarean section is regional anesthesia. However, in patients with intracranial hypertension and central nervous system infection, this technique should be avoided. General anesthesia poses

high risks for pregnant patients. These patients have potentially difficult airways with delayed gastric emptying, which are factors increasing the possibility of pulmonary aspiration after general anesthetic induction. This paper aimed at reporting the anesthetic management of a parturient with intracranial hypertension due to meningioma submitted to elective cesarean section. This kind of surgery needs special attention and specific skill of the anesthesiologist.

Keywords: meningioma, parturient, anesthesia, pregnancy, management

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INTRODUCTION

Intracranial tumors during pregnancy are very rare, with the estimate incidence about 7 cases per 125,000 pregnancies. The first pregnancy with brain tumor case was reported by Bernard in 1898.¹ The incidence of primary central nervous system tumor in pregnancy is 6 cases per 100.000 pregnancies and this number is lower than the incidence of a non-pregnant woman in similar age range. Symptoms of an intracranial tumor including nausea, vomiting, headache, visual disturbances and seizures, which are similar to symptoms of hyperemesis gravidarum during early gestation or eclampsia in the last period of pregnancy.

Meningiomas are the most frequent intracranial tumors and most likely to grow faster during pregnancy because it related to estrogen and progesterone receptors. The rising vascularization during pregnancy can also contribute to the increasing complaints of pregnant patients with meningioma.^{1,2} In most cases, a surgical procedure for a tumor in pregnancy should be delayed until delivery. However, when the tumor leads to acute neurological worsening, with the risk of herniation and tend to have high mortality risk, an immediate surgical procedure is required.

Anaesthetic management for cesarean section in patients with brain tumor requires a careful decision for both mother and neonates. Some of the neuroanesthesia technique or protective intervention that may give more advantage for the mother, unfortunately, can increase the risk for the

fetus. Rapid sequence induction can increase blood pressure and intracranial pressure, while hyperventilation and inhalation anesthetic application may decrease uterine blood flow and can cause fetal hypoxemia.¹⁻³

CASE ILLUSTRATION

A 34-year-old with 36-weeks pregnant presented with blurred vision since 2 months ago. The symptoms accompanied by intermittent headache. There was no nausea, vomiting, and other neurological disturbance. Two months ago, she felt progressive deterioration of visual field at her right eye. She underwent MRI examination and resulted in a brain tumor. Results of her antenatal examinations were normal. She had no history of chronic diseases.

There were no signs of neurological deficit, but there was a sign of cupping. The laboratory test revealed no abnormalities but mild anemia with a hemoglobin level of 9.5 g/dL. MRI revealed a mass in the area of the sphenoid plane to the suprasellar region. Some part of its boundaries were irregular, especially in the area near the pituitary gland. The mass size was 2.6 x 1.9 x 3 cm. It pressed on the optic chiasm superiorly as well as on the left and right internal carotid arteries. The mass was suggestive of a meningioma.

A case conference decided that a C-section will be scheduled upon the full-term of the fetus, and the removal of the meningioma will be done afterward, electively. We decided to go with general anesthesia with rapid sequence induction (RSI) technique for

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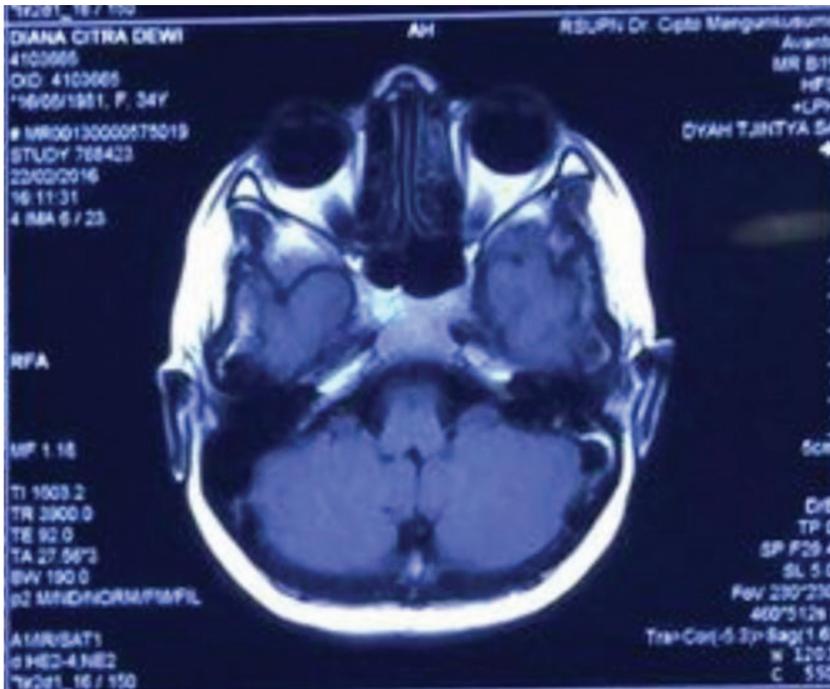


Figure 1 MRI revealed extra-axial tumor of the sphenoid plane. The feature is suggestive of a meningioma

the C-section. Preoperatively, the patient was given ranitidine 50 mg, metoclopramide 10 mg, and dexamethasone 4 mg. Standard ASA monitoring was applied to the patient. Before induction, her blood pressure was 102/63 mmHg with a heart rate of 104 bpm.

Preoxygenation with 100% O₂ was given for 5 minutes. We administered 1.5 mg/kgBW lidocaine and 2.5 mcg/kgBW fentanyl 5 minutes before intubation. We induced the patient with 2 mg/kgBW propofol and rocuronium 1.2 mg/kgBW was given for muscle relaxation. After intubation, the anesthesia was maintained with sevoflurane 1.5 vol% with 50% O₂ mixture. Ventilation was maintained to EtCO₂ of 28-32 mmHg.

A healthy female neonate weighed 2.4 kg was delivered five minutes after skin incision. Her APGAR score at one minute was 9, and 10 at five minutes. After the baby was delivered, 50 mcg fentanyl was added to maintain patient anesthesia state. After placenta delivery, 20 IU oxytocin was given on slow drip in 500 mL Ringer lactate.

The cesarean section was done in 55 minutes with the average systolic blood pressure 110-130 mmHg, diastolic blood pressure 70-80 mmHg, heart rate 90-100 bpm, oxygen saturation 98-99%. Total blood loss was 500 mL and total urine output was 100 mL. The fluid infusion was given with 700 mL crystalloid. After operation procedure had been held, extubation was done in operation room with awake extubation technique. Ventilation assistance was given until the patient spontaneously and

adequately breathing, with reversal neostigmine 0.02 mg/kgBW was given. Extubation was held with lidocaine 1 mg/kgBW to avoid cough. Postsurgical analgesia combination paracetamol 1 gram and tramadol 100 mg were given to the patient.

DISCUSSION

Meningiomas growth is faster during pregnancy. The mechanism of this tumor's growth is still controversial.³ Meningioma seems to have a close relationship with the sex hormones since its growth accelerates during the luteal phase of the menstruation cycle and during pregnancy.^{4,5} This condition was associated with the expression of progesterone receptor by 69% and the expression of the estrogen receptor by 13%.⁴

The management of pregnant patients with brain tumors requires a multidisciplinary approach involving neurosurgeon, obstetrician-gynecologist, and anesthesiologist. The right time to do the surgery must be tailored to the patient, depending on the patient's neurologic status, the possibility of preterm labor, gestational age, and fetal lung maturity. There are several things to consider in order to achieve optimal results, such as the physiological effects of pregnancy on tumor size, maternal cerebral circulation, autoregulation, and cerebral perfusion pressure. Some used the same principle while some others could be contradictory.

Craniotomy surgery for brain tumor removal in a pregnant woman is not usually performed until the delivery. A craniotomy is performed if there is a neurological deficit caused by the tumor. The medical team needs to decide whether craniotomy can be performed while maintaining the pregnancy, or performed cesarean section operation simultaneously with a craniotomy. Cesarean section followed by a craniotomy can be performed in pregnancies over 32 weeks. It is based on the consideration that the risk for baby due to preterm birth in 32 weeks of gestational age is less than the risk to the fetus to the mother by the manipulation of the operation, such as controlled hypotension techniques, osmotic diuresis, and mechanic hyperventilation.⁷

Tumor removal should be done after 30 weeks of gestation. In patients with the worsening condition, severe neurological deficit, or intracranial hypertension, craniotomy must be done immediately to save the mother's life. The fetal condition should be monitored periodically.⁶ After the termination of pregnancy, the patient's hormonal status should go back to normal, and the growth speed of the tumor should be decline.

There are several physiological changes during pregnancies, such as increased cardiac output and blood volume, as well as the retention of water

and salt that can aggravate the condition of cerebral edema. During delivery, cardiac output will increase with elevated systolic pressure at each contraction. In some journals, vaginal delivery in patients with increased intracranial pressure can be done with intra labor analgesia (ILA).⁶

However, intracranial pressure will continue to increase in phase 2 labor along with the increase of labor contraction. Unfortunately, intracranial pressure will be rising more when patients push in labor. In this condition, intracranial pressure can reach more than 70 cmH₂O. This explains why increased intracranial pressure is one of the relative contraindications to vaginal delivery.⁸

This patient developed neurological symptoms such as intermittent headache in the second trimester of pregnancy. This is consistent with the theory that patients with brain tumor in pregnancy will experience symptoms associated with increased intracranial pressure due to the acceleration of tumor growth. This patient also had anemia with a hemoglobin level of 9.5 g/dL which is caused by dilutional anemia.⁵

Anesthesia drugs selected in this case are fentanyl, propofol and 1.5 vol% sevoflurane for maintenance. The aim of choosing those drugs is to prevent brain vasodilation. Furthermore, it is also fit to the theory that progesterone has a sedation effect that reduces the need for anesthesia gas.^{7,9} Anaesthetic approach that combines neuroanesthesia and general anesthesia for C-section requires a comprehensive knowledge of maternal and fetal physiology, neuroanesthesia, and pharmacology with the goal of optimal care for the mother and fetus. With the principle of neuroanesthesia, endotracheal intubation should be facilitated so there will be no increased blood pressure and intracranial pressure. However, rapid sequence induction for C-section will increase intracranial pressure. In this case, we used lidocaine and fentanyl to inhibit the sympathetic stimulation when tracheal intubation was performed. High dose rocuronium (1.2 mg/kgBW) with cricoid pressure was administered instead of succinylcholine.⁷

Premedication with ranitidine and metoclopramide were given because of the risk of aspiration.³⁻⁶ Application of opioids such as fentanyl for cesarean section is still controversial. Opioids can cause chest wall muscle rigidity and apnea for the infant, but beneficial for the mother since it can suppress the stress response and the increasing intracranial pressure. All opioids were given before labor can cause respiratory depression for the infant. Therefore, a skilled neonatal resuscitation and monitoring team needs to be informed and be present when the baby was born. Several studies have shown that opioids such as fentanyl with short duration

(2-5 mcg/kgBW) or remifentanyl (1 mcg/kgBW) are safe. Lidocaine (1.5-2 mg/kgBW) can also be used in conjunction with opioids to suppress sympathetic response in intubation. In this case, we used a combination of lidocaine and fentanyl during induction with a good result.⁴⁻⁷

Inhalation anesthetic can be used in C-section. All inhalation anesthetic and N₂O may increase intracranial pressure because of cerebral vasodilation, yet it can be normalized by hyperventilation. For general anesthesia maintenance, inhalation agents such as isoflurane and sevoflurane in <1 MAC is effective. For parturients, the dose of inhalation agent needs to be lowered by 25%. In this concentration, uterus blood flow disruption and hemorrhage risk tend to be minimal and cerebral autoregulation can be maintained. Oxytocin was given to prevent postpartum hemorrhage. Methylergometrine was not used since it may lead to hypertension and tend to increase intracranial pressure in a patient with already high intracranial pressure and disrupted blood-brain barrier.^{6,7}

Postoperative analgesics in these patients used a combination Tramadol 2 mg/kgBW and Paracetamol 20 mg/kgBW. It is known that opioids are commonly given for postoperative analgesics have side effects that can result in increased intracranial pressure, such as drowsiness, nausea, vomiting, and hypertension.¹⁰

Before removing the endotracheal tube for extubation, the patient consciousness should be full and has a good airway reflex to minimize the risk of aspiration. In a conscious patient, early neurological status evaluation can be done immediately. During extubation period, coughing or straining can cause increased ICP and brain hemorrhage. Giving lidocaine 1-1.5 mg/kgBW and fentanyl 0.5-1 mcg/kgBW at the end of the surgery may help prevent coughing or straining.¹¹

CONCLUSION

Successful anesthetic management of cesarean section in a patient with intracranial tumor depends on the multidisciplinary collaboration, comprehensive preoperative assessment, a thorough knowledge of the physiology and pharmacology of the maternal and fetal, and postoperative supportive care and analgesia. For the safety of both the mother and fetus, it is very important to maintain the stability of maternal, optimal timing of taking actions, and the selection of medication and proper anesthetic technique.

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