



Anesthetic Management for Caesarean Section and Craniotomy at the Same Session in Pregnant Patient with Spontaneous Cerebellar Hematomas

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Abstract

The incidence of spontaneous cerebellar hematomas (SCHs) during late pregnancy is increasing, though still rare. Managing parturients with SCHs poses significant challenges due to the need to balance maternal safety with neonatal considerations, requiring a multidisciplinary approach. This report presents two cases where general anesthesia was used for concurrent Caesarean section and craniotomy. Both patients, at 36 weeks' gestation, presented with severe headaches, nausea, vomiting, and gait ataxia. MRI scans revealed cerebellar hematomas, necessitating surgical intervention. Both surgeries were successful with stable maternal vital signs and healthy neonates delivered with high APGAR scores. Postoperative recovery was uneventful, and both patients were discharged without neurological deficits. The report emphasizes the importance of rapid induction and recovery, maintaining hemodynamic stability, and ensuring sufficient cerebral perfusion while avoiding fetal depression during such complex procedures.

Keywords

Spontaneous Cerebellar Hematomas, Late Pregnancy, General Anesthesia, Caesarean Section, Craniotomy

Introduction

The incidence of spontaneous cerebellar hematomas (SCHs) during late pregnancy is very low but increasing over time [1,2]. Management of parturients with SCHs must balance maternal safety and neonatal considerations and is a challenge for anesthesiologists, neurosurgeons, and obstetricians. To date, no details of the anesthetic management of these patients have been reported. We present two patients with SCHs where general anesthesia was used for both Caesarean section and craniotomy in the same session.

Case Report

Patient #1:

A 29-year-old Chinese woman (height 160 cm, weight 68 kg) at 36 weeks gestation was referred to a neurosurgeon in our hospital due to the rapid onset of a severe headache localized to the bilateral frontal area of the head following a quarrel with her husband two hours before admission. This was accompanied by giddiness, nausea, vomiting, and gait ataxia. She had no history of hypertension, convulsions, or any other neurological symptoms. The pregnancy had been uneventful, and laboratory tests were within normal

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range. Brain magnetic resonance imaging (MRI) revealed multiple left cerebellar hematomas (max 32×41 mm in diameter).

After a multidisciplinary consultation among the anesthesiologist, obstetrician, neurosurgeon, patient, and her relatives, it was decided that a Caesarean section would be performed under general anesthesia with a neonatologist on standby for the baby's delivery, followed by a craniotomy to clear the cerebellar hematoma. In the operating theater, a left lateral tilt was applied to decrease pressure on the inferior vena cava, along with a 15-degree reverse Trendelenburg position to reduce intracranial pressure. Monitoring included heart rate, ECG, pulse oximetry, and an arterial line from the right radial artery. A modified rapid sequence induction with cricoid pressure was performed using combined volatile and intravenous induction with incremental sevoflurane inhalation and intravenous propofol (1 mg/kg). Rocuronium (0.9 mg/kg) was used to facilitate endotracheal intubation. Anesthesia was maintained with 2~2.5% sevoflurane in a fresh gas flow of 1 L/min of 100% oxygen. Ventilation was controlled with an 8 ml/kg tidal volume and a respiratory rate of 9-11 breaths per minute to keep the end-tidal CO₂ (P_{ETCO₂}) in mild hypocapnia (30~35 mmHg). Before induction of anesthesia, the patient's heart rate was 90 bpm, and blood pressure was 110/80 mmHg. After induction, they were maintained at 80-90 bpm and 90-110/65-80 mmHg, respectively, throughout the procedure.

Eight minutes after the skin incision, a healthy female neonate weighing 2.8 kg with APGAR scores of 8 and 10 at 1 and 5 minutes, respectively, was delivered. Oxytocin (5 units IV bolus and 30 units in 500 ml 0.9% NaCl infusion) was started. Fentanyl (0.25 mg) was administered, and remifentanyl (0.15 to 0.25 µg/kg/min continuous infusion) and sevoflurane (2% in 1 L/min of fresh air) were started, and an occipital craniotomy was performed. Dexamethasone (0.1 mg/kg) and mannitol infusion (0.5 mg/kg) were administered to decrease intracranial pressure and relieve brain edema, and the cerebellar hematoma of approximately 20 ml was removed without complication. Vital signs remained stable during the operation. Sevoflurane and remifentanyl infusion were stopped at the end of surgery, muscle relaxation was

reversed with neostigmine (1.0 mg) and atropine sulfate (0.35 mg IV), and extubation was performed five minutes after the end of surgery when the patient responded to verbal stimulation. The patient was sent back to the neurosurgical ward, and after six days of treatment, she was discharged to a rehabilitation center with a GCS score of 15 and no neurological deficits detected (**Fig-1**).

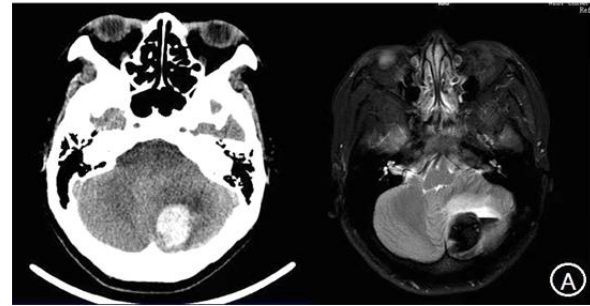


Fig-1: Brain Computed Tomography (CT) of patient #1
Left cerebellar multiple hematomas

Patient #2:

A 19-year-old Chinese primigravida (height 158 cm, weight 64 kg) at 36 weeks gestation was admitted to our Emergency Clinic with complaints of a severe headache localized to the occipital area of the head following diaphoresis for three days. This was accompanied by nausea, vomiting, giddiness, and gait ataxia. On physical examination, the patient was alert, with a GCS of 15, and there were no positive findings of the neurologic systems. Baseline hematological, biochemical, and coagulation profiles, ECG, and chest X-ray were all normal. Brain magnetic resonance imaging (MRI) demonstrated a right cerebellar hematoma (37×42 mm in diameter), with brainstem compression and mild dilation of the lateral and third ventricles.

The planned procedure was a Caesarean section followed by a craniotomy to clear the hematoma. During surgery, the patient was placed in a 15° head-up position with a left lateral tilt. Standard monitors and a radial arterial line were applied before induction, and intubation was performed after a modified rapid sequence induction using inhalational incremental sevoflurane, intravenous propofol, and rocuronium with cricoid pressure. Anesthesia was maintained with 2~2.5% sevoflurane in a fresh gas flow of 1 L/min of 100% oxygen. Ventilation was controlled with an 8 ml/kg tidal volume and a respiratory rate of 9-11

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breaths per minute to keep the end-tidal CO_2 (P_{ETCO_2}) in mild hypocapnia (30-35 mmHg). A healthy male baby weighing 3.2 kg was delivered five minutes after the skin incision, with APGAR scores of 8 and 10 at 1 and 5 minutes, respectively. After delivery, oxytocin (5 units IV bolus and 30 units in 500 ml 0.9% NaCl infusion) was started, and dexamethasone (0.1 mg/kg) and mannitol infusion (0.5 mg/kg) were administered. Anesthesia was maintained with sevoflurane 2% in 1 L/min of fresh air (0.5 fraction of inspired oxygen with air and oxygen), supplemented with fentanyl (0.15 mg) and remifentanyl (0.15 to 0.25 $\mu\text{g/kg/min}$ continuous infusion), and an occipital craniotomy was performed. The cerebellar hematoma of approximately 25 ml was removed, and the patient's heart rate and blood pressure were maintained at 75~90 bpm and 100~120/60~85 mmHg, respectively, during the operation (Fig-2).

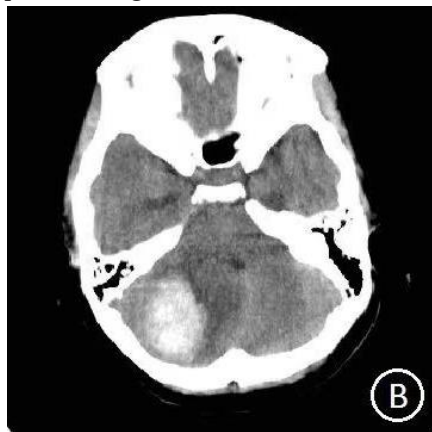


Fig-2: Brain Computed Tomography (CT) of patient #2

Right cerebellar hematoma, with brainstem compressed, and lateral ventricular and the third ventricular mildly dilated.

Five minutes after the operation, the patient was awake, and the trachea was extubated. The postoperative course was uneventful, and the patient was discharged to a rehabilitation center seven days later.

Discussion

Spontaneous cerebellar hemorrhage accounts for approximately 9% to 10% of all intracranial hemorrhages (ICH) [3], and they can be detected by computed tomography (CT) or MRI with regard to their location, size, and degree of brainstem compression. Although with sensitivity equal to that of a CT scan, brain MRI is less often used in the acute

setting [4]. The criteria for surgical treatment include a hematoma diameter equal to or greater than 3 cm (volume of at least 14 cm^3), the presence of hydrocephalus, brainstem compression, and the enlargement of the third and lateral ventricles [5]. Survival benefits after surgical hematoma evacuation are driven by patients with larger hematoma volumes, associated with an increased probability of survival at three months compared with conservative treatment [6].

For the two patients we present, SCHs occurred in late pregnancy. Obstetrical and neuroanesthetic considerations for maternal safety and the fetus may be conflicting. The choice of anesthetic technique must focus on both neurosurgery and the delivery of the newborn, including rapid onset and recovery, maintenance of cardiovascular stability, sufficient cerebral perfusion pressure (CPP), a relatively low cerebral metabolic rate for oxygen (CMRO_2), and avoidance of any factors that may increase intracranial pressure (ICP) [7] or have adverse effects on the newborn [8]. Sevoflurane is widely used for neuroanesthesia due to its low blood-gas partition coefficient (0.63~0.69), which permits fast induction and emergence from anesthesia [9], and its nonirritant property for the respiratory tract makes it suitable for volatile induction [10]. Sevoflurane has been proven safe during CS without harmful effects on the fetus [11,12]. For modified rapid sequence induction, spontaneous ventilation could be preserved, and the depth of anesthesia could be achieved by sevoflurane inhalation [13]. We chose the regimen of combined sevoflurane inhalation and intravenous propofol for the induction of anesthesia to achieve fast onset, and sevoflurane and remifentanyl for rapid recovery. In terms of muscle relaxant, succinylcholine has been proven to reduce the risk of aspiration in pregnant patients due to its rapid onset, but it was avoided due to concerns of increasing intracranial pressure. We used intravenous rocuronium 0.9 mg/kg to perform the intubation less than 60 seconds after the disappearance of the eyelash reflex.

During the operation, maternal blood pressure was maintained at 90-120/65-85 mmHg to achieve sufficient CPP, and mild hypocapnia by hyperventilation was maintained to decrease ICP.

Before the delivery of the newborn, 100% oxygen was administered to achieve higher umbilical venous O₂ saturation and higher Apgar scores. Nitrous oxide was avoided due to its property of cerebral vasodilation and increasing CMRO₂ [14].

Sevoflurane provides satisfactory analgesia for patients in labor without the use of analgesia adjuncts [15], and opioids, including fentanyl, were not used before the delivery of the baby because they may cause neonatal depression. APGAR scores in these two cases were 8 at 1 minute and 10 at 5 minutes following delivery, and the neonates did not need any interventions due to central system depression.

The use of oxytocic drugs is associated with hypertensive responses, which may increase ICP [16,17]. Lower doses of oxytocin are suggested for routine elective cesarean deliveries and higher doses for women at greater risk of postpartum hemorrhage. To counteract the ICP-increasing effect of oxytocin and to decrease cerebral edema, mannitol infusion 0.5 mg/kg and dexamethasone 0.1 mg/kg were administered. The procedures of CS and craniotomy were smooth, and the obstetrician and neurosurgeon were satisfied with the anesthesia.

In summary, anesthetic management for pregnant patients with cerebellar hematomas must emphasize both fetal and maternal considerations. The key points include rapid induction and smooth recovery, maintenance of hemodynamic stability and cerebral perfusion, and avoidance of fetal depression.

Conflict of Interest

The authors have read and approved the final version of the manuscript. The authors had no conflicts of interest to declare.

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