CASE REPORT

Multistage anaesthetic management of a pregnant woman with cerebral venous thrombosis: From emergency decompressive craniectomy to elective caesarean section and reconstructive cranioplasty

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Abstract

Cerebral Venous Thrombosis (CVT) is an uncommon, life-threatening neurological disorder that can arise during pregnancy, requiring emergent intervention. This case report describes the course of a primigravida diagnosed with CVT, who underwent three major surgeries under General Anaesthesia (GA): decompressive craniectomy, elective Lower Segment Caesarean Section (LSCS) with Rapid Sequence Induction (RSI), and cranioplasty. Anaesthetic management was tailored to physiological status during different stages of pregnancy, raised intra-cranial pressure, neurological status and effects of anticoagulation.

Keywords: Cerebral venous thrombosis, obstetric anaesthesia, pregnancy, decompressive craniectomy, lower segment caesarean section

Introduction

Pregnancy is a hypercoagulable state, increasing risk of thromboembolic events, including Cerebral Venous Thrombosis (CVT)[1]. Although rare, CVT carries significant risk of morbidity and mortality, particularly when complicated by increased Intracranial Pressure (ICP) or mass effect [2]. This case report highlights management of a primigravida requiring decompressive craniectomy for antepartum CVT, followed by caesarean delivery and cranioplasty, emphasizing perioperative anaesthetic strategies for high-risk obstetricneurosurgical cases.

Case Report

Surgery 1: Decompressive craniectomy

A 31-year-old primigravida at two months' gestation had presented with a two-week history of holocranial headache, intermittent in nature, followed by three days of vomiting. She, then developed acute left eyelid ptosis, followed by slurred speech, inability to follow commands and right lower limb weakness. There was no positive previous medical or surgical history. Airway assessment showed a difficult airway with buck teeth and Mallampati grade four. Neurological examination revealed dysarthria, left eye ptosis, right upper motor neuron facial palsy and right hemiparesis. Cranial imaging confirmed left temporoparietal haemorrhagic venous infarct with midline shift. Patient underwent emergency craniectomy under General Anaesthesia (GA) with goals being maintaining cerebral perfusion, avoiding ICP fluctuations, and maternal-foetal safety. An 18-gauge Intravenous (IV) cannula and American Society of Anaesthesiologists (ASA) monitors were placed. Modified Rapid Sequence Induction (RSI) was performed avoiding succinylcholine induced ICP rise with intubation via video laryngoscope (IV Injection

thiopentone 5 mg/kg, rocuronium 1 mg/kg, preservative free lignocaine 1.5 mg/kg). Anaesthetic maintenance used sevoflurane 1–1.5% with controlled hyperventilation ($PaCO_2$ 28–32 mmHg). The heart rate, systolic blood pressure and oxygen saturation (SpO_2) were maintained between of 80-90 beats/min, 100-120 mmHg and 98-100% respectively. Low dose of IV mannitol (0.2 gm/kg) and dexamethasone 8 mg were administered in view of cerebral oedema. The neurosurgical team reported optimal operating conditions. Patient was shifted to neuro intensive care unit and trachea was extubated after 48 hours. Slow neurological improvement was observed over 25 days. At discharge she had non fluent aphasia, dysarthria, right hemiparesis (upper and lower limb power 4/5) and Glasgow Coma Scale (GCS) score was15. Postoperative Foetal Heart Rate (FHR) monitoring and ultrasonography were normal. Low Molecular Weight Heparin (LMWH) anticoagulation was started on the first Postoperative Day (POD). On second POD, she was shifted from neurocritical care to ward and was discharged from hospital on eighth POD.

Surgery 2: Elective LSCS under GA with RSI

At 35 weeks' period of gestation, she presented with complaint of vomiting. On further neurological evaluation, she was conscious, coherent. GCS was 15/15. Right upper limb power was reduced and mild speech aphasia was present. Right hemiparesis was noted. No history of seizures. Cranial imaging revealed subacute infarct in left temporal and parietal region. She was on LMWH and levetiracetam (2 g/day). Elective Lower Segment Caesarean Section (LSCS) was planned. Given the history of craniectomy and potential ICP fluctuations and anticoagulation, GA was considered. The patient was prepared for GA with anti-aspiration prophylaxis. After preoxygenation, modified RSI was performed with IV injection glycopyrrolate 0.2 mg, thiopentone 5 mg/ kg and rocuronium 1 mg/kg for neuromuscular blockade. Cricoid pressure was applied until intubation was confirmed. Stress response to intubation was blunted with IV injection lignocaine 60 mg. Anaesthesia was maintained with oxygen-air mixture 60% and sevoflurane1-2%. Analgesia was achieved with bilateral transverse abdominis plane block (0.25% bupivacaine 30 ml + dexamethasone 4 mg) and IV paracetamol 1 g. Uterine tone was managed with oxytocin infusion 10 U IV in 500ml normal saline. A live healthy baby was delivered with good APGAR scores. The patient remained hemodynamically stable throughout the procedure. Extubation was uneventful. Both mother and child remained stable until discharge on fifth POD.

Surgery 3: Reconstructive cranioplasty

Cranioplasty was scheduled nine months later. Examination was normal (Figure 1). After securing IV access and standard ASA monitors, anaesthesia was induced with intravenous injection glycopyrolate 0.2 mg, midazolam 0.05 mg/kg, fentanyl 2 µg/kg, propofol 2 mg/kg, preservative free lignocaine 1.5 mg/kg and vecuronium 8 mg, with intubation via video laryngoscope. Management focused on positioning, ventilation and avoiding ICP increase. Extubation and recovery were uneventful.

Discussion

CVT is the presence of a blood clot in the dural venous sinuses, the cerebral veins, or both [2]. Presenting symptoms of CVT can be due to increased ICP or focal parenchymal injury, with or without mass effect [3]. Venous thromboembolism is a major cause of death in the peripartum period, owing to its hypercoagulable nature [1]. CVT is rare

and easily misdiagnosed in pregnancy as the symptoms are generalised [3]. Headaches, the most common presentation [4] (85%) [5], may be attributed to the physiological changes in pregnancy [6]. Mechanical thrombectomy can be a potential treatment for CVT in pregnant patients who fail to improve with conventional therapy [2]. Endovascular therapy has some role in moribund patients[7].

This case shows the anaesthetic considerations in antepartum CVT. Challenges included balancing ICP control with foetal safety, avoiding hypotension and hypoxia, and managing anticoagulation, which contraindicated regional anaesthesia and increased bleeding risk. For LSCS, GA with RSI was essential due to aspiration and airway risks. During cranioplasty, maintaining stable cerebral physiology and fluid management were crucial. Anaesthetic approach considers the effects of pregnancy on drug metabolism, neurological status of the patient, and the impact of neuroprotective measures on foetal wellbeing [8]. A study suggests spinal anaesthesia might be a safe alternative to GA, with rapid onset and reduced stress response, provided anticoagulants were stopped at an appropriate time and the patient is neurologically and haemodynamically stable [9]. But in a patient with craniectomy, where a portion of skull is removed, normal dynamics of CSF and brain may be altered and the loss of CSF with spinal needle may cause pressure gradient and potentially may lead to herniation. [10]. In the unique circumstance of craniectomy in pregnancy, maternal ICP and hemodynamic control may have detrimental foetal consequences. [10]. Appropriate selection and dosing of medications during pregnancy is important. GA has the advantage of avoiding neurological events due to the accidental dural puncture, associated variations in ICP and controlled hypocapnea (25–30mmHg). But there can be still stress response induced variations in ICP during anaesthetic induction, risk of aspiration and potential difficult airway [3].

For GA, utilization of advanced airway techniques like video laryngoscopy or fiberscope intubation enhances intubation control [5], decreases stress response to laryngoscopy and therefore better haemodynamic stability. Currently, relatively few anaesthetic agents are still omitted in the neurosurgical pregnant patient; however, access is required to critical care units for monitoring and support during recovery [10]. Timely, accurate diagnosis is vital to determine the management and subsequent anaesthetic management.

LMWH with a target international normalized ratio of 2.0 to 3.0 should be continued for at least six weeks after delivery (for a total minimum length of three months) for antepartum CVT. LMWH in full anticoagulant doses should be continued throughout pregnancy. With comparable rates of systemic bleeding, LMWH is favored over unfractionated heparin for reduced mortality and improved functional results. Because LMWH does not penetrate the placenta and has less teratogenicity, it is the preferred anticoagulant treatment for individuals with CVT during pregnancy.

The normal maternal partial pressure of arterial carbon dioxide ($PaCO_2$) is 30 to 32 mm Hg; the target $PaCO_2$ for maternal hyperventilation during brain surgery is 25 to 30 mm Hg. Because of uterine artery vasoconstriction and decreased maternal oxygen dissociation, controlled hyperventilation with PaCO2 below 25 to 30 mm Hg can restrict fetal oxygen delivery while also briefly lowering ICP. Osmotic diuretics, such as mannitol, should only be used in pregnant patients when absolutely necessary. Changes in osmolality, fluid depletion, and

disruptions in the mother's and the foetus' electrolyte balance can affect the foetal heart rate and increase the risk of premature labor. Higher doses of mannitol should only be used in life-threatening situations; a low first dose is recommended.

Conclusion

This case report emphasizes the importance of early recognition and treatment of CVT, anticoagulation during pregnancy, perioperative planning and a multidisciplinary approach for maternal and foetal well-being, anaesthetic considerations in craniectomised parturient. The three sequential surgeries, each with unique risks, were managed successfully with a clear perioperative neuroprotective strategy, intra operative monitoring and plan of anaesthesia that were carefully carried out.

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