Anaesthesia Management for Craniotomy in Pregnant Patients

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ABSTRACT

Meningioma is an intracranial tumour originating from the meninges and is often benign. Its management becomes complex when it occurs in pregnant women, as it must consider the safety of both mother and foetus simultaneously. This paper aims to describe the management of a parasagittal meningioma case in a third-trimester pregnant woman through a multidisciplinary approach. A 37-year-old female patient at 28-29 weeks of gestation was diagnosed with an extra-axial tumour in the left parietal region suspected as parasagittal meningioma and had right hemiparesis. Management was carried out in a multidisciplinary manner involving neurosurgery, obstetrics and gynaecology, anaesthesia, and intensive care teams. After craniotomy for tumour excision, the patient's neurological condition showed improvement without severe complications. The pregnancy was maintained, and the patient left the hospital in a steady state of health, without seizures, and with a good surgical wound. No signs of foetal distress were found during and after the procedure. Surgical intervention for meningioma cases in the third trimester of pregnancy can be performed safely and effectively with multidisciplinary team coordination. Thorough planning and intensive monitoring are key to success in maintaining the safety of both mother and foetus..

KEYWORDS: Meningioma, Pregnancy, Craniotomy, Hemiparesis, Multidisciplinary Case.

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INTRODUCTION

An estimated 2% of pregnant women are likely to require non-obstetric surgical procedures during their pregnancy. Pregnant patients often require neurosurgery for subarachnoid haemorrhage management and intracranial haemorrhage interventions or brain abscesses largely involving interventional neuroradiology procedures and spinal surgeries occasionally alongside intracranial operations and tumour removals (1). Management of intracranial lesions during pregnancy remains woefully inadequate often necessitating careful consideration of various treatment modalities and risk assessment. Neurosurgical interventions profoundly alter physiology in pregnant women. The impact of anaesthetic medications on the patient and foetus must be considered very carefully under diverse clinical circumstances obviously. Multiple factors, such as brain pathology, type, size, and location, neurological symptoms, foetal age, and maternal well-being, must be considered before undertaking neurosurgical intervention during pregnancy. Continuous foetal heart rate monitoring during surgical procedures alongside avoidance of maternal hypotension ensures optimal obstetric outcome and adequate fetoplacental perfusion (2).

CASE REPORT

A female patient, 37 years old, presented with chief complaints of right limb weakness and progressive headache for the last two years. The patient was overweight with a body mass index of 28.9. The patient was a primigravida with a gestational age of 28-29 weeks at the time of treatment, with breech foetal position and placenta previa totalis condition. In addition, preeclampsia screening showed a positive result.

Five years ago, neurological symptoms began in the form of numbness and tingling in the right extremity that was intermittent. Three years ago, the complaints progressed to persistent weakness in the right hand and foot, accompanied by tremors and falls while driving. Initial examination with Computed Tomography (CT) scan at the rural hospital showed an extra-axial intracranial mass in the left parietal region, but the patient refused referral to the referral hospital. The patient continued conservative treatment with dexamethasone and neuro-vitamin therapy for one year.

There was a homogeneous contrast-enhancing extra axial mass with well-defined borders measuring 6.4x8x6.3 cm on the left parietal with a base impression attached to the convexity.

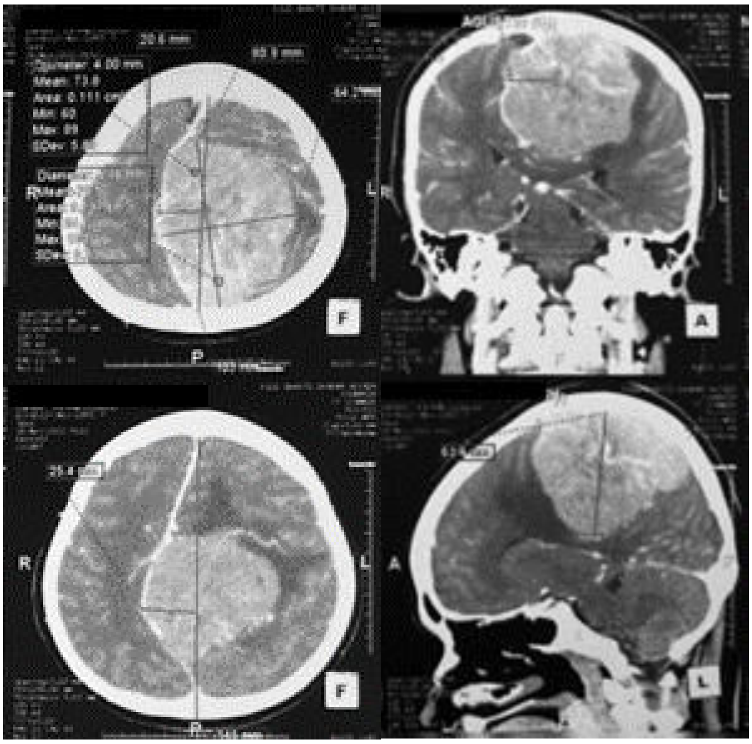

Figure 1. Head CT with Contrast 28/11/2022

At the gestational age of **2**8 weeks, a case conference was held to discuss further management of this pregnant patient with a history of brain tumour. The medical team conducted comprehensive education to the patient and family regarding the current clinical condition and future medical action plans. The patient was admitted to the hospital and underwent a Magnetic Resonance Imaging (MRI) examination of the head without contrast, received steroid injections, and was provided with lung maturation for foetal readiness. Evaluation of maternal and foetal well-being will determine whether the patient can return to outpatient care.

In addition, the team said that the use of phenytoin, which is classified as category D in pregnancy, will be considered only when there is a strong medical indication. If the drug had to be administered, the obstetrics and gynaecology team would again educate the patient and family about the risks. The patient has also been planned to undergo tumour excision surgery after reaching 28 weeks of gestation. This procedure will be performed with multidisciplinary coordination between the neurosurgery, anaesthesia, and neonatology teams. Prior to surgery, the patient will be given gynaecologic strengthening drugs as well as foetal neuroprotectants. If during and after surgery, the mother's condition is stable, the pregnancy can be maintained. However, if there is an emergency in the mother or foetus, the pregnancy will be terminated immediately by caesarean section (CS).

A follow-up consultation with a neurosurgeon confirmed the diagnosis of an extra-axial tumour of the sinistra parietal region, which was strongly suspected to be parasagittal meningioma. Supportive therapy was given in the form of normal saline infusion, analgesic, proton pump inhibitor for gastrointestinal prophylaxis, and high dose corticosteroid which was then continued for seven days. A low-calorie and high-protein diet is also recommended in the preparatory phase of surgery.

A follow-up head MRI performed before surgery revealed an extra-axial mass measuring approximately 8 × 6.9 × 7.1 cm that appeared firm but had uneven edges. This mass appeared to originate from the falx to the convexity of the left parietal lobe, consistent with a meningioma. In addition, bilateral maxillary and right ethmoidal sinusitis, and hypoplasia of the right anterior cerebral artery (ACA) were found. No signs of hydrocephalus were found. These findings strengthened the indication for surgery, taking into account the obstetric status and multidisciplinary coordination.

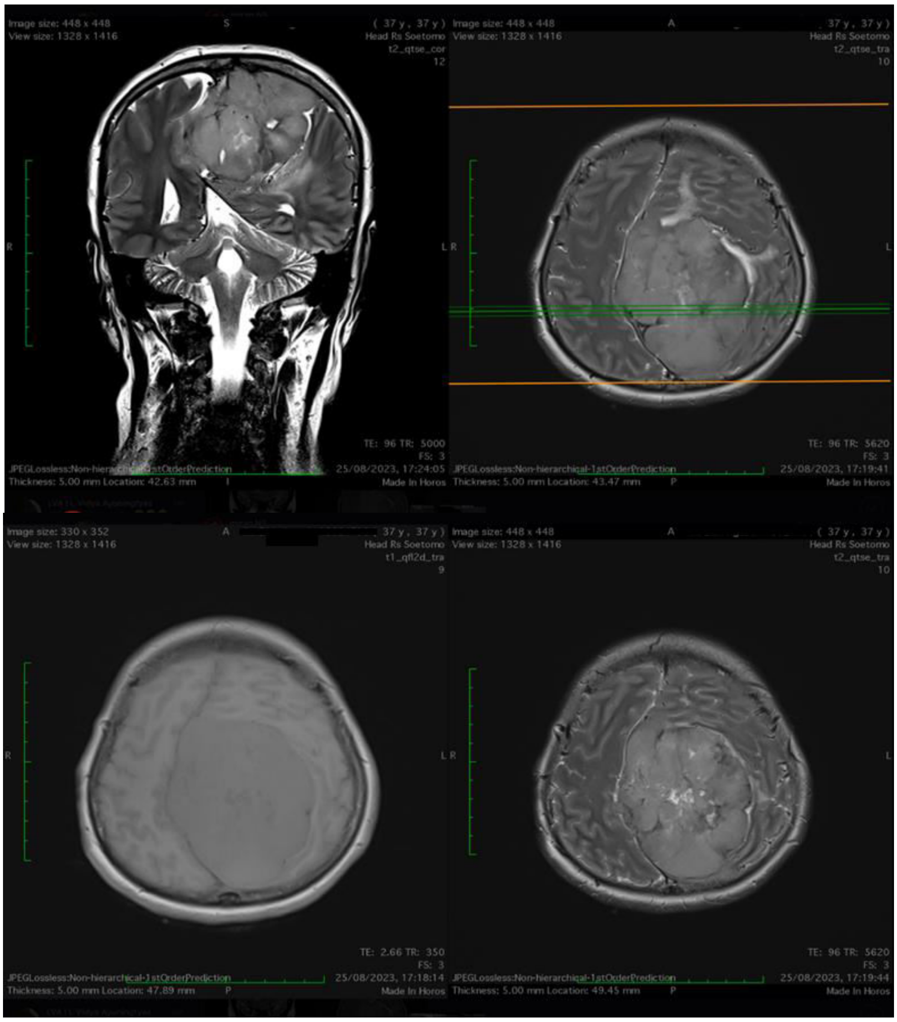

Figure 2. Head MRI Imaging

Craniotomy was performed. Induction with Fentanyl 100 mcg, Propofol 100 mg, and Rocuronium 50 mg. Intubation was performed with no. 7 endotracheal tube. Scalp Block was performed with Ropivacaine 0.5% 22 ml (11 ml right side, 11 ml left side). Maintenance during surgery with TCI (targeted control infusion) Propofol with Schnider Effect Mode with target 3-5, Dexmedetomidine loading 0.7 mcg/kg/hour for 30 minutes followed by 0.4 mcg/kg/hour, and Rocuronium 20 mg/hour. The combination of TCI Propofol and Dexmedetomidine, SCALP block maintained the patient's hemodynamic stability during surgery with a target MAP> 70 mmHg.

The foetus was observed using continuous NST (Nonstress Test) during surgery. If nonreactive NST occurs and termination is performed. However, a reactive NST value was obtained so the pregnancy was maintained. Fentanyl is given as an analgesic by considering Induction Delivery Time (IDT).

Tumour excision and osteoplasty surgery were successful, the condition of the mother and foetus was stable. With a duration of 10 hours and a bleeding volume of 2500 ml. Given 1200 ml of Crystalloid, 1500 ml of Colloid and 1200 ml of Whole Blood. Post-operatively, the patient was still intubated and given sedation with dexmedetomidine in the ICU. At 24 hours of post-operative care, the patient was extubated. On the third day post-operatively, the patient was moved to low care and discharged from the hospital on the fifth post-operative day.

DISCUSSION

In this case, a multidisciplinary approach is needed regarding patient management. In this patient, a tumour excision craniotomy was performed due to worsening neurological symptoms. Pregnancy was maintained as long as possible to reach gestational age of 20 weeks, and the foetus weighed > 1500 grams to ensure more mature foetal development. Pregnancy-strengthening drugs and foetal neuroprotectants were given. A reactive NST value was obtained using continuous NST during surgery so the pregnancy was maintained.

During pregnancy, capillary engorgement of the larynx, nasal, and oropharyngeal mucosa begins in the first trimester and progresses throughout. Nasal breathing commonly becomes difficult, and nasal congestion may contribute to the perceived shortness of breath during pregnancy. Respiratory patterns remain relatively unchanged. Minute ventilation rises by increasing tidal volume from 450 to 600 mL and slightly increasing respiratory rate by 1 to 2 breaths per minute. The ratio of total dead space to tidal volume stays constant during pregnancy, resulting in a 30% to 50% increase in alveolar ventilation above baseline. With uterine growth and diaphragm elevation, the functional residual capacity (FRC) begins to diminish around the fifth month of pregnancy, dropping by 400 to 700 mL to 80% of the pre-pregnancy value at term. PaO2 rises to 100 to 105 mm Hg as a result of increased alveolar ventilation and a decrease in PaCO2. As the pregnancy proceeds, oxygen intake increases but cardiac output decreases, resulting in a lower mixed venous oxygen content and an increasing arteriovenous oxygen differential. After mid-gestation, pregnant women in the supine position typically have PaO2 levels less than 100 mm Hg. This occurs because the FRC may be smaller than the closing capacity, causing small airways to close during normal tidal volume breathing. The higher oxygen tension increases oxygen transport from the placenta to the foetus. PaCO2 drops to around 30 mm Hg by 12 weeks of gestation but does not alter further for the rest of the pregnancy. This is due to decreased alveolar dead space caused by increased cardiac output and basilar atelectasis during pregnancy. Pregnancy-induced respiratory alkalosis induces a compensatory increase in renal bicarbonate excretion and a decrease in serum bicarbonate concentration to around 20 mEq/L, a base excess of 2 to 3 mEq/L, and a total buffer base of roughly 5 mEq/L. A minor respiratory alkalosis would ordinarily shift the oxyhaemoglobin saturation curve to the left, but a rise in 2,3-bisphosphoglycerate (2,3-BPG) causes the curve to shift slightly to the right. The combination of lower FRC and increased oxygen consumption causes rapid oxygen desaturation during apnoea (3). Preoxygenation (denitrogenation) prior to induction of general anaesthesia is therefore mandatory to avoid hypoxemia in pregnant patients. When pregnant women lie supine at term, their closing volume surpasses their FRC. Atelectasis and hypoxemia are common in these circumstances. Engorgement of the respiratory mucosa during pregnancy predisposes the upper airways at risk for trauma, haemorrhage, and blockage. During general anaesthesia, use gentle laryngoscopy and smaller endotracheal tubes (6-6.5 mm) (4). In this case, we prepared equipments for anticipating the difficult airway. Intubation was performed with no. 7 endotracheal tube.

Cardiac output and blood volume rise in response to increasing maternal and foetal metabolic demands. Maternal plasma volume expansion starts as early as 6 weeks' gestation and continues until 34 weeks' gestation, when it achieves a net increase of about 50%. After 34 weeks of gestation, plasma volume stabilizes or declines slightly. Red blood cell volume declines during the first 8 weeks of pregnancy, increases to the pre-pregnancy level by 16 weeks, and then rises to 30% over the pre-pregnancy level at term. The volume of red blood cells rises in response to higher erythropoietin levels and the erythropoietic actions of progesterone, prolactin, and placental lactogen. The increase in plasma volume surpasses the rise in red blood cell volume, resulting in physiologic anemia of pregnancy. The physiologic hypervolemia promotes nutrition supply to the foetus, protects the mother from hypotension, and lowers the risk of bleeding after delivery. The decrease in blood viscosity caused by reduced haematocrit causes lower resistance to blood flow, which may be a crucial component in maintaining the patency of the uteroplacental vascular bed. Furthermore, the decrease in haemoglobin concentration is counterbalanced by an increase in cardiac output and a rightward shift of the haemoglobin dissociation curve, which maintains oxygen supply to tissues. At term, most women's blood volume has grown by 1000-1500 mL, making it easier to endure the blood loss involved with birth; total blood volume reaches 90 mL/kg. The average blood loss with vaginal birth is 200-500 mL, compared to 800-1000 mL during caesarean operation. Blood volume does not return to normal for 1-2 weeks following birth. Cardiac chambers expand, and myocardial hypertrophy is frequently seen on echocardiography. Central venous, pulmonary artery, and pulmonary artery occlusion pressures remain unchanged. Cardiac output begins to grow at five weeks of gestation and is 35% to 40% higher than baseline by the end of the first trimester. It continues to rise during the second trimester, reaching amounts that are almost 50% higher than nonpregnant levels. Cardiac output is stable during the third trimester. Cardiac output begins to grow at five weeks gestation and is 35% to 40% higher than baseline by the end of the first trimester. It continues to rise during the second trimester, reaching amounts that are almost 50% higher than nonpregnant levels. Cardiac output is unchanging during the third trimester. The first rise in cardiac output is the result of an increase in heart rate. By the conclusion of the first trimester, the heart rate has increased by 15% to 25% over baseline and has remained generally consistent throughout the pregnancy. Cardiac output continues to rise throughout the second trimester due to an increase in stroke volume. Stroke volume rises by around 20% during the first trimester and by 25% to 30% over baseline during the second trimester (3). In this case, we prepared Crystalloid, Colloid, and Whole Blood to anticipate the massive haemorrhage during surgery. We maintained the MAP of the patient above 70 mmHg.

Cardiac output might decrease in the supine position after week 20 of pregnancy. Up to 15% of pregnant women develop bradycardia and a significant fall in blood pressure while reclining, known as the supine hypotension syndrome (aortocaval compression). The bradycardia and hypotension may take several minutes to develop, and they are frequently preceded by a period of tachycardia. The condition is caused by a significant drop in venous return and preload, for which the cardiovascular system cannot adjust. Compression of the inferior vena cava occurs as early as 13 to 16 weeks of gestation, as evidenced by a 50% rise in femoral venous pressure when these women assume the supine position. The term gravid uterus can compress the aorta while in the supine position. This compression might explain why the femoral artery has lower pressure than the brachial artery in the supine position. Women who assume the supine posture at term gestation have a 10% to 20% drop in stroke volume and cardiac output, which is associated with a decrease in right atrial filling pressure. Upper extremity blood flow is normal, however, uterine blood flow is reduced by 20% and lower extremity blood flow is reduced by 50% (3). When combined with the hypotensive effects of regional or general anaesthesia, aortocaval compression can easily result in foetal hypoxia. Turning the patient on her side essentially recovers venous return from the lower body and corrects hypotension in such cases. This technique is easily executed by positioning a wedge (>15 degrees) beneath the right hip. At term, the left lateral decubitus posture is related to less stimulation of cardiac sympathetic nervous system activity and less inhibition of cardiac vagal activity than the supine or right lateral decubitus positions. Uterine contraction decreases caval compression but increases aortic compression. Chronic partial caval obstruction in the third trimester predisposes to venous stasis, phlebitis, and oedema in the lower extremities (4). In this case, the patient was positioned in the left lateral decubitus by putting a pillow (>15 degrees) beneath the right hip.

During pregnancy, cerebrovascular blood flow rises. The rise was due to a decrease in cerebrovascular resistance and an increase in internal carotid artery diameter. Other brain alterations that occur during pregnancy include (1) increased blood-brain barrier permeability due to lower cerebrovascular resistance with an increase in hydrostatic pressure, and (2) increased capillary density in the posterior cerebral cortex. During pregnancy, the volume of epidural fat and the epidural venous plexus increase, but the volume of spinal CSF decreases. The expanding uterus obstructs the inferior vena cava, which dilates the epidural venous plexus and raises epidural blood volume. The latter has three key effects: (1) reduced spinal CSF fluid volume, (2) decreased potential volume of the epidural space, and (3) increased epidural (space) pressure. Despite the fact that epidural veins compress the dural sac, pregnant women have the same CSF pressure as nonpregnant women. The rise in cardiac output and the development of oedema may accelerate tumour growth, particularly in cases of meningioma, schwannoma, pituitary adenoma, or rupture of vascular lesions. (5). Due to increased ventilation during pregnancy, the normal $PaCO_2$ level under stable conditions ranges from 30 to 32 mmHg. Controlled hyperventilation remains an option in cases of acute intracranial pressure (ICP) elevation. In the patient with high ICP, there may be a conflict between maternal and foetal interests. Moderate mechanical hyperventilation may be utilized to lower elevated ICP in non-pregnant individuals with a brain tumor or damage. During normal pregnancy, minute ventilation rises, resulting in a maternal PaCO2 of 28 to 32 mm Hg; further hyperventilation and hypocapnia may produce uterine artery vasoconstriction and a shift to the left in the maternal oxyhaemoglobin dissociation curve. Wang and Paech proposed a target PaCO2 range of 25 to 30 mm Hg for pregnant women with an acute elevation in ICP; however, there is presently insufficient data to support evidence-based recommendations for pregnant women having intracranial surgery. In pregnant patients with increased ICP, maintenance of maternal PaCO2 in the middle or at the lower end of the normal range for pregnancy is recommended (3) (4). Management should be tailored to the clinical context. In this case, high-dose corticosteroid was administered for seven days before surgery to reduce the vasogenic oedema of the tumor. PaCO2 was maintained in the normal range. Finally, craniotomy and tumour excision were performed to omit the meningioma.

During pregnancy, both the glomerular filtration rate (GFR) and renal plasma flow rise significantly due to lower renal vascular resistance; as a result, serum creatinine and blood urea nitrogen levels may drop to as low as 0.5-0.6 mg/dL and 8-9 mg/dL, respectively. A reduced renal tubular threshold for glucose and amino acids is common and frequently causes moderate glycosuria, proteinuria, or both (3) (4). Vigilant monitoring of urinary output on an hourly basis is essential for assessment of renal perfusion and volume status (5). In this case, we try to maintain the urinary output of the patient during surgery, ranging from 0.5-1.0 ml/kg/hour.

Special consideration
General anaesthesia of this case was performed with airway intubation management, scalp block with the aim of reducing opioid use and maintenance during surgery with TIVA. TCI Propofol**,** Dexmedetomidine continuously and rocuronium were given to the patient continuously.

Anaesthetic management begins with thorough medical history and physical examination, and requisite laboratory investigations before surgery under general anaesthesia. Foetal well-being and maturity along with gestational age are assessed additionally during this period quite frequently nowadays. A low dose of anxiolytic medication might be prescribed for anxious patients if strict monitoring facilities are readily available nearby. Non-particulate antacids like sodium citrate and prokinetic agents such as metoclopramide are often given before procedures alongside gastric acid suppressants (6)

In pregnant patients undergoing non-obstetric surgery, there are many special considerations. One of them is the selection of an anaesthetic agent that does not induce contractions in the patient. The use of target-controlled infusion (TCI) of propofol in pregnant women undergoing non-obstetric surgery requires special considerations for the safety of the mother and foetus. Propofol, as an intravenous anaesthetic agent, has been proven safe in clinical doses without teratogenic effects based on recent studies (7) . The TCI mechanism allows precise control of plasma concentrations or site effects using pharmacokinetic models such as Schnider or Marsh [9], thereby reducing the risk of overdose and maintaining hemodynamic stability. This is crucial because maternal hypotension can interfere with uteroplacental perfusion (7).

In vitro studies have shown that propofol in clinical concentrations (2-5 μg/ml) causes a dose-dependent decrease in uterine muscle contractions, with a reduction in contractile activity of 45-53% at concentrations of 5-8 μg/ml (8). The mechanism of this inhibition involves a decrease in intracellular calcium levels ($[Ca^{2+}]i$) through blockade of voltage-dependent calcium channels (VDCC) and reduction in inositol 1,4,5-triphosphate ($[IP_3]i$) production. However, in the use of TCI with a target concentration of 3.5-5 μg/ml as reported in cases of oncological surgery during pregnancy, propofol is able to maintain adequate uterine tone for surgical procedures without compromising placental perfusion. Controversy arises from the finding that propofol concentrations >10 μg/ml (exceeding the clinical dose) can reduce active uterine muscle tension by up to 45%. However, the TCI system minimizes the risk of overdose through a pharmacokinetic model that predicts plasma concentrations in real time. In cases of abdominal radical trachelectomy during pregnancy, propofol TCI with a target of 3.5-5 μg/ml maintained the foetal heart rate (FHR) of 120-140 beats/minute (9).

The use of dexmedetomidine in pregnant women undergoing non-obstetric surgery requires special consideration regarding its effects on uterine contractions. Several studies have shown that dexmedetomidine can modulate myometrial activity through α_2-adrenergic receptor agonism, with effects varying depending on dose and trimester of pregnancy. In pregnant rats, administration of low-dose dexmedetomidine (10^{-9} mol/L) increased the amplitude of uterine contractions in the second trimester, but reduced the frequency of contractions in the third trimester (10).

In humans, dexmedetomidine shows a stable hemodynamic profile during caesarean section with a decrease in maternal stress response without adverse effects on neonates. Clinical studies in caesarean section patients found that dexmedetomidine infusion of 0.5 μg/kg/hour reduced the requirement for volatile anaesthetics (sevoflurane) by 30-40% while maintaining adequate uterine tone. Its synergistic analgesic effect with opioids can reduce postoperative analgesic requirements by up to 40% (10).

The use of rocuronium in pregnant women undergoing non-obstetric surgery requires special considerations regarding maternal and foetal safety. Rocuronium is a non-depolarizing muscle relaxant that is often chosen because of its rapid onset (60-90 seconds) and moderate duration of action (25-80 minutes), as well as a better safety profile compared to succinylcholine in terms of the risk of hyperkalemia and contraindications in patients with a history of malignant hyperthermia (11). Studies show that rocuronium doses of 0.6-1 mg/kg do not cause significant side effects on uterine contractions or uteroplacental blood flow because of its highly ionized nature (87%), so that it minimally penetrates the placenta. This is supported by research that found that rocuronium levels in the umbilical vein were only 11-16% of maternal levels (12).

However, use in the first trimester of pregnancy requires caution because several reports have shown the potential for neonatal respiratory depression. For emergency non-obstetric surgery, rocuronium remains the first choice with the caveat that close monitoring using train-of-four (TOF) is required and the anticipated use of sugammadex as a specific antagonist. Recent recommendations state that the combination of rocuronium 1 mg/kg with sugammadex 16 mg/kg can provide complete recovery of neuromuscular blockade (NMB) (TOF ≥0.9) within 3 minutes, minimizing the risk of residual postoperative paralysis (13).
If a pregnant patient undergoes non-obstetric surgery and uterine contractions are found during surgery, the main step that must be taken is to immediately control the contractions to prevent premature labour and foetal complications. This management must involve a multidisciplinary team, including anaesthesiologists, obstetricians, and perinatologists. The use of tocolytics such as indomethacin (oral or suppository) and magnesium sulphate (intravenous) can be considered to inhibit perioperative uterine contractions, although magnesium sulphate should be used with caution because it can affect the vascular response and aggravate hypotension during surgery (14).

During pregnancy, most antiemetic agents demonstrate acceptable such as metoclopramide, antihistamines, and droperidol. Serotonin 3 (5-HT3) receptor antagonists have been found to be safe based on animal studies (6).

Various measures to control intracranial pressure (ICP) can be applied, such as positioning the head slightly elevated, using low tidal volume during intermittent positive pressure ventilation, and avoiding vomiting. Mannitol, when administered to pregnant women, gradually accumulates in the foetus, and foetal hyperosmolality leads to physiological changes such as decreased foetal lung fluid production, reduced urinary blood flow, and increased plasma sodium concentration. In individual case reports, mannitol doses of 0.25-0.5 mg/kg have been used and appear to be safe. Furosemide can be used as an alternative. A single administration of dexamethasone has not demonstrated teratogenic or carcinogenic properties in animal models and has been utilized in numerous gravid patients without documented adverse outcomes. Beyond its primary role in mitigating peritumoral oedema, corticosteroid administration confers the ancillary benefit of enhancing foetal pulmonary maturation through augmentation of surfactant production, though betamethasone remains the preferred corticosteroid agent specifically for antenatal lung maturation therapy (6).

The fetal NST measures variations in the FHR pattern over time and reflects the maturation of the fetal autonomic nervous system. Therefore, it is less effective in very preterm foetuses (<28 weeks' gestation). An NST is conducted before the commencement of labor and does not include invasive (intrauterine) monitoring. The test involves recording the FHR for 20 to 40 minutes and then evaluating the data for the existence of periodic variations. The FHR is measured externally using Doppler ultrasonography, in which sound waves generated from the transducer are deflected by movements of the heart and valves. A sensor detects the frequency change in these deflected waves and converts it to heart rate. The results of the NST are classified as reactive or nonreactive. A reactive FHR tracing has two or more accelerations that peak at least 15 bpm for 15 seconds during a 20-minute period, but do not necessarily remain there. For preterm foetuses (<32 weeks' gestation), an FHR tracing is considered reactive if it shows two or more accelerations of at least 10 bpm for 10 seconds. A reactive NST is interpreted as an indication of fetal health. A nonreactive NST does not obtain adequate accelerations throughout a 40-minute period; nevertheless, this finding may not always suggest an unhealthy foetus, since it is often caused by a fetal sleep cycle. A nonreactive NST must be interpreted in considering the gestational age, underlying clinical circumstances, and previous FHR tracing results (3). In this case, continuous NST (Nonstress Test) evaluation during surgery was used to determine the condition of the foetus. If nonreactive NST occurs and termination is performed, the possibility of uterine contraction disorders can be minimized because the patient does not receive inhalation anaesthetic agents. A reactive NST value was obtained so the pregnancy was maintained.

To preserve cerebral and uteroplacental perfusion, hemodynamic stability should be maintained by administering appropriate fluids, avoiding aortocaval compression, using vasopressor drugs prophylactically or early, and instituting intraarterial blood pressure monitoring before inducing anesthesia. In general, blood pressure should be preserved near to baseline values; but, in the event of an emergency neurosurgery operation in a patient with high ICP, a reduction in blood pressure may jeopardize cerebral perfusion. Fluid therapy during intracranial surgery should include the use of isonatremic, isotonic, and glucose-free intravenous solutions to limit the risk of cerebral edema and hyperglycemia. Mannitol administered to a pregnant woman gradually accumulates in the foetus, resulting in fetal hyperosmolality and the subsequent physiologic changes of reduced fetal lung fluid production, decreased fetal urine production, and increased fetal plasma sodium concentration; however, mannitol doses of 0.25 to 0.5 mg/kg have been reported in individual cases and appear to be associated with favorable maternal and fetal outcomes (3) (4). Neurosurgical procedures frequently involve substantial blood loss, necessitating large-caliber intravenous access. Clinicians may establish central venous access for the delivery of concentrated vasoactive agents, monitoring of central venous pressure, or aspiration of air emboli (6).

Following intracranial interventions, pregnant patients require intensive care monitoring. Optimal postoperative pain management is essential to ensure maternal comfort, facilitate early mobilization, and prevent adverse hemodynamic fluctuations. A multimodal analgesic approach incorporating local anaesthetic techniques, judicious opioid administration, and paracetamol provides superior pain control. Comparative studies of post-craniotomy analgesia indicate that morphine offers superior pain relief with a more favourable side effect profile than alternative opioids such as codeine or tramadol (6).

CONCLUSION

A patient with an extra-axial brain tumour in the left parietal region, confirmed as a parasagittal meningioma and presenting with hemiparesis along with pregnancy complications such as breech position, complete placenta previa, and risk of preeclampsia, successfully underwent craniotomy and tumour excision. The procedure was carried out in a multidisciplinary approach involving neurosurgery, obstetrics and gynecology, anaesthesiology, and neonatology teams, while maintaining the pregnancy. The surgery proceeded well without the need for pregnancy termination, as both maternal and foetal conditions remained stable during and after the procedure. The patient showed significant neurological improvement postoperatively and was discharged fully conscious, stable, free of pain complaints, and under close monitoring for her pregnancy. The success of this treatment highlights the importance of interdisciplinary coordination in managing complex cases involving severe comorbidities and concurrent pregnancy.

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