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Anesthetic Management of the Pregnant Patient with Intracranial Heamorrhage for Cesarean Section & Craniotomy

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ABSTRACT

A 22 years old primigravida patient presented with intracranial heamorrage during the third trimester of pregnancy after road traffic accident. The neuroanesthetic requirement for this patient is prevention of rise in intracranial pressure with a slow & smooth induction and maintainance of the deep plane of anesthesia, wherease caesarean section demand rapid induction with minimum anesthesia until the delivery of baby. Achieving these contradictory requirements at the same-time can be challenging to an anesthesiologist. We report the anesthetic management of this patient during above surgical procedure.

INTRODUCTION

Neuroanesthesia for the pregnant patient is required infrequently and evidence-based recommendations for neuroanesthetic management are sparse. We present a case report of a practical approach to anesthesia of the pregnant patient with traumatic brain injury. The importance of a team approach is emphasized. The anesthesiologist may have to anesthetize the pregnant patient for neurosurgery well before delivery, for cesarean delivery at the time of the neurosurgical procedure, or for delivery after neurosurgery. Fetal safety during anesthesia should be considered but mother's life is always at preference.

CASE SCENARIO

22 years old FEMALE with 34 weeks pregnancy was admitted in the emergency department with history of head injury and loss of consciousness following road traffic accident. Without of having any significant past medical or surgical history. Till now her obstetric history was uneventful.

EXAMINATION:

Patient's vitals were Pulse 128/min, BP 136/82 mm hg, RR 17/min, normal, **SpO_2**-*89%.*

CNS examination revealed**,** patient was *unconscious*, localizes painful stimuli with exaggerated planter reflex. Right pupil was dilated & left pupil was semi dilated, sluggish light reflex in both eyes. **GCS** was *E1 V1 M5* .patient was having spontaneous respiration with bilateral lower zone *crepitations*, cardiovascular system revealed normal heart on clinical ground. On Abdomen examination uterine size was 34 weeks with presence ***FHS*** .

Following good IV cannulation patient was given giving Inj. Propofol 1.5mg/dl, patient was *intubated* with oral portex cuff Endotracheal tube no7.5 to protect airway and for oxygenation. As patient was spontaneously breathing, was maintained on O2 via T-piece. Neurosurgeons and Obstetricians were consulted. All necessary investigations were done.

Investigations were **Hb**-10.2 gm%**, Blood group**-B+ve **, CT scan brain**-*Extradural hemorrhage* in right parietal-temporal region, *subdural hemorrhage* in left parietal & anterior cerebral hemispherical fissure, *cerebral edema* with *midline shift* to right. Fetal sonography 34 week maturity, *live fetus* with good FHS. All other types of injuries were ruled out.

Neurosurgeons advised urgent *craniotomy and evacuation of hemorrhage* as life saving measure while obstetricians advised *LSCS for viable fetus*. Therefore it was decided to do LSCS followed by craniotomy. Neonatal resuscitation unit was informed to take care of baby after delivery.

Anesthesia management

Informed written high risk consent was taken from guardian and patient was shifted to OT. Routine monitors like ECG, PULSEOXYMETER, TEMPERATURE PROBE and NIBP were applied. Another 18 gauge IV cannula was inserted.ETT suction & refixation was done. Patient was oxygenated with 100% O2 and was given ***PREMEDICATION:*** Inj Glycopyrollate 0.04mg/kg IV, Inj Ondensetron 4mg IV, Inj Dexamethasone 8 mg IV.

INDUCTION was done with Inj Propofol 2 mg/ kg IV followed by ***MAINANANCE*** with O2 & isoflurane with controlled ventilation. Obstetrician performed LSCS and baby of 2.6 kg was delivered. After delivery of the baby, Patient was given inj Fentanyl 2mcq/kg IV, Inj Vecuronium 0.1mg/kg, Inj Oxytocin 20 units in Inj NS drip and maintained on O2 & isoflurane with Inj.Vecuronium IV as required. Patient was ventilated with control positive pressure ventilation at rate 18-20/min, tidal volume of 6 ml/kg to maintain ETCO2 at 25-28 mm hg. Immediately neurosurgeon started craniotomy, evacuations of intra cranial hemorrhage was done.

During operation Patient was given IV fluid according to calculated loss and she received 1 liter of normal saline, 500ml of hydroxylethylstarch & 3 units of PCV with adequate urine output. Per-operative patient was stable thermodynamically with vitals within range of Pulse: 100-140/min, SBP: 100-130 mm hg, DBP: 60-90 mm hg, SpO2: 100% on control ventilation and normal body temperature.

Following completion of both the operations, patient was unconscious, responding to painful stimuli with return of spontaneous respiration. GCS of patient was E1VTM5. So Patient was shifted to neurosurgical ICU with ETT in situ & was kept on mechanical ventilation.

DISCUSSION

Trauma during pregnancy, including head injury is a leading cause of incident maternal death and morbidity and complicates 6%-7% of all pregnancies. The literature is generally unhelpful with respect to evidence-based neuroanesthetic management for the pregnant patient and so planning and decision making must be based largely on general principles of neurosurgical and obstetric anesthesia. We present our view of the literature to provide the anesthesiologist with a practical approach to such cases. Traumatic brain injury in the pregnant patient may be associated with other injures to body. Early aggressive maternal resuscitation is the main priority because effective ma-

ternal resuscitation also provides fetal resuscitation. If tracheal intubation and positive pressure ventilation are indicated, a rapid sequence induction with thiopental or propofol and succinylcholine should be used. To avoid caval venous compression, after 20 wk gestation, left lateral tilt of the whole body should be applied through log rolling. Difficult intubation can be expected in 1 in 300 pregnant patients. Because of the additional difficulty that may come from pregnancy and unstable neck. Lack of time, equipment, or expertise may necessitate direct laryngoscopy with manual-in-line stabilization for intubation.

FETAL CONCERNS IN THE PERIPARTUM PERIOD

The fetus may be compromised directly or indirectly by maternal hypotension, uterine artery vasoconstriction, maternal hypoxemia, and acid–base changes, effects of anesthetic and analgesic drugs, anticonvulsants drugs. Recommendations in relation to radiation exposure of the pregnant patient should be always followed. Fetal heart rate (FHR) monitoring should be done. Severe fetal bradycardia mandates attempts to improve uteroplacental flow and fetal oxygenation by increasing maternal arterial BP and ensuring left lateral Tilt and normoventilation.

TIMING AND METHOD OF DELIVERY

Neurosurgical fetal management can be based on obstetric considerations. The anesthesiologist may face one of three scenarios:

1. Neurosurgery performed with a view to maintaining the fetus in utero nearly pregnancy.
2. Cesarean delivery before the neurosurgical procedure. Obstetric and neurosurgical anesthesia principles may need to be modified.
3. Cesarean delivery followed by later neurosurgery.

Basic Anesthetic Considerations during Pregnancy

The anesthesiologist must understand the physiological changes of pregnancy, its implications and the specific risk so anesthesia during pregnancy so that a plan can be developed. When time permits multidisciplinary and co-operative approach involving neurosurgeon, anesthesiologist, obstetrician and neonatologist is recommended. Anticonvulsant therapy may need to be implemented or continued in the preoperative phase and pregnancy-induced changes occur in the clearance, unbound fractions and half-lives of some anticonvulsant drugs.

Pregnant women are more likely to experience both symptomatic and silent regurgitation. Most antiemetic drugs appear to be safe to use during pregnancy, with the best risk categorizations. During pregnancy, oxygen requirements increase and respiratory mechanics change due to the effects of the gravid uterus and weight gain. The reduction in functional residual capacity lead to rapid maternal desaturation during hypoventilation or apnea. Because the arterial oxygen tension decreases at twice the nonpregnant rate, administration of oxygen is essential.

Careful airway assessment and management planning is necessary. As fat deposition and upper airway mucosal edema, pregnant women are considered more likely to be difficult to intubate. Smaller than usual oraltracheal tubes are useful, additional equipments of managing a difficult airway should be readily available. Rapid sequence induction is advisable early within the second trimester to reduce the risk of aspiration.

PATIENT DURING NEUROSURGERY

Intra arterial BP monitoring is recommended to detect early hemodynamic changes in response to fluid administration, aortocaval compression, effect of vasopressor drugs. Neurosurgery may causes substantial bleeding and warrant large bore IV access. Central venous access may be considered for administration of concentrated vasoactive drugs, central venous pressure monitoring or aspiration of air emboli. For an emergency neurosurgical procedure where the intracranial pressure (ICP) is increased, decreasing the BP is less advisable. As a result of increase ventilation during pregnancy, the normal arterial carbon dioxide tension (PAco2) at steady state is 30–32 mmHg. Controlled hyperventilation to reduce the ICP remains an option in the case of acutely increased ICP. Although the clinical effects on placental blood flow are arguable, severe hyperventilation (PAco2 25 mmHg) may cause uterine artery vasoconstriction and left ward shift to the maternal oxy-hemoglobin dissociation curve. Indeed, prophylactic hyperventilation of head-injured patients to Pco2 25 mmHg has a negative impact on patient outcome. We therefore maintain maternal Paco2 between 25–30mmHg. Hyperventilation may adversely affect the fetus by reducing cardiac output due to reduced venous return, thus decreasing uterine blood flow, producing hypocapnic induced uterine/umbilical artery vasoconstriction, and by producing alkalosis induced shift of the O2-hemoglobin dissociation curve to the left, thus reducing O2 delivery to the fetus.

Providing an adequate depth of anesthesia will reduce the risk of awareness. However, it is also desired to avoid the hemodynamic effects of excessively deep anesthesia and achieve rapid recovery. Temperature Regulation is also necessary. Induced hypothermia is no longer recommended as a means of neuronal preservation.

A variety of measures to control ICP, such as slight head-up position, low tidal volumes during intermittent positive pressure ventilation and avoidance of vomiting are applicable. Mannitol given to the pregnant woman slowly accumulates in the fetus, and fetal hyper osmolality leads to physiological changes such as reduced fetal lung fluid production, reduced urinary blood flow and increased plasma sodium concentration. IV fluid therapy during cerebral and spinal neurosurgery should consist of isonatremic, isotonic and glucose-free solutions to reduce the risk of cerebral edema and hyperglycemia. Hemodynamic stability is important for maintaining maternal cerebral perfusion as well as prevention of uterine hypoperfusion and fetal hypoxia.

A single dose of dexamethasone is not teratogenic or carcinogenic in animals and appears safe. The administration of steroids to reduce peritumor edema acts to accelerate fetal lung maturity by increasing surfactant production, also helps in reducing airway edema.

To reduce fluctuations in ICP and cerebral blood flow secondary to the intubation-induced hypertensive response or anesthesia-induced hypotension, a smooth rapid sequence induction with Thiopental is still most frequently used IV induction drug for general anesthesia during pregnancy, propofol is another acceptable option. Thiopental and propofol reduce the hypertensive response ICP and cerebral metabolism, maintaining cerebral auto regulation and permitting rapid wakening, although propofol may better attenuate the hemodynamic response to laryngoscopy and intubation. Propofol do allow good smooth muscle relaxation, bronchodilatory effects over thiopental. Propofol should not be used for very long procedures. We used propofol for only up the delivery of the baby.

Volatile anesthetics suitable for anesthesia during pregnancy include isoflurane and sevoflurane. These are also favored in neuroanesthesia because they reduce cerebral metabolic rate, have the least effect on ICP and provide a level of cerebral protection in animals. The MAC of most volatile anesthetics is reduced by approximately 25% during pregnancy and so initial end-tidal isoflurane or sevoflurane concentrations of 1.0% and 1.5%, respectively, are appropriate. These maintain a suitable depth of anesthesia, a degree of uterine relaxation, preserve cerebral auto regulation. Post partum hemorrhage from uterine atony remains a risk during the subsequent neurosurgery. Despite infusion of an oxytocic drug, some authors suggest a change from a volatile-based anesthetic for cesarean delivery to an IV technique for the intracranial procedure to further reduce uterine blood loss. For general anesthesia, either total IV anesthesia with propofol or balanced IV or volatile anesthesia are reasonable choices. The use of propofol for induction and maintenance of anesthesia for cesarean delivery associated with reduced neonatal neurobehavioral performance compared with thiopental and volatile maintenance. These effects are of argu-

able clinical significance. Propofol (2–2.5mg/kg) are followed by succinylcholine (1–1.5mg/kg), there may be a transient, but clinically unimportant, increase in ICP. The choice of a nondepolarizing neuromuscular blocking drug for tracheal intubation is controversial because of difficult intubation.

Pre delivery opioids are associated with fetal chest wall rigidity, apnea so naloxane should be available during neonatal resuscitation.

The effect of oxytocic drugs on ICP and cerebral blood flow has not been well studied, but the use of synthetic oxytocin without adverse effect has been described in patients with intracranial tumors. It should be appreciated that oxytocin causes transient hypotension and a significant increase in heart rate and cardiac output for several minutes. Ergometrine is a potent vasoconstrictor, producing a hypertensive response that may further elevate increased ICP in the presence of a disrupted blood–brain barrier and loss of auto regulation.

Craniotomy for intracranial hemorrhage in near-term pregnancy, optimally Cesarean section is performed as soon after induction of anesthesia as possible to avoid

1. Prolonged exposure to pharmacologic agents,
2. Hemodynamic fluxes, and
3. Changes in temperature that may have unfavorable effects on the fetus.

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