

Anaesthetic Management of Cervical Spine Surgery for Traumatic Tetraplegia in 32 Weeks Pregnant Patient:

A Case Report and Literature Review

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Abstract

A 30 year old woman with 32 weeks pregnancy and hypothyroidism admitted in the hospital with traumatic cervical SCI (Spinal Cord Injury) with quadriplegia but intact sensation (ASIA-B). Patient was haemodynamically unstable. Immediately intravenous fluid (IVF), Dopamine infusion and Oxygen by mask were started to improve spinal cord and placental circulation and oxygenation. Injection Methylprednisolone 1 gm infusion was given. Injection Dexamethosone 12 mg intravenous(IV) stat was given and then repeated after 12 hrs it improve foetal circulation and lung maturation of developing foetus. Injection Isoxsuprine Hydrochloride was started to prevent premature labour.

Standby Obstetrician and Paediatrician were requested during spine surgery. Morning dose of injection Isoxsuprine 10 mg slow IV was given before shifting the patient to the Operation Theatre (OT). Anaesthesia was induced with Propofol and Rocuronium. Manual in-line axial stabilization was maintained during intubation. Anaesthesia was maintained with Mechanical Ventilation, Oxygen, Air, Isoflurane and Ketofol (Ketamine and Propofol in 1:5 ratio). Nitrous oxide was avoided because

it increases the risk intracranial haemorrhage in premature foetus and may affect DNA synthesis. Foetal monitoring was done throughout the procedure. After the surgery patient was reversed and extubated. Prophylactic tocolytic therapy was re-started in recovery room. Injection Enoxaparin 40 mg subcutaneous(s/c) given for 15 days.

At 36 weeks of pregnancy, hospital arranged Paediatric team and incubator from outside. No sedation was given in premedication. Caesarian section was done under GA and normal healthy girl baby was delivered. Now patient is able to stand and walk without support.

Keywords: Cervical Spine injury, Quadriplegia, Third trimester Pregnancy, Spine surgery and Anaesthesia.

Introduction

Cervical spinal cord injury causes sudden changes in the body physiology such as hemodynamic instability as a result of Autonomic dysfunction, immobility and psychological trauma, which incur devastating effects on human body and fetus^[1]. Hemodynamic instability leads to hypo-perfusion and hypoxic injury to spinal cord, placenta and fetus^[1]. Here two lives (mother and fetus) are in danger and a multidisciplinary approach of management is required. Hypercoagulable state of

pregnancy and the relative immobility after SCI increases the risk of thromboembolic disease in pregnancy. Anticoagulation therapy needs to be given.

Case Description/Report

History: A case of 30-year-old pregnant patient in her third trimester (32 weeks) with weight 57 kg, presented in our emergency room with traumatic fracture (C4), dislocation cervical spine (C4/5) with quadriplegia, ASIA grade B along with bowel and bladder involvement following a road traffic accident. After accident primary treatment was given in a local hospital, next day she was shifted to our hospital.

She had undergone one LSCS 13 months back and was on tablet Thyroxin 25 microgram once a day for Hypothyroidism.

Pre-operative Management

She was fully oriented, pulse 82/min, BP 90/60 mmHg, and respiration was adequate. Oxygen saturation was 98% with oxygen by face mask. MRI cervical spine revealed fracture of C4. Intravenous fluid and Dopamine were started to maintain the MAP above 90 mmHg. A wedge was applied under the right hip to avoid supine hypotension syndrome. Dexamethasone 12 mg intramuscularly was given, then repeated after 12 hours to improve fetal circulation and to aid lung maturation^[2]. Injection Methylprednisolone 1gm infusion was given over 30 minutes^[3]. Injection Paracetamol was given for analgesia. Inj. Enoxaparin 40 mg subcutaneously OD was started. Hemoglobin was 8.6 gm%, one PRBC transfused. Injection Isoxsuprine 10 mg slow intravenous given, then 10 mg intramuscular 6 hourly started prophylactic to prevent premature labor^[4].

Cervical traction was applied for three days to reduce the dislocation of C4/C5 vertebrae. Anterior cervical discectomy and fixation (ACDF) was planned under General Anesthesia on the 4th day of trauma. Services of

an Obstetrician and a Pediatrician, along with incubator were requested for standby during the procedure.

Anaesthetic Management

Pre-operative counseling and premedication:

Patient and relatives were counseled regarding the need of the surgery and were explained about risks and benefits of anesthesia and surgery to the mother and the fetus. Mild anxiolytic tablet Alprazolam 0.25 mg was given the night before the surgery, Tablet Thyroxine continued and injection Ranitidine 50mg intravenous and Sodium citrate 30 ml orally given one hour before the surgery. Morning dose of injection Isoxsuprine 10 mg slow intravenous given just before shifting the patient to the OT. Monitors attached, Dopamine continued and routine premedication, injection Glycopyrolate .2 mg, Fentanyl 100 micrograms, Xylocard 60 mg IV given on OT table.

Anaesthesia For Spine Surgery

Induction of anaesthesia was done with injection Propofol 1.5 mg/ kg. After check ventilation by mask, injection Rocuronium bromide 50 mg IV given. Manual inline-axial stabilization of cervical spine was applied and patient was intubated with the help of Videolaryngoscope. Cuffed ETT (7.5 mm) placed and secured. Anaesthesia was maintained with IPPV, oxygen, air, isoflurane, Atracurium and Propofol+Ketamine (5:1 ratio) infusion. Dopamine was continued. Fetal monitoring (FHS) was done continuously by the obstetrician. Surgical duration was about 3 hours. Inj Paracetamol 1 gm given over 20 minutes and patient was reversed as routine (Neostigmine and Glycopyrolate) and extubated. Isoxsuprine 10 mg IM given prophylactically in recovery room then 6 hourly for 24 hours, then 8 hourly for another 24 hours followed by 10 mg orally thrice a day for next 5 days. Injection Enoxaparin 40 mg subcutaneous once a day was restarted and was continued for next two weeks.

Anaesthetic Management For Caesarian Delivery

As our hospital is a super-specialized center for orthopaedics and spine injuries, we do not have the required infrastructure to deal with high risk pregnancies and since the patient could not be shifted to other centre due to spine injury, an incubator and paediatric team was arranged from outside. LSCS was done under general anaesthesia at 36 weeks. Normal weight baby girl was delivered. Now patient is able to stand and walk with support.

Discussion

Most of the patients with complete cervical SCI (American Spinal Injury Association ASIA- A and B) develop bradycardia, 68% develop arterial hypotension, 35% require vasopressor treatment, and cardiac arrest occurs in 16%^[5,6]. In incomplete cervical SCI (ASIA C and D), 35% to 71% develop bradycardia, and few experience hypotension.

Medical management in ICU

Mean arterial pressure was maintained above 90 mmHg so that spinal cord perfusion and placental circulation could be maintained. Dopamine helps in maintaining blood pressure, heart rate as well as uterine blood flow and is safe in pregnancy.^[7]

In case of preterm labour foetal lungs are not mature. Maternal dexamethasone administration to pregnant women improves the blood flow of the maternal uterine artery, fetal MCA, descending aorta and umbilical artery 24 h after its administration. It helps in maturation of foetal lungs^[2]. Injection Methylprednisolone 1gm infusion was given over 30 minutes. Methylprednisolone is considered a Class C drug in pregnancy. High dose (30 mg/kg for 3 days) of methyl prednisolone has been used successfully in third trimester without any complication in fetus, but since adequate human reproduction studies have not been done with corticosteroids, the possible benefits of

the drug be weighed against the potential hazards to the fetus.^[3] Pregnancy is an acquired hypercoagulable state with a four- to tenfold increased thrombotic risk, quadriplegia further increases the risk of venous thromboembolism in pregnant women. Brenner B. suggested that Low-molecular-weight heparin is the drug of choice in pregnancy.^[8] A retrospective French study on use of enoxaparin during 624 pregnancies also revealed a good safety profile.^[9]

Prophylactic tocolytic therapy can be considered in third trimester during peri-operative period^[10], as we gave injection isoxsuprine in our patient.

Anaesthetic Management

Pre-operative counseling and Premedication

Traumatic quadriplegia with pregnancy is a very stressful situation. It is must to relieve the pain, allay the anxiety and counsel the patient and close relatives regarding the risk and benefits of anaesthesia and surgery before taking for any non-obstetric procedure. Mild anxiolytics can be given in pre-operative period. We gave tablet Alprazolam 0.25mg the night before surgery.^[10]

Risk of aspiration is higher due to reduced gastric barrier pressure and lower oesophageal sphincter tone due to the effect of progesterone.^[11] H2-blocker injection Ranitidine 50mg intravenous and non particulate antacid Sodium citrate 30 ml oral were given one hour before surgery.

Conduct of Anaesthesia for Spine Surgery

In supine position, gravid uterus may cause aortocaval compression and supine hypotension syndrome. To avoid aortocaval compression, we applied a wedge under the right hip and gave the patient 15° left lateral tilt.

Pregnant patients desaturate early during endotracheal intubation. In anticipated difficult intubation because of immobile cervical spine, proper pre-oxygenation is must, as we did in our case.

After induction of Anaesthesia check ventilation with mask was done before administration of muscle relaxant. This gives opportunity to avoid muscle relaxant and early spontaneous reversal/awakening of the patient in case of failed ventilation. After injection Rocuronium bromide cervical spine manually immobilised during videoscopic intubation to prevent further damage to spinal cord.

It is suggested that Nitrous oxide (N₂O) affects DNA synthesis by inhibiting Methionine synthetase in the foetus. However this effect has been seen only in animals exposed to high concentration of N₂O for long duration.^[12] Polvi H.J. et al.^[13] suggested that 30% N₂O inhalation causes decreased central vascular resistance in mother and foetus. Thus there is increased risk of cerebral hyperaemia and intracranial haemorrhage in preterm foetus by N₂O. However no adverse effect has been seen in both mother and foetus in clinical practice. FDA has classified Ketamine in pregnancy as category B drug. Ketamine is generally considered safe in pregnancy. However this has not been adequately studied in pregnant women^[14] Ketamine at 2 mg/kg intravenous dose has been found to cause uterine contractions in early pregnancy which are equal to Ergometrine 0.5 mg but it exerts no effect in late pregnancy.^[15] We used Ketamine mixed with propofol at a very low dose(.2-.3 mg/kg/hour) infusion in late pregnancy. This was an analgesic dose of Ketamine so that we could reduce the doses of other anaesthetic agents like Propofol, Isoflurane and consequently their effects on haemodynamics.

American College of Obstetrics and Gynaecology Committee strongly recommends for multidisciplinary team approach for optimal safety of the mother and her baby.^[16] We requested an Obstetrician and a Paediatrician to act as a standby who monitored foetal wellbeing during spine surgery.

Obstetric procedure at a non-obstetric centre is a big challenge. In Obstetric procedures suitable arrangements which commensurate with the requirements must be made before going for the procedure. Our hospital arranged a paediatric team and incubator from outside to manage the baby after the caesarian section.

Conclusion

Traumatic quadriplegia in late pregnancy is a physiological and psychological trauma to the patient where major hemodynamic instabilities can occur. Haemodynamic instability and psychological stress, directly affect the patient and the foetus. There is a risk of circulatory and respiratory insufficiency to the mother that may lead to premature labour, foetal asphyxia and foetal death. Anaesthesia for non-obstetric surgery in pregnant patient with all these challenges may prove to be a hazard if risk- benefit assessment is not done and suitable technique is not applied. Here multidisciplinary team approach is highly recommended to ensure standard of care.

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