Anaesthesia for non-obstetric surgery in the pregnant patient: A case report

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ABSTRACT
Non obstetric surgery in the pregnant women is a challenge for the anaesthesiologist as it may be required at any period during the pregnancy. Common non obstetric surgeries performed during pregnancy are for cervical incompetence, appendicitis, ovarian cyst, breast mass, and trauma. Anaesthesia for non-obstetric surgery in pregnancy can result in perinatal mortality to the mother and the fetus.

We will be presenting a case of 22 year old Primigravida at 18 weeks of gestation, with the rapidly growing mass in the right breast. The lump was 10x10cm in size, freely mobile, non tender, with no history of discharge from the nipple. The left breast and axilla were normal. A clinical diagnosis of Cystosarcoma Phylloides was made. She was posted for excision biopsy and frozen section.

The patient was shifted into the operation theatre and the thoracic epidural catheter was placed in the T3-T4 interspace. After placing the patient supine, 10.5ml of 0.5% Bupivacaine was injected into the epidural catheter, so that dermatomes from T1-T7 were blocked using a dose of 1.5 ml per segment. The surgery was performed under thoracic epidural anaesthesia only. Postoperatively, epidural analgesia was administered and patient was stable.

In this case, a high thoracic epidural was given to minimize the exposure of the fetus to multiple drugs, especially during the first trimester, as it is the time when organogenesis takes place. It also avoids the instrumentation of the airway, as the incidence of failed intubations in pregnant women is estimated to be 1 in 500 patients. High Thoracic Epidural is a good alternative to general anaesthesia for surgery on the thorax, chest wall, and axilla, as excellent Intraoperative anaesthesia and post operative analgesia can be provided via the thoracic epidural catheter. It decreases the chances of gastric aspiration and patients can be mobilized earlier and the recovery time is shortened. The primary goal is always to preserve the life of the mother first and the fetus.

Keywords: high thoracic epidural, cystosarcoma phylloides, mastectomy, second trimester

INTRODUCTION
Non-obstetric surgery in the pregnant woman is a challenge for the anesthetist as it may be required at any period of pregnancy.

Common non-obstetric surgeries performed during pregnancy are: for the management of cervical incompetence, appendicitis, cholelithiasis, ovarian cysts, breastmass, and trauma. Major procedures like craniotomy, cardiopulmonary by-pass and liver transplant have also been performed on the pregnant patient with good outcomes for the mother and the fetus1,2,3,4.

Anaesthesia for non-obstetric surgery in pregnancy can result in perinatal mortality to the mother and fetus. Spontaneous abortions, premature delivery, low birth weight and possible teratogenic effects of anaesthetic drugs on the fetus have also been reported1,2,3,4.

CASE REPORT
A 22 year old primigravida at 18 weeks of gestation presented with a rapidly growing mass in the right breast of four months
duration. The lump was 10cm x 10 cm in size, freely mobile, non-tender with no history of discharge from the nipple. There was no family history of breast cancer.

Pre-operative examination revealed a 50 kg female with a heart rate of 72/min, BP of 110/70 mmHg and respiratory rate of 18/min. Her cardiovascular and respiratory systems were within normal limits. Abdominal examination revealed a uterus size corresponding to 18 weeks.

Breast examination revealed a non-tender mobile mass 10x10 cms in size in the upper outer quadrant of the right breast. There were no palpable lymph nodes in the right axilla. The left breast and axilla were normal. A provisional clinical diagnosis of giant fibroadenoma; differential diagnosis of cystosarcoma phylloides was made. A needle biopsy performed yielded a negative result. Laboratory investigations were normal. USG abdomen was done pre and post operatively to confirm viability of the fetus. Consent was obtained for termination of pregnancy in the event of premature labor and lack of viability of the fetus post operatively. She was posted for surgical excision biopsy and frozen section. A mastectomy was planned if the biopsy revealed malignancy.

Airway assessment revealed a Mallampatti Score of I, with intact definition, adequate mouth opening and a full range of neck movements. The various anaesthetic options were discussed with the patient and it was decided that a high thoracic epidural would be used. The patient was given Ranitidine 150mg orally on the night prior to the surgery and at 6:00am on the day of surgery. A tocolytic agent Ritodrin 50mg in 500ml of Normal Saline was given intravenously at the rate of 8 drops/min 4 hours before surgery, and continued in the post operative period for 24 hours.

The patient was shifted to the operation room where peripheral venous access was secured. Monitoring consisted of continuous ECG, NIBP, and pulse oximetry. Midazolam 1mg was given intravenously to achieve moderate sedation. The patient was pre-loaded with 750 ml of crystalloids (15ml/kg) intravenously. With the patient in the sitting position a thoracic epidural catheter was placed in the T3-T4 space. After placing the patient supine 10.5ml of 0.5% Bupivacaine was injected into the epidural catheter so that the dermatomes from T1 to T7 were blocked using a dose of 1.5ml/segment.

There were no fluctuations in the maternal vital signs. The sensory blockade was confirmed by loss of sensation to pinprick over the T1-T7 dermatomes. A facemask with oxygen at 6 l/min was applied. The patient was sedated during the procedure by infusion of Propofol 80 mg/hr for anxiolysis. A wide local excision of the breast mass was done and sent for frozen section. As the report was negative for malignancy, mastectomy was not done and the operative site was closed. The patient was comfortable during the surgical procedure which was successfully completed in an hour and 30 min. During the operative procedure 1800 ml of crystalloids were given intravenously.

Postoperative analgesia was maintained for 8 hours after the surgery by infusion of Bupivacaine 0.0625% in a syringe pump at a rate of 6ml/hour. Breakthrough pain relief was needed only once in this period in the form of Inj Tramadol 50mg IV. After the epidural infusion was stopped the catheter was removed. Analgesia was maintained with intravenous Tramadol 50 mg 8 hourly for another two days. The patient was discharged on the fifth postoperative day. She was pain free and without complaints.

**DISCUSSION**

The most important focus in non-obstetric surgery during pregnancy is the safe and skilled anaesthetic management to minimize risk to the mother and the fetus rather than any specific agent or technique. It is possible that many such cases are missed, as preoperative pregnancy testing is not done routinely. The choice of anaesthetic depends on
the time and duration of surgery and the trimester when surgery is done.

**TIMING OF SURGERY:** The ideal time for surgery is the second trimester. In the first trimester there is a danger of spontaneous abortion. Surgery in the third trimester can give rise to premature labor. Elective surgery should not be performed during pregnancy. Emergency surgery has to be done regardless of gestational age. All anaesthetic choices are good provided fetal hypoxia is avoided by preventing maternal hypoxia and hypotension. No study has correlated an improved fetal outcome with either regional or general anaesthesia for surgery on the pregnant patient.

**PHYSIOLOGICAL CHANGES IN PREGNANCY:** The pregnancy-induced alterations in maternal physiology involve most organ systems in the body. It is necessary to review the normal physiological changes in pregnancy as they may increase maternal risk and affect the anesthetic management of a pregnant patient for non-obstetric surgery.

Changes in cardiovascular physiology, which need consideration during anaesthesia in a pregnant woman, are the increase in the blood volume and cardiac output. They can cause an increase in blood pressure, blood volume and cardiac output to meet the increased maternal and fetal metabolic demands. Compression of IVC (inferior vena cava) by the gravid uterus results in hypotension in the supine position after 28 weeks of pregnancy. When this is combined with the hypotensive effects of general or regional anesthesia, the *Aortocaval compression* in the supine position can cause fetal asphyxia.

Pregnancy induced alterations in respiratory physiology include an increase in tidal volume and minute ventilation which decreases the PaCO2. There is a higher O2 consumption, and a lowered FRC, both of which result in a marked decrease in the safe duration of apnea in the pregnant women. The PaO2 in the first minute of apnea after preoxygenation falls by 30% in a pregnant woman as compared to a decrease of 10% in the non-pregnant woman. The decrease in FRC (functional residual capacity) is further compromised by supine position. If there is delay due to difficult intubation then, the decreased FRC and increased O2 consumption in pregnancy, can lead to rapid desaturation and lowering of cardiac output leading to fetoplacental compromise. MAC (minimum alveolar concentration) for all general anaesthetic agents progressively decreases during pregnancy as much as 30-40%.

Increased mucosal vascularity of the respiratory tract during pregnancy may lead to difficulty in endotracheal intubation. The edema of the airway results in increased potential for bleeding during nasal intubation, with a need to use similar sized endotracheal tubes.

Pregnancy induced changes in gastrointestinal physiology results in decrease gastric motility, with an increased risk of gastric aspiration after the 18-20 weeks of gestation. This is due to a decrease in gastro esophageal sphincter tone by narcotics, anticholinergic and increased progesterone levels.

Acid aspiration prophylaxis is recommended for emergency surgery. The commonly used technique for general anaesthesia is rapid sequence induction after preoxygenation, followed by application of cricoid pressure (Sellick maneuver) and intubation after giving an Opioid and / or a moderate concentration of an inhalation agent. A rapidly acting muscle relaxant like Succinylcholine is used for intubation. Nitrous oxide (N2O) increases post-operative nausea and vomiting (PONV) and has been known to vasoconstrict uterine vasculature. No other adverse effects of N2O have been demonstrated in human pregnancy. A cautious approach to the use of nitrous oxide during pregnancy would be to limit the concentration to 50% or less and avoid using it extremely long operations.
requirements of local anaesthetic agents and MAC for inhalation agents are both decreased due to physiological changes in the CNS in pregnancy. Preoperative medications to allay anxiety are indicated as elevated maternal catecholamine levels can decrease uterine blood flow.

Anaesthesia in early pregnancy is associated with an increased risk of spontaneous abortion, while late pregnancy anaesthetic interventions can result in premature labor causing fetal mortality. Risk factors for development of pulmonary edema are, gestational age more than 20 weeks, preoperative respiratory rate more than 24 breaths per minute, preoperative temperature more than 100° Fahrenheit, fluid load more than 4L in first 48 hours, and concomitant tocolytic use. There is a need for conservative fluid management in pregnant patients posted for emergency appendectomy.

Between the 15th and 56th days of gestation, the human embryo is considered to be the most vulnerable to teratogenic effects of a drug. This is when organogenesis takes place. The teratogenic effects of anaesthetic drugs in pregnancy have been studied in animals. Prospective studies have failed to demonstrate any relation between oral cleft anomalies and the use of diazepam in pregnancy. However there is no specific data linking anaesthetic inhalational agents with the production of teratogenic effects in the fetus.

The main objective of any anaesthetic technique used during pregnancy is to avoid maternal hypoxia, hypercarbia, and hypotension in order to avoid fetal asphyxia. It is essential to maintain uterine perfusion, so as to preserve maternal and fetal oxygenation. Prolonged maternal hypoxia causes uteroplacental vasoconstriction resulting in fetal hypoxemia and acidosis. Maternal hypercapnia directly causes fetal respiratory acidosis and fetal myocardial depression.

Regional anaesthetic techniques like spinal anaesthesia minimize the exposure of fetus to multiple drugs especially in the first trimester. This is important in decreasing the problem of teratogenicity in pregnancy. The use of regional anaesthesia avoids instrumentation of the airway, as the incidence of failed intubations in pregnant women is estimated to be 1 in 500. A high thoracic epidural is a good alternative for general anaesthesia for surgery on the thorax, chest wall and axilla as post operative analgesia can be provided via a thoracic epidural catheter. It decreases the chance of gastric aspiration and minimizes PONV. Patients can be mobilized earlier and recovery time shortened. The risk of thromboembolism is high in pregnancy, hence early mobilization.

In pregnancy, the epidural veins are engorged due to venocaval compression. This increases the danger of inadvertent intravascular injection while using regional anaesthesia. Accidental dural puncture can occur during epidural anaesthesia. The epidural space is reduced in pregnancy and this can increase the spread of local anaesthetics. Hypotension and bradycardia can occur due to sympathetic block with epidural anaesthesia. Ephedrine has traditionally been the vasopressor of choice in this situation due to its alpha and beta-receptor stimulating properties and because it does not decrease uterine blood flow. Recent data suggest that Phenylephrine is equally useful for maintaining normal maternal blood pressure.

In the case discussed here, a high thoracic epidural was given in the T3-T4 space. She was preloaded postoperatively with 750ml of crystalloid to prevent hypotension after the epidural. 10.5ml of 0.5% Bupivacaine was given at a dose of 1.5ml /segment. T1-T7 dermatomes were anaesthetized. The patient was comfortable during the procedure and the anaesthesia was adequate for wide excision of the breast tumor which was completed without any complication. Postoperative analgesia was provided.
for 24 hours by an epidural infusion of 0.0625% Bupivacaine at 6ml/hr. At 18 weeks of pregnancy, the high thoracic epidural also minimized fetal drug exposure.

Thoracic paravertebral block is an alternative to epidural anaesthesia with advantage that there is no danger of hypotension and bradycardia\(^5,6,7\).

The primary goal is always to preserve the life of the mother first, then the fetus. Intra operatively, there is no evidence that any anaesthetic technique is better than another as long as maternal oxygenation and uterine perfusion are maintained.

For emergency surgery, the choice of anaesthetic technique will depend on the trimester during which the surgery was performed and the type and duration of surgical procedure. Whenever possible, a regional anaesthetic technique should be used. The challenge for the anesthesiologist is to balance the needs of the mother and the fetus while being flexible enough to modify the approach based on the presenting circumstance.

**REFERENCES**

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