

## Anaesthetic Management of Penetrating Obstetric Trauma at 36 Weeks of Gestation: Whom to Save Mother or Baby?

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### Abstract:

**Background:** Trauma is very common among pregnant patients. Both blunt and penetrating trauma may frequently injure the uterus. Blunt trauma as a result of automobile collision is the most frequent form of serious injury involving pregnant women. However penetrating trauma abdomen is also of common occurrence.

**Case Report:** We describe the anesthetic management of a 25-years-old second gravida at 36 weeks gestation of pregnancy presenting at the emergency ward in haemorrhagic shock sustained due to a penetrating trauma abdomen and uterine cavity due to an arrow. A multispecialty team approach resulted in adequate timely resuscitation of the mother followed by operative treatment and urgent cesarean delivery to save the mother and baby. The patient recovered well postoperatively and was discharged along with her baby.

**Conclusion:** The clinical and surgical management of penetrating trauma abdomen in pregnant women should be determined by a multispecialty team, and a tailored intervention should be chosen for each patient.

**Keywords:** obstetric trauma, haemoperitoneum, arrow injury.

### I. Introduction

Trauma during pregnancy is a significant contributor to both maternal and fetal morbidity and mortality in developed countries.<sup>1</sup> Trauma, affects 7% of all pregnancies and is the leading cause of nonobstetric death in pregnant women, with an overall maternal mortality of 6% to 7%.<sup>2,3</sup> 20% of these affected woman require emergency surgery.<sup>1</sup> Motor vehicle accidents are by far the most common cause of injury related maternal death.<sup>1</sup> Trauma is often associated with first trimester pregnancy loss, premature labour, placental abruption, uterine rupture and stillbirth.<sup>4</sup> Trauma is responsible for 0.3% to 0.4% of maternal hospital admissions.<sup>5</sup> Direct fetal injury is uncommon with blunt trauma. Fetal injury and death is more an indirect result. The most common cause of fetal death is maternal shock and death.<sup>1</sup>

### II. Case Summary

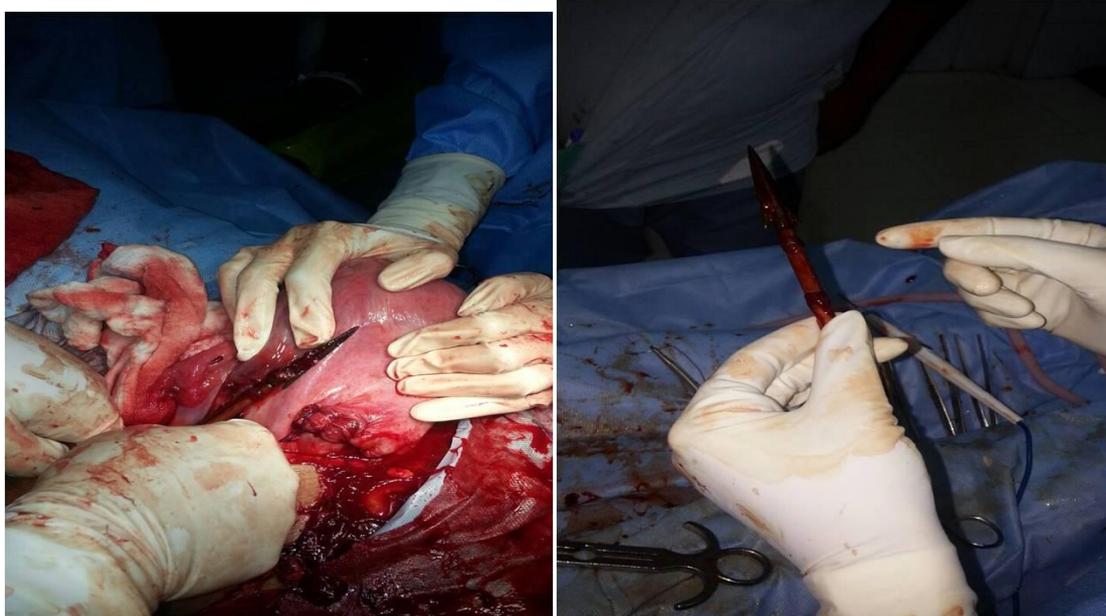


Picture 1: Preoperative picture showing penetrating arrow in abdomen.

A 25years old second gravida presented in the emergency ward at 36-weeks of gestation in haemorrhagic shock with penetrating wound in her right iliac fossa. Primary survey revealed her airway was patent but breathing was labored with a respiratory rate of 26/minute. She was conscious, verbally oriented, with

cold clammy extremities, a thready pulse of 140/minute and a blood pressure of 80/50 mm Hg. Further examination revealed a penetrating arrow wound in her right iliac fossa with active bleeding from the site and an old laparotomy scar. Her abdomen was tense and tender with the uterine fundus palpable just below the xiphisternum, fetal heart sound(FHS) was audible. No other injury or other site of active bleeding was noted. 16 gauge IV cannulation was done in each forearm and patient was administered 2L of pre-warmed isotonic saline and 500ml of colloid (tetra starch). Oxygen was administered via nasal prongs @ 4L/min. Gastric and urinary catheters were placed in situ. 20 minutes into resuscitation her vitals recorded were heart rate (HR) of 120/min, blood pressure(BP) of 90/60 mm Hg. Thereafter monitoring of patients vitals and foetal cardiac activity was done at 10 minute intervals. Detailed history revealed that 4 hours ago a mentally ill person in her village had shot an arrow at her when she was out for an evening walk. She had her last meal 8 hours earlier. She denied any history of bleeding diathesis or major systemic illness. Her antenatal checkup record showed fetal wellbeing. She complained of regular uterine contractions since last 2 hours. She had a previous caserean delivery 4 years ago, which was uneventful. Blood investigations were sent from the emergency department. Focused assessment with sonography in trauma(FAST) confirmed moderate free fluid within peritoneal cavity (suggestive of haemoperitoneum), gravid uterus of 36 weeks gestational age, with fetal heart rate of 130-140 per minute and an arrow head projectile which had penetrated through the uterine wall, the placenta and was lying within the amniotic cavity along with the fetus. There was no solid organ injury. Arrangement for blood and blood products was done on emergency basis. Investigations revealed her Packed Cell Volume (PCV) was 25% (Hemoglobin 6.2 g/dl). Rest investigations were within normal limits. The obstetric and the anesthesia team present at emergency reviewed the case and counselled the patient and husband regarding further management. After a written informed consent for operative intervention patient was immediately shifted to obstetric operating room for urgent laparotomy.

She was administered Inj. Metoclopramide 10mg IM and Inj. Ranitidine 50mg IV. The patient was kept in a 20 degree left tilt and leg end was slightly elevated. Patient had received 3 L IV fluid and ½ L colloid preoperatively and had a urine output of 100 ml over 2 hours. Antibiotic prophylaxis as per hospital protocol was administered pre-operatively. Standard ASA monitors were attached. On table vitals recorded were heart rate of 132/min, NIBP of 94/62 mm Hg, SpO<sub>2</sub> 98% at room air. FHS was 142 beats/min. Infusion Noradrenaline was started at 2-4 mic/minute and titrated to maintain mean arterial pressure (MAP) above 70 mm Hg. Airway assessment was done. Difficult airway cart was kept ready. After preoxygenation with 100% oxygen for 3 minutes induction was done with Inj. Etomidate 12mg IV, following which muscle relaxation was achieved with Inj. Succinyl Choline 50mg IV and airway was secured. Anesthesia maintained with oxygen and nitrous oxide in 1:2 ratio and divided doses of Inj. Atracurium. Infusion Paracetamol 1000mg IV was given for analgesia. The intraoperative blood pressure varied between 100 mm Hg to 120 mm Hg systolic and 55 mm Hg to 80 mm Hg diastolic, heart rate of 110 to 130 beats per minute. Noradrenaline infusion was titrated intraoperatively as per blood pressure. Inj. Oxytocin 10 units IV in fluid and 10 units IM was administered post-delivery. Inj. Midazolam 2mg and Inj. Fentanyl 100µg IV was administered following delivery of the baby to prevent intraoperative awareness. The whole operative procedure lasted 45 minutes with an estimated blood loss of 1700 ml.



**Picture 2&3:** Showing arrow had penetrated into the uterus and the arrow after recovery.

Laparotomy revealed a haemoperitoneum, a large parametrial haematoma with oozing of blood from uterine vessels. The sharp edge of the arrow had pierced through the uterine vessels on the right side before piercing through the uterine wall. A caecal serosal tear was also noted. Cesarean section was performed carefully the arrow head was stabilized and a 2.5 kg male child was delivered with a sharp cut mark over the right cheek sustained due to the sharp edge of the arrow. Hemorrhage from the site was controlled by ligation of the uterine vessels on the right side. Anterior and posterior uterine wall lacerations were repaired. Intraoperatively patient received 1200 ml of isotonic saline and 2 units of whole blood. Urine output was 100ml intraoperatively. At the end of the procedure oropharyngeal suctioning was done and patient was reversed adequately. TAP block with 0.2% Ropivacaine was administered 20 minutes before reversal. Patient received another two unit blood post operatively. Apgar scores of the baby delivered was 9 at 1 and 5 minutes. Noradrenaline infusion was continued post operatively and was tapered off on the following day. Postoperative recovery was uneventful and she was discharged along with her baby on 7<sup>th</sup> postoperative day.



**Picture 5:** Baby had traumatic arrow wound on the face, sustained intrauterine due to the tip of the arrow hitting the baby.

### III. Discussion

Head injury and haemorrhagic shock are major causes of maternal death following trauma.<sup>3</sup> 82% of foetal deaths are secondary to maternal trauma, 11% of foetal deaths occurred secondary to maternal death after trauma.<sup>6</sup> Uterine rupture is seen in 1% of cases of abdominal trauma and is associated with 10% maternal and 100% foetal mortality.<sup>1</sup> Trauma is associated with frequent spontaneous abortions, preterm labour, premature delivery, intrauterine death depending on the site and magnitude of injury.<sup>2</sup> Trauma occurring during period of organogenesis can cause birth defects directly or secondary to exposure to teratogenic drugs, radiation or placental ischaemia.<sup>7</sup>

Third trimester pregnancy at the time of traumatic injury is an independent risk factor for the need of specialized care in a trauma centre.<sup>8,9</sup> Engagement of foetal head in maternal pelvis confers a 25% foetal mortality rate due to skull and brain trauma as sequelae of maternal traumatic pelvic fractures.<sup>8</sup> Rate of trauma admissions rises with each trimester of pregnancy.<sup>1</sup>

- 8% first trimester.
- 40% second trimester.
- 52% third trimester.

Usually third trimester foetal loss in pregnant trauma patients is due to direct effect of trauma whereas first trimester foetal loss after trauma is due to hypotension and uterine hypoperfusion.<sup>1</sup> Our patient presented in 3<sup>rd</sup> trimester pregnancy with arrow trauma presenting in haemorrhagic shock. Due to physiological changes that occur during pregnancy, the clinical findings may differ in the following ways:

- Absence of abdominal tenderness or classic abdominal signs in pregnancy may not exclude an abdominal trauma.<sup>1</sup>
- A normal blood pressure in a pregnant trauma patient may not rule out hypovolaemia.
- Pregnant patients may lose up to 2 to 3 liters of blood before showing signs of hypovolaemia.<sup>10</sup>

The principle of treating a pregnant trauma patient is to **treat the mother first<sup>1</sup>** and to provide **the optimal maternal care, which is the best strategy to optimize foetal survival.<sup>5</sup> Maternal resuscitation is the most effective method of foetal resuscitation.** In traumatically injured pregnant patient, both physiological and anatomical changes of pregnancy can affect both evaluation and management strategies. Hospitals must develop multidisciplinary rapid response teams comprising of experts in obstetrics, anaesthesia, internal medicine, surgery and nursing who are skilled in care of pregnant patients under the most demanding clinical circumstances.<sup>1</sup> Pregnancy should be considered in any female trauma patient of reproductive age group. If possible, a brief obstetric history should be obtained as a part of initial evaluation. If a trauma patient is pregnant, the guidelines for ATLS pre hospital care are similar to those of non-pregnant patient with the addition of left uterine displacement during transport to avoid aorto-caval compression. The emergency room primary survey of a trauma pregnant patient should be similar to the survey of a non-pregnant patient. The secondary survey should include a detailed history, comprehensive head to toe inspection, palpation and auscultation, with focus on the mechanism of injury, weapons used if any, alcohol or drug involvement and seat belt use. As soon as patient arrives in emergency, an obstetric consultation should be requested and foetal monitoring should be initiated as soon as possible provided period of gestation is greater than 24 weeks, for at least 4 to 6 hours and sometimes upto 24 hours and beyond.<sup>11</sup> Prolonged monitoring is needed if the mother experiences >4 uterine contractions/hour post trauma or if her **ISS( Injury Severity Score) is > 9.**<sup>12</sup> Foetal heart rate tracing may give an early warning of impending maternal cardiovascular collapse than maternal pulse and blood pressure alone.<sup>1</sup> The presence of **frequent uterine (>8/hour)** contractions has been the **most sensitive predictor of placental abruption.**<sup>13</sup> The indications for imaging studies of the injured patient are similar for both pregnant as well as non-pregnant patients. Ultrasonography should be the first imaging test used in the evaluation. FAST has 80% to 85% sensitivity and 98% to 100% specificity for free peritoneal fluid in pregnant patients.<sup>14,15,16</sup> Diagnostic peritoneal lavage is obsolete and should be done in absence of modern diagnostic modalities like ultrasound or CT.<sup>1</sup> In our patient, FAST revealed hemoperitoneum.

Initial laboratory studies should include complete blood counts, coagulation studies (PT,aPTT,INR,Fibrinogen), serum electrolytes, urine analysis, arterial blood gas analysis, toxicological analysis of blood, blood sample to blood bank for grouping and crossmatching.<sup>1</sup> Pregnancy induces profound physiological changes and laboratory tests will reflect these adaptations.<sup>1</sup> Kleihauer-Betke(KB) test to determine any fetomaternal bleeding specially in Rh negative mothers.<sup>14,15</sup> The goals of resuscitation are control bleeding, replace volume deficits, prevent and/or treat coagulopathy. Modified ACLS protocols and drug therapies similar to that implemented in non-pregnant females must be followed.<sup>17</sup> The major modifications in cardio-pulmonary resuscitation recommendations for pregnant woman include:<sup>17</sup>

- Prompt airway management.
- Meticulous attention to lateral displacement of uterus.
- Chest compressions in lateral tilt position hand position for chest compressions being slightly higher up than normal patients.
- Search for reversible causes of cardiac arrest, e.g.magnesium toxicity.
- Caution with use of sodium bicarbonate.
- Early initiation of perimortem caserean delivery.

For perimortem caesarean deliveries experts recommend **4 minute rule**, where initiation of cesarean delivery within 4 minutes of maternal cardiac arrest with delivery of foetus within next 5 minutes was followed but now **5 minute rule** is recommended by AHA where Cesarean delivery is done within 5 minutes of failed maternal resuscitation following cardiac arrest ( improves maternal and neonatal outcomes).<sup>18</sup>

Anesthetic management in obstetric trauma patients compels the need for an experienced obstetric anaesthetist along with adequate manpower. Use of standard ASA monitors and invasive monitoring should be made available. Ideally invasive blood pressure monitoring with maintenance of intraoperative MAP above 60

mm Hg to be done. Proper aspiration prophylaxis to mother by prokinetic agents and antacids, nasogastric emptying of gastric contents before induction of anaesthesia. Minimum 3 minute pre-oxygenation or 4 vital capacity breaths over 30 seconds before induction should be done. Hypotensive or cardio-depressant induction agents like Propofol and Thiopentone to be avoided, ideally Etomidate to be used.<sup>7</sup> Keeping difficult airway cart ready, optimal best attempt at laryngoscopy and intubation should be done while maintaining in line stabilization specially for cervical spine trauma cases. Avoid repeated attempts and lighter planes of anaesthesia during intubation. Short acting muscle relaxants like Succinyl Choline are ideally suited for intubation (if not contraindicated). Atracurium/Cis-Atracurium owing to its unique metabolism, is ideally suited for maintenance of intraoperative muscle relaxation in these group of patients. In our patient we used Succinyl Choline to secure the airway. Dose modification of other anaesthetic drugs to be done as per patient status, body weight and patients physiological response to administered drugs. Drug producing uterine atony to be avoided. Mechanical ventilation settings should be done keeping in mind the end-tidal carbon dioxide, cardiac output and the type and severity of trauma in such patients. Avoid hypercarbia, hyperventilation, alkalosis, use of larger tidal volumes and excess PEEP wherever applicable. Avoid inhalational nitrous oxide in all patients undergoing trauma surgery. Goal directed fluid therapy with prewarmed saline, blood and blood products should be used. Adequate neuromuscular reversal to be done at the end of the procedure and patient is to be extubated only when she is fully awake and following commands or patient can be shifted to PACU, to be extubated when haemodynamically stable. We extubated our patient in the operating room after the surgery.

#### IV. Conclusion

“THE BEST TREATMENT OF THE DEVELOPING FOETUS IS RAPID AND COMPLETE RESUSCITATION OF THE MOTHER”.<sup>7</sup> So in obstetric trauma cases in order to have the best outcome for mother and baby, a rapid response multidisciplinary team with training in resuscitation of pregnant patient is always mandatory. The ultimate aim is to provide the most advantageous care to both the mother and the foetus, performing diagnostic tests and making therapeutic decisions with both patients in mind. Providing optimal care to the mother enhances foetal wellbeing and survival, however when there is a conflict between the care that favours maternal survival and the care that favours foetal survival, the interests of the mother takes priority.<sup>1</sup>

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