

Anesthetic Management of a Patient with Penetrating Thoracoabdominal Trauma

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Abstract

Anesthetic management of a patient with penetrating thoracoabdominal trauma is a challenge for the anesthetist. Unstable hemodynamics, inadequate fasting, improper positioning for intubation, and the need for emergent surgery can complicate anesthetic management of such patients. We report a case of penetrating thoracoabdominal injury with arrow-shaped iron rods. Rapid and judicious management along with good communication between the surgeon and the anesthetist led to a successful outcome.

Key words: Airway management, damage control surgery, penetrating thoracoabdominal trauma, resuscitation

INTRODUCTION

Penetrating trauma to the thorax and abdomen can lead to potentially life-threatening situations.^[1-3] Anesthetic management of such patients may be complicated due to the urgency of the procedure, hemodynamic instability, inadequate fasting, and the less-than-ideal positioning of the patients for induction of anesthesia.^[1,4] Many of these surgeries are done out of routine working hours when the availability of resources and personnel may be limited.

We report a patient who appeared at our hospital with multiple penetrating injuries involving the thorax, abdomen, and thigh. The anesthetic challenges faced along with their management are discussed.

CASE REPORT

A 32-year-old male presented to our Emergency having being impaled on a spiked iron fence after a fall from an electric pole. He was received in the prone position with two partly embedded iron rods, one protruding from the back [Figure 1] and one from the right thigh [Figure 2]. A bleeding lacerated wound was seen in the right hypochondrium [Figure 3]. A chest x-ray subsequently confirmed the presence of a third iron rod in the right hypochondrium extending into the right hemithorax [Figure 4], which was not visible externally. A right-sided haziness suggestive of hemothorax was also noted.

Focused assessment with Sonography in Trauma (FAST) scan was found to be positive, which indicated hemoperitoneum, thus the patient was shifted immediately to the operating room (OR) for exploratory laparotomy.

The patient was received in the OR in the prone position with the projecting rods *in situ*. He was conscious and oriented with a pulse rate of 100 beats/min, blood pressure of 80/54 mmHg, respiratory rate of 22–24 breaths/min, and arterial oxygen saturation of 95%. Air entry was decreased on the right side of the chest. Fluid resuscitation was done using two wide-bore intravenous (IV) cannulas.

Routine monitors of electrocardiography (ECG), noninvasive blood pressure (NIBP), and pulse oximetry (SpO₂) were connected to the patient. A decision to intubate the patient in the right lateral position was taken as the protruding rod from the back precluded supine positioning of the patient.

The patient was premedicated with glycopyrrolate 0.2 mg, ondansetron 4 mg, and midazolam 1 mg IV. He was

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Figure 1: Patient in prone position with first iron rod protruding from the back



Figure 2: Patient in prone position with second iron rod protruding from the thigh



Figure 3: Patient in prone position with bleeding lacerated wound in right hypochondrium (cephalic end is at the bottom right of the picture)

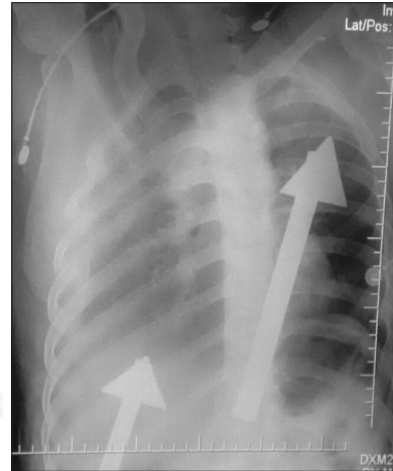
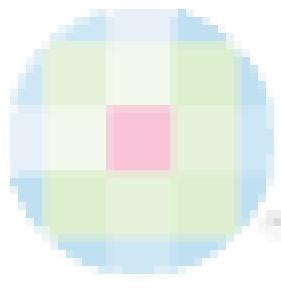


Figure 4: Chest x-ray showing the impaled rods: The first rod is seen in the midline and the third rod, which was concealed, is seen in the lower right side of the chest

preoxygenated for 3 min. As his fasting status was uncertain, he was presumed full stomach and a modified rapid sequence induction was done with ketamine 100 mg, succinylcholine 100 mg, and fentanyl 120 mcg IV. The trachea was intubated with 8.5-mm internal diameter cuffed endotracheal tube. A nasogastric tube was placed, the radial artery was cannulated, and the urinary bladder was catheterized. End-tidal carbon dioxide (ETCO₂) was monitored and a nasopharyngeal temperature probe was placed. Anesthesia was maintained with 50% oxygen-air mixture with isoflurane, and muscle relaxation was achieved with intermittent doses of IV atracurium. Controlled fluid resuscitation to a mean arterial pressure (MAP) of 40–50 mmHg was targeted till surgical control of bleeding was achieved.

The patient was then positioned prone and the first iron rod impaled in the back was removed by the cardiothoracic surgeons after exploring the wound to preclude any injuries to the vital structures. The patient was then placed in the left lateral position. A right thoracotomy was done and 200 mL of

collected blood there was drained. A diaphragmatic rent was noted through which the third iron rod was palpable in the liver. Removal of this rod necessitated a laparotomy, thus an intercostal drain was placed and the thorax was closed.

The patient was then turned supine and the right internal jugular vein was cannulated. The second iron rod that was in the thigh was now removed after ruling out neurovascular injury.

This was followed by an exploratory laparotomy to retrieve the third iron rod from the liver. Laceration and bleeding from segments 5–8 of the right lobe of the liver was observed. The rod was found deeply embedded in the liver [Figure 5]. Manipulation to retrieve it led to massive blood loss and hypotension. Intraoperative blood loss was estimated at around 2000 mL. Four pints of packed cells, 4 units of fresh frozen plasma, and 7 L of crystalloids were transfused. Despite multiple transfusions, the patient continued to be hypotensive, thus inotropic support with noradrenaline was

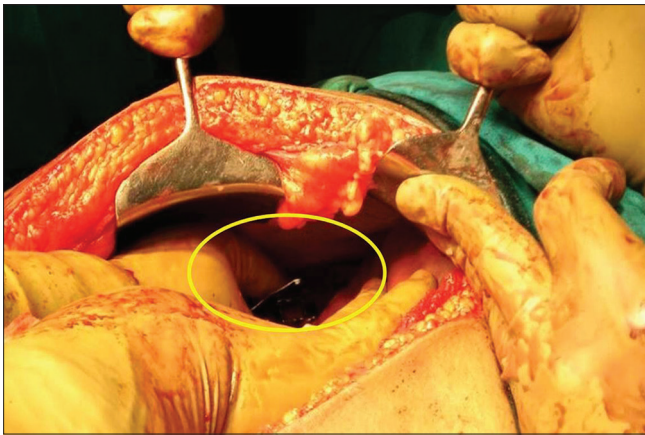


Figure 5: Third iron rod seen deeply embedded in the liver on laparotomy

started. Following persistent hypotension, the anesthetist and the surgeon collaborated to take the decision of damage control surgery in order to preserve patient homeostasis. Active bleeders in the liver were ligated and surgical packs were placed to control the bleeding. Arterial blood gas (ABG) analysis showed metabolic acidosis. The patient was shifted to the intensive care unit (ICU) for continued mechanical ventilation, postoperative monitoring, and stabilization of physiological status. After 48 h, the patient underwent a relaparotomy, which revealed hemostasis. The abdominal packs were removed and subsequently the patient was extubated the next day. The rest of the recovery was uneventful.

DISCUSSION

Anesthetic management of a patient with penetrating thoracoabdominal trauma is a challenge for the anesthetist.

Airway management may be difficult, as the presence of a protruding foreign body may preclude the ideal position for intubation. Intubations with the patient placed supine on two operating tables with the foreign body hanging in between, laterally, or even in prone position have been reported.^[4,5] Intubation was successfully achieved in our patient in the lateral position.

Usually, most anesthetic induction agents can exacerbate hypotension when used in hemodynamically unstable patients, thus it is recommended that titrated doses of induction agents be used.^[6] Etomidate with its minimal effects on the cardiovascular system and ketamine due to its sympathetic stimulation and positive inotropic action are the preferred drugs in hypotensive patients.^[7] For rapid sequence induction, succinylcholine can be used as a muscle relaxant due to its quick onset of action. Accordingly, ketamine and succinylcholine were used to secure the airway in our patient.

Limited resuscitation to a MAP of 40-50 mmHg is recommended for trauma patients till surgical control of bleeding is achieved. Aggressive IV fluids can inhibit platelet

aggregation, dilute clotting factors, and increase blood pressure, which can mechanically disrupt the thrombus, leading to excessive bleeding. Studies have shown that damage control resuscitation, that is, permissive hypotension in trauma patients till surgical control of bleeding is achieved, is associated with better patient survival.^[8]

In cases of hemodynamically unstable patients, invasive monitoring is essential for fluid replacement, administration of ionotropes, and for blood gas analysis.^[6] All fluids should be warmed and adequate fluid resuscitation with crystalloids, colloids, blood, and blood products should be done.^[9]

Ideally, a penetrating foreign body should be removed in a controlled environment such as the OR, as loss of tamponade effect following its removal may lead to massive hemorrhage, which can be managed by immediate surgical exploration.^[3,4] In our patient, too, all the rods were retrieved under controlled conditions by the surgeons in the OR.

The liver is the most commonly injured organ in abdominal trauma. Operative intervention is indicated for hemodynamically unstable patients.^[10] Effective communication is essential between the surgeon and the anesthetist so that a decision of damage control surgery can be taken in case of impending physiological compromise of the patient. This will prevent the lethal triad of acidosis, coagulopathy, and hypothermia.^[3,8,9] After optimization of physiological status, the patient can be taken up for reoperation later. Our patient became hemodynamically unstable intraoperatively, thus the bleeders were ligated, abdominal packs were placed, and the patient was shifted to the ICU. He was taken up for reexploration after his condition had been stabilized in the ICU. Following this, the patient made a complete recovery.

CONCLUSION

Anesthesia for a hemodynamically unstable patient with inadequate fasting, challenging airway management, and the possibility of emergent surgery requires close and vigilant monitoring, preparedness to deal with anticipated complications, effective teamwork, and rapid and judicious management to enable a successful patient outcome.

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Conflicts of interest

There are no conflicts of interest.

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