

Emergency anaesthetic management of penetrating thoracic trauma: Combining skill with fortuity

INTRODUCTION

The results and management of penetrating thoracic trauma are largely dependent upon the extent of injury to internal organs as well as the skills of the attending clinicians. Thoracic trauma in children may be associated with rib fractures, flail chest, soft tissue injury, intrapleural lesions such as haemothorax and pneumothorax, parenchymal lung injuries such as pulmonary contusion and lung laceration as well as mediastinal lesions, including cardiac injury,^[1,2] and yet our patient fortuitously had none of these, despite suffering a major, and what could potentially have been a life-threatening accident.

The sources of perioperative morbidity and mortality in subjects suffering penetrating thoracic injuries include airway obstruction, respiratory failure and haemorrhage. Clinicians need to be adequately trained to deal with these problems. Trauma mainly affects the younger population and happens to be the most common cause of mortality in patients in the first three decades of life. The technical difficulties encountered during the perioperative management of the patient with severe penetrating thoracic injury are highlighted here.

CASE REPORT

A 14-year-old boy was brought to the emergency with a penetrating chest injury, following a fall from the rooftop, over a sickle, which had penetrated his chest from the back. He presented, lying in the right lateral position with the sharp object *in situ*. The entry was from the level of the left 12th rib posteriorly, 5 cm lateral to the midline. Anteriorly it produced an elevation of the skin at the left 3rd intercostal space 2 cm from the midline, and posteriorly, it was projecting out of the body around 3 cm. He was tachypnoeic with a respiratory rate of 30/min, but haemodynamically stable, with a heart rate of 103 beats/min, blood pressure 124/64 mm Hg and SpO₂ of 93–95% on room air. Bilateral air entry was equal. The patient was complaining of severe pain. Pain relief was provided

with injection morphine intravenous (IV) through a 20 G IV cannula established in the casualty. Increments of 3 mg were used up to a total of 6 mg until the patient was comfortable.

Computed tomography scan [Figure 1], which was performed without changing the patient's position, ruled out major cardiovascular and airway injury. Preoperative haematological and biochemical investigations sent from the casualty were within normal limits, with haemoglobin of 10.2 g/dL. Patient was taken inside the cardiothoracic operating theatre for surgery. The perfusionist was informed about the case, and cardiopulmonary bypass was kept ready. The boy was shifted on to the operating table maintaining the right lateral position. After connecting the monitors and noting the baseline parameters, a 16 G IV cannula was secured on the left forearm. He was preoxygenated with 100% oxygen and induced with ketamine 50 mg, thiopentone 100 mg and rocuronium 30 mg. With cricoid pressure, laryngoscopy and intubation was performed in the lateral position with seven size endotracheal tube and tube fixed after confirming bilateral air entry. A 7 Fr triple lumen central venous catheter was inserted into the left internal jugular vein under ultrasound guidance. Right radial artery was cannulated with a 20 G cannula for invasive blood pressure monitoring.

Two incisions were made, one in the 4th intercostal space and the other, by extending the entry wound medially. The endotracheal tube was pushed inside blindly (fiberoptic bronchoscope was not available during the emergency hours) by about 3 cm and left lung was thus collapsed for facilitating the surgery.



Figure 1: Plain computed tomography scan of the thorax and abdomen, showing the sickle-like object embedded

The sickle was found hooking the heart between the pulmonary veins. It was removed without injuring any structures. Pericardial tear and diaphragmatic injury associated with a gastric rent were seen. Diaphragmatic rent was repaired, and thoracotomy was closed after inserting a chest drain. Before changing the position to supine, an epidural catheter was placed at the T10-T11 level. Patient was then turned supine for the first time after presenting to the hospital. Epidural analgesia was activated with 6 ml of 0.25% bupivacaine. A laparotomy was performed, and the gastric rent was repaired followed by a feeding jejunostomy. Total estimated blood loss was around 700 mL. Fluids infused included 1200 mL of crystalloids and one colloid. No blood or blood products were used.

The patient had stable haemodynamics, proper oxygenation and normal arterial blood gas (ABG) values at the end of surgery, and was extubated on table before shifting to the intensive care unit for observation.

Postoperative analgesia was continued in the form of epidural bupivacaine infusion of 0.125% at 6 ml/hr. On postoperative day 1, he had febrile spikes, which responded to a change of antibiotics. Epidural infusion was continued for 48 h and then the catheter was removed.

Management of penetrating thoracic trauma poses a major challenge in children. Injury accounts for the maximum number of deaths in children above 1-year in industrialised countries^[3]. It has been estimated that thoracic trauma is a major problem in India as well.^[4] In a 1-year Indian study of patients admitted to an urban trauma unit, 78% had sustained blunt trauma while the remaining had were of penetrating nature.^[5]

Stab injuries result in damage to structures only directly adjoining the point of contact,^[6] as opposed to other penetrating injuries such as gunshots, where tissue damage can be extensive. Luckily for the patient, the sickle had, by some quirk of fate, avoided contact with any of the vascular structures and lung despite traversing a fair bit within the thoracic cavity.

A flail chest is defined as three or more rib fractures in two or more places. Rib fractures result in severe pain, causing tachypnoea and decreased tidal volumes, but

the ventilation/perfusion mismatch and respiratory insufficiency associated with flail chest is attributed to the underlying pulmonary contusion. Our patient had multiple rib fractures, but there was no pulmonary contusion, and thus, once good pain relief was established by activating the epidural infusion following removal of the sickle, we were able to safely extubate the patient on the operating table.

CONCLUSION

Penetrating thoracic trauma requires a high index of suspicion to detect and manage injury to intrathoracic viscera, as signs/symptoms may be confusing, and laboratory investigations are limited during emergency situations. However, careful assessment, judicious planning and management can often bail the clinician out of intraoperative difficulties.

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