



## Case Report

# The critical role of anaesthesia in multifaceted care for severe thoracic trauma: A case study

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## ABSTRACT

Blunt trauma to the thorax can be viciously dangerous and carries high mortality which warrants aggressive resuscitation and life-saving measures failing which cardiac arrest can occur. We present a case of a polytrauma male patient in the emergency department with diaphragmatic rupture, and bilateral pelvic and clavicular fractures in hypovolemic shock which progressed to cardiac arrest. The patient was immediately resuscitated with Cardiopulmonary and cerebral resuscitation (CPCR) according to Advanced cardiac life support (ACLS) guidelines and stabilized with intravenous fluids and further optimized with blood products. He was operated on for diaphragmatic rupture and shifted to intensive care where he was paralysed and kept on mechanical ventilation for 48 hours treated for severe metabolic acidosis and hemodynamic instability following which he was weaned off successfully. During his stay, he was evaluated for pelvic and clavicular fractures and treated for ICU-related delirium and Methicillin Resistant Staphylococcus infection (MRSA). Our case suggests that diaphragmatic injuries are uncommon but deadly in cases of abdominal forceful trauma because they can result in hemothorax and the movement of intestinal contents into the thoracic cavity. Such cases must be managed with clinical knowledge employing expedient surgical care and the best critical care. This case demonstrates the indispensable and undeniable contributions by anaesthesiologists who assume multiple roles within a hospital setup.

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## 1. Case Report

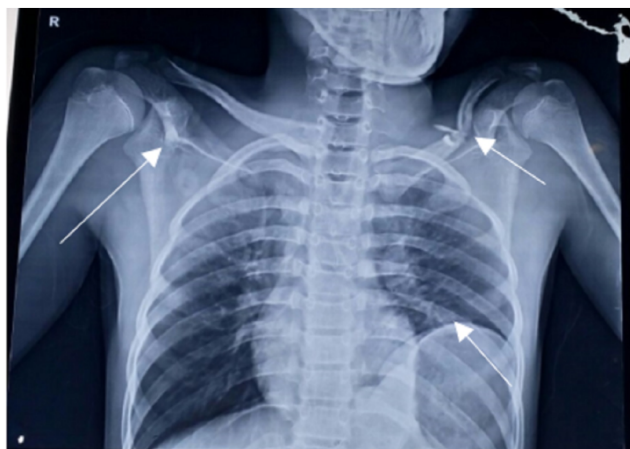
A 16-year-old male patient arrived at the emergency department with gasping with an alleged history of blunt trauma abdomen due to a Road traffic accident. During primary survey, he developed a cardiac arrest and cardiopulmonary resuscitation was initiated according to ACLS guidelines. He was immediately intubated and Ambu ventilated and two grey intravenous cannula were secured and Immediate resuscitation with 2 litres of

crystalloids Ringer and 2 units of 1:1:1:1 of Packed Red Blood Cells: Fresh Frozen Plasma: Platelets were rushed. Return of spontaneous circulation occurred after four cycles of CPR. After the secondary survey, he was diagnosed with left hemidiaphragmatic rupture with retroperitoneal haemorrhage from CECT abdomen, bilateral pelvic fracture, and bilateral clavicular fracture following chest X-ray and pelvic X-ray (Figure 1) (Figure 2). After inserting an abdominal drain, a gush of 1 litre blood accumulated.

On further examination, his peripheral pulses were absent, his blood pressure was non-recordable, and B/L

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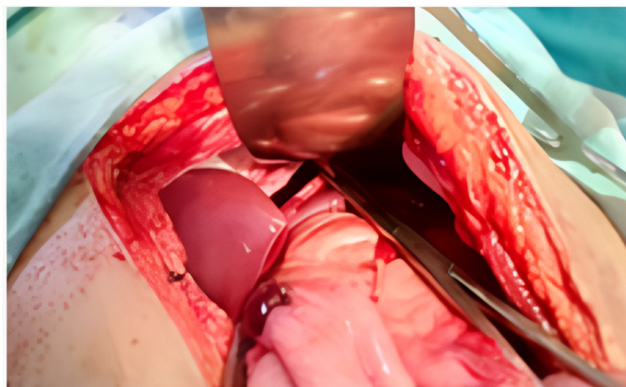
**Figure 1:** X-ray chest (Pre op); X-ray chest AP view showing bilateral clavicular fracture and right sided pulled up hemidiaphragm due to diaphragmatic rupture



**Figure 2:** X-ray pelvis (Pre op); X-ray pelvis; AP showing bilateral pelvic bone fracture

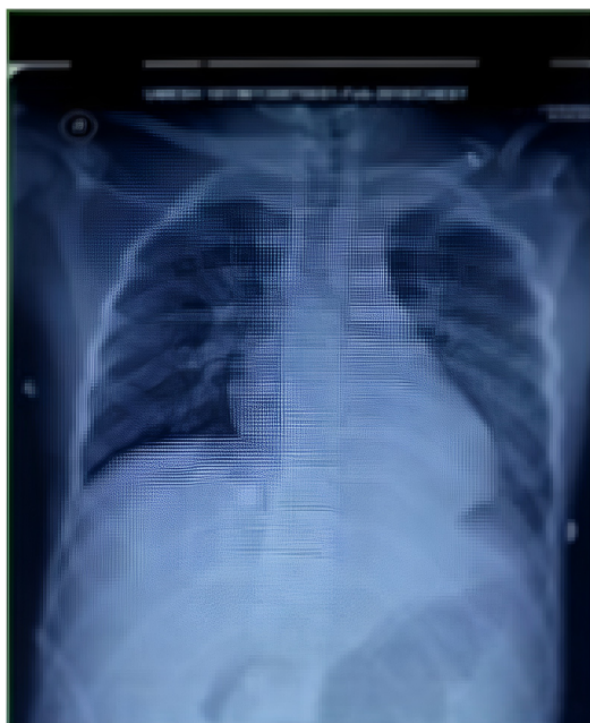
Pupils were normal in size and sluggishly reacting, and air entry was decreased on the right side with muffled heart sounds. He was started on inotropic support on Adrenaline infusion. He was shifted to emergency operation room for urgent laparotomy for repair of diaphragmatic rupture. (Figure 3). High-risk consent was taken from his parents. All non invasive monitors were attached and invasive lines like central venous catheter and arterial line were secured & vasopressor support was started with Noradrenaline and dobutamine infusion after tapering down adrenaline and blood pressure was relatively 90/64 mm Hg, heart rate 124 per min and a saturation of Spo<sub>2</sub> – 92%. The patient was induced with injection ketamine 80 mg and injection vecuronium 4 mg intravenously and maintained with minimal sevoflurane (1%) and Oxygen : Nitrous oxide mixture in a ratio of 50:50 and on intermittent positive pressure ventilation. He was maintained on the vasopressor cover and 3 units of packed red blood cells were transfused intraoperatively. The total surgical duration

lasted for 3 hours. The patient was shifted to the intensive care unit (ICU) for postoperative mechanical ventilation and haemodynamic monitoring. Inside the ICU, the patient's pulse rate was 130 beats per minute, blood pressure was 100/50 mm of mercury, and SPO<sub>2</sub> was 93% on 50% Fraction of inspired oxygen (FiO<sub>2</sub>). To hasten the healing of the diaphragmatic repair, full sedation, paralysis, and artificial ventilation was initiated for 48 hours. A minimum tidal volume of 200 ml, a respiratory rate of 20, and a minimum Positive end expiratory pressure (PEEP) of 3 cm H<sub>2</sub>O were set on the ventilator's volume control mode for 48 hours.



**Figure 3:** Intraop diaphragmatic rupture repair; Intraoperative image showing ruptured diaphragm undergoing primary repair

His post-operative haemoglobin level was 6.8gm%. For serial arterial blood gas analysis, an invasive arterial line was secured, and the appropriate acid-base balance was maintained. An antithrombotic regimen was initiated. He was receiving optimum antibiotic and vasopressor coverage. For pelvic and clavicular fractures, skeletal traction, a figure-of-eight collar, and pelvic binder were used. Post operative chest x-ray was done to assess the prognosis (Figure 4) Vasopressor support was gradually reduced, and sedation was discontinued after 48 hours. After three days, the patient was gradually weaned off from Synchronized Intermittent Mandatory Ventilation (SIMV) mode and switched to Continuous positive airway pressure (CPAP) mode with a FIO<sub>2</sub> of 40%, PEEP of 5 cmH<sub>2</sub>O, pressure support above PEEP of 7 cm H<sub>2</sub>O. He was prescribed inj. minocycline after his blood culture report revealed Methicillin Resistant Coagulase Negative staphylococci (Figure 5). Over the course of his hospitalisation in the ICU, he received four units of whole blood transfusion, one unit of packed red blood cells, three units of fresh frozen plasma, and six units of platelets. During his stay in the ICU, he experienced acute delirium for which bedside psychiatric consultation was conducted and the patient was prescribed Tab. Olanzapine. Bedside physiotherapy was started. After 25 days, when his hemodynamic parameters had fully stabilised, he was moved to the ward. (Table 1)



**Figure 4:** Post op chest x ray; Post operative image of the patient showing healed diaphragm

**Table 1:** Post-op status of the patient with full recovery

S. No.	Antibiotic Sensitivity	Resistant/Sensitive
1.	Erythromycin	R
2.	Minocycline	S
3.	Linezolid	R
4.	Cephalexin	R
5.	O-Trimoxazole	R
6.	Polymyxin-B	R

## 2. Discussion

Patients with blunt abdominal trauma and polytrauma present with massive hemorrhagic shock and hemodynamic instability, necessitating intensive care for the management of a variety of problems. The diaphragm being the primary muscle of respiration when injured causes breathing difficulty and takes more time to heal and can lead to respiratory acidosis. Chest X-ray and CT scan are used for detecting the type of injury but MRI specifies the preoperative diagnosis.<sup>1</sup> Atelectasis is one of the commonest complications of diaphragmatic injury,<sup>2</sup> which leads to impaired oxygenation and decreased compliance. The appropriate and timely management of atelectasis plays a crucial role in a better outcome in critical patients. Associated injuries and haemorrhagic shock with injury severity score will predict the outcome with right sided diaphragmatic rupture causing more mortality.<sup>3</sup> Ventilation during diaphragmatic injuries must be in a controlled mode



**Figure 5:** Blood culture report; Blood culture report showing Methicillin resistant coagulase negative staphylococci (Mirconi) sensitive to Minocycline

with minimum work to the diaphragm to give healing time. So minimum tidal volume in controlled mode is a preferred one.

The case management with the anaesthetist role therein is not only bound to inside of the operation theatre but also in emergency rooms/casualties for resuscitation, intensive care, radiology suites for sedation during imaging, pain medicine and palliative care etc and hence the omnipresence.

The role of Anaesthesiologists as frontline workers in critical care setup has been undervalued but cannot be ignored. Their immense contribution inside the ICU came into limelight only during the covid pandemic before which they were always the regarded as heroes behind the screens.<sup>4</sup> Before ultrasound machine became prevalent in ICU, the hands of the anaesthesiologists was able to secure difficult airway, venous cannulations, central vein and artery catheterizations without difficulty only by landmark technique. This is substantiated in MACOCHA scoring wherein 'A' the absence of Anaesthesiologist in a difficult airway scenario inside ICU added upto as a predictor for difficult airway.<sup>5</sup> But it's a bitter truth that National Board

of examinations (NBE) has made general medicine postgraduate curriculum mandatory for entry into superspeciality concerned with critical care medicine (DM., DNB critical care medicine) from NEET SS 2022 and requires the anaesthesiologists to prepare himself/herself with medicine syllabus hence cutting down the number of potential anaesthesiologists entering into the field of critical care medicine.<sup>6</sup> The role of Ultrasonography in emergency settings is crucial as it is used for assessment of trauma – FAST (Focussed Assesment With Sonography In Trauma) and the use in shock – RUSH (Rapid Ultrasound in Shock and Hypotension) and for bedside echocardiography, dynamic indices of fluid responsiveness like IVC filling etc and also for cannulation of central venous catheterization and arterial cannulation.<sup>7–9</sup> The absence of ultrasonography in our hospital was a major limitation which would have further helped the physicians in expediting their treatment. Although due credit has to be given to the surgeons and paramedical staffs for their contribution in this case, their role was specific and limited to a station while the role of the Anaesthesiologists was extensive ranging from an emergency physician to perioperative physician extending to an intensivist.<sup>10</sup>

### 3. Conclusion

It is not an overstatement to term ‘Anaesthesiologists’ as ‘Omnipresent’ as they play a vital role at multiple levels and sites within a hospital providing exemplary micromanagement of a multitude of work.

### 4. Source of Funding

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### 5. Patient Consent


Written consent taken from guardian in her own language and patients anonymity was preserved.

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