

Blunt Trauma Neck with Complete Tracheal Transection - A Diagnostic and Therapeutic Challenge to the Trauma Team

K. N. J. Prakash Raju, D. Anandhi, R. Surendar, Ashwith Shetty, Vinay R. Pandit

Department of Emergency Medicine and Trauma, Jawaharlal Institute of Postgraduate Medical Education and Research, Puducherry, India

Abstract

Survival following trachea-esophageal transection is uncommon. Establishing a secure airway has the highest priority in trauma management. Airway management is a unique and a defining element to the specialty of emergency medicine. There is no doubt regarding the significance of establishing a patent airway in the critically ill patient in the emergency department. Cannot intubate and cannot ventilate situation is a nightmare to all emergency physicians. The most important take-home message from this case report is that every Emergency physician should have the ability to predict “difficult airway” and recognize “failed airway” very early and be skilled in performing rescue techniques when routine oral-tracheal intubation fails. Any delay at any step in the “failed airway” management algorithm may not save the critically ill dying patient. Here, we report a case of blunt trauma following high-velocity road traffic accident, presenting in the peri-arrest state, in whom we noticed “failed airway” which turned out to be due to complete tracheal transection. In our patient, although we had secured the airway immediately, he had already sustained hypoxic brain damage. This scenario emphasizes the importance of prehospital care in developing countries.

Keywords: Cannot intubate cannot ventilate, complete tracheal transection, surgical airway

INTRODUCTION

High-velocity impact to the neck pushes the mobile trachea against the rigid cervical spine, causing tracheal cartilage and soft tissue lacerations but leaving the skin intact. This injury is rare due to the flexibility of the tracheal cartilages and the protection offered by the mandible, manubrium of the sternum, clavicles, and cervical spine.^[1]

Traumatic tracheal injury after blunt neck trauma is rare; however, most patients with complete tracheal transection usually die at the scene due to the loss of airway. The few, who survive and arrive at a hospital, pose a diagnostic, and therapeutic challenge to the trauma team. These patients often suffer fatal outcomes even if the diagnosis is made early.^[2,3]

The incidence of traumatic tracheal injuries seems to be roughly 0.5%–2% among individuals sustaining blunt trauma, including blunt trauma to the neck. Main types of blunt injuries are high-impact blunt compression injuries such as road traffic accidents (59%), followed by crush injuries (27%). In blunt injuries, intrathoracic trachea and main-stem bronchi injury account for 62%, cervical trachea 23%, and lobar bronchi 15%.^[4]

CASE REPORT

A 50-year-old male sustained road traffic accident (while traveling in bicycle, hit by a car and was thrown to the footpath nearby). He was brought to our hospital after 90 min of injury by 108 Ambulance. On arrival, he was unconscious, not responding to painful stimuli, gasping, peripheral pulses not palpable, heart rate was 40/min, saturation: 46% at room air. There were no external injuries, but significant surgical emphysema was noticed on his neck, face, chest, and abdomen. He was treated with oxygen by bag-mask ventilation. On bag-mask, there was inadequate chest rise; hence was planned for securing definitive airway by endotracheal intubation with manual in-line stabilization. With intravenous ketamine 75 mg, intubation was tried with 7.5 size endotracheal tube. During intubation, vocal cords were visualized, but it was difficult to

Address for correspondence: Dr. K. N. J. Prakash Raju,
Department of Emergency Medicine and Trauma, Jawaharlal Institute of
Postgraduate Medical Education and Research,
Puducherry - 605 006, India.
E-mail: jyothiprakash41@gmail.com

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pass the tip of the endotracheal tube (ET) beyond the level of vocal cords. Without forcing the tube further inside, we ventilated the patient using Ambu bag. The subcutaneous emphysema over the neck increased with each ventilatory effort. In suspicion of laryngotracheal injury, we prepared for a surgical airway. After identifying anatomical landmarks, we gave vertical incision with 20 size surgical blade for cricothyroidotomy. After dissection, we identified the tip of ET tube lying out of trachea, with complete transection at cricotracheal level. The lower tracheal end was held with forceps, and a new ET tube was inserted through the distal tracheal end, the cuff was inflated, and the patient was ventilated [Figure 1]. Within a minute of securing the airway, he went into pulseless electrical activity; cardiopulmonary resuscitation (CPR) was started, after two cycles (4 min) of high-quality CPR, return of spontaneous circulation was achieved. Postcardiac arrest vital signs were heart rate: 120/min, SpO₂: 98% with oxygen, blood pressure: 110/80 mm of Hg. On simultaneous assessment of breathing, air entry was reduced bilaterally on auscultation. Tension pneumothorax was relieved by bilateral needle thoracocentesis followed by bilateral tube thoracostomy. After stabilizing the patient, he was shifted for pan-computed tomography (CT) imaging. His pan-CT revealed tracheal injury with multiple bilateral rib fractures, bilateral pneumothorax, and left hemothorax with pneumomediastinum [Figures 2 and 3]. He was immediately shifted to the emergency operating room. Intraoperative findings were as follows: linear, vertically oriented fracture at thyroid cartilage, multiple displaced fracture fragments of cricoid cartilage, with complete cricotracheal separation. Anastomosis of all fractured segments [Figure 4] and end tracheostomy were done on second tracheal ring [Figure 5]. His sensorium remained E1VtM1 for the first 24 h. On day 2, Glasgow Coma Scale improved to E1VtM2 but again deteriorated to E1VtM1 on day 3. His repeat CT brain revealed diffuse cerebral edema with multiple watershed infarcts suggestive of hypoxic brain injury [Figure 6]. On day 4, he went into cardiac arrest and ultimately succumbed to hypoxic ischemic encephalopathy.



Figure 1: Image of surgical airway

DISCUSSION

Three theories have been proposed to describe the tracheal and bronchial injuries. The first associates tracheobronchial disruption with a sudden, forceful compression of the chest, decreasing the anterior-posterior diameter of the chest while widening the transverse diameter. The second theory suggests compression of the chest and trachea with a closed glottis. The third theory associates rapid deceleration seen in motor vehicle accidents.^[5] The lungs are fixed at the carina, whereas they are more mobile within the pleural space. Rapid deceleration produces a shearing force, causing rupture of the trachea and bronchi. This mechanism of injury seems the most logical in the current population of blunt trauma victims, the majority of whom are involved in motor vehicle accidents.

Direct blows are most likely to injure the cartilages of the larynx while flexion/extension injuries are most commonly associated with tracheal tears or laryngotracheal separation. When the trachea is damaged from a crushing injury, it may be the result of the trachea becoming compressed between the manubrium and the vertebral column. Blunt injuries to the chest may produce vertical tears in the membranous portion of the trachea or bronchi, usually within 2.5 cm of the carina.^[6,7]

In a large autopsy based study, of 1187 trauma patients, Bertelsen and Howitz found that 33 patients (0.03%) had tracheobronchial injury. Of them, 27 died immediately after the accident and 24 had severe associated injuries.^[8] Approximately 82% (27 patients) had died at the scene.

In diagnosing the laryngotracheal injury, trauma physician should take into consideration the mechanism of injury, clinical signs; surgical emphysema; changes in the voice, such as hoarseness or stridor; respiratory distress; and hemoptysis. Subcutaneous or mediastinal emphysema is sometimes the only findings in distal tracheal injury and the airway appears surprisingly normal.^[9]

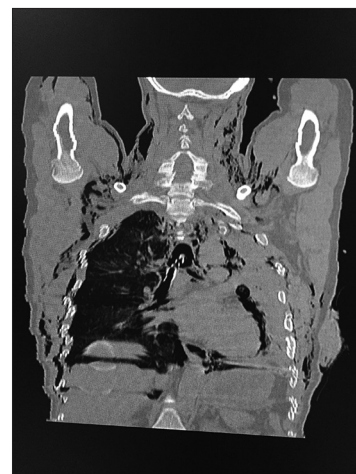


Figure 2: Coronal section of computed tomography neck and thorax showing bilateral extensive subcutaneous emphysema, with multiple rib fractures and pneumomediastinum

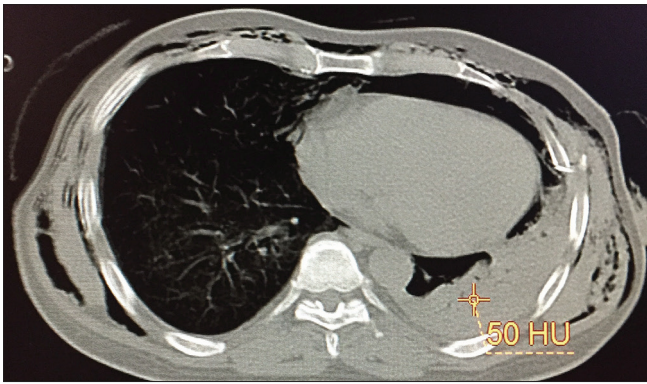


Figure 3: Computed tomography thorax axial view showing left side hemopneumothorax

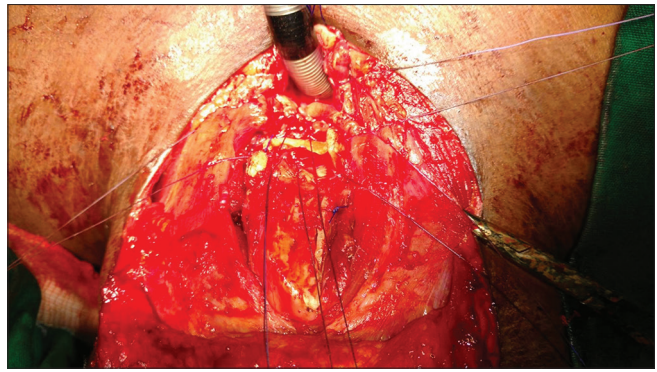


Figure 4: Intra-operative anastomosis of fractured thyroid cartilage, multiple displaced fracture fragments of cricoid cartilage, with complete cricotracheal separation

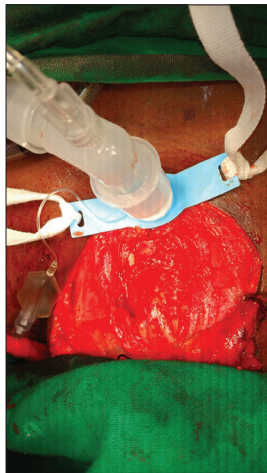


Figure 5: After anastomizing all fractured segments, end tracheostomy was done on second tracheal ring



Figure 6: On day 3 repeat computed tomography brain revealed diffuse cerebral edema with multiple watershed infarcts suggestive of hypoxic brain injury

Airway management in patients with neck trauma is based on a high index of clinical suspicion for cricoid or cervical tracheal injuries. Attempts at endotracheal intubation in patients with unsuspected cricoid injuries can be disastrous. Cricoid pressure or the attempted passage of an ET may dislocate a fractured cricoid cartilage and/or entirely disrupt a partial tracheal transection, producing complete airway obstruction.^[6]

In our patient, initially, we did not suspect laryngotracheal injury. As he was already in respiratory arrest on arrival to the emergency room, securing the airway was our utmost priority. While intubating, we noticed that tip of ET was not passing beyond the vocal cords. This led to suspicion of laryngotracheal injury, and we decided to perform emergency surgical airway. Although it is possible that the initial intubation attempt in this patient might have converted a partial tracheal transection into a complete one, as has previously been reported,^[10] this is unlikely to be the case due to his clinical findings such as massive subcutaneous emphysema and increase in emphysema over neck with each Ambu bag ventilation. Moreover further our intubation attempt was gentle, and the tip of ET was not forced once the resistance was felt beyond the vocal cords and also his intra-operative findings such as

multiple fracture fragments of thyroid and cricoid cartilages indicate that he might have sustained complete tracheal transection post high-velocity injury rather than secondary to endotracheal intubation. There are case reports of patients surviving for several hours even with complete tracheal transection.^[11] Some may present with subtle clinical findings because the peritracheal fascial sleeves and other soft tissues might maintain their airway for a short period.^[12] Since we did not have fiberoptic bronchoscope available at our emergency room, emergency surgical airway was considered the only option available after failed attempt at orotracheal intubation. If fiber optic bronchoscopes are available, it is advised to use them to secure the airway. In laryngotracheal injury, controversies regarding the advantages and disadvantages of cricothyroidotomy versus tracheostomy persist. We preferred emergency cricothyroidotomy over tracheostomy because the former could be easily and rapidly performed, especially in our patient who was in dire need for airway control. Although the laryngeal injury is considered a relative contraindication to perform cricothyroidotomy, it is the emergency airway procedure of choice, in a life-threatening airway obstruction.^[13]

On the contrary, tracheostomy is time-consuming and requires significant expertise and is preferably done in the operating room. Emergency tracheostomy has two-fold complication rate than the elective, due to longer time spent isolating the trachea as a result of commonly occurring bleeding.^[14] After giving incision for emergency surgical airway, we found the tip of ET tube lying outside the trachea and so, we passed a new ET tube through the distal tracheal end.

The mortality of tracheobronchial injury is high, with most of the patients dying at the scene. The prognosis of those who reach the hospital alive depends on clinical stability and associated injuries. A high index of suspicion is needed to identify tracheobronchial injury. Timely management of the airway plays a key role in predicting the clinical outcome. In our patient, although we had secured the airway immediately he had already sustained hypoxic brain damage. He reached our hospital 90 min after sustaining airway injury, being complicated with bilateral tension pneumothorax. Appropriate prehospital airway management, high flow oxygen and needle thoracocentesis might have saved this patient. This scenario emphasizes the importance of improving prehospital care in developing countries.

CONCLUSION

Tracheal transection is potentially fatal. Timely diagnosis is essential. If tracheal transection is strongly suspected from physical examination and radiographic findings, fiber optic bronchoscopy should be carried out. If fiber optic bronchoscopy is available, it can be used for diagnosing and managing the tracheal injury. In scenarios where fiber optic bronchoscopy is not available, early diagnosis of airway compromise, skillful airway management, and prompt surgical repair are important for positive outcomes.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other

clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

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