

## Traumatic Trachea Rupture in a 3-Year-Old Toddler: A Case Report

Kafshgari R. MD<sup>\*</sup>, Kalbasi M. MD<sup>\*\*</sup>

### Abstract:

The traumatic injury of the airway is one of the most important and serious issues in pediatric trauma and is one of the most common causes of disability and mortality in them. In the absence of a suitable airway, any attempt to resuscitate and manage of the trauma can be failed. The patient is a 3-year-old toddler boy brought to the emergency department. Primarily there was extensive subcutaneous emphysema in the neck and chest that ruptures of the thoracic trachea was detected. The patient underwent non-surgical conservative management and was discharged after recovery.

*Key Words: Airways Trauma, Trachea Rupture, Subcutaneous Emphysema*

### Background and Objectives

In adherence to advanced trauma resuscitation protocols, the primary objective in the management of injured patients is to ensure the establishment of a secure airway. The absence of a functional airway renders resuscitation efforts ineffective in cases of trauma. This concern is particularly pronounced when the trauma has resulted in airway injury, which is recognized as one of the most critical and life-threatening complications. Alarming, only a small fraction of patients with such injuries arrive at medical facilities alive.<sup>1</sup>

Tracheobronchial injury refers to damage that extends from the cricoid cartilage to the distal ends of the right and left main bronchi.

Diagnosing these injuries in pediatric patients presents unique challenges, often leading to their oversight due to the rarity of traumatic laryngotracheal injuries and the presence of more severe concurrent injuries. Overall, it is estimated that approximately 0.5% of patients suffering from multiple traumas also present with tracheobronchial injuries.<sup>2</sup>

### Case Presentation

We present the case of a three-year-old child who was brought to the emergency department following a collision with a vehicle, after which the child was thrown from the point of impact. Upon initial evaluation, the child was alert and

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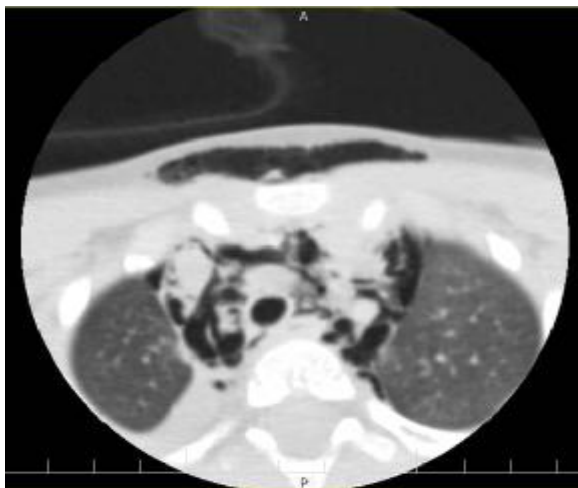
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demonstrated stable vital signs (BP=120/60, PR=130, RR=14). In light of the severity of the injuries sustained, immediate management was promptly undertaken. During the evaluation of the airway and respiratory function, the child exhibited no signs of respiratory distress, with pulse oximetry indicating an oxygen saturation level of 99%. However, significant subcutaneous emphysema was observed in the neck and upper chest regions. A radiographic examination of the chest revealed no evidence of rib fractures, pneumothorax, or hemothorax, and auscultation of the lungs demonstrated clear and symmetrical breath sounds bilaterally. Furthermore, there was no tenderness detected in the chest wall, and no crepitus was noted.

Following this initial assessment, additional investigations, including ultrasound examinations, yielded normal results. The systemic examination identified only multiple abrasions on the face and limbs. To ascertain the cause of the subcutaneous emphysema, a computed tomography (CT) scan of the neck and chest was performed, which revealed a suspicious laceration in the posterior wall near the trachea at the carina (Image 1) and evidence of pneumomediastinum. These findings raised the possibility of an isolated tracheal injury, specifically a membranous injury, possibly resultant from increased intratracheal pressure.



*Figure 1 - Injury to the posterior tracheal wall with extensive mediastinal emphysema*

Given the child's stable condition, full consciousness, absence of respiratory distress,

and the presence of only mild, non-progressive emphysema, a conservative management strategy was adopted. The child was placed under close monitoring in the intensive care unit. Due to the uncertainty regarding the presence of a concurrent esophageal injury, the patient was advised to abstain from oral intake. Notably, throughout the initial 24 hours of monitoring, no expansion of the subcutaneous emphysema was observed.

On the second day of hospitalization, an esophagogram utilizing diluted barium was performed to evaluate the esophagus, yielding normal results. In light of these findings, oral feeding was subsequently initiated, which the patient tolerated excellently. Throughout the course of the hospitalization, a notable reduction in the subcutaneous emphysema observed in the chest was documented, facilitating the patient's transfer to the ward on the fourth day post-admission. A chest X-ray conducted on the fifth day also indicated normal findings. Ultimately, on the same day, the patient was discharged in good general condition. A follow-up appointment at the pediatric outpatient clinic one week subsequent to discharge revealed no indications of emphysema in the neck.

### Discussion and Conclusion

In the management of pediatric trauma, the implementation of immediate resuscitative and diagnostic measures is paramount for the stabilization of the patient, irrespective of the nature of the trauma. Among these measures, the establishment of a secure airway and the assurance of adequate ventilation are of critical importance.<sup>3</sup> The diagnosis of specific airway injuries requires a heightened clinical suspicion accompanied by a comprehensive history and physical examination. Clinical manifestations such as dyspnea, respiratory distress, neck pain, coughing, pneumothorax, pneumomediastinum, and subcutaneous emphysema serve as essential indicators for guiding the diagnostic process. In cases of deep neck emphysema and pneumomediastinum, it is anticipated that these findings will be present in approximately 60% of cases.<sup>4</sup> Blunt trauma to the airway in the neck may result from either direct injury or neck hyperextension, necessitating an exhaustive diagnostic evaluation in instances where tracheal injury is suspected. Delays in diagnosis can

significantly elevate the risk of adverse outcomes and long-term complications. Following the establishment of a diagnosis, initial management revolves around two primary objectives: stabilizing the patient and determining the location and extent of the injury. The most prevalent sites for tracheobronchial injuries include the carina and main bronchi (80%), the trachea (15%), and the distal bronchi (5%), with the right main bronchus being the most frequently affected region.<sup>5</sup>

Computed tomography (CT) scans of the neck and upper chest are recognized as reliable diagnostic modalities in the assessment of airway injuries. Key indicators of such injuries include the presence of mediastinal air, destruction of the tracheobronchial column, deviation of the airway, and specific damage to the airway structures. It is imperative to note that a negative CT scan does not definitively exclude the possibility of injury, nor does it diminish the necessity of bronchoscopy in instances where clinical suspicion persists.

In patients with suspected airway injuries, bronchoscopy is considered the definitive diagnostic approach. The fiberoptic bronchoscope proves particularly effective, facilitating a comprehensive examination of the tracheobronchial tree and enabling precise evaluation of the injury's location and extent. While bronchoscopy is proficient in identifying central airway injuries, it may exhibit limited sensitivity in detecting smaller lacerations.

The selection of the diagnostic approach is contingent upon the presence and severity of concomitant trauma. The primary objective in the management of airway injuries is to ensure the maintenance of airway patency. In cases

where patients exhibit respiratory distress or progressive emphysema, immediate intubation is paramount. Most airway injuries are characterized by mucosal lacerations measuring less than 2-3 centimeters in length and involving less than one-third of the tracheal diameter in stable patients; these cases are often amenable to management with supportive interventions, including airway control or selective intubation.<sup>6</sup> Particularly concerning are injuries to the distal trachea, carina, and proximal main bronchus, which are fraught with controversy and necessitate close collaboration between the surgeon and intensivist. In numerous instances, single-lumen intubation may not yield optimal results; therefore, current best practices recommend the use of a long tube positioned beyond the injury site. The deployment of double-lumen tubes is generally contraindicated, as they may exacerbate the existing injury.<sup>7</sup>

Surgical interventions can range from straightforward repairs to complex reconstructive procedures.<sup>8</sup> Given that most blunt injuries occur in the distal trachea and the right main bronchus, a right posterolateral thoracotomy may be indicated if surgical intervention is deemed necessary.<sup>9</sup>

It is critical to recognize that the considerable energy required to inflict blunt tracheal trauma suggests a high likelihood of associated injuries, significantly impacting overall outcomes, with such injuries occurring in 40 to 100 percent of cases. Among these, injuries to the esophagus and cervical vertebrae are of particular concern and must be meticulously considered in the comprehensive management of the patient.<sup>10</sup>

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