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Case Report

Laryngotracheal Trauma: Report of Two Clinical Cases and Review of the Literature

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Abstract

Background: Laryngotracheal trauma is a rare but life-threatening emergency that endangers both airway patency and vocal function. Prompt diagnosis and multidisciplinary management are essential for optimal outcomes.

Objective: To describe two cases of open laryngotracheal trauma and discuss diagnostic strategies, surgical repair, and postoperative recovery.

Methods: Two patients presenting with open laryngotracheal injury following cervical trauma were managed surgically with airway reconstruction.

Results: Both patients underwent early surgical repair with restoration of airway patency and satisfactory voice recovery.

Conclusion: Early recognition and prompt surgical intervention remain the cornerstone of successful management of laryngotracheal trauma.

Keywords: Laryngotracheal trauma; Airway injury; Cricoid fracture; Surgical repair; Neck trauma

Introduction

Cervical trauma involving the larynx is a rare but critical emergency that can threaten life and compromise essential neck functions such as ventilation, phonation, and swallowing [1].

These injuries can occur alone or, more often, in association with multiple traumatic injuries [2], creating considerable diagnostic and therapeutic challenges due to the anatomical complexity of the laryngotracheal framework and its proximity to vital structures.

Laryngeal lesions range from minor mucosal edema to displaced cartilage fractures or complete laryngotracheal separation [3]. The incidence has been reported to range from 1 per 14,000 to 1 per 40,000 emergency department admissions, with mortality rates as high as 40% for severe blunt trauma and 7–20% for penetrating injuries [4]. Because of their rarity and potentially devastating consequences, laryngotracheal injuries remain underreported, and few studies have detailed their combined clinical, radiological, and surgical aspects. The present work aims to describe two cases of open laryngeal trauma, emphasizing the diagnostic approach, imaging findings, surgical management, and postoperative outcomes.

Case Presentations

Two male patients with penetrating cervical trauma involving the laryngotracheal axis were managed in our department. Their presentations, imaging findings, surgical management, and outcomes are detailed below.

Case 1

A 26-year-old man was admitted to the emergency department after being assaulted with a broken glass bottle, resulting in a penetrating wound to the anterior cervical region directly involving the laryngotracheal axis. On arrival, he presented with acute respiratory distress (SaO_2: 80%, HR: 120/min). A bleeding horizontal cervical wound was observed, associated with extensive subcutaneous emphysema extending into the upper thoracic region.

Given the extent of the injury, an urgent cervicothoracic computed tomography (CT) scan was performed. It revealed diffuse subcutaneous emphysema and a tracheal laceration at the level of the third tracheal ring (Figure 1).

Because of the respiratory compromise, emergency endotracheal intubation was performed, ensuring adequate ventilation. Immediate

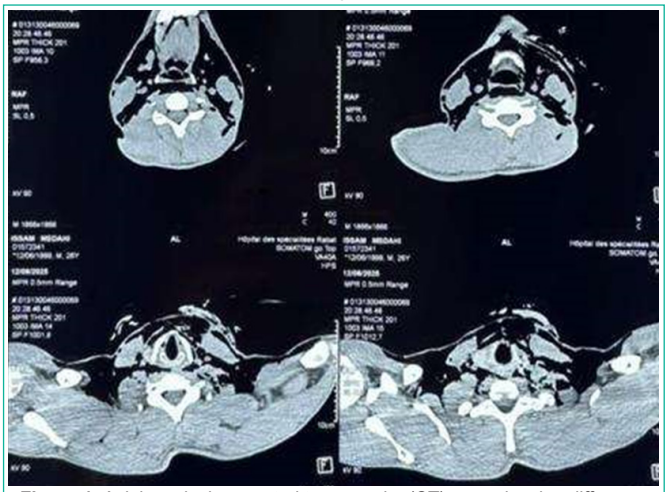

Figure 1: Axial cervical computed tomography (CT) scan showing diffuse subcutaneous emphysema extending through the cervical soft tissues.

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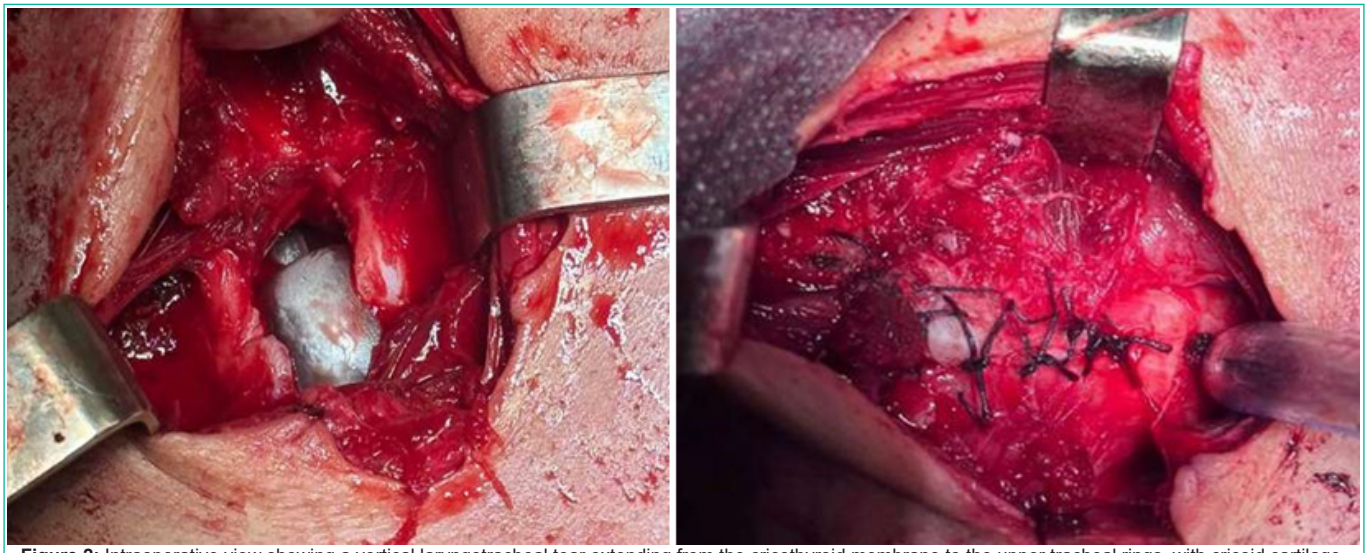

Figure 2: Intraoperative view showing a vertical laryngotracheal tear extending from the cricothyroid membrane to the upper tracheal rings, with cricoid cartilage involvement before repair.

surgical exploration was undertaken through direct access via the wound. Injured vessels were controlled, and examination revealed a vertical laryngeal tear extending from the cricothyroid membrane to the first three tracheal rings, with cricoid cartilage involvement.

A primary tracheostomy was performed between the fourth and fifth tracheal rings, followed by cricoid cartilage repair using interrupted 2-0 Prolene sutures (Figure 2). The wound was closed in layers after placement of a suction drain, and a nasogastric tube was inserted for postoperative feeding.

Postoperatively, the patient received broad-spectrum empirical antibiotics and intravenous corticosteroids to prevent post-traumatic laryngeal edema.

The postoperative course was favorable, with decannulation on day 10 and complete recovery of airway and vocal function. Follow-up nasofibroscopy at one month showed mobile vocal cords without residual lesions (Figure 3).

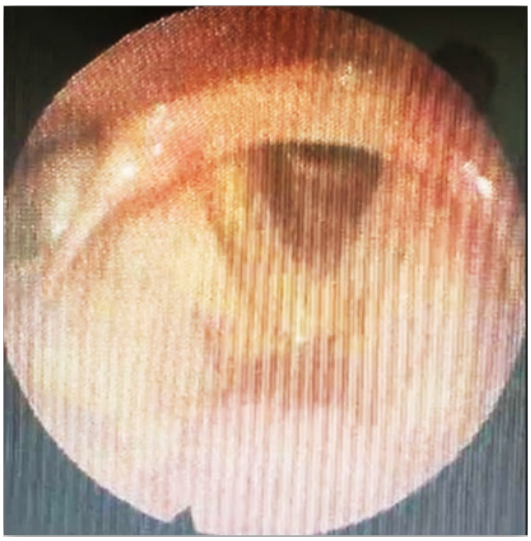

Figure 3: Follow-up nasofibroscopic examination one month after surgery demonstrating mobile vocal cords and complete mucosal healing without residual lesions

Case 2

A 21-year-old man presented to the emergency department after a knife assault, with a penetrating anterior cervical wound. Clinically, he demonstrated moderate inspiratory dyspnea, dysphonia, and mild hemoptysis, findings highly suggestive of a laryngotracheal injury.

Physical examination revealed bilateral diffuse subcutaneous emphysema extending from the cervical to the upper thoracic regions. Considering the penetrating mechanism and evidence of subcutaneous emphysema, an urgent cervicothoracic CT scan was performed. Imaging demonstrated extensive bilateral subcutaneous emphysema tracking into the retropharyngeal spaces and superior mediastinum, with no distinct visualization of a laryngotracheal breach (Figure 4).

Airway control was achieved through orotracheal intubation, followed by surgical exploration and wound closure, during which no significant laryngotracheal lesion was identified (Figure 5). The patient was placed in a semi-sitting position and received oxygen

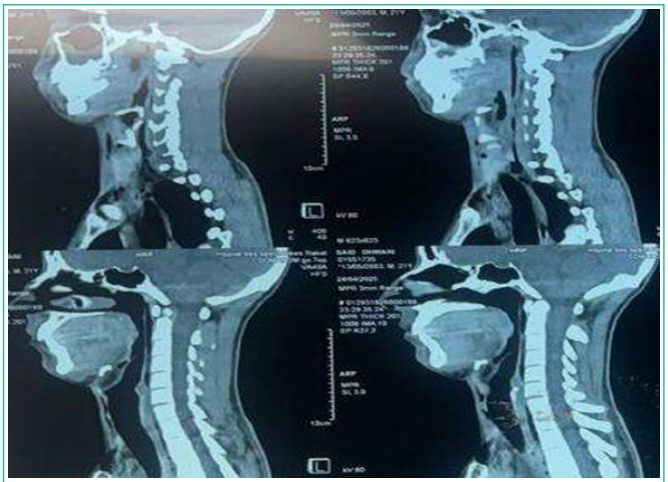

Figure 4: Cervicothoracic computed tomography (CT) scan revealing extensive bilateral subcutaneous emphysema extending into the retropharyngeal spaces and superior mediastinum, without a visible laryngotracheal defect.

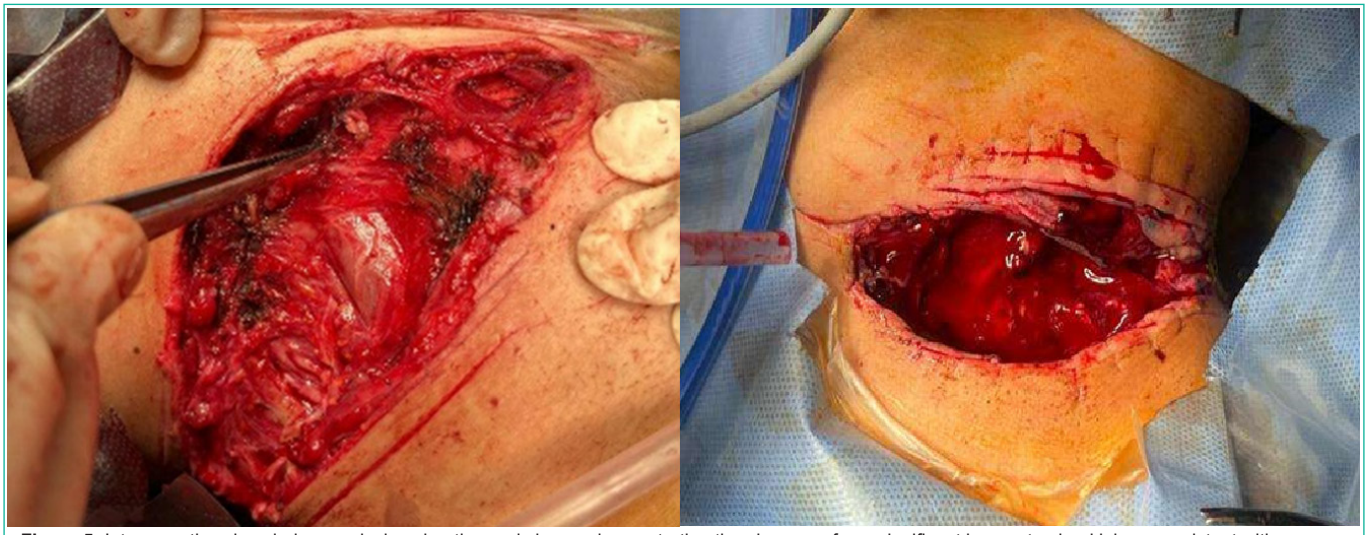

Figure 5: Intraoperative view during surgical exploration and closure demonstrating the absence of any significant laryngotracheal injury, consistent with a conservative treatment strategy.

therapy, broad-spectrum empirical antibiotics, and a nasogastric tube for enteral feeding. Close monitoring was maintained for 48 hours to detect any clinical deterioration or progression of the emphysema. The clinical course was favorable, with no complications during hospitalization, allowing safe discharge and scheduled outpatient follow-up.

These two cases illustrate the broad spectrum of cervicolaryngeal trauma severity, ranging from simple superficial wounds to complex laryngotracheal disruptions. They emphasize the critical importance of early airway control, accurate imaging assessment, prompt surgical decision-making, and tailored multidisciplinary management to optimize functional outcomes and prevent long-term complications.

Discussion

The neck is classically divided into three anatomical zones according to the Roon and Christensen classification, which provides a practical framework for assessing penetrating cervical injuries.

- **Zone I** extends from the sternal notch to the cricoid cartilage,
- **Zone II** from the cricoid cartilage to the angle of the mandible, and
- **Zone III** from the angle of the mandible to the skull base [5] (Figure 1).

The larynx is most frequently affected in Zone II injuries (between the cricoid cartilage and the mandibular angle), representing 60–75% of penetrating cervical traumas according to Miller et al. [6] Both of our patients sustained injuries within this region. In the literature, the incidence of laryngeal fractures is estimated at approximately 1 in 30 000 cases, with a high mortality rate in cases of delayed management [6] (Figure 6).

Laryngeal trauma may result from blunt mechanisms (road traffic accidents, strangulation) or penetrating injuries (knife assaults, foreign bodies, or sharp objects). In open injuries, the mechanism often involves disruption or disinsertion of mucosal, cartilaginous, and muscular structures [3].

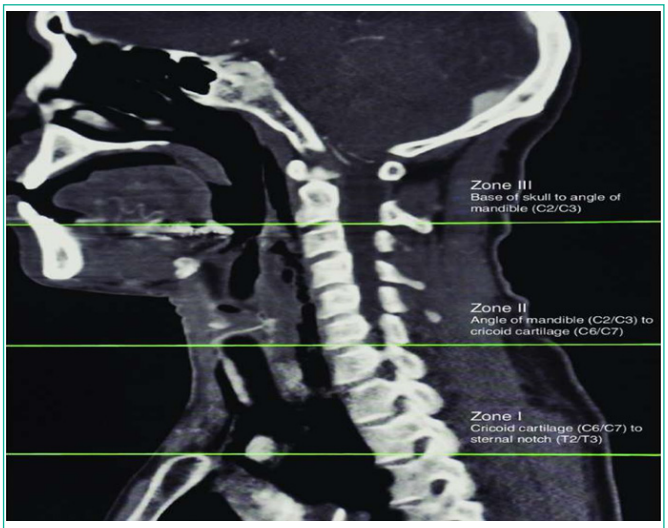

Figure 6: Sagittal cervical computed tomography (CT) reconstruction illustrating the anatomical neck zones according to the Roon and Christensen classification, with labeled boundaries of Zones I, II, and III.

Clinical Presentation

The clinical picture of cervical trauma is dominated by respiratory symptoms such as subcutaneous emphysema, respiratory distress, and hemoptysis. Warning signs of external laryngeal injury include stridor, diffuse subcutaneous emphysema, dysphagia, and hemoptysis, which may indicate underlying laryngotracheal disruption [3].

In both of our patients, the initial presentation involved airway compromise with subcutaneous emphysema and dysphonia—classic signs necessitating immediate airway evaluation.

Imaging Evaluation

Contrast-enhanced cervicothoracic computed tomography (CT) remains the gold standard for assessing the extent of laryngotracheal trauma. It allows the identification of "red flag" findings such as displaced cartilaginous fractures, vocal cord immobility or tears, and large endolaryngeal hematomas [4].

Grade	Description
I	Minor endolaryngeal hematoma or superficial mucosal laceration without fracture
II	Non-displaced fracture with mucosal injury but no cartilage exposure
III	Displaced fracture with edema, mucosal tear, and cartilage exposure
IV	Multiple displaced fractures or massive mucosal trauma
V	Complete laryngotracheal separation

Figure 7: Schaefer–Fuhrman classification of laryngeal trauma [9].

CT plays a decisive role in triaging patients between surgical exploration and conservative management. In our experience, imaging findings were essential for orienting the therapeutic strategy: while the first patient showed a clear tracheal defect requiring surgery, the second had no visible laryngotracheal breach and was treated conservatively.

However, in resource-limited or emergency settings, clinical assessment and flexible endoscopy may remain the only diagnostic tools available, emphasizing the value of experienced clinical judgment.

Classification and Management

Schaefer and Fuhrman proposed a five-grade classification for laryngeal trauma that correlates closely with the required level of intervention [8]:

Our first case corresponded to Grade IV, with a displaced cricoid fracture and laceration of the upper tracheal rings, requiring emergency surgical exploration and repair.

This classification remains extremely useful for determining the indication for surgery and predicting prognosis (Figure 2,7).

Patients with Grade I–II lesions can generally be managed conservatively through oxygen therapy, systemic corticosteroids, and close observation for 24–48 hours, with nasogastric feeding if needed. Close monitoring is essential, as delayed airway obstruction can occur secondary to progressive edema [10].

Conversely, Grade III–V injuries, including displaced fractures, extensive mucosal tears, or laryngotracheal separation, warrant urgent surgical exploration.

Airway stabilization, most often by tracheostomy, is the initial priority. Surgical exploration aims to reconstruct the laryngotracheal framework, reapproximate mucosal edges, and prevent long-term stenosis [10].

Timing of Surgery

There is no universal consensus regarding the optimal timing of surgical fixation for laryngeal fractures [11]. Nevertheless, most authors advocate for early intervention, particularly in displaced fractures or extensive mucosal lacerations. According to Fogelman and Stewart, mortality was 6% among patients undergoing immediate surgical exploration versus 35% in those with delayed repair, underscoring the decisive impact of early management on both survival and functional outcomes [12].

Based on our experience, prompt airway stabilization and early surgical decision-making were key factors contributing to successful recovery in both cases, regardless of the therapeutic approach chosen.

Follow-up and Outcomes

A structured long-term follow-up is essential to detect delayed complications such as laryngeal stenosis, synechiae, persistent dysphonia, or vocal cord paralysis.

Flexible nasofibroscopy remains the reference method for evaluating vocal cord mobility, mucosal healing, and airway patency during follow-up.

In our first case, nasofibroscopy at one month revealed normal vocal cord motion and intact mucosa, indicating a successful functional outcome [13].

Both cases demonstrate that careful postoperative surveillance is crucial, even when the initial course appears favorable.

Multidisciplinary Considerations

Optimal management of laryngotracheal trauma requires a multidisciplinary approach, involving otolaryngologists, anesthesiologists, radiologists, and intensive care specialists. Early coordination ensures prompt airway control, accurate radiologic assessment, and timely surgical repair, minimizing the risk of life-threatening or functional sequelae.

Conclusion

Management of external laryngeal trauma relies on rapid diagnosis, injury grading based on the Schaefer–Fuhrman classification, and an individualized therapeutic plan adequate to the mechanism and severity of injury. Early surgical intervention and structured postoperative follow-up significantly improve airway and phonatory outcomes while reducing morbidity and mortality.

Ultimately, early airway control, accurate imaging, and multidisciplinary collaboration remain the cornerstones of successful management, ensuring both airway preservation and functional voice recovery.

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