

"Stridor, Stenosis, And Survival: The Multidisciplinary Rescue Of A Traumatized Cervical Axis"

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Abstract

Penetrating neck injuries involving the trachea are rare but carry significant morbidity and mortality risks. This case report presents a 26-year-old female who sustained a stab injury to the neck, necessitating an emergency tracheostomy through the trauma site. Her postoperative course was complicated by pneumothorax, oesophageal stricture, and dysphagia. A multidisciplinary approach led to successful management and recovery. This report underscores the importance of prompt intervention and coordinated care in such complex cases.

INTRODUCTION

Penetrating neck injuries (PNIs), though relatively rare, represent approximately 5–10% of all trauma presentations to emergency departments and pose substantial clinical challenges due to the dense concentration of vital anatomical structures within a restricted anatomical space (1). The cervical region contains critical elements of the vascular, respiratory, gastrointestinal, and neurological systems, rendering even superficial wounds potentially life-threatening (2). Mortality rates associated with PNIs range from 2% to 10%, depending on factors such as the mechanism of injury, the anatomical structures involved, and the promptness of medical intervention (3).

The conventional classification of PNIs into anatomical zones has traditionally served as a framework for clinical management. Zone I spans from the clavicles to the cricoid cartilage, Zone II extends from the cricoid cartilage to the angle of the mandible, and Zone III lies between the angle of the mandible and the base of the skull (4). Injuries within Zone II, such as the one described in this case, are particularly worrisome due to the close approximation of vital structures including the carotid arteries, jugular veins, trachea, and esophagus (5). Over the past several decades, management paradigms for PNIs have evolved considerably. Historically, any injury penetrating the platysma muscle warranted mandatory surgical exploration. While this approach facilitated the identification of significant internal injuries, it also resulted in a high incidence of non-therapeutic surgical procedures, reported in some series to exceed 70% (6). More contemporary practices favor a selective, conservative strategy, particularly for hemodynamically stable patients. This approach relies on the use of advanced diagnostic modalities—such as computed tomography angiography (CTA), flexible endoscopy, and bronchoscopy—to delineate the extent of internal damage (7). Selective non-operative management (SNOM) has now gained widespread acceptance, particularly in civilian trauma settings, where it has been shown to reduce morbidity without compromising clinical outcomes (8). Airway management remains a critical component of the initial response to PNIs, particularly when the injury involves the aerodigestive tract (9). Conventional endotracheal intubation can be challenging in these cases due to anatomical distortion or ongoing bleeding. Emergency tracheostomy, as performed in this case, is sometimes necessary and can be lifesaving when a secure airway cannot be established through less invasive means (10). This method is particularly effective in preventing hypoxia and ensuring ventilation in critically injured patients (11). Complications following PNIs, including pneumothorax and esophageal injuries, are not uncommon. Early recognition and management are vital to prevent secondary complications such as infection, mediastinitis, and

nutritional deficits (12).

Esophageal injuries, although less common than vascular or tracheal injuries, carry a high risk of morbidity due to delayed diagnosis and the potential for mediastinal contamination (13). In particular, esophageal strictures resulting from trauma can lead to dysphagia and necessitate interventions such as feeding jejunostomy (FJ) to ensure adequate nutrition (14). Multidisciplinary management involving trauma surgeons, gastroenterologists, and otolaryngologists is essential to address both acute injury and long-term rehabilitation needs (15).

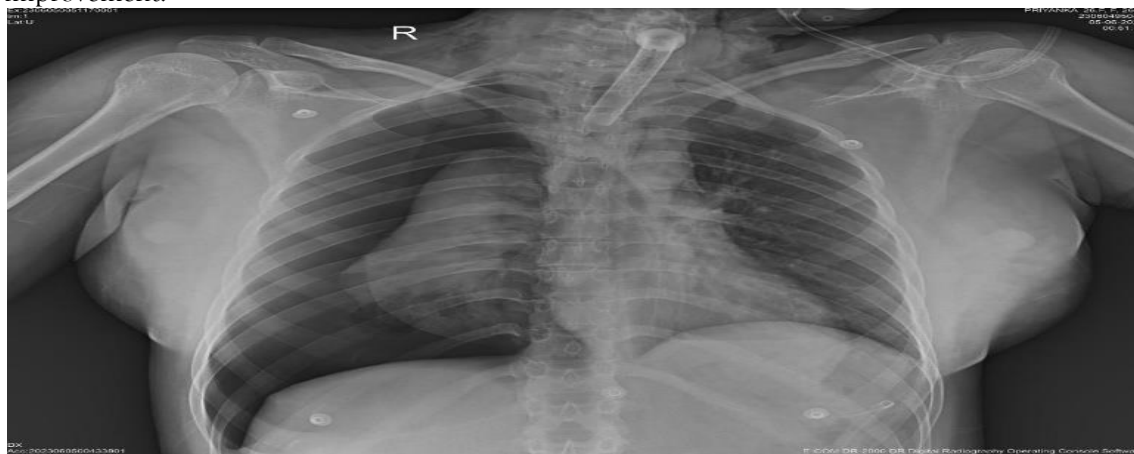
This case report highlights a rare scenario of a penetrating neck injury with tracheal involvement managed through an innovative emergency tracheostomy directly through the trauma site. The clinical course, characterized by complications such as pneumothorax, esophageal stricture, and dysphagia, emphasizes the importance of a systematic, evidence-based approach to trauma management.

Case Presentation

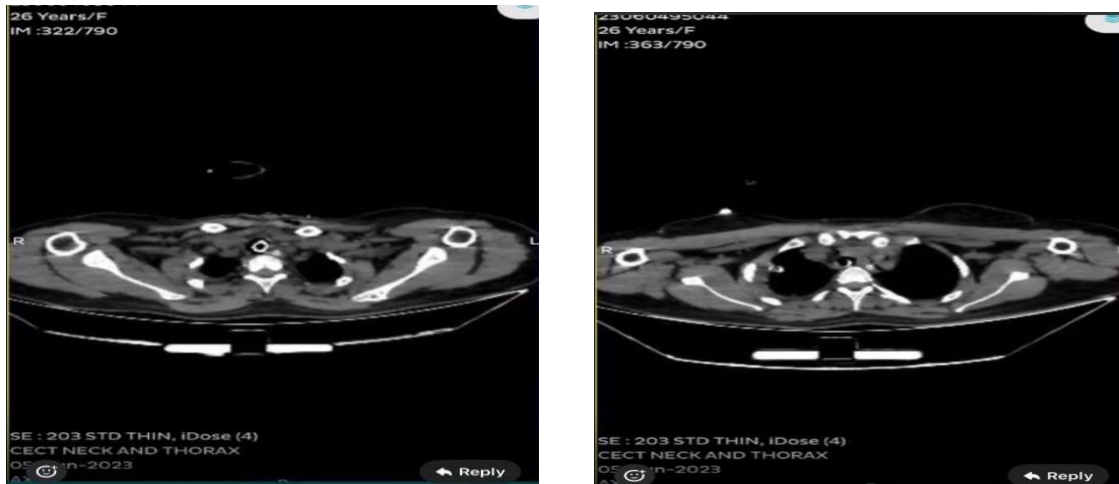
A 26-year-old female presented to the emergency department with a stab wound to the anterior neck following an assault. On arrival, she was conscious but in respiratory distress, with stridor and subcutaneous emphysema noted. Vital signs indicated tachypnea (respiratory rate: 28 breaths per minute), tachycardia (heart rate: 110 beats per minute), and hypotension (blood pressure: 90/60 mmHg).



Primary survey revealed a 3 cm transverse laceration in the anterior neck at the level of the cricoid cartilage (Zone II). Active bleeding was controlled with direct pressure. Given the airway compromise and location of the injury, an emergency tracheostomy was performed through the existing wound to secure the airway. The procedure was uneventful, and the patient's oxygenation improved immediately. On postoperative day (POD) 1, the patient developed sudden onset dyspnea and decreased breath sounds on the right side. A chest radiograph confirmed a right-sided pneumothorax, likely secondary to the initial trauma or tracheostomy procedure. An intercostal chest drain (ICD) was inserted, resulting in rapid clinical improvement.



By POD 2, the patient reported difficulty swallowing and experienced episodes of aspiration. A barium swallow study demonstrated pooling of contrast in the upper esophagus with delayed clearance, raising suspicion for an esophageal injury. An esophagogastroduodenoscopy (EGD) revealed a 2 cm esophageal stricture approximately 15 cm from the incisors, with mucosal edema and erythema suggestive of traumatic etiology.



A feeding jejunostomy (FJ) was placed to provide nutritional support while allowing the esophagus to heal. The patient was managed conservatively with proton pump inhibitors and broad-spectrum antibiotics to prevent infection. Over the next four weeks, the patient's condition improved steadily. Serial EGD showed gradual resolution of the esophageal stricture. The tracheostomy tube was decannulated after one month, and the FJ was removed after two months as the patient tolerated oral intake. At a three-month follow-up, she reported mild dysphagia but was able to maintain adequate nutrition orally.

DISCUSSION

Penetrating neck injuries (PNIs) present a complex challenge to trauma surgeons due to the potential involvement of critical vascular, aerodigestive, and neurological structures within a confined anatomical space (1). The management of PNIs has evolved significantly over the past decades, transitioning from a mandatory exploration approach to a more selective and conservative strategy in stable patients (2,3). This shift has been largely driven by advancements in diagnostic imaging and a better understanding of injury patterns. The management of tracheal injuries, as seen in this case, is critical due to the immediate risk of airway compromise. The decision to perform an emergency tracheostomy directly through the trauma site was unconventional but appropriate given the patient's presentation. Studies indicate that early establishment of a secure airway is crucial in preventing hypoxia and reducing mortality (4,5). Traditional methods of intubation may not always be feasible in the setting of significant neck trauma, particularly when there is anatomical distortion, bleeding, or disruption of the tracheal rings (6). Emergency tracheostomy has been reported as a viable method of airway control in selected cases of PNI, particularly when endotracheal intubation is not possible (7). Pneumothorax is a known complication of both penetrating neck trauma and tracheostomy procedures. It occurs when air accumulates in the pleural space, impairing lung expansion and potentially leading to life-threatening respiratory distress (8). In this patient, the development of a pneumothorax on postoperative day 1 necessitated prompt intervention with an intercostal drainage (ICD) tube, which is the standard of care for managing pneumothoraces (9). Early chest radiography or ultrasonography is recommended to facilitate the diagnosis and guide treatment, particularly in trauma settings (10).

The development of dysphagia and aspiration on postoperative day 2 raised concerns for esophageal injury. Esophageal injuries in PNIs are rare but carry significant risks of mediastinitis and sepsis if not identified early (11). The esophageal stricture observed in this patient was likely a result of trauma-induced inflammation and subsequent fibrosis. Management typically involves nutritional support, as evidenced by the placement of a feeding jejunostomy (FJ) in this case (12). Endoscopic evaluation and dilatation of the stricture may be necessary in severe cases, and conservative management with proton pump inhibitors can aid in mucosal healing (13). The successful outcome in this case was facilitated by a multidisciplinary

approach involving trauma surgeons, otolaryngologists, gastroenterologists, and critical care specialists. Such an approach ensures comprehensive management, from securing the airway and managing respiratory complications to addressing nutritional needs and esophageal healing (14). Evidence from recent studies supports the use of a multidisciplinary team in improving outcomes in complex trauma cases, particularly when complications such as strictures and dysphagia are present (15). There has been a paradigm shift towards selective non-operative management (SNOM) in stable patients with PNI. This approach reduces unnecessary surgical explorations, decreases healthcare costs, and minimizes the risk of iatrogenic injury (16). In this case, conservative management of the esophageal stricture with nutritional support and endoscopic monitoring avoided the need for invasive surgical interventions. A growing body of literature supports SNOM, especially when combined with modern imaging modalities such as computed tomography angiography (CTA) and endoscopy to rule out significant vascular or aerodigestive injuries (17,18). The long-term prognosis of patients with PNI depends on the timeliness of intervention and the management of complications. This patient, despite initial complications such as pneumothorax and esophageal stricture, demonstrated good recovery and was able to transition to full oral intake within two months. Mild dysphagia at follow-up was a positive outcome considering the severity of the initial injury. Studies indicate that early rehabilitation and a gradual reintroduction to oral feeding can significantly improve quality of life and reduce dependency on feeding tubes in such cases (19,20). This case highlights the importance of tailored management strategies in penetrating neck injuries. The combination of innovative airway management, vigilant monitoring for complications, and a conservative yet effective treatment approach contributed to a favorable outcome. Continued advancements in imaging, endoscopic techniques, and interdisciplinary care are likely to further improve management protocols and patient outcomes in similar trauma scenarios.

CONCLUSION

Penetrating neck injuries involving the trachea are complex and require immediate, coordinated care to optimize outcomes. This case illustrates successful management through prompt airway control, vigilant monitoring for complications, and a multidisciplinary approach to address the patient's needs throughout recovery.

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