

8-1-2021

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### Logo Recommended Citation

Yousuf, M. S., Pervez, M. B., Fatimi, S., Samad, K. (2021). Anaesthetic management of tracheal injury following blunt neck trauma: An unusual late presentation. *Journal of the College of Physicians and Surgeons--Pakistan : JCPSP*, 31(8), 992-994.

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# Anaesthetic Management of Tracheal Injury following Blunt Neck Trauma: An Unusual Late Presentation

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## ABSTRACT

Tracheal injuries, following blunt neck trauma, are life-threatening surgical emergencies with high risk of mortality. A high index of suspicion is necessary to avoid missing an occult injury because delays in diagnosis and definitive treatment are associated with poorer outcomes. We, herein, report a case of a 28-year man who presented in Emergency Department 15 days after blunt neck trauma from an accident involving electric cable. Anaesthetic challenges, airway management and importance of effective close loop communication, during repair of complex tracheal reconstruction, will be discussed in this case report.

**Key Words:** Blunt trauma, Airway and anesthetic management, Tracheal injury.

**How to cite this article:** Yousuf MS, Pervez M, Fatimi S, Samad K. Anaesthetic Management of Tracheal Injury following Blunt Neck Trauma: An Unusual Late Presentation. *J Coll Physicians Surg Pak* 2021; **31(08)**:992-994.

## INTRODUCTION

Tracheal injuries, following blunt neck trauma are surgical emergencies that require an immediate focused surgical intervention. The causes of blunt trauma include direct blows, compression and shearing injuries from sudden flexion, extension or deceleration. The majority of upper airway injuries involve the cervical trachea, while others involve laryngeal injuries.<sup>1</sup>

Up to 25% of patients with acute laryngotracheal trauma requiring surgery have no physical evidence of the injury at initial presentation, and signs may be delayed for 24 to 48 hours. A high index of suspicion is necessary to avoid missing an occult injury because delays in diagnosis and definitive treatment are associated with poorer outcomes. Mortality is relatively high in patients with acute trauma to the trachea with a reported range varying between 15% to 40% depending on mechanism and classification.<sup>2</sup> Tracheal injury, following blunt trauma, is a challenging entity and can be lethal, if not diagnosed early and accurately. High degree of suspicion and timely intervention is required for better outcome.

We, herein, present an unusual case of an adult male patient, who reported in Emergency Department after 15 days following blunt neck trauma from an electric cable.

## CASE REPORT

A 28-year man with no known comorbidities presented in Emergency Department with complaints of shortness of breath, surgical emphysema around neck and chest (worsening on breathing deeply) and stridor following blunt trauma to neck, which occurred approximately 15 days back, via electric cable placed on roadside during riding a motorcycle. Physical examination showed a lesion on neck at the level of cricoids; his oxygen saturation was 86% on air which rose to 98% on application of 5 L/min oxygen through face mask. The respiratory rate was 26/min, and on auscultation, there was decreased air entry in bilateral mid and lower hemithorax with stridors and conducting sounds. Airway examination showed a Mallampati score of 3 and inter-incisors distance about 3 finger breadth, while the neck movement was restricted due to surgical emphysema around the neck.

A suspicion of tracheal injury was raised secondary to worsening surgical emphysema and increasing difficulty in breathing in emergency department. CT chest and neck revealed disruption of cervical trachea along its right anterolateral wall of about 8 mm at the level of 6<sup>th</sup> cervical vertebrae with narrowing at 7<sup>th</sup> cervical vertebrae, and subcutaneous emphysema in neck involving bilateral supraclavicular regions which extended to anterolateral chest wall, pneumomediastinum (anterior and lateral) and minimal bilateral pneumothorax (more on right side, Figure 1).

Patient was shifted to operating room for emergency tracheal repair and reconstruction. Routine monitoring was applied including electrocardiography, noninvasive blood pressure, and pulse oximetry, and two large bore intravenous cannulas were inserted.

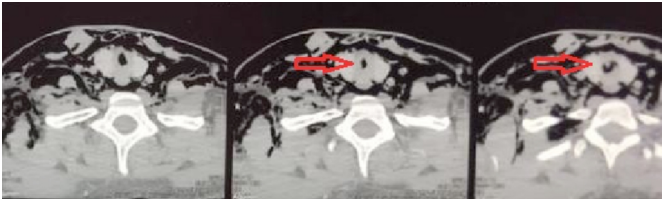
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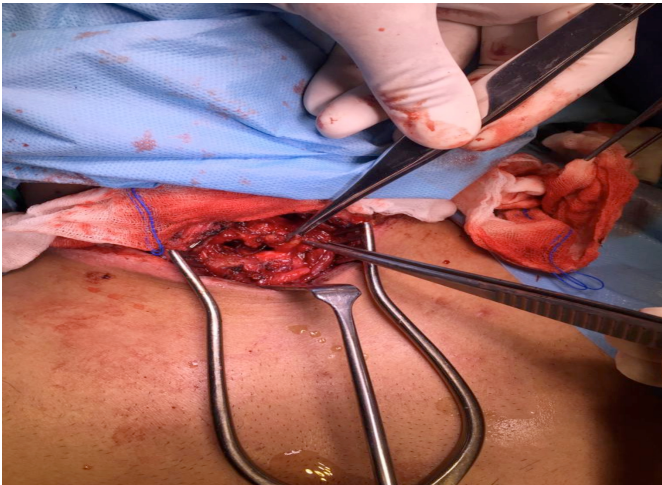
Received: October 03, 2019; Revised: November 15, 2019;

Accepted: November 27, 2019

DOI: <https://doi.org/10.29271/jcpsp.2021.08.992>



**Figure 1: Narrowing of cervical trachea (C7).**



**Figure 2: Transverse collar incision revealing extensive circumferential injury to trachea with granulation tissue overgrowth.**

His baseline blood pressure in operating room was 130/80 mmHg, heart rate was 82 beats/min, and oxygen saturation was 98% on 5 L/min oxygen. Preinduction arterial line was inserted in left radial artery. General anaesthesia with endotracheal intubation was planned. In order to prevent tension pneumothorax during induction of anaesthesia, we prepared chest tubes and the cardiothoracic surgeon was put on standby to manage if this anticipated complication occurred. After achieving adequate depth of anaesthesia with sevoflurane in 100% oxygen and face-mask and small boluses of intravenous propofol, flexible fiberoptic bronchoscopy was done to determine site and size of tracheal injury. It revealed a tracheal laceration at the level of cricoid cartilage with extensive granulation tissue causing stenosis of the airway. Due to Mallampati score of 3 and restricted neck movement, it was decided to prepare the video-laryngoscope for intubation. Rapid sequence induction technique was used and anaesthetic depth was increased with fentanyl, propofol and succinylcholine. The trachea was intubated by using small reinforced endotracheal tube of size 7.5 mm *via* video laryngoscope (Cormack and LEHAN laryngoscopy grading 2b) and fixed to the lip at 23 cm, beyond tracheal injury in order to prevent leak (confirmed by flexible fiberoptic bronchoscope) and further worsening of surgical emphysema. Anaesthesia was maintained with isoflurane with oxygen-air mixture; and intermittent boluses of cisatracurium were used for muscle relaxation. Intravenous dexamethasone, 8 mg, was given intraoperatively to decrease airway edema and paracetamol, 1 gm, was given for analgesia. Bilateral chest tubes were then inserted and placed on suction.

Intraoperatively, patient was placed in supine position with slight extension of neck. Incision was made along the line of

injury in the anterior neck and dissection was carried out until the right anterolateral injury in the trachea was exposed, which was approximately 6 cm below the level of the vocal cords. Internally, the mucosa had dissociated from the underlying cartilage suggesting a compression-decompression pattern of injury. This was further compounded by the damage to the cartilaginous ring at multiple points and the presence of extensive dirty granulation tissue causing stenosis of the airway. A generous debridement of the injured tissue, granulation tissue and mucosal flap was carried out to relieve the airway obstruction (Figure 2). The endotracheal tube was then advanced distal to the level of tracheal injury so that the interrupted sutures were made to repair the lateral and anterior aspects of the trachea. The initial endotracheal tube was then taken out during repair of posterior layer and the sterile endotracheal tube was inserted by the surgeon through the distal end of the trachea. Occasional episodes of oxygen desaturation occurred during the period of anastomosis, which were managed with fractional inspiration of oxygen ( $\text{FiO}_2$ ) of 1.0; otherwise, the intra-operative course was stable. After complete reconstruction of trachea, the second distal endotracheal tube was replaced with the oral endotracheal tube of size 7.5 mm by using video laryngoscope. The surgeon repeated flexible bronchoscopy to inspect and clean the airways. The duration of procedure was about 3 hours.

The patient was weaned gradually and extubated within half an hour in the operating room. After tracheal extubation, the patient was positioned in a sitting position with his neck flexed by placing pillow under his head. Patient was then shifted to post-anaesthesia care unit with oxygen supplementation of 5 L/minute *via* face mask and shifted to special care unit after close observation for approximately 4 hours. On 3<sup>rd</sup> postoperative day, his oxygen saturation was 97% on room air and was able to feed orally with effective phonation.

## DISCUSSION

Blunt trauma to the neck may cause laceration of the trachea requiring surgical intervention in almost all cases, especially if associated with surgical emphysema.<sup>3</sup> Depending on the mechanism, it may be associated with trauma to nearby structures including cervical spine disruption and injury to the great vessels or digestive tract.

Up to 25% of patients with acute laryngotracheal trauma requiring surgery have no physical evidence of the injury at initial presentation, and signs may be delayed for 24 to 48 hours. Symptoms and signs range from mild (blood-tinged sputum) to severe with frank hemoptysis, shortness of breath, dysphagia, and cyanosis. Around 85% of the cases present with hoarseness of voice. On physical examination, pertinent findings include stridor, cyanosis, dyspnea, voice changes / hoarseness, subcutaneous emphysema, and mediastinal crunch on auscultation. In this case, blunt trauma to neck had occurred 15 days back, which was missed on initial presentation and the patient presented in Emergency Department with complaints of shortness of breath and stridor. His hemodynamics were stable but maintaining oxygen

saturation of 98% on face mask of 5 L/min oxygen and 86% on room air with decreased air entry in bilateral mid and lower hemithorax with stridors and conducting sounds. Therefore, despite the mechanism, early diagnosis and definitive surgical repair are important factors in reducing complications and to preserve respiratory function.<sup>4-7</sup>

It is crucial to have a high level of clinical suspicion because routine diagnostic imaging can miss severe injuries. Ballouhey *et al*<sup>5</sup> found that CT scan did not accurately describe the extent of the tracheo-bronchial tear. The gold standard for diagnosis is bronchoscopy.<sup>6,7</sup> It determines the location and severity of the laceration preoperatively and assesses the adequacy of the repair postoperatively.<sup>6</sup> Successful management of these patients requires constant communication between the anaesthesiologist and the surgeon. The goal of airway management during repair is to bypass the laceration and ventilate distally. We used flexible fiberoptic bronchoscope to reveal the level and extent of tracheal laceration and stenosis before attempting tracheal intubation to prevent any airway trauma.

The key for successful anaesthetic management is to control airway, maintain optimal ventilation and resuscitation.<sup>8</sup> We used rapid sequence induction technique for intubation in this case to prevent aspiration. As the level of injury was in proximity to major vessels and anticipating hemodynamic instability due to hypoxia, hypercarbia, high airway pressures, hemorrhage, or compression of the heart or major vessels, it was decided to insert arterial line preinduction in operating room and two wide bore intravenous cannulas were inserted.

It is important that anaesthesiologists are familiar with the cross-ventilation technique and are knowledgeable about how to safely ventilate these patients. Initially, the endotracheal tube (ETT) was advanced distal to the level of tracheal injury during repair of anterior and lateral aspect of trachea. While during repair of posterior layer of the trachea, the surgeon placed a sterile ETT directly into the intact trachea, distal to the laceration. The oral ETT was withdrawn and a sterile circuit was connected to the ETT. The trachea was then safely repaired while maintaining adequate ventilation. Once the trachea was repaired, the cross-field tube was withdrawn by the surgeon and the oral ETT was advanced back into the trachea by the anaesthesiologist.

In literature, it is suggested that patients undergoing tracheal resection and reconstruction are allowed to emerge from general anaesthesia with the ETT or laryngeal mask airway (LMA) in place, with extubation in the operating room.<sup>9</sup> Therefore, we gradually weaned and extubated in operating room after achieving the prerequisites for extubation, which includes a thoroughly suctioned and dry oropharynx, complete return of neuromuscular function after reversal of the neuromuscular blocking agent (NMBA) by using train of four ratio on twitch monitor, optimal respiratory mechanics (typically achieved by elevating the head of the bed approximately 30 degrees), adequate spontaneous tidal volumes and respiratory rate, and full consciousness of the patient, so that he can protect his airway after extubation.

Tracheal trauma represents a high-risk acute condition with the potential to adversely affect the patient's ability to maintain an airway. A multidisciplinary approach and effective communication is the key to manage the repair of tracheal trauma. Any delay in definitive treatment may be associated with poorer outcomes.

#### PATIENT'S CONSENT:

The patient has given consent for clinical information to be reported in the journal.

#### CONFLICT OF INTEREST:

The authors declared no conflict of interest.

#### AUTHORS' CONTRIBUTION:

MSY: Primary anaesthesiologist/data collection/analysis/drafting/interpretation of data.

MP: Primary surgeon/data collection/analysis/drafting/interpretation of data.

SF: Primary surgeon/revised the draft/approve final version.

KS: Primary anaesthesiologist/revised the draft/approved final version.

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