

## **Management of a Self-Inflicted Laryngeal Injury**

Shehab Khashaba, MB, BCh\* Khadija AbuHassan MB, BCh, CABA\*\* Hiba Al-Reefy, MB, BCh, MRCS, DOHNS FRCS, ORL-HNS\*\*\* Eamon Tierney, MBBCh, FJFICMI, FFARCSI\*\*\*\*

**We present a case of deliberate self-inflicted trauma to the airway. The patient presented with a slit throat secondary to attempted suicide. The patient had a GCS score of 15 in the emergency department with an ability to maintain his own airway and phonation. A cuffed tracheostomy tube was inserted through the wound to maintain the airway. The patient had full wound exploration and repair of anterior tracheal wall. Repeat laryngoscopy and bronchoscopy was done postoperatively which revealed left vocal cord palsy which recovered completely after 2 weeks.**

---

\* Senior House Officer  
Department of Surgery

\*\* Senior Registrar  
Department of Anesthesia

\*\*\* Consultant Rhinologist  
Department of ENT

\*\*\*\* Director of Intensive Care and Consultant Anesthetist  
Associate Professor of Physiology and Critical Care, RCSI-MUB  
Department of Intensive Care  
King Hamad University Hospital  
Kingdom of Bahrain  
Email: shehab.khashaba@khuh.org.bh; eamon.tierney@khuh.org.bh

Cut-throat injury is a unique form of trauma that is potentially devastating and associated with significant airway problems as well as substantial emotional, physical and financial burden on the community and hospital resources<sup>1</sup>. The causes of throat injuries are usually due to gunshot or a knife wound either accidental, suicidal or homicidal.

Airway injuries are considered of utmost priority in the management of trauma. The American College of Surgeons in its Advanced Trauma Life Support (ATLS) program emphasizes the recognition of ventilatory compromise and accuracy of ventilations as being of primary importance<sup>2</sup>.

The neck is divided into three zones; zone I includes the thoracic inlet which extends up to the level of the cricothyroid membrane. Zone I and its injuries are treated by thoracic surgeon. Zone II extends from the cricothyroid membrane to the angle of the mandible. Zone III is above the angle of the mandible and treated as a head injury<sup>3</sup>.

In general, zone II wounds have a lower mortality because hemorrhage can be controlled with direct pressure and the anatomic structures are easily accessible for surgical exploration<sup>4</sup>.

Airway management in neck trauma is difficult for multiple reasons including injury to the airway and distortion of anatomical landmarks. Profuse bleeding might prevent visualization of the vocal cords at laryngoscopy. The use of emergency tracheostomy is usually performed as a rescue measure, but can be difficult in cases of low neck injury<sup>5</sup>.

The aim of this case report is to emphasize the need for proper and prompt airway management in laryngeal trauma cases.

## THE CASE

A twenty-seven-year-old man presented with a slit throat secondary to attempted suicide. The patient was awake, coherent and able to verbalize. On arrival, his heart rate was 102 BPM, blood pressure was 129/80 mmHg, respiration was 19 breaths per minute and oxygen saturation was 100% on room air.

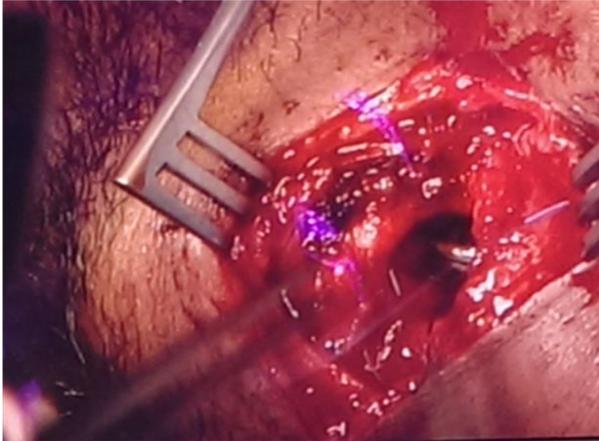
On inspection, 6 cm laceration was found at zone II of the neck associated with hesitation marks on the left side and exposure of the trachea, see figure 1. The patient was breathing through the wound as well as through his larynx, no active bleeding or large hematoma, see figure 1.



**Figure 1: Zone II Wound in the Neck**

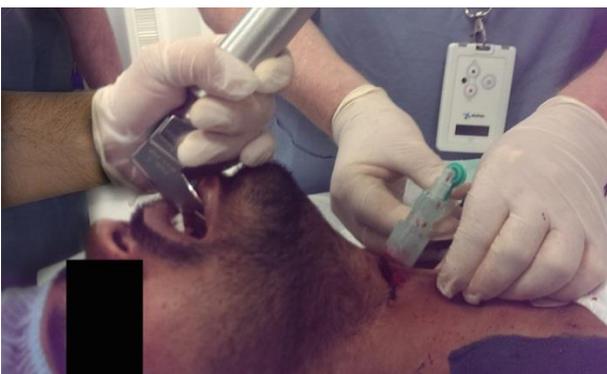
Cuffed tracheostomy tube was inserted through the wound. Pre-operative assessment by the anesthetist revealed that the patient was ASA 1E with long neck and a Mallampati score of 2, which suggests relative ease of intubation of the trachea by the oral route<sup>6,7</sup>. Transnasal flexible laryngoscopy was done and the vocal cords were seen to be fully mobile bilaterally. Anesthesia was then induced with the patient breathing oxygen and sevoflurane spontaneously through the tracheostomy tube. Endotracheal intubation was attempted, the trial failed due to the presence of laryngeal edema. The visualization of the larynx was judged to be a Cormack and Lehane level 2a, since the view with direct laryngoscopy had a full view of the arytenoid cartilages and a partial view of the glottis. This Cormack and Lehane score signifies an incidence of difficult intubation of 7% as investigated by Yentis and Lee in elective cases<sup>8</sup>.

Sixty cm gum elastic bougie (GEB) was used to aid endotracheal intubation. The bougie was placed between the vocal cords into the trachea, and the trachea was then intubated, with prior removal of the tracheostomy tube. The trachea was intubated with a size 7 endotracheal tube, which was then pushed distal to the tracheal laceration, see figure 2. Placement of the tube was confirmed by chest auscultation and by end-tidal carbon dioxide readings.



**Figure 2: Visualization of the ET Tube beyond the Laceration**

Surgical inspection revealed a deep-neck wound at the level of the sub-glottis, see figure 3. The platysma and strap muscles were divided by the injury. There were no injuries to the posterior wall of the trachea or to the superior laryngeal nerves as they were visualized intra-operatively. The vascular bundles of the neck bilaterally including the carotid artery jugular vein and thyroid arteries were intact. Repair of the trachea along with the strap muscles and platysma was done uneventfully. A flexible bronchoscopy was then performed through the endotracheal tube to ensure no distal airway injuries had been missed. The patient was kept electively intubated and transferred to the Intensive Care Unit; he was breathing spontaneously and was sedated with a remifentanyl infusion overnight.



**Figure 3: Maintenance of the Airway Using the Stoma during Intubation**

Prior to extubation, transnasal laryngoscopy and endotracheal bronchoscopy were repeated in the ICU. No signs of supraglottic injury, inflammation or surgical emphysema were noted

postoperatively. The patient was extubated and found to have regular breathing with the ability to phonate. On the third day, nasopharyngoscopy was repeated and the patient was found to have supraglottic edema with left vocal fold immobility with incomplete vocal folds closure. The patient was given dexamethasone for the prevention of edema preoperatively and this was continued during the postoperative period.

Flexible laryngoscopy was performed six days post-injury and the left vocal cord palsy was noted, but with patient able to phonate normally. At 2-week follow-up visit, flexible laryngoscopy was performed and both vocal cords were mobile.

## **DISCUSSION**

The key to saving the life of a severe trauma patient are definitive airway management, proper oxygenation, and stabilizing the circulation by early restoration of homeostasis as emphasized by Ono et al<sup>9</sup>.

Management of acute blunt and penetrating external laryngeal trauma has improved significantly post World War II due to early management of injuries, preservation of the airway and maintenance of normal and functional anatomy<sup>10-14</sup>.

The initial management of the airway in the emergency department is crucial to avoid hypoxia and to prevent blood and secretions entering the airway. Early management of the airway is crucial because any delay in securing an airway will result in edema, which would obscure the view at laryngoscopy and obstruct the airway<sup>2</sup>.

The use of dexamethasone in multiple doses decreases airway edema and the incidence of complications post extubation according to the Meta analysis by Fan et al who found that steroids decrease laryngeal edema after extubation by 62% and that of subsequent reintubation by 71% whether through single or multiple doses<sup>15</sup>.

Maintaining spontaneous breathing of the patient before, during and after intubation is an important factor in the management. Muscle relaxants are usually used to ease intubation, but in case of airway compromise, it could be deleterious to the patient due to difficulty in maintaining airway, risk of aspiration, and risk of emphysema<sup>16</sup>. Negative pressure ventilation in a patient with localized injury to the airway reduces the possibility of air tracking which might lead to wound dehiscence, pneumothorax, pneumo-mediastinum, subcutaneous emphysema and even pneumoperitoneum<sup>17-20</sup>. Khan et al described pneumothorax, and pneumoperitoneum occurring in a patient which could have been avoided by maintaining the patient on spontaneous ventilation<sup>17</sup>.

We deliberately kept the patient breathing spontaneously through the endotracheal tube post-operatively. The patient was maintained on a remifentanyl infusion to tolerate the endotracheal tube.

The patient was assessed daily by the ENT team and underwent repeated flexible nasal endoscopies to assess the mobility and status of his upper airway. Initial post-operative

assessment revealed right vocal cord paresis that was secondary to laryngeal bruising as the recurrent laryngeal nerve was not involved in the injury. The paresis recovered fully and the patient had fully mobile normal bilateral cords upon discharge with a normal voice.

## CONCLUSION

**A case of self-inflicted airway injury in a twenty-seven-year-old male was managed through multidisciplinary team approach where close collaboration between anesthetists and surgeons managed to secure the airway and repair the injury. The patient had a full recovery.**

---

**Author Contribution:** All authors share equal effort contribution towards (1) substantial contribution to conception and design, acquisition, analysis and interpretation of data; (2) drafting the article and revising it critically for important intellectual content; and (3) final approval of manuscript version to be published. Yes.

**Potential Conflicts of Interest:** None.

**Competing Interest:** None.

**Sponsorship:** None.

**Submission Date:** 7 July 2014.

**Acceptance Date:** 2 November 2014.

**Ethical Approval:** Department of Research and Ethics, King Hamad University Hospital, Bahrain.

## REFERENCES

1. Krug EG, Sharma GK, Lozano R. The Global Burden of Injuries. *Am J Public Health* 2000; 90(4):523-6.
2. American College of Surgeons. Advanced Trauma Life support (ATLS) Student Course Manual. 9<sup>th</sup> edition. Chicago, IL. 31-49.
3. Tisherman SA, Bokhari F, Collier B, et al. Clinical Practice Guideline: Penetrating Zone II Neck Trauma. *J Trauma* 2008; 64(5):1392-405.
4. Steinfeldt J, Bey TA, Rich JM. Use of a Gum Elastic Bougie (GEB) in a Zone II Penetrating Neck Trauma: A Case Report. *J Emerg Med* 2003; 24(3):267-70.
5. Ray DK. Anaesthesia in a Cut-Throat Injury. A Case of Unusual Airway Obstruction. *Anaesthesia* 1962; 17:363-7.
6. Daabiss M. American Society of Anaesthesiologists Physical Status Classification. *Indian J Anaesth* 2011; 55(2):111-5.
7. Mallampati SR, Gatt SP, Gugino LD, et al. A Clinical Sign to Predict Difficult Tracheal Intubation: A Prospective Study. *Can Anaesth Soc J* 1985; 32(4):429-34.
8. Yentis SM, Lee DJ. Evaluation of an Improved Scoring System for the Grading of Direct Laryngoscopy. *Anaesthesia* 1998; 53(11):1041-4.

9. Ono Y, Yokoyama H, Matsumoto A, et al. Surgical Airways for Trauma Patients in an Emergency Surgical Setting: 11 Years' Experience at a Teaching Hospital in Japan. *J Anesth* 2013; 27(6):832-7.
10. Schaefer SD. Management of Acute Blunt and Penetrating External Laryngeal Trauma. *Laryngoscope* 2014; 124(1):233-44.
11. Holinger PH, Johnston KC. Laryngeal Trauma and Its Complications. *Am J Surg.* 1959; 97(4):513-7.
12. Harris HH, Ainsworth JZ. Immediate Management of Laryngeal and Tracheal Injuries. *Laryngoscope* 1965; 75:1103-15.
13. Harris HH, Tobin HA. Acute Injuries of the Larynx and Trachea in 49 Patients. (Observations over a 15-Year Period). *Laryngoscope* 1970; 80(9):1376-84.
14. Curtin JW, Holinger PH, Greeley PW. Blunt Trauma to the Larynx and Upper Trachea: Immediate Treatment, Complications and Late Reconstructive Procedures. *J Trauma* 1966; 6(4):493-502.
15. Fan T, Wang G, Mao B, et al. Prophylactic Administration of Parenteral Steroids for Preventing Airway Complications after Extubation in Adults: Meta-Analysis of Randomised Placebo Controlled Trials. *BMJ* 2008; 337:a1841.
16. Massó E, Sabaté S, Hinojosa M, et al. Lightwand Tracheal Intubation With and Without Muscle Relaxation. *Anesthesiology* 2006; 104(2):249-54.
17. Khan MM, Ahmed SM, Shakeel M, et al. Complication Following Primary Repair of a Penetrating Bull Horn Injury to the Trachea. *J Emerg Trauma Shock* 2008; 1(2):123-5.
18. Kumar D, Farrell T, Tierney E. A Frightening Complication of General Anaesthesia for Paediatric Dental Extractions. *Pediatr Surg Int* 2007; 23(6):613-6.
19. Marty-Ané CH, Picard E, Jonquet O, et al. Membranous Tracheal Rupture after Endotracheal Intubation. *Ann Thorac Surg* 1995; 60(5):1367-71.
20. Xu X, Xing N, Chang Y, et al. Tracheal Rupture Related to Endotracheal Intubation after Thyroid Surgery: A Case Report and Systematic Review. *Int Wound J* 2014.