

Case Series

Role of Tracheostomy in Dealing with Penetrating Neck Trauma: A Double Edged Sword

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ABSTRACT

Background

Penetrating neck trauma is an injury in which platysma muscle in neck is breached. It is a life threatening emergency and it requires urgent management by securing airway and neck exploration. Tracheostomy is one of the important procedures as it secures the airway though associated with complications and morbidity in the patients.

Case Presentation

We present 3 cases of penetrating neck trauma. Each patient is managed by different means of securing airway depending on the site of trauma and associated laryngeal injury.

Conclusion

Tracheostomy in penetrating neck trauma helps in securing the airway and paves way for safe neck exploration. Minor laryngeal injuries are managed conservatively in order to avoid complications associated with tracheostomy. Tracheostomy and other means of airway management in penetrating neck trauma depend mainly on individualised approach though tracheostomy at a lower site to that of wound should be preferred in major laryngeal injuries.

Keywords: Penetrating Neck Trauma; Tracheostomy; Laryngeal Injuries; Airway Management.

INTRODUCTION

Penetrating neck injury is a life threatening emergency situation and it requires urgent management as neck has vital structures like laryngotracheal framework, major blood vessels, oesophagus, nerves.¹ Penetrating neck injury is defined as an injury in which platysma muscle in neck is breached.² The incidence of penetrating neck injury is about 5-10 % of all trauma cases with mortality rate being 3-6 %.³ The most common causes of penetrating neck injuries are road traffic accidents, stab wounds, ac-

cidental fall of sharp objects, firearm injuries. Vascular trauma occurs in 25% of cases mostly causes injury to carotid and subclavian vessels which may cause massive bleeding and death of the individual.^{4,5} Tracheobronchial injury accounts for 10-20% of penetrating neck injuries with mortality rate being 20%. Immediate airway management is required in these patients.³ The management requires multi-disciplinary approach involving anesthesiologist, otolaryngologist, cardiothoracic and vascular surgeons.

The importance of otolaryngologist is primarily to secure the airway which prevents mortality in the patients and secondarily to restore swallowing and phonation which helps in limiting morbidity in the patients.⁵ The signs of airway injury include change in voice, subcutaneous emphysema, bubbling from the wound, difficulty in breathing, stridor.² The immediate airway management can be done by orotracheal intubation in stable patients, intubation via the injury itself (temporary until definitive airway was established) or cricothyroidotomy or tracheostomy.⁶ Tracheostomy is done only when indicated as it is associated with complications associated with it and it affects the morbidity in the patient. Tracheostomy should be done in skeletal collapse, partial or complete transection of larynx or trachea or significant structural disruption in airway.²

Tracheostomy is one of the important procedures in reviving the patients with penetrating neck injury. Here we discuss the different approaches in managing the airway in the penetrating neck injury and the role of tracheostomy in these patients.

CASE 1

A 30 years male came to the emergency with stab injury to the anterior aspect of the neck with pocket knife. On examination there was a laceration $2 \times 2 \times 1$ cm present in the neck and subcutaneous emphysema around the wound. On exploration, there was injury over skin, subcutaneous tissue, platysma, bilateral anterior jugular vein and were repaired. There was also a tracheal rent over 3rd ring of trachea with posterior wall of trachea being intact (Figure 1). To secure the airway, 8mm tracheostomy tube was inserted through the rent with the help of tracheal dilator after freshening the margins of the rent. Endoscopic evaluation of larynx was done and vocal cords were normal and mobile. As tracheal injury was in the site of usual tracheostomy site and endoscopic evaluation was normal we did not go for tracheostomy in another site. Repeat endoscopic evaluation was done after 4 days and found to be normal, Patient was decannulated and patient was discharged. After 15 days of discharge, he came with complaints of swelling over neck which occurred only on phonation (Figure 2). On radiological evaluation there was a pocket of air around the trachea. As it may be due to air leak from the stoma site, we planned for conservative management and he was advised absolute voice rest to reduce subglottic pressure while phonation and pressure dressing was done. Patient was reviewed after 10 days and found that the swelling was not there and wound was healthy.

Figure 1. Case 1 with tracheal rent (*) through which tracheostomy tube inserted.



Figure 2. Swelling in the wound site while phonation in case 1.



CASE 2

A 25 years male came with laceration $10 \times 4 \times 5$ cm in the anterior aspect of neck caused by fall over sharp object in a road traffic accident. Patient had voice change, difficulty in breathing and air leak from the wound. Emergency tracheostomy was done with incision given lower to that of the wound to secure the airway (Figure 3). CT- angiography was done and there were no major vascular injury noted. Neck exploration was done under GA and found that there was injury to strap muscles, hyoid bone (fracture), suprahyoid muscles, base of tongue and floor of the mouth. Bilateral Submandibular glands were exposed, but there was no injury to the glands. Fractured hyoid bone was aligned and sutured. Base of tongue and floor of mouth lacerations were sutured. Strap muscles, suprahyoid muscles were sutured and wound was closed. Laryngeal and vocal cord assessment done with FOL (Fibre Optic Laryngoscopy) on POD5 and found to be normal. Patient was decannulated and discharged.

Figure 3. Case 2 in which emergency tracheostomy done lower to that of wound to secure the airway and then neck exploration was done



CASE 3

A 40 years male came to the emergency department with history of suicidal injury to the neck with sharp blade. There were 2 lacerations of size 6x4x2cm in the region of thyroid notch and 3 × 1 × 1 cm present above the former (Figure 4). There were no voice changes, difficulty in breathing. Endoscopic evaluation of larynx was done and there were no inner mucosal injury in the larynx and trachea. Patient was intubated and wounds were explored. There was injury to skin, subcutaneous tissue, platysma, strap muscles, anterior jugular vein on left side and linear undisplaced fracture over anterior aspect of thyroid cartilage just below the notch in the first wound and only skin, subcutaneous tissue and platysma in the second wound. Cut ends of anterior jugular vein were ligated. Strap muscles and skin were sutured. Patient was discharged.

Figure 4. Case 3 with two lacerated wound in the neck with no air leak.



DISCUSSION

Roon and Christensen classified Neck into 3 zones which help in assessing the severity and in the management of neck injury.

Zone 1: Between the sternal notch/ clavicle to the lower border of cricoid cartilage. Trachea, oesophagus, great vessels, lung apices, thoracic duct lies in it. It has the highest mortality.

Zone 2: Between the cricoid cartilage to the angle of mandible. Larynx, pharynx, trachea, jugular veins, oesophagus, carotid arteries are involved in this zone. It is the most commonly involved in penetrating neck injuries.

Zone 3: Between the angle of mandible to the base of the skull. Carotid and vertebral arteries, jugular veins.^{7,8}

Though zone 2 is more common, mortality in this zone is less because neck exploration is readily accessible and zone 1 and 3 have difficult anatomical assessability.^{2,8} All 3 cases in this study involved are zone 2 and there was no mortality in any of the cases.

There is male predominance in penetrating neck injuries and is given in most of the articles and mainly attributed to violent behavior and other physical activities.^{5,7}

Laryngotracheal trauma was classified by Schafer- Fuhrman into 5 groups namely:

1: Minor endolaryngeal lacerations or hematomas; conservative management with humidified oxygen, antibiotics and observation in intensive care unit.

2: Mucosal oedema, hematoma without exposed cartilage, nondisplaced fracture; tracheostomy and panendoscopy is needed.

3: Massive oedema, large mucosal lacerations, exposed cartilage, displaced fractures, vocal cord paralysis; treatment is tracheostomy followed by surgical exploration and repair.

4: Similar to Group 3 but more severe disruption, unstable fracture or more than 2 fracture lines; treatment is emergency tracheostomy followed by surgical repair (possible stent placement).

5: Complete laryngeal separation; treatment is emergency tracheostomy followed by surgical repair including stent placement.⁹

Tracheostomy is one of the most important procedure done in penetrating neck injuries as it caters airway compromise and post-operative oedema.⁵ Tracheostomy itself may lead to long term laryngotracheal complications like subglottic stenosis, granulation, tracheostomy oesophageal fistula, etc., and constant care and suctioning of the tube. Hence it should be performed only when indicated.²

In previous studies, they had secured the airway by inserting the endotracheal tube through the open part of trachea for ventilation. This method of securing the airway is not preferred nowadays as there is risk of complete transection in partial tracheal injury patients.^{2,5} Here, case 1 belongs to group 3 so we did tracheostomy and introduced the tube through the rent in the trachea to secure the airway. As the tube seals the rent and there were no air leak or difficulty in breathing and the rent was also present in the 3rd tracheal ring which is usually the site for tracheostomy we did not go for tracheostomy in the lower trachea. Though the patient came with complaints of swelling over wound while phonation it was managed conservatively by voice rest to reduce subglottic pressure and pressure dressing. Both helped in sealing the stoma in the trachea.

Case 2 also belongs to group 2 of classification. In this case we did emergency tracheostomy at a site lower to that of the wound in 2-4th tracheal ring as revealed in most of the studies.^{1,2,7} This technique is preferred in laryngeal injuries as other methods of securing airway like intubation may further injure the larynx and it helps in laryngotracheal repair. After securing the airway, neck injury was explored and repaired.

Case 3 had minimal thyroid cartilage undisplaced fracture with intact mucosa and so tracheostomy was not done in this patient. Recent studies prefer conservative management for minor laryngeal injuries as they avoid morbidities associated with surgical airway management. They can be managed with head end elevation, voice rest, steroids and constant monitoring of wound and saturation. If the patient developed any complications emergency surgical intervention should be done. In a study by Juutilainen et al, out of 33 cases 20 patients (61%) were treated conservatively.¹⁰

In a study by Vishwanatha et al, zone 1 injuries are involved in 6 patients, zone 2 in 34 patients and zone 3 in only 2 patients. Out of which 40 patients underwent emergency tracheostomy and neck explo-

ration. They also added that there was no uniform method in managing airway in penetrating neck injury and tracheostomy should be preferred under local anesthesia if possible. Any blind attempt of intubating trachea should be avoided as there is risk of laryngeal disruption.

A study concluded that group 2 and above in Schaefer-Fuhrman classification of laryngeal trauma needs tracheostomy whenever possible and endotracheal intubation should not be done for these patients. He added that for penetrating neck injuries first secure the airway, then do endoscopic evaluation of aerodigestive tract and imaging modalities if possible and then do neck exploration. Early intervention helps in better voice outcomes in this patients.¹¹

The hard sign in penetrating neck injury requires immediate exploration. They include airway compromise, hoarseness, stridor, shock, expanding Hematoma, pulsatile bleeding, difficulty or pain when swallowing and neurological deficits.² First two cases had hard signs and there were immediately explored.

Endotracheal intubation can be done when laryngotracheal injury was suspected but it should be done cautiously like case 3. If available it should be done under direct visualization with fiberoptic laryngoscopy. Only if intubation is not suitable or feasible, surgical airway is necessary as done in case 1 and 2. Tracheostomy not only helps in securing airway it may facilitate laryngotracheal repairs.¹²

CONCLUSION

Tracheostomy is a life saving emergency procedure in penetrating neck injury. It helps in securing the airway and also paves way for surgical exploration of the wound. It is also associated with postoperative complications. Hence there is also ambiguity in indication and site of tracheostomy in penetrating neck injury. Tracheostomy should be preferred only in case of failed intubation and major laryngeal injuries. We recommend tracheostomy at a lower site to that of penetrating neck wound in securing the airway and thus allows the surgeon to do endoscopic and radiological assessment of the wound and plan for wound exploration and repair.

CONFLICTS OF INTEREST

None.

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