

Primary Management and Outcome – Open Laryngotracheal Trauma

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ABSTRACT

Acute external injury to the larynx is both life threatening and a potential long term management challenge. As Otorhinolaryngologist we must be prepared and well versed to manage these patients. In our study seven patients of open laryngeal traumas were managed by primary closure. In five patients nature of injury was known in other two patients exact nature of injury was not known. After primary closure five patients with known injury survived and two patients with unknown injury died. As per our experience, we recommend primary closure, if the exact nature of injury is known as the outcome is definitely favourable.

Keywords: Acute external injury, Larynx, Tracheostomy

INTRODUCTION

The incidence of laryngotracheal trauma is 1 in 30,000 admissions to emergency departments [1]. Neck wounds that extend deep to the platysma are considered penetrating injuries. Penetrating neck injuries comprises 5–10% of all trauma cases that present to the emergency department and result in significant mortality [2,3]. Among penetrating neck injuries external injuries to the larynx threaten both the quality and maintenance of life [4] so its management requires a logical approach with swift assessment of the adequacy of airway and circulation. Essential to the preservation of the phonatory and protective respiratory functions of the larynx is restoration of its skeletal framework, ligaments, muscles, and epithelial covering. Laryngeal trauma may also affect children, though paediatric laryngeal injuries are much less common than adult injuries, since the paediatric larynx sits much higher in neck than adult larynx and is therefore better protected by mandible [5].

CASE SERIES

Case 1

A 24-year-old female presented to the casualty with alleged history of assault by using knife on neck five hours earlier. Informant was the father. Multiple lacerations over neck and face, shoulder were present, out of which the largest wound was on neck extending from right sternocleidomastoid to left sternocleidomastoid horizontally and obliquely towards the left angle of mandible measuring approximately 15×3 cm [Table/Fig-1a]. Trachea was exposed and air leak was present through the defect [Table/Fig-1a]. There was no free bleeding, no swelling over neck and no obvious cervical spine injury. Patient was immediately shifted to operation room, airway secured by doing low tracheostomy below the defect. Then on exploration of the neck wound, all major vessels of the neck were found to be intact. Thorough saline wash was given and then debridement of wound with primary closure was done. A defect over anterior trachea found, was closed primarily using 3-0 vicryl [Table/Fig-1b] and then the neck wound was closed in layers, skin was sutured using 3-0 Ethilon [Table/Fig-1c]. Nasogastric tube was inserted and patient was put on antibiotic treatment. On day 14th sutures were removed and tracheostomy tube was changed to Fullers tracheostomy tube no.30, patient was able to talk afterwards.



[Table/Fig-1]: a) Exposed trachea with defect; b) Repair of the tracheal defect; c) Primary closure; d) On follow up.

Nasogastric tube was removed on 21st day. Patient was discharged after that and follow up was done after one week [Table/Fig-1d].

Case 2

A 34-year-old female, with unknown nature of injury, presented with wound over neck to casualty, accompanied by her husband. The laceration was extending from right sternocleidomastoid to left sternocleidomastoid and had irregular margins. Trachea and larynx were exposed with tissues loss [Table/Fig-2]. Air leak was present from the defect in trachea. SpO₂ was 96% and patient was haemodynamically stable. Then patient was shifted to OT. Tracheostomy was done, on exploration of the wound above findings were confirmed, there was loss of anterior cricoid cartilage lamina and anterior portion of first tracheal ring. Vocal cords were damaged, major vessels of the neck were found to be intact and no swelling noted in neck, strap muscles were cut. Thorough saline wash was given and debridement of the wound and primary closure was done. Tracheal and cricoids cartilage defect was repaired using patients auricular conchal cartilage and sutured with 3-0 vicryl.

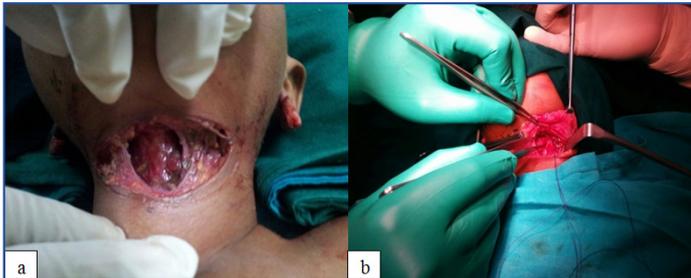


[Table/Fig-2]: Exposed trachea and larynx with loss of the anterior lamina of cricoids cartilage and the first tracheal ring.

Remaining wound was sutured in layers. Patient was then put on ventilator. Patient died after 48 hours of procedure.

Case 3

A three-year-old male child was brought to the casualty by parents with history of unknown animal bite on neck with a cut lacerated wound on anterior part on neck [Table/Fig-3a]. Informant was parents. Patient was drowsy at the time of examination. SpO₂ was 94% on 4 lit of oxygen. Child was shifted to OT and was intubated using 4.5 sized uncuffed endotracheal tube. Thorough exploration of wound was done. Major vessels were intact, strap muscles were cut, thyroid membrane was ruptured and thyroid cartilage was lacerated on the left lateral aspect [Table/Fig-3b]. There were multiple small abrasions all over the body. Thorough saline wash was given and then debridement of wound and primary closure was done. The neck wound was closed in layers after closing the cricothyroid

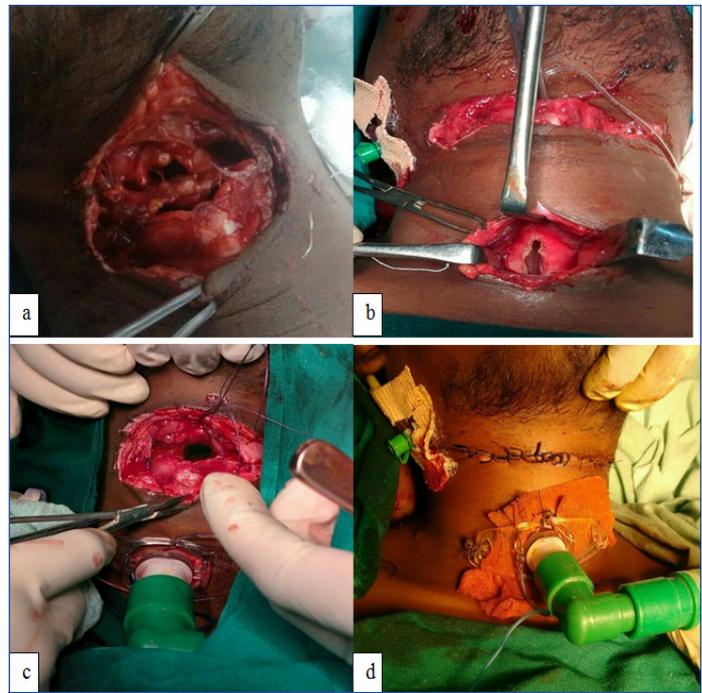


[Table/Fig-3]: a) Laceration with exposed thyroid cartilage with defect; b) Closure of the defect.

laceration, strap muscles were closed using 3-0 vicryl, neck wound closed using 3-0 monocryl and patient was kept on ventilator for 48 hours. Patient died after 48 hours of procedure.

Case 4

A 24-year-old male reported to the casualty with alleged history of assault by using sharp object on the neck within 2 hours of injury. Informant was brother. On examination a laceration extending from anterior border of one sternocleidomastoid muscle to other, approximately measuring 7×5 cm, platysma and strap muscles were cut in the midline, thyroid and cricoids cartilage were exposed [Table/Fig-4a]. There was a defect in middle of thyroid cartilage, vocal cords were exposed. He had three episodes of vomiting after injury. He was haemodynamically stable. He was shifted immediately to operation theatre and awake intubation done through exposed vocal cords under local anaesthesia and airway was secured by doing tracheostomy [Table/Fig-4b] and then thorough inspection of the wound was done. Major vessels of a neck were found to be intact, no swelling noted in neck. Primary closure of the thyroid cartilage is done using 3-0 vicryl [Table/Fig-4c] and wound was closed in layers. Skin closure was done using 3-0 Ethilon [Table/Fig-4d]. Then patient was put on ventilator for 48 hours, patient finally could be discharged home.



[Table/Fig-4]: Laceration with thyroid cartilage defect; b) Endotracheal tube passed through exposed vocal cords; c) Repair of thyroid cartilage; d) wound closure with tracheostomy tube.

Case 5

A 45-year-old female was brought to the casualty with history of self trauma to neck using blade within an hour after injury. Informant was daughter. Patient was known case of leprosy. On examination two different lacerations were noted, upper one being superficial and the lower one deep with exposed thyroid cartilage having defect, air leak was present through the defect. Lower laceration was extending from anterior border of left sternocleidomastoid muscle crossing midline and approximately measuring 6×3cm [Table/Fig-5a]. She was haemodynamically stable. There was history of two episodes of vomiting after trauma. Ryle's tube insertion was done. She was shifted immediately to operation theatre. Then thorough inspection of the wound was done. Major vessels of the neck were found to be intact, no swelling noted in neck. Primary closure of the thyroid cartilage



[Table/Fig-5]: a) Exposed thyroid cartilage with defect; b) Primary closure.

is done using 3-0 vicryl and wound was closed in layers. Skin closure was done using 3-0 Ethilon [Table/Fig-5b]. Patient finally could be discharged home.

Case 6

A 29-year-old male was brought to the casualty with alleged history of assault by sharp object on the neck within an hour of injury. Informant was the brother. On examination a laceration extending from the anterior border of one sternocleidomastoid muscle to other, approximately measuring 8×3cm, platysma and strap muscles were cut in the midline, thyroid cartilage was exposed [Table/Fig-6a] with defect. Air leak was present through the defect. He was

haemodynamically stable. He was shifted immediately to operation theatre. Airway was secured by doing tracheostomy and then thorough inspection of the wound was done. Major vessels of the neck were found to be intact, no swelling noted in neck. Primary

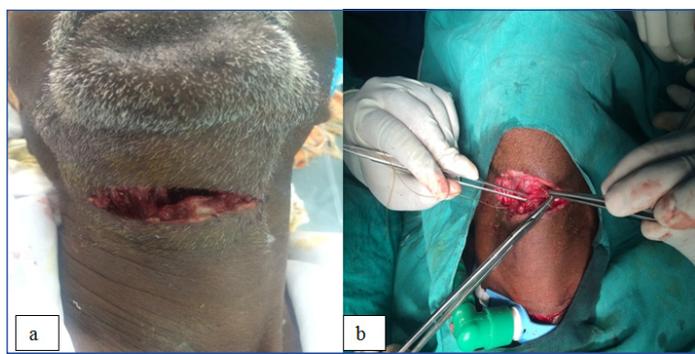


[Table/Fig-6]: a) Laceration with thyroid cartilage defect; b) Closure of the defect.

closure of the thyroid cartilage is done using 3-0 vicryl [Table/Fig-6b] and wound was closed in layers. Skin closure was done using 3-0 Ethilon. Then patient was put on ventilator for 48 hours, patient finally could be discharged home.

Case 7

A 55-year-old male brought to casualty with history of assault using knife within 3 hours of injury. Informant was son. On examination a laceration extending from anterior border of one sternocleidomastoid muscle to other, approximately measuring 8x4cm platysma and strap muscles were cut in the midline. Thyroid cartilage was exposed and had defect with air leak [Table/Fig-7a]. He was haemodynamically stable. He was shifted immediately to operation theatre, airway was secured by doing tracheostomy and then thorough inspection of the wound was done. Major vessels of neck were found to be intact, no swelling noted in neck. Primary



[Table/Fig-7]: a) laceration with thyroid cartilage defect; b) closure of the defect.

closure of the thyroid cartilage is done using 3-0 vicryl [Table/Fig-7b] and wound was closed in layers. Skin closure was done using 3-0 Ethilon Then patient was put on ventilator for 48 hours, patient finally could be discharged home.

DISCUSSION

Injuries of larynx and trachea can be grouped into direct and indirect trauma, according to patho-mechanism [6]. Direct trauma constitutes blunt extra-luminal causes of trauma, blunt intra-luminal causes of trauma, sharp extra-luminal cause of trauma, sharp intraluminal causes of trauma, endolaryngeal mucosal lesion.

To ascertain the severity of injury, rapidly identifying patients who require immediate airway intervention are the most important aspects of examining a patient with suspected laryngeal trauma [4]. This can be a challenge, since relatively minimal signs and symptoms may mask severe injury that has not yet reached a critical level of obstruction. A second survey should be carried out to check for symptoms and signs of subcutaneous emphysema, hoarseness,

stridor, loss of normal thyroid prominence, haemoptysis, deviation of larynx, loss of laryngeal crepitus and respiratory distress and external injuries to the neck [7].

Signs of airway distress, like dyspnoea and stridor, require immediate assessment and if necessary, a tracheostomy should be established, where possible. Vocal quality should be noted, and the patient should be questioned about changes in voice. The neck and upper chest should be palpated for subcutaneous emphysema, and the larynx and trachea should be palpated for tenderness and crepitus. Whenever, laryngotracheal injury is suspected, intubation should be carried out with great care as further damage to the airway may occur and false passages can be created. Controlled tracheostomy under local anaesthesia is always preferred.

If larynx and trachea is exposed or there is complete laryngotracheal separation then these patients will present with severe respiratory distress and require tracheostomy. Performance of tracheostomy can be extremely difficult due to altered anatomy. And most of such patients also have bilateral vocal cord paralysis due to stretching or tearing of the recurrent laryngeal nerves. If the severed ends of the nerve can be located, they should be repaired primarily [5].

The following injuries will require surgical repair - disruption of anterior commissure, major endolaryngeal lacerations, tear involving vocal cords, immobile vocal cord, cartilage exposure, displaced cartilage fractures, arytenoids subluxation or dislocation.

In the present series, laceration in all the patients was almost extending from right sternocleidomastoid to left sternocleidomastoid muscle and neck strap muscles were cut. In five patients thyroid cartilage was exposed and had defect. In two patients injury to trachea was present. Cricoid cartilage defect was present in two patients. Vocal cords were damaged in two patients. None of the patients had injury to major vessels of the neck. Among these patients, one patient had extensive loss of soft tissue along with anterior lamina of cricoid cartilage and first tracheal ring was absent. Thorough cleaning of wound and debridement was done in all the cases. In five patients, tracheostomy was done to secure the airway. Primary closure of the cartilage defect was done in all the cases using absorbable suture material, only in one patient with cartilage loss, the defect was closed using conchal cartilage graft. All the patients with tracheostomy were put on ventilator for 48 hours and antibiotic treatment. After primary closure five patients with known injury survived and two patients with unknown injury died.

Konobu T et al., reported four cases with fresh laryngotracheal injury due to penetrating neck trauma. They performed laryngotracheoplasty by absorbable material within eight hours after trauma. Two patients underwent tracheostomy at the lower level of the laryngotracheal injury. Three cases were extubated successfully and discharged without major airway problem. One died due to haemorrhagic shock. They concluded that penetrating laryngotracheal trauma should be considered as a serious airway injury which may be hidden under the superficial small wounds. Also, rapid local wound exploration and laryngotracheoplasty is important for saving life [8].

CONCLUSION

Acute external injury to the larynx is uncommon and life threatening with a long-term management challenge. As per our study we recommend primary closure, if the exact nature of injury is known as the outcome is favourable. However further studies are required with large sample size.

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