

Comminuted Laryngeal Fracture Following Blunt Trauma: A Need for Strict Legislation on Roads!

Shraddha Jain, Pragya Singh, Minal Gupta, Bhavna Kamble, Suresh S. Phatak¹

Departments of Otorhinolaryngology and Head and Neck Surgery and ¹Radiodiagnosis, Jawaharlal Nehru Medical College, DMIMSU, Wardha, Maharashtra, India

Abstract

Laryngeal fracture is a rare condition with potential life-long implications related to airway patency, voice quality, and swallowing. Rarity of the condition leads to lack of consensus on the most suitable way to manage this injury. The mode of injury can be prevented by strict legislation on the roads. We report a case of a 28-year-old Indian male who sustained a comminuted displaced fracture of the thyroid cartilage with disruption of anterior commissure due to blunt trauma caused by the metallic side rod of a ladder projecting from the rear of a vehicle in front of the bike on which he was riding. He presented with breathing difficulty, change in voice, surgical emphysema, and pneumomediastinum, but without any skin changes over the neck. His airway could be restored due to early tracheostomy and open reduction with internal fixation with sutures along with laryngeal stenting. He has no significant swallowing or breathing problem and reasonably good voice 6 months after surgery. This case highlights the need for strict legislation on roads in India and the importance of high level of suspicion for laryngeal fracture in acute trauma patient. Early identification and timely internal fixation not only restore the airway but also improve long-term voice and airway outcomes.

Keywords: Laryngeal injury, laryngeal trauma, pneumomediastinum, road traffic accident, thyroid cartilage fracture

INTRODUCTION

Laryngeal fracture is a rare condition with potential life-threatening and lifelong implications related to airway patency, voice quality, and swallowing. Its reported incidence is 1 in 30,000 patients who present to the emergency department of severe trauma centers.^[1-5] Many laryngeal fractures go undiagnosed or have a delayed referral because of the uncommon nature of this injury along with a low index of suspicion on the part of attending physicians.^[2,6,7] Rarity of the condition leads to lack of consensus on the most suitable way to manage this injury. Even when laryngeal fractures are diagnosed, the management is often poor, leading to significant problems with airway patency, voice production, and swallowing.

We report a case of a comminuted laryngeal fracture in a young male. This case highlights that the presence of pneumomediastinum with normal skin appearance over neck, may be misleading and a severe laryngeal injury may not be suspected initially.

CASE REPORT

A 28-year-old Indian male was riding a bike when a horizontal

metallic rod of a ladder projecting from the rear of a vehicle in front of his bike hit against the anterior part of his neck due to sudden brake by a front vehicle. He lost his control and sustained blunt trauma to the neck. He was brought to the emergency department with breathing difficulty and inability to speak. On examination, he had surgical emphysema over neck and chest and a lacerated wound over the left parotid region. There was no sign of external trauma over larynx in the form of swelling, laceration, or bruising. The patient was unable to speak and had stridor in lying down position. Since a laryngeal injury was suspected on the basis of mode of injury, tracheostomy was done. X-ray chest revealed pneumomediastinum. The wound over parotid developed salivary collection which was drained and pressure dressing applied. Computed tomography (CT) scan of the neck was obtained after 3 days after general condition of the patient stabilized. It revealed a comminuted fracture of

Address for correspondence: Dr. Shraddha Jain,
Department of Otorhinolaryngology and Head and Neck Surgery,
Jawaharlal Nehru Medical College, DMIMSU, Sawangi, Wardha - 442 004,
Maharashtra, India.
E-mail: sjain_med@yahoo.co.in

Access this article online

Quick Response Code:



Website:
www.amsjournal.com

DOI:
10.4103/ams.ams_60_15

This is an open access article distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 3.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as the author is credited and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Jain S, Singh P, Gupta M, Kamble B, Phatak SS. Comminuted laryngeal fracture following blunt trauma: A need for strict legislation on roads!. *Ann Maxillofac Surg* 2017;7:124-8.

the left lamina of the thyroid cartilage with two fracture lines, one vertical in midline displacing the left lamina and other horizontal in the left thyroid lamina along with chip fracture of cricoid displacing the arytenoid anteromedially [Figures 1 and 2]. Preoperative videolaryngoscopy showed narrowed glottic chink even on deep inspiration and gap between the anterior commissure and vocal cords fallen back [Figures 3 and 4]. Based on endoscopic and CT findings, the laryngeal injury was graded as SF Grade IV [Table 1]. He was taken to the operating room and underwent an open reduction and internal fixation (ORIF) of the thyroid cartilage with 4–0 prolene sutures [Figures 5 and 6]. Plate fixation was not possible as the cartilage was soft and tight screw fixation was not possible [Figure 6]. Mucosal tears were sutured with 6–0 vicryl. Vocal cords had fallen back and were resuspended with 4–0 vicryl to external perichondrium of thyroid cartilage. Endolaryngeal stenting was done with 3.5 mm long polyvinylchloride (PVC) endotracheal tube of 6 mm external diameter and closing the top end by sutures to prevent aspiration [Figure 7]. The portion of the tube approximating the true and false cords was narrowed with a clamp. The stent was positioned to extend up through the true and false vocal cords and inferiorly to first tracheal ring and secured with 4–0 prolene sutures that traversed the

stent superiorly through the laryngeal ventricle and inferiorly through the cricothyroid membrane. The sutures were passed through the strap muscles laterally and then through a button, secured to the skin to be removed later at the time of stent removal. Injectable antibiotics – piperacillin and tazobactam, gentamicin, and clindamycin along with dexamethasone – were given along with nebulization with acetylcysteine and adrenalin to decrease secretions and edema. After 11 days, stent removal was done by direct laryngoscopy. Videostroboscopy performed 2 weeks after the event showed reduced left vocal cord mobility with normal anterior commissure and reasonably patent glottic chink [Figure 8]. He had slight aspiration problems initially which he overcame by swallowing maneuvers. There is no significant swallowing or breathing problem after 6 months with persistent mild hoarseness of voice, for which he is receiving speech therapy.

Table 1: Severity of laryngeal injury (Schaefer Fuhrman's classification)

Group	Injury
I	Minor endolaryngeal hematoma without detectable fracture
II	Edema, hematoma, minor mucosal disruption without exposed cartilage, and nondisplaced fractures
III	Massive edema, mucosal disruption, exposed cartilage, vocal fold immobility, and displaced fracture
IV	Group III with disruption of anterior larynx, unstable fractures, two or more fracture lines, or massive trauma to laryngeal mucosa
V	Complete laryngotracheal separation

DISCUSSION

Laryngeal fracture is a rare type of injury.^[2,7] Blunt external trauma to the neck has been reported to be a more common cause of laryngeal fracture as compared to penetrating trauma.^[3,4] The mortality rate in laryngeal fracture caused by blunt trauma has been reported to be higher than 40%, whereas that for penetrating trauma has been reported to be lower than 20%, reflecting greater severity of injury in blunt trauma.^[5,6] Blunt injury can result from motor vehicle accidents, sports-related trauma, assault, and strangulation.^[3,7] The major cause of laryngeal fracture is a direct anterior impact on the larynx in a motor vehicle accident. Automobile accidents, as a cause of anterior blunt laryngeal injury, are in general decreasing due to seat belt laws, front seat airbag, lower speed limitation, and improved legislation regarding drunken driving; however, laryngeal trauma due to two-wheelers seems to be increasing.^[8] In case of a rear-end collision, the passenger and the driver are hit from behind causing neck hyperextension and forward propulsion. Clothesline injuries can occur when the rider of a two-wheeler

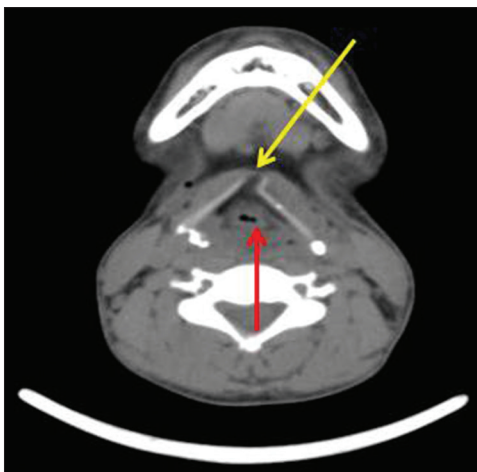


Figure 1: Computed tomography - larynx (axial section) showing comminuted fracture of the left thyroid lamina with disruption of the anterior commissure (yellow long arrow) and narrowed lumen of larynx (red small arrow), due to falling back of vocal cords

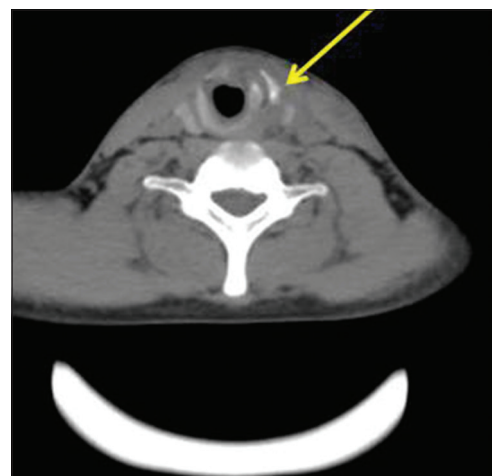


Figure 2: Computed tomography - larynx (axial section) showing triangular chip fracture of cricoid cartilage on the left side (yellow arrow)



Figure 3: Preoperative videolaryngoscopic picture showing narrowed glottic chink on deep inspiration (red arrow) and the gap between anterior commissure and vocal cords fallen back (black solid arrow)



Figure 4: Preoperative videolaryngoscopic picture showing closed glottis on phonation (red arrow)

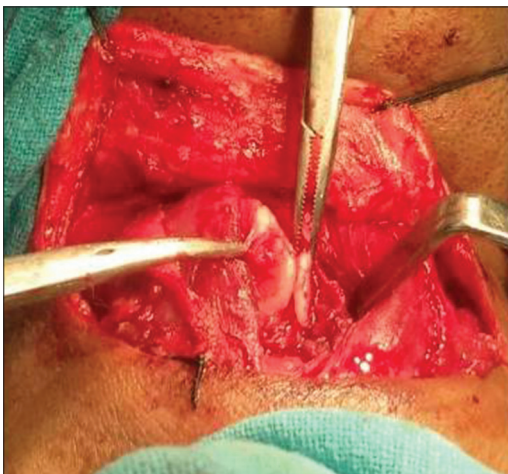


Figure 5: Preoperative photograph showing vertical fracture line in midline of thyroid cartilage passing through anterior commissure; after reduction and realignment of the fracture fragments

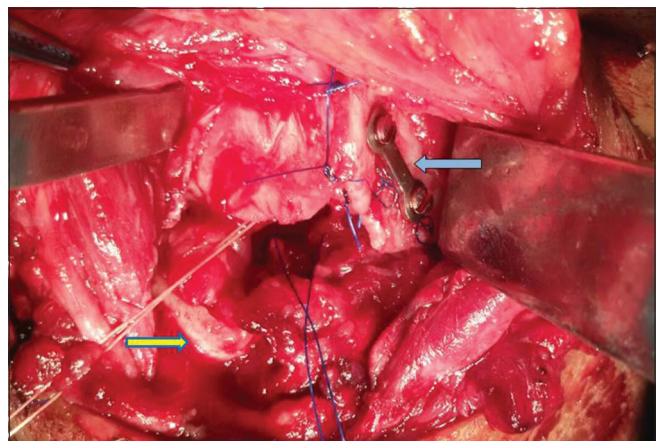


Figure 6: Preoperative photograph showing prolene sutures applied to the two fracture lines; plate application was attempted (blue arrow), but screws could not be tightened and had to be removed; cricoid chip fracture fragment can be seen (yellow arrow)

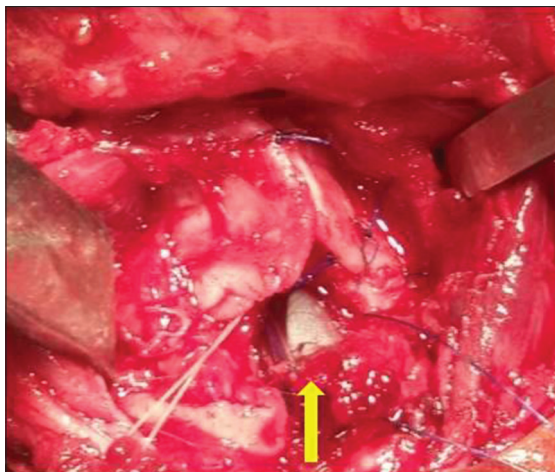


Figure 7: Preoperative photograph showing endotracheal stent (endotracheal tube) held by prolene sutures (yellow arrow)

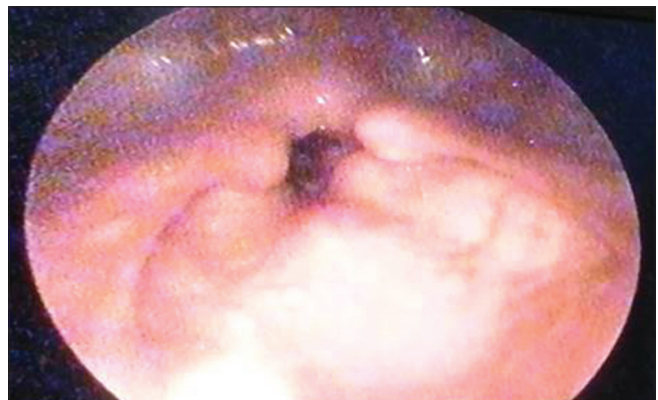


Figure 8: Postoperative videolaryngoscopic picture showing reasonably good glottic chink and realigned anterior commissure

encounters a fixed horizontal object stretching across his path. In such injuries, a large amount of energy is applied to a small

area of the neck and can result in severe degree of damage to thyroid and cricoid cartilage and cricotracheal separation may also result. Our patient had a clothesline type of injury with a similar mechanism but with probably greater impact as the front vehicle stopped suddenly. The mode of injury that occurred in our patient is very rare and could have been

avoided by strict legislation on roads regarding carrying projecting objects on vehicles.

Laryngeal fracture can result in great variability in clinical findings ranging from normal to severe airway collapse and death.^[3] It has been emphasized by various authors that in case of blunt laryngeal trauma, the diagnosis of an injured airway may be missed initially as it is hidden beneath the intact skin and symptoms on admission do not always correlate with the degree of internal injury.^[3,8,9] This was the case in our patient when he sustained comminuted fracture of thyroid cartilage and disruption of anterior commissure with chip fracture of cricoid cartilage (SF Grade IV) without any skin changes [Table 1]. In blunt trauma cases, the thyroid cartilage and the front area of the cricoid cartilage, being relatively protruded, bear the major burden of impact and hence, are frequent injury sites.^[5] We feel that this could be a possible explanation for sparing of the vessel injury and hence relative lack of skin changes. In our patient, such a severe injury was not expected from external skin appearance. The only symptoms were hoarseness of voice, dyspnea, and surgical emphysema. The symptoms of laryngeal fracture that have been reported include hoarseness, dysphagia, odynophagia, anterior neck pain, dyspnea, stridor, cough, and hemoptysis. Clinical findings comprise ecchymosis, hematoma, neck wound, pain, surgical emphysema, and cracking on palpation.^[1-5,7-11] The normal appearance of skin over neck along with the rare presence of pneumomediastinum, as in our case, can delay the diagnosis of laryngeal fracture. The patient in such a situation is initially managed in an Intensive Care Unit (ICU) by a general surgeon, and lung injury is suspected as a cause of pneumomediastinum. It should be borne in mind that the pneumomediastinum can also result from the airway dissection through fractured thyroidal cartilages with negative pressure of the thorax, and hence, CT scan of the neck should be undertaken. Recognizing any kind of laryngotracheal trauma, in general, can be difficult because approximately one-third of patients are thought to be asymptomatic at initial presentation, with symptoms and signs developing over a 24–48-h period.^[9] Hence, knowing about the mode of trauma and having a high index of suspicion are very important to be able to diagnose laryngeal fracture.

A CT scan of the neck is a gold standard investigation for diagnosing and grading this type of injury for management planning.^[2-4,7] Management depends on the type and severity of injury. Minor endolaryngeal lacerations and abrasions may be managed conservatively, whereas major endolaryngeal soft tissue injury (vocal ligament avulsion, epiglottis detachment, and arytenoid dislocation) is managed either through thyrotomy or endoscopically.^[8,12] Laryngeal skeletal fractures require internal fixation. Nondisplaced fractures can be managed nonoperatively or better with internal fixation, but displaced fractures should always undergo ORIF with sutures or plates, as soon as possible.^[1-4,8,12] Butler *et al.* found better outcomes for voice and airway function with early treatment within 48 h, as compared to delayed treatment.^[7] Endolaryngeal stenting is reserved for comminuted fractures and where the

anterior commissure is significantly disrupted (SF Grade IV and above). In these cases, the stent helps maintain the proper configuration of the commissure and prevent anterior glottic webs.^[8,12] For stenting, various options are available, but soft materials are preferred for longer duration.^[8] We used PVC endotracheal tube for only small time.

In acute setting of laryngeal trauma, both endotracheal intubation and tracheostomy have been recommended as a means of maintaining airway patency. Intubating a patient who has sustained a severe degree of laryngeal trauma can aggravate the injury. Hence, tracheostomy should be performed in preference over intubation whenever suspecting severe laryngeal injury. Mendelsohn *et al.* recommended tracheostomy within 24 h to secure the airway as it decreases the length of stay in both the ICU and hospital.^[13]

CONCLUSION

- This case illustrates the importance of good history taking and a high level of suspicion for laryngeal fracture in a blunt trauma patient presenting with pneumomediastinum and subcutaneous emphysema
- Upper airway injury such as laryngeal fracture should be ruled out by a CT scan
- Early identification of this injury and timely intervention favorably alters the prognosis in terms of long-term voice and airway outcomes
- This case highlights that the traffic police needs to be more vigilant and ensures strict implementation of the legislation regarding carrying projecting goods on vehicles on roads.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Schaefer SD. The acute management of external laryngeal trauma. A 27-year experience. *Arch Otolaryngol Head Neck Surg* 1992;118:598-604.
2. Bent JP 3rd, Silver JR, Porubsky ES. Acute laryngeal trauma: A review of 77 patients. *Otolaryngol Head Neck Surg* 1993;109(3 Pt 1):441-9.
3. Jalisi S, Zoccoli M. Management of laryngeal fractures - A 10-year experience. *J Voice* 2011;25:473-9.
4. Schaefer N, Griffin A, Gerhardy B, Gochee P. Early recognition and management of laryngeal fracture: A case report. *Ochsner J* 2014;14:264-5.

5. Kim JP, Cho SJ, Son HY, Park JJ, Woo SH. Analysis of clinical feature and management of laryngeal fracture: Recent 22 case review. *Yonsei Med J* 2012;53:992-8.
6. Minard G, Kudsk KA, Croce MA, Butts JA, Cicala RS, Fabian TC. Laryngotracheal trauma. *Am Surg* 1992;58:181-7.
7. Butler AP, Wood BP, O'Rourke AK, Porubsky ES. Acute external laryngeal trauma: Experience with 112 patients. *Ann Otol Rhinol Laryngol* 2005;114:361-8.
8. Becker M, Leuchter I, Platon A, Becker CD, Dulguerov P, Varoquaux A. Imaging of laryngeal trauma. *Eur J Radiol* 2014;83:142-54.
9. MacFarlane P, Stranz C, MacKay S. Missed laryngotracheal rupture leading to delayed presentation. *ANZ J Surg* 2008;78:1030-1.
10. Narci A, Embleton DB, Ayçiçek A, Yücedag F, Cetinkursun S. Laryngeal fracture due to blunt trauma presenting with pneumothorax and pneumomediastinum. *ORL J Otorhinolaryngol Relat Spec* 2011;73:246-8.
11. Juutilainen M, Vintturi J, Robinson S, Bäck L, Lehtonen H, Mäkitie AA. Laryngeal fractures: Clinical findings and considerations on suboptimal outcome. *Acta Otolaryngol* 2008;128:213-8.
12. Schaefer SD. Management of acute blunt and penetrating external laryngeal trauma. *Laryngoscope* 2014;124:233-44.
13. Mendelsohn AH, Sidell DR, Berke GS, John MS. Optimal timing of surgical intervention following adult laryngeal trauma. *Laryngoscope* 2011;121:2122-7.