

Severe laryngeal injury caused by blunt trauma to the neck: a case report

D. GOLDENBERG, M.D., A. GOLZ, M.D., R. FLAX-GOLDENBERG, M.D.*, H. Z. JOACHIMS, M.D.

Abstract

Acute blunt laryngeal trauma can be a life-threatening event and often poses a difficult airway management problem. Patients may be unable to supply important anamnestic facts because of aphonia or intubation as a result of their injury. Therefore the immediate recognition and appropriate initial assessment and treatment are vital for a successful outcome. The first step is assuring an appropriate airway, either by careful intubation or temporary tracheotomy. An assessment of potential vascular and oesophageal injuries must be undertaken. The use of computerized tomography (CT) with contrast material is especially useful in identifying and localizing the damage caused by blunt neck injuries. Laryngeal fractures, air in the soft tissues and the extravasation of contrast material in the neck are all helpful in assessing the injuries before surgical intervention. Immediate initial surgery is aimed at stabilizing the cartilaginous framework and repairing the mucosa. We present a case of severe laryngeal injury caused by blunt trauma to the neck; our evaluation, treatment and the outcome.

Key words: Wounds, non-penetrating; Larynx; X-ray, diagnostic; Surgery, operative

Case report

A 19-year-old construction worker was injured while drinking water from a faucet. An iron net weighing approximately half a ton fell on his back and neck trapping him between the net and the faucet pipe. He was rushed to Accident and Emergency. On arrival he was fully conscious and complained of severe neck pain. On admission hoarseness and moderate dyspnoea were noted. On physical examination there was profound subcutaneous emphysema of the neck and upper chest, no bleeding or haematoma were noted and no neurological deficit was found. The rest of the physical examination was unremarkable. The patient was carefully intubated and sedated.

A CT scan of the head, neck, chest, and abdomen was performed, and compound fractures of both the thyroid cartilage (Figure 1) and the cricoid cartilage (Figure 2) were identified. There was extensive subcutaneous emphysema extending from the base of the skull to the chest. In addition, a massive pneumomediastinum was noted. There were no signs of either vascular or vertebral injuries. The patient was taken to the operating theatre. Initially an oesophagoscopic examination was performed. The mucosa of the oesophagus was found to be intact.

Next a laryngoscopic examination was performed. There was severe oedema of the mucosa, the right vocal fold was mobile, the left fold was not visible. A flexible bronchoscopy was performed through the tracheal tube. The

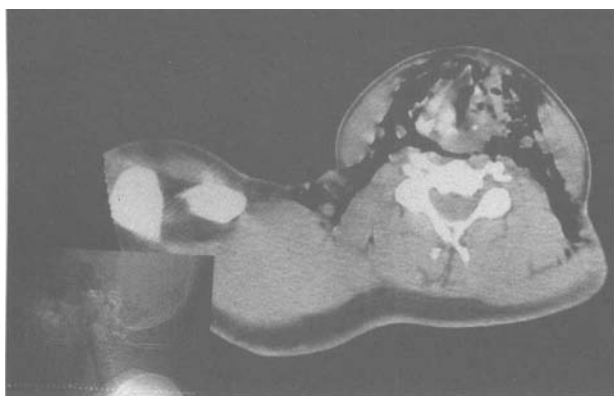


FIG. 1

Crushed thyroid cartilage and extensive subcutaneous emphysema of the soft tissues.

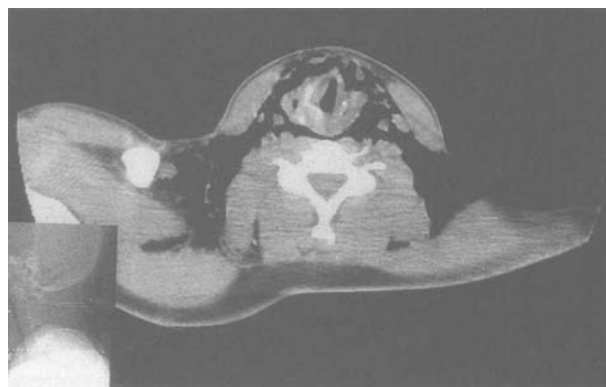


FIG. 2

Compound fracture of the cricoid cartilage, soft tissue emphysema.

From the Department of Otolaryngology, Head and Neck Surgery Rambam Medical Center and Faculty of Medicine, Technion-Israel Institute of Technology, Haifa, and the Department of Radiology*, Carmel Hospital, Haifa, Israel.
Accepted for publication: 12 September 1997.

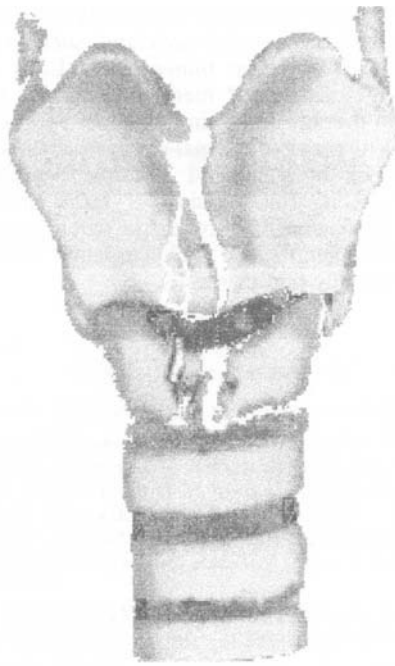


FIG. 3

A computerized reconstruction of the fractured laryngeal cartilages.

trachea below the level of the tube was normal. The damage to the laryngeal cartilages was directly through a large midline incision assessed (Figure 3). The thyroid cartilage was fractured into two main pieces, which were displaced to either side. There were an additional three smaller fragments. The cricoid cartilage was fragmented with very small free-floating pieces of cartilage in place of the anterior arch. A temporary tracheotomy was performed at the level of the third tracheal ring. Laryngeal stenting was attempted using a Hood laryngeal stent but was unsuccessful due to lack of adequate support caused by the missing pieces of cartilage. At this point it became obvious that the larynx was damaged almost beyond any possible reconstructive procedure. Nevertheless a decision was taken to try and salvage the larynx. A shortened intubation tube was then placed in the lumen, in place of a stent and the pieces of the thyroid cartilage were painstakingly assembled together and sewn around it, after careful adjustment of the torn mucosal lining (Figure 4). The cricoid cartilage was reconstructed using only the larger viable fragments.

A gap measuring 4 mm was left in the anterior aspect of the cricoid cartilage. The 'stent' was left in place for a total of three weeks. After its removal a direct laryngoscopy was performed and paralysis of the left vocal fold was noted. The patient was released with a temporary tracheotomy. At his six week check up, the patient was readmitted for another direct laryngoscopic examination, and for closure of the tracheotomy. At direct laryngoscopy the subglottic area was seen to be patent. At eight weeks the patient was breathing normally both at rest and on physical exertion. His speech, although hoarse, was surprisingly good. At indirect laryngoscopic examination there was persistent paralysis of the left vocal fold.

Discussion

Since the introduction of seat belts, blunt laryngeal trauma has become less common (O'Keeffe and Maw, 1992). It is estimated that one per 14,000–42,000 patients

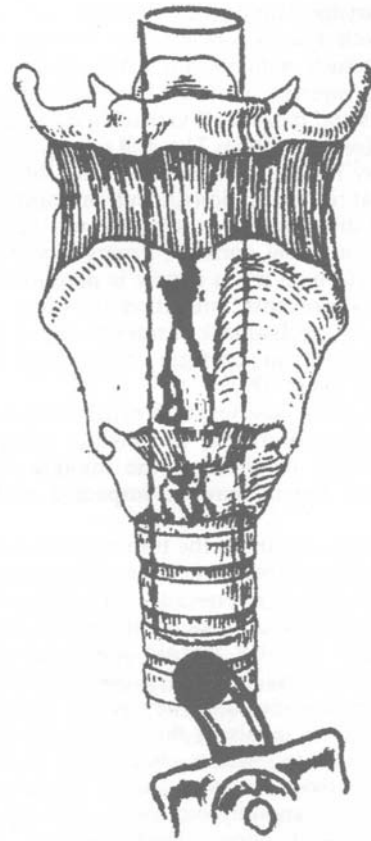


FIG. 4

An illustration showing improvised stenting of the fractured larynx using a shortened endotracheal tube.

present to Accident and Emergency with laryngeal trauma (Billir and Moscova, 1996). High-speed motor vehicle accidents are still the most common cause (Ganzel and Mumford, 1989), followed by violent confrontations and, less commonly, contact sports and 'clothesline' type accidents.

Some distinctive clinical signs indicating laryngeal injury are loss of normal anatomical landmarks, tenderness in the neck, especially above the larynx, crepitus, and subcutaneous emphysema. In glottic injuries, where the thyroid cartilage is fractured in the region of the true vocal folds, patients may present with marked alterations of the voice (dysphonia or aphonia) (Duplechian and Miller, 1989) and some degree of laryngeal obstruction. Other symptoms may be dyspnoea, stridor, hoarseness, neck pain, haemoptysis, dysphagia and odynophagia. The physical examination should include palpation of the neck for soft tissue swelling, cervical emphysema and normal anatomical contours.

Direct laryngoscopy is mandatory to assess the presence of mucosal tears, bleeding or oedema, vocal fold mobility, and damaged or dislocated cartilage. Radiological evaluation should be performed only after the patients airway is established and stabilized and should include a lateral plain film and CT scan of the neck (Angood and Attia, 1986). Initial treatment of patients with direct laryngeal trauma entails establishing an airway either by careful intubation or temporary tracheotomy.

The means of establishing an airway must be individualized based on the severity of the injury, the presence of an accompanying cervical spine injury and the skills of available medical personnel.

Because laryngeal injuries are relatively rare and usually accompany other more obvious life-threatening injuries and because such patients are often unable to give a history these injuries often go unrecognized adding to complications and morbidity (Ganzel and Mumford, 1989; Biller and Moscota, 1996). The end result of this missed diagnosis may lead to a premature tracheotomy making later laryngeal reconstruction difficult or impossible. Blind intubation is discouraged as it may cause false passages and augment mucosal damage. Emergency tracheotomy should be performed when airway is deteriorating, when C-spine injury prevents intubation or when conditions (field conditions) such as lack of trained staff or equipment are not available to perform orotracheal intubation (Fuhrman and Stieg, 1990).

In cases of glottic injuries, with resultant damage to the thyroid cartilage and the underlying vocal folds, a thyrotomy should be done at the midline so that the interior of the larynx may be inspected and carefully repaired.

When primary closure of the torn mucosa is impossible, advancement flaps of pyriform fossa mucosa may be used. Vocal cord paralysis is not usually corrected at this time as function frequently returns spontaneously in a few months time. Fractures of the thyroid cartilages should be elevated, aligned and sutured. Loose small fragments should be removed because they act as foreign bodies. Infraglottic injuries involving the cricoid are usually, but not always, associated with tracheal injury as well. Vocal fold paralysis often accompanies these injuries as a result of trauma to the cricothyroid joints with injury to the recurrent laryngeal nerve. Depression or compound fracture of the cricoid can usually be stabilized with suturing or wiring. If the anterior arch is crushed beyond repair a hyoid bone graft may be inserted or the trachea may be sutured directly to the thyroid cartilage. A stent should always be inserted in patients with such an injury. This necessitates maintenance of the head in the flexed position for at least two weeks.

Conclusion

Blunt laryngeal trauma, although uncommon, is a serious, potentially life threatening injury. The proper initial work up and treatment may be life saving and voice

sparing. We feel that because of the remarkable capacity of the larynx to recover, extreme measures, such as removal of damaged cartilage, are unnecessary. Early surgical reconstruction is feasible if meticulous care is taken to repair tears in the mucosal lining, to cover exposed viable cartilage and to provide internal support of the cartilaginous framework by means of stenting. An aggressive approach including the excision of large amounts of fragmented cartilage usually results in strictures and later requires more complicated reconstruction with tissue grafting and usually poorer results.

References

- Angood, P. B., Attia, E. L. (1986) Extrinsic civilian trauma to the larynx and cervical trachea – Important predictors of long term morbidity. *Journal of Trauma* **26**: 869–873.
- Biller, H. F., Moscota, J. (1996) Laryngeal trauma. In *Otorhinolaryngology, Head and Neck Surgery*. 15th Edition. (Ballenger, J. J., ed.), Williams and Wilkins, Baltimore, pp 518–531.
- Duplechian, J. K., Miller, R. H. (1989) Laryngeal trauma: diagnosis and management. *Journal of Laryngology* **141**: 17–20.
- Fuhrman, G. M., Stieg, F. H. (1990) Blunt laryngeal trauma: Classification and management protocol. *Journal of Trauma* **30**: 87–92.
- Ganzel, T. M., Mumford, L. A. (1989) Diagnosis and management of acute laryngeal trauma. *American Surgeon* **55**: 303–306.
- O’Keeffe, L. J., Maw, A. R. (1992) The dangers of minor blunt laryngeal trauma. *Journal of Laryngology and Otology* **106**: 372–373.

Address for correspondence:

Dr David Goldenberg,
Department of Otolaryngology, Head and Neck Surgery,
Rambam Medical Center,
P.O.B. 9602,
Haifa,
Israel.

Fax: 972-4-8515710
email:gdavid@tx.technion.ac.il