

## Acute laryngeal trauma

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### Introduction

Acute blunt injuries to the larynx are rare and potentially life-threatening. The aim of initial management is to relieve any upper-airway obstruction and to protect the airway in the least traumatic manner. Fiberoptic endoscopy and computed tomography are invaluable aids in the management of patients. Early recognition is vital to prevent residual impairment of the laryngeal functions. We report two cases of such injuries with a brief review on recent management of these patients.

#### Case 1

A 31-year-old motorcyclist was admitted after a road traffic accident. He sustained massive soft-tissue injuries of the face and neck, a LeFort II fracture of the maxilla, and fractures of the body and angle of the mandible. A large transverse bruise was present across the neck with loss of laryngeal prominence. Crepitus was palpable across the front of the neck. He was mildly dyspneic although pulse oximetry did not show any period of desaturation.

In view of the imminent danger of airway obstruction, he was brought into the operating theater to secure the airway by means of a tracheostomy and for exploration of the face and neck injuries. After the tracheostomy was done, laryngoscopy showed that visualization of the glottis was not possible because of the distortion from the injuries and profuse bleeding. An open reduction and internal fixation of the maxillofacial fractures was done. A subsequent computed tomograph (CT) showed

significant endolaryngeal edema (Fig. 1), as well as fractures of the anterior arch of the cricoid cartilage.

The fractured larynx was electively operated on 1 week after the accident. The supraglottic mucosa was edematous and traumatized. The cricoid fragments were fixed with prolene, the vocal cords anchored to the perichondrium of the thyroid cartilage, and a laryngeal stent inserted. The patient was discharged 1 week post-operatively with removal of the laryngeal stent 6 weeks later.

#### Case 2

A 19-year-old motorcyclist sustained trauma to the neck after his motorcycle skidded. On arrival at the casualty department, he was confused, stridorous, and cyanosed, with extensive neck swelling. Endotracheal intubation was successful after several attempts as visualization of the larynx was difficult owing to bleeding. A subsequent cervical spine X-ray and CT scan of the head showed no abnormalities.

Seven hours after admission, the patient was awake and orientated, and vital signs were stable. Immediately after extubation, he developed airway obstruction and was reintubated. During laryngoscopy, no abnormalities were seen and vocal cord movements were normal.

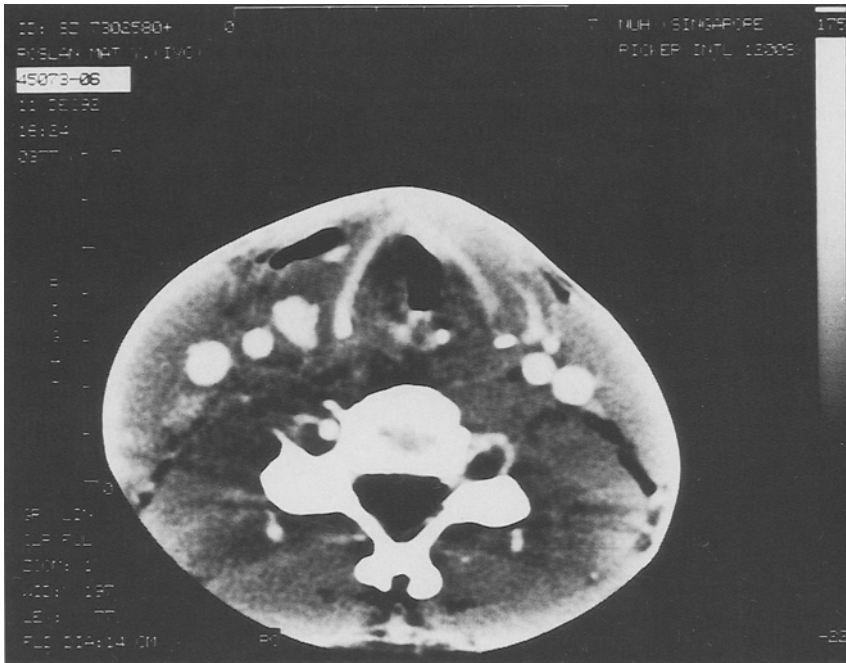
A subsequent X-ray showed subcutaneous emphysema over the neck region. A CT examination showed laryngeal fractures. A microlaryngoscopy and esophagoscopy examination was found to be normal. Subsequent exploration of the neck revealed fractures of the cricoid cartilage. Repair of the fractures was performed and a laryngeal stent inserted to maintain airway patency. A tracheostomy was also fashioned. Subsequent recovery was uneventful.

### Discussion

Acute blunt tracheolaryngeal injuries are rare [1], and they usually occur as a result of vehicular accidents,

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**Fig. 1.** Computed tomography shows subcutaneous emphysema and significant endolaryngeal edema at the level of the thyroid cartilage

close-contact sports, or strangulation attempts. Commonly during a vehicular accident where the unrestrained driver or the front passenger is thrown forward, extension of the neck would result in the trachea or larynx being compressed between the steering wheel or the dashboard and the vertebral bodies. Ligamentous membrane rupture or fractures of the laryngotracheal cartilages may result. Other associated injuries involving the head, cervical spine, chest, and esophagus are common [2].

A significant number of these patients die at the scene of the accident after airway obstruction. Of those who survive, some will present with signs of upper-airway obstruction, as seen in our first patient, while others remain undetected owing to the presence of other more obvious major injuries.

Airway obstruction may result from avulsion, fracture, or dislocation of the thyroid, cricoid, or tracheal cartilages. In addition, accumulation of edema fluid or hematoma in the subglottic and supraglottic mucosa may occur. Air dissecting into the submucosa planes from the disrupted airway may also reduce the lumen of the trachea or larynx, contributing to the symptoms.

The most important clinical sign of blunt injury to the neck is bruising and swelling. The neck contour may appear flattened owing to the loss of the thyroid cartilage prominence. Surgical emphysema over the neck usually signifies that the laryngotracheal complex is ruptured.

If the head trauma or the maxillofacial injuries are severe or the patient is unconscious, the laryngotracheal fractures may be missed altogether. Hurried and inex-

perienced intubation may then further exacerbate an already precarious airway. Even if the patient survives the initial injuries, missed laryngeal fractures may result in respiratory distress when the patient is extubated, and this is illustrated in our second patient.

Definitive diagnosis of the level and extent of suspected laryngotracheal injury is made by radiographic and endoscopic examinations. X-rays of the neck are essential to assess the cervical spine and to demonstrate injuries to the laryngotracheal complex indicated by the presence of swelling or shift in the position of the epiglottis, an abnormally shaped column of air in the tracheal outline, or subcutaneous emphysema. Cricotracheal separation may be present if the hyoid bone is found to be shifted upward above the upper level of the third cervical vertebra [3].

A computed tomographic scan is an excellent diagnostic tool to confirm the diagnosis of laryngotracheal fracture and detect unsuspected injuries, and it may be done before or after the airway is secured [4,5]. Some trauma centers routinely perform a CT scan in all cases of suspected laryngeal trauma, whereas others [6–8] suggest that it should be reserved only for those cases where the radiographic results may determine subsequent management.

Indirect laryngoscopy is often used to assess the degree of damage and the integrity of the glottis. However, in uncooperative patients or where mouth opening is limited owing to concomitant maxillofacial injuries, this could be difficult. Recently, fiberoptic nasoendoscopy and bronchoscopy [9–11] were used with success to assess the airway with minimal manipu-

lation of the cervical spine. Furthermore, immediate airway control is possible, if required, by railroading an endotracheal tube over the instrument.

In the management of blunt trauma to the neck, the integrity of the airway takes precedence. Cervical spine protection measures should be undertaken until the integrity of the spine is assured. Measures to secure the airway and the timing of surgical intervention will be determined by the level and severity of the injury, and the degree of the airway compromise. Mild cases with minimal symptoms may be managed conservatively with close observation and humidified air. However, progressive edema of the glottis may occur and the airway may be compromised rapidly. When the initial assessment indicates that airway control is necessary, the airway should be secured as rapidly and in the least traumatic manner possible. The manner in which the airway is secured remains controversial. Tracheostomy is preferred, as endotracheal intubation carries the risk of disruption of the fractured sites or tears of the mucosa [1,8,12]. False passages and total separation of the transected ends may result. Tracheostomy may, however, be extremely difficult in the confused, hypoxic, or uncooperative patient, or in those with gross distortion of the cervical anatomy from the trauma. Endotracheal intubation, with or without the aid of fiberoptic endoscopy, has been shown to be safe [13,14]. Under direct vision, the risk of creating a false passage is minimized. However, blood in the tracheobronchial tree may impair the visibility of the scope. If endotracheal intubation is deemed impossible, ventilation via cricothyroidotomy may be employed while tracheostomy is being prepared.

In summary, a high index of suspicion for laryngeal trauma should be maintained in all cases of multiple injuries involving the head and neck regions. In those patients where immediate airway control is required, most authors recommend a tracheostomy. Endotracheal intubation by an experienced anesthetist is an

alternative, but extreme caution should be exercised. A CT scan and endoscopic examination of the larynx should be performed to determine the extent of injury. Early diagnosis and proper management are essential for a successful outcome and preservation of laryngeal functions.

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