Assessment and initial management of laryngeal injuries

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Introduction

Laryngeal injuries are potentially very serious life threatening injuries, which, if untreated can result in death or long-term morbidity (1). A high index of suspicion is often required to make an early diagnosis. Despite a relatively low incidence (approximately 1 in every 30 000 emergency cases), together with head injuries, laryngeal injuries are one of the major causes of trauma-related deaths worldwide (2).

What guidance exists?

The main guidelines that currently exist are

• Guidelines for Essential Trauma Care from the WHO (2014)
• NICE guidance on Translaryngeal tracheostomy (2013)
• BMJ Major trauma (2005)
• Difficult Airway Society guidelines for management of unanticipated difficult intubation in adults (2015)

However, a lot of useful information can also be found on various articles and books such as
How do these guidelines differ?

The BMJ Major Trauma and WHO Essential Trauma Care are more general in their description and therefore provide a good overall guide to trauma management, which includes laryngeal injuries. The NICE guidance focuses exclusively on translaryngeal tracheostomy.

With regards to initial airway stabilising measures, preferences vary (between orotracheal or endotracheal intubation, the first option being through the mouth, the latter through the nose), awake fiberoptic, tracheotomy and cricothyroidotomy (3). With regards to associated open wounds some guidelines recommended packing and others warn against it.

Key elements in these guidelines

1 High risk mechanisms

i) Inhalation –foreign body, heat or caustic liquid, or

ii) Direct blunt or penetrating trauma.

2 Consider laryngeal (or upper airway) injury in any patient presenting with

i) Haemoptysis

ii) Hoarseness

iii) Dysphagia or odynophagia

iv) Dyspnoea or stridor
3 Look for deviation of the larynx, subcutaneous emphysema, loss of anatomical landmarks in the neck (4).

4 Consider associated injuries (notably oesophageal and vascular)

Initial assessment

1. The first priority is to establish and maintain a stable airway. Nebulised adrenaline can help relieve stridor and facilitate preparation to securing the airway (5). Crepitation, laryngeal tenderness and loss of anatomical landmarks are particularly worrying signs. Air trapped in the soft tissues on a C-spine X-Ray, pneumothorax and pneumoediastinum are red lights as well. These findings should also alert to the possibility of associated upper aerodigestive tract (oesophageal) injuries. In such cases evaluation should include flexible fiberoptic laryngoscopy as well as contrast enhanced CT (1).

2. Consider the possibility of associated injuries (notably cervical spine, oesophageal and vascular). Look for skin abrasions, bruising, haematoma and entry and exit wounds. Protect the cervical spine as per current guidelines.

3. Bleeding from a penetrating neck wound indicates more than a laryngeal injury and should be carefully investigated. Open wounds should be managed with extreme caution, as further haemorrhage may suddenly occur if explored. This can result in rapid compromise of the airway and blood loss (4, 2).

4. Patients should be re assessed frequently, even if they appear to be stable. Laryngeal haematomas and oedema can slowly progress and worsen over time. Bruits within the carotid arteries can be an indication of serious injury. These should be checked frequently (following investigation) as occlusion or dissection can occur later without preceding signs or symptoms. Angiography or serial duplex ultrasound should be considered. If dissection or occlusion are suspected, refer immediately to vascular surgery and/or interventional radiology (depending on local protocols) (6).
5. Contrast radiography, endoscopy, and CT angiography have all been shown to provide additional diagnostic utility when assessing laryngeal fractures. They are also valuable in planning repair and reconstruction of a fractured larynx. However, in patients who cannot lie still for the study (e.g. inebriated, combative), different imaging techniques such as ultrasound may be required. Repositioning uncooperative patients regularly may be helpful for the above-mentioned imaging techniques (1, 7).

6. MRI is more sensitive for detecting involvement of the cartilage. Its use avoids radiation exposure, but requires stable and cooperative patients (8).

Management

1. Preparation and anticipation are an important aspect in care. Patients should be kept under close observation with equipment immediately to hand (e.g. a difficult intubation trolley).

2. Most guidelines suggest using the Shaefer Classification System (see Table 1) to determine ongoing management. Specific treatment is suggested for each group.

3. Non surgical measures consist of steroids, antibiotics, anti-reflux medication, humidification, head-of-bed elevation and voice rest (1).

4. Mild laryngeal trauma may be managed with patient observation and the non surgical measures mentioned above.

5. If the airway worsens at any point, the vast majority of guidelines suggest a tracheotomy. However, in the case of active haemorrhage, or excessive blood in the mouth or nose, cricothyroidotomy may be preferred (see Table 2). Awake fiberoptic intubation (AFOI) and laryngeal thyrotomy are also suggested options. AFOI is recommended for patients with previous history of difficult airway, anticipated difficult airway in initial assessment, or inability to access the pre-cricoid or pre-tracheal regions. The final choice is often based on the expertise available (9).

6. A chest radiograph should be taken to check the position of any tracheal tube. The tip of the tube should not lie below level of the aortic arch in a supine radiograph and should be a minimum of 3.5 cm above the carina (10).
7. Surgical repair is often required for more severe laryngeal injuries, with stents placed if the anterior commissure or the vibratory edge of vocal cords are significantly injured. If there are multiple, severe endolaryngeal lacerations, resorbable sutures may be used to repair mucosal tears. Laryngeal fractures with displaced cartilage can be repaired with mini plates to recover a stable laryngeal framework (11).

**Aims of treatment**

In the long term, the goal is to optimise functional outcomes, notably breathing, speech, and swallowing, and avoiding laryngeal stenosis.

Speech therapy plays a remarkable role in the recovery and rehabilitation of patients who suffer laryngeal trauma.

**Table 1 Schaefer-Fuhrman Classification of Laryngeal Trauma**

<table>
<thead>
<tr>
<th>Group 1</th>
<th>Minor endolaryngeal hematomas or lacerations</th>
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<tbody>
<tr>
<td></td>
<td>No detectable fracture</td>
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<tr>
<td>Group 2</td>
<td>Oedema, hematoma, minor mucosal disruption without exposed cartilage</td>
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<tr>
<td></td>
<td>Non-displaced fracture</td>
</tr>
<tr>
<td></td>
<td>Varying degrees of airway compromise</td>
</tr>
<tr>
<td>Group 3</td>
<td>Massive oedema, large mucosal lacerations, exposed cartilage</td>
</tr>
<tr>
<td></td>
<td>Displaced fracture(s)</td>
</tr>
<tr>
<td></td>
<td>Vocal cord immobility</td>
</tr>
<tr>
<td>Group 4</td>
<td>Same as group 3 but more severe with:</td>
</tr>
<tr>
<td></td>
<td>Severe mucosal disruption</td>
</tr>
<tr>
<td></td>
<td>Disruption of the anterior commissure</td>
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<td></td>
<td>Unstable fracture, two or more fracture lines</td>
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<tr>
<td>Group 5</td>
<td>Complete laryngotracheal separation</td>
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</tbody>
</table>
Table 2 Airway management procedures for laryngeal injuries and definitions

<table>
<thead>
<tr>
<th>Procedure</th>
<th>Description</th>
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<tbody>
<tr>
<td>Thyrotomy</td>
<td>Incision of the larynx through the thyroid cartilage - cutting the thyroid gland</td>
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<tr>
<td>Tracheostomy</td>
<td>Surgically created opening through the neck into the trachea to allow direct access to the airway commonly done in the operating room under general anaesthesia (<em>tracheotomy</em> being the actual procedure) (^{12, 13})</td>
</tr>
<tr>
<td>Cricothyroidotomy</td>
<td>Surgical incision in the cricothyroid membrane, followed by inserting a tracheostomy tube, to allow ventilation (^{13})</td>
</tr>
<tr>
<td></td>
<td>It is indicated when other types of intubation have failed</td>
</tr>
<tr>
<td>Awake Fiberoptic Intubation</td>
<td>Technique which allows a flexible oral or nasal route to provide a clear visualisation of the vocal cords, and subsequent passage of an endotracheal tube into the trachea under direct vision (^{1, 14})</td>
</tr>
</tbody>
</table>
ALGORITHM FOR DIAGNOSIS AND INITIAL MANAGEMENT OF LARYNGEAL INJURIES (14, 15, 16)

References


2 WHO International Society of Surgery and International Association for the Surgery of Trauma and Surgical Intensive Care, Guidelines for Essential Trauma Care, 2004


4 Sandhu Guri S, Reza Nouraei S.A, Chapter 70: Laryngeal and Esophageal Trauma, In Cummings Otolaryngology Head and Neck Surgery, 2009
Learning points

1 Laryngeal injuries are uncommon and can be easily overlooked.

2 Patients require careful clinical evaluation and investigation. During this time, close observation is needed as they can rapidly deteriorate.

3 Haemoptysis, a change in the voice, stridor and surgical emphysema following an injury to the front of the neck should prompt one to consider upper airway injury.
4 Seek advice or help early as patients may require urgent intubation or a surgical airway - anticipate and be prepared.

5 Don't forget the adjacent structures (notably vessels, oesophagus and spine)

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Comments? - go to Forums to discuss this and any other topics of interest