Evaluation: External Examination

- Abnormal voice quality
- Stridor
- Ecchymosis, haematoma, contusion, abrasion
- Distortion of laryngeal landmarks (laryngeal prominence)
- Tenderness
- Subcutaneous emphysema
Evaluation: Flexible Laryngoscopy

- Assess
  - Airway
  - Oedema
  - Haemorrhage
  - Haematoma
  - Mucosal lacerations
  - Exposed cartilage
  - VF mobility
- Determines next step
Initial Management

- Secure the airway
- *Beware cervical spine injury*

- Complete secondary survey
- Determine order & timing of definitive treatment of injuries
How should the airway be secured?

- Orotracheal intubation
  - Pros
    - Quick
    - Familiar
  - Cons
    - Failure to intubate/loss of airway
    - False passage creation
    - Further laryngeal injury
  - Indications
    - Endolaryngeal mucosa intact
    - Minimally displaced fractures
    - Skilled personnel

- Cricothyroidotomy
  - Pros
    - Quick
  - Cons
    - Not helpful cricoid injury
    - Further laryngeal injury

- Tracheostomy
  - Awake LA
Further Management

- Observation
- CT scan
- Tracheostomy
- Direct laryngoscopy
- Open repair
Imaging

- Cervical spine
- CT neck
  - Detect occult #
  - Determine extent of suspected #
- Angiography
## Classification of Laryngeal Injury

<table>
<thead>
<tr>
<th>Group</th>
<th>Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>Minor haematomas or lacerations, no fracture, minimal airway compromise</td>
</tr>
<tr>
<td>II</td>
<td>Oedema, haematoma, minor mucosal tear, no exposed cartilage, non-displaced fracture</td>
</tr>
<tr>
<td>III</td>
<td>Massive oedema, large mucosal lacerations, exposed cartilage, displaced fracture, VF immobility</td>
</tr>
<tr>
<td>IV</td>
<td>Similar to III with multiple fractures, massive mucosal disruption, instability of anterior larynx or cricoid</td>
</tr>
<tr>
<td>V</td>
<td>Cricotracheal separation</td>
</tr>
</tbody>
</table>

Schaefer, 1982
Treatment: Non-Surgical

- Mild trauma
  - Stable airway
  - Minor lacerations
  - No exposed cartilage
  - Minor haematoma/oedema
  - Single undisplaced # of thyroid cartilage

- Treatment
  - Admit for airway observation
  - Humidification
  - Steroids
Treatment: Surgical

- Moderate-severe trauma
  - Unstable airway/impending obstruction
  - Extensive mucosal lacerations
  - Anterior commissure injury
  - Exposed cartilage
  - Multiple, comminuted, unstable or displaced #s
  - Disrupted CA Joint/Impaired VF motion
  - Uncontrolled subcutaneous emphysema
  - Cricotracheal separation

- Treatment
  - Tracheostomy
  - Direct laryngoscopy
  - Open repair
Goals of Treatment

- Maintain airway
- Prevent aspiration
- Restore voice
Laryngeal Trauma

- Endolaryngeal
  - Iatrogenic
    - Intubation, Endolaryngeal surgery
  - Caustic ingestion
  - Inhalational injuries (thermal)
- External
  - Blunt external trauma
  - Penetrating external trauma
  - Iatrogenic
    - Tracheostomy, Thyroidectomy, Laryngeal surgery
Surgical Repair

- 32% required open surgery (Jewett 1999)
- Timing
  - Early repair: 24-48 hours
    - Better results esp. if exposed cartilage, extensive lacerations
  - Delayed repair: 3-5 days
- ORIF #s
- Closure of mucosal lacerations
- Covering exposed cartilage
- Reduction/reposition of arytenoids
- Resuspension of AC
- Stent placement
Displaced #
Comminuted #
Unstable #
ORIF: T.S. 38 M
ORIF: T.S. 38 M
ORIF: T.S. 38 M
ORIF: K.M. 28 M
ORIF: K.M. 28 M
ORIF: K.M. 28 M
Laryngotomy: Indications

- Extensive mucosal lacerations
- Exposed cartilage
- Disrupted CA joint
- Anterior commissure injury
- Stent placement
Blunt & Penetrating External Laryngeal Trauma

- Uncommon
  - 1/5,000 – 1/30,000 ED visits (US)
- Important
  - 2\textsuperscript{nd} most common cause of death in patients with trauma of the head & neck
  - Assoc injuries (Jewett 1999)
    - Intracranial 17%
    - Cervical spinal 13%
    - Pharyngoesophageal 3%
- Long term sequelae
Outcomes

- Late sequelae
  - Laryngeal stenosis
  - Dysphonia
  - Dysphagia

- Possible treatments
  - Vocal fold augmentation
  - Thyroplasty
  - Arytenoid Repositioning
  - Cordotomy
  - Endoscopic Dilation
  - Resection
  - Laryngeal transplant (!)
Conclusion

- Uncommon injury
  - Blunt > penetrating
- Assess & secure the airway if required
  - Orotracheal intubation or tracheostomy
- Evaluation
  - History, Laryngoscopy, CT
  - Early detection important
- Treatment
  - Mild injury: non-surgical treatment
  - Moderate-severe injury: surgical treatment
- Follow up important for functional sequelae
Fin
Endoscopy (GA)

- Direct laryngoscopy
  - Haematoma
  - Oedema
  - Mucosal lacerations
  - Exposed cartilage
  - Passive ROM of arytenoids
- Tracheoscopy
- Pharygo-oesophagoscopy
Stent Placement

- **Goals**
  - Prevention of webs
  - Support of grafts & flaps
  - Internal support

- **Indications**
  - Anterior commissure injury
  - Comminuted, unstable cartilage #s

- **Disadvantages**
  - Pressure necrosis, mucosal injury, scar
Laryngeal Anatomy

- Zone II of neck
- Protected
  - Mandible
  - Cervical spine
  - SCM
  - Sternum
Mechanisms of Injury

- Blunt
  - MVA
  - Assault
  - Sport
  - Fall
  - Horse kick
  - Clothesline
  - Crush
- Penetrating
  - GSW
  - Knife
Blunt: Compression against Vertebral Column

- Anterior blunt trauma
- Fracture
- Arytenoid dislocation
- Pharyngeal tear
- Cricotracheal separation
Blunt: Lateral Force

- Fracture
- Haematoma
Penetrating Injury

- Knife, GSW
- High vs low velocity
- Extent underestimated

- Associated injuries
  - Vascular
  - Neurological
  - Pharyngoesophageal
Evaluation: History

- Mechanism of injury
- Dysphonia
- Dyspnoea
- Odynophagia
- Dysphagia
- Pain
- Haemoptysis