Baltimore

The Hood...

Portland

The real Hood....
Laryngeal Trauma

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Key Points

- Laryngeal trauma is rare although life threatening
- Multiple etiologies: blunt, penetrating, intubation, caustic, thermal, radiation
- Evaluation and Airway management
- Timing of intervention
- Sequelae
Overall incidence is stable

Blunt trauma with increased mortality

Blunt trauma more likely to require tracheotomy

Bhojani, RA - J Trauma 2005

Blunt trauma:
Mechanics of injury impacted by age and degree of calcification
Signs & Sx’s of external laryngeal trauma

- Hoarseness 28 (85%)  
- Dysphagia 17 (52%)  
- Pain 14 (42%)  
- Dyspnea 7 (21%)  
- Hemoptysis 6 (18%)  

Luutilainen M  
Acta Oto-Laryngologica 2007

Evaluation

- Airway  
- Endoscopy  
- Imaging  
- Classification
Developing the Airway Response Team
Operational, Safety, and Educational Initiative.

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Nasir Bhatti, OHNS
Renee Cover, ORM
Jeffery Dodd-O, ACCM
David Effron, Gen Surg
Elliot Haut, Gen Surg
Carol Heiser, ACCM
Eugenia Heitmiller, ACCM
Peter Hill, ED
Thomas Kirsch, ED
Christina Lundquist, ACCM
Lynette Mark, ACCM
David Tunkel, Peds OHNS
Imaging

Secure airway

Assess C-spine

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**Schaefer-Fuhrman classification of laryngeal trauma**

- **Group 1**  
  Minor endolaryngeal hematomas or lacerations  
  No detectable fracture

- **Group 2**  
  Edema, hematoma, minor mucosal disruption without exposed cartilage  
  Non-displaced fracture  
  Varying degrees of airway compromise

- **Group 3**  
  Massive edema, large mucosal lacerations, exposed cartilage  
  Displaced fracture(s)  
  Vocal cord immobility

- **Group 4**  
  Same as group 3 but more severe with:  
  Severe mucosal disruption  
  Disruption of the anterior commissure  
  Unstable fracture, 2 or more fracture lines

- **Group 5**  
  Complete laryngotracheal separation

*Ann ORL 1982; J Trauma 1990*
Approach to assess need for surgical intervention

- **Laryngeal Framework**
  - *Stable*
    - No fractures
    - A single non-displaced fracture
  - *Unstable*
    - A single displaced fracture
    - >1 fracture line
    - Cricoid fracture
  - *Potentially non-viable*
    - Framework comminution with devitalized cartilage fragments

- **Laryngeal Mucosa**

- **Vibratory Apparatus**

- **Laryngotracheal junction**
Approach to assess need for surgical intervention

**Laryngeal Framework**

- **Stable**
  - No fractures
  - A single non-displaced fracture
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- **Potentially non-viable**
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**Laryngeal Mucosa**

- **Intact / Minimally injured**
  - No mucosal injuries; Small submucosal hematoma
  - Linear laceration with no exposed cartilage
- **Injured**
  - Jagged / multiple linear lacerations
  - Exposed cartilage
  - Large hematoma(s)
- **Massively injured**
  - Devitalized and/or significant loss of mucosa
16 yo female with history of fall

Neck tenderness and subcutaneous emphysema

Sandhu in Cummings OHNS 2010
Concomitant injuries with laryngeal trauma

<table>
<thead>
<tr>
<th>Injury</th>
<th>(%)</th>
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<tbody>
<tr>
<td>Open Neck Injury</td>
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<tr>
<td>Maxillofacial Fractures</td>
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<tr>
<td>Intracranial Injuries</td>
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<td><strong>Cervical Spine Fracture</strong></td>
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<tr>
<td>Chest Injury</td>
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<tr>
<td>Other Facial Injury</td>
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<td>Skull Fracture</td>
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<tr>
<td>Open Pharyngeal Injury</td>
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</tbody>
</table>

Management

- Acute trauma
17 yo HS student struck in neck with lacrosse stick

Pain
Hoarseness
Approach to assess need for surgical intervention

- **Vibratory Apparatus**
  - *Intact*
  - *Injured*
    - Anterior commissure
    - Vibrating edge of the vocal cord(s)
    - Arytenoid dislocation

Sandhu in Cummings OHNS 2010
47 yo female

Touring racing stalls in Dubai

Horse bite to the neck

Tracheotomy performed urgently
No definitive repair
Approach to assess need for surgical intervention

- Laryngotracheal junction
  - Intact
  - Any degree of laryngotracheal separation
Management – penetrating trauma

- **External**
  - *Penetrating*
    - Stab wound
    - Emergent cricothyrotomy
    - Projectile
      - *Bullet*
        - Low velocity
        - High velocity
Tracheotomy/cricothyrotomy - acute

- Hemorrhage
- Decannulation or tube obstruction
- False passage
- Laceration of laryngeal framework

Cricothyroidotomy

laryngeal trauma
“Slash”
Cricothyroidotomy
necessitates early
early endoscopic evaluation and repair

Cummings OHNS 2010

Voice outcome following laryngeal trauma

Results from Schaefer

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<tr>
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<tr>
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Results from Luutilainen et al

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Mechanisms of trauma

**Internal**
- Foreign body
- Iatrogenic
  » Endoscopic
  » Intubation
  » Radiation therapy
- Thermal
  » Ingestion, inhalation
- Caustic
  » Acid vs. Alkali

Intubation Injuries - delayed

**Granuloma**
**Chondritis**
**Laryngeal stenosis**
  - glottic, subglottic
**Tracheal stenosis**
Mechanisms of Trauma

**Internal**
- Foreign body
- Iatrogenic
  - Endoscopic
  - Intubation
  - Radiation therapy
- Thermal
  - Ingestion, inhalation
- Caustic
  - Acid vs. Alkali

Prolonged intubation defined by hours
- Weymuller
Mechanisms of Trauma

**Internal**
- Foreign body
- Iatrogenic
  - Endoscopic
  - Intubation
  - Radiation therapy
- Thermal
  - Ingestion, inhalation
- Caustic
  - Acid vs. Alkali

Electro-cautery induced fire during tracheotomy

Acute

1 week
Management

- Sequelae

Long term sequelae

- Vocal fold motion impairment
  - Paralysis
  - Dislocation
  - Joint fixation
- Stenosis
S/P MVR
Posterior glottic fibrosis

Posterior cricoid split with graft
Posterior graft in position
23 yo female with poly trauma secondary to MVA
Tracheotomy in the field
Unable to decannulate
Multiple endoscopic procedures
Stent left in place for 2 weeks

Decannulated
Intubation Injuries - Contributing factors

- Technique
  - visualization vs. blind, laryngeal blade
- ETT
  - size, duration, material
- Vent pressure, ETT fixation

Intubation Injuries - Contributing factors

- Patient activity - motion
- Unconscious patient
- NG tube, GER
- Obesity, DM, nutritional status...
Intubation Injuries - Prevention

- Preop laryngoscopy?
- Smallest tube, shortest duration
- Anti-reflux regimen
- Avoid rigid NGT

Intubation Injuries - Prevention

- Monitor vent/cuff pressures
- Early trach in high risk patients
- Endoscopic assessment
  - steroid injection may be beneficial
Key Points

- Laryngeal trauma is rare although life threatening
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- Evaluation and Airway management
- Timing/sequence of intervention
- Sequelae
Laryngeal Stenosis

56 yo male s/p chemo-XRT for T₃ N₂b SCCA
Laryngeal Paralysis
Vocal fold polyp
Subglottic stenosis

Endoscopic resection and placement of T-tube through trach site
Trach stenosis due to chronic intubation

Intubation Injuries - delayed

- Tracheomalacia
- TE fistula
- Intranasal synechia
- Sinusitis
Intubation Injuries - acute

- Dental injury
- Soft tissue trauma
  - nasal, oral, pharyngeal, hypopharyngeal
- Vocal fold contusion, laceration
- Vocal fold motion impairment

70 yo male
intubated 7 days
S/P CABG
with NGT
69 yo female prolonged intubation S/P CABG
Mechanisms of Trauma

**External**

- **Blunt**
  - Hanging
  - Clothesline injury
  - Sports Injury
  - Motor Vehicle Accident

- **Penetrating**
  - Stab wound
  - Emergent cricothyrotomy
  - Projectile

**Internal**

- **Penetrating**
  - Bullet
    - Low velocity
    - High velocity

Management

**External**

- **Blunt**
- **Penetrating**
Post cricoid split – endoscopic view