Laryngeal Trauma

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Introduction

- Incidence: 1 in every 30,000 ER visits
- Laryngeal injuries in 30 to 70% in penetrating neck trauma (especially zone II)
- Blunt and penetrating neck injury
  - Airway
  - Major vascular structures
  - Cervical esophagus
  - Cervical spine.
Laryngeal Embryology

- 3\textsuperscript{rd} and 5\textsuperscript{th} branchial arches
- 3\textsuperscript{rd} week
  - Respiratory primordium is derived from primitive foregut
- 4\textsuperscript{th} - 5\textsuperscript{th} weeks
  - Tracheoesophageal (TE) septum forms by fusion of (TE) folds
Support: Hyoid, thyroid, cricoid

Protection of the larynx
- Superiorly by the mandible
- Inferiorly by the sternum
- Laterally by the sternomastoid muscle
- Posteriorly by the cervical spine

Innervation: RLN, SLN
Anatomy

- **Supraglottis**
  - External support
  - Soft tissue attachments

- **Glottis**
  - Relies on external support
  - Narrowest in the adult
  - Susceptible to obstruction

- **Subglottis**
  - Cricoid-narrowest in infants
Laryngeal Function

- Breathing passage
- Airway protection
- Clearance of secretions
- Vocalization
Mechanism of Injury

- **Blunt trauma**
  - MVA
  - Clothesline
  - Crushing
  - Strangulation injuries

- **Penetrating trauma**
  - GSW - related to the type of weapon
    - Directly penetration or indirectly by the blast effect
  - Knives

Mechanism of Injury

- **Blunt injuries**
  - Most commonly from motor vehicle accidents
  - Forward thrust
    - Neck extension impacting steering wheel
    - Removes the mandibular barrier
    - Laryngeal skeleton is compressed between a foreign object (i.e., steering wheel or dashboard) and the anterior aspect of the cervical spine

- **Decrease incidence** - seat belt harness and air bags

He is not cover!
Initial Evaluation

- ATLS principles
- Intubation hazardous
  - Schaefer in 1991 - worsen preexisting injury
  - Further tears or cricotracheal separation
- Respiratory distress
  - Tracheotomy under local anesthesia
- Avoid cricothyroidotomies
  - Worsen injury
- If no acute breathing difficulties
  - Detailed history and careful physical examination
Pediatric patient

- Blunt pediatric neck injuries
  - Uncommon the larynx lies higher than the adult
    - Protected by the mandible
  - More often life-threatening
    - Significant injury including laryngotracheal disruption
    - Smaller cross-sectional area of the pediatric population

- Rigid bronchoscopy followed by tracheotomy over the bronchoscope
Diagnosis

**History**
- Change in voice
- Pain
- Dyspnea
- Dysphagia
- Odynophagia
- Hemoptysis
- Inability to tolerate the supine position

**Physical Exam**
- Respiratory rate (saturations)
- Stridor
- Neck skin
  - Contusions, Abrasions or Line pattern
- Subcutaneous emphysema
- Tracheal deviation
- Open wound
  - Air bubbles
  - Exposed tracheal cartilage
- Don’t probe open wounds
  - May dislodge a hematoma
Diagnosis

- Unstable
  - Tracheotomy and neck exploration

- Stable patients
  - Flexible fiberoptic laryngoscopy in the ER
    - CT scan, direct laryngoscopy, bronchoscopy and esophagoscopy
CT Scan

- CT allows:
  - Evaluation of the laryngeal skeletal framework
  - Noninvasive avoiding unnecessary operative explorations

Hematoma
Fracture Anterior Lamina
SQ emphysema

CT Scan

■ Reserved
  – Suspected laryngeal injury by history and physical examination
  – No obvious surgical indications

Laryngotracheal Injury Classification

- **Group I injuries**
  - No fracture
  - Minor hematoma, edema or laceration

- **Group II injuries**
  - Nondisplaced fractures
  - Edema or hematoma
  - Minor mucosal disruption without exposed cartilage

- **Group III injuries**
  - Displaced fractures
  - Massive edema or mucosal disruption
  - Exposed cartilage and/or cord immobility

- **Group IV injury (group III)**
  - Addition of two or more fracture lines
  - Skeletal instability or significant anterior commissure trauma
  - Complete laryngotracheal separation
Medical Management

- Group I injuries
  - Minimum of 24 hours of close observation
  - Head of bed elevation
  - Voice rest
  - Humidified air
  - Anti-reflux medication
  - Serial flexible fiberoptic exams

- Antibiotics for laryngeal mucosa disruption
Steroid

- Controversial

- Early systemic steroids therapy are often given to reduce laryngeal edema

- One randomized controlled trial (Ghorayeb 1985)
  - Intravenous dexamethasone for preventing traumatic laryngeal edema in pediatric bronchoscopy
  - This study showed no reduction in postbronchoscopy laryngeal edema with the use of intravenous dexamethasone
Surgical Management

- Hemostasis
- Evacuation of hematoma
- Reconstruction of the laryngeal framework
- Coverage of de-epithelialized surfaces
- Group II to V required surgical intervention

Surgical options
- Endoscopy alone
- Endoscopy with exploration
- Endoscopy with exploration and stenting
Surgical Management

- Any doubt about the extent of injury endoscopy should be performed
- Indications for surgical exploration include:
  - Large mucosal lacerations
  - Exposed cartilage
  - Multiple or displaced cartilaginous fractures
  - Vocal cord immobility
  - Fractured cricoid
  - Disruption of the cricoarytenoid joint
  - Lacerations involving the free margin of the vocal cord or anterior commissure
- Explore within 24 hours of the injury
  - Maximize airway and phonation results

Surgical Management

- Laryngeal skeleton is exposed from the hyoid to sternal notch
- Midline thyrotomy
  - May use a vertical fracture (2 to 3mm of midline)
- Nondisplaced fractures
  - Suture outer perichondrium
  - Primary closure with nonabsorbable sutures
  - Debridement should be minimized
- Mucosal lacerations
  - Meticulously repaired using fine absorbable sutures
  - Knots outside the laryngeal lumen (prevent granulation)
Surgical Management

- Displace fractures of the cartilages are reduced
  - Stabilized using stainless steel wires, nonabsorbable suture or miniplates.
  - Small fragments of cartilage with no intact perichondrium are removed to prevent chondritis.

- Anterior commissure- suspend the anterior true vocal cords to the outer perichondrium of the thyroid cartilage

- Close the thyrotomy
  - Nonabsorbable suture, wires or miniplates

Surgical Management

- Endolaryngeal stenting
  - Disruption of the anterior commissure
  - Massive mucosal injuries
  - Comminuted fractures of the laryngeal skeleton

- From the false vocal fold to the first tracheal ring
  - Stability and prevent endolaryngeal adhesions

- Removed in a period of 10 to 14 days to prevent mucosal damage

Stents

- **Types of stents**
  - Endotracheal tube *(COVER THE TOP END TO PREVENT ASPIRATION)*
  - Finger cots filled with gauze or foam
  - Polymeric silicone stents

- **Secure the stent**
  - Heavy, nonabsorbable suture
    - Larynx at the ventricle
    - Cricothyroid membrane
    - Tied outside the skin
    - Endoscopically removed
Laryngeal trauma although uncommon can be life-threatening. Recognizing any airway compromise and need for immediate intervention could prevent immediate death as well as acute and long term morbidity. Initial management should follow ATLS principles. Most authors agree that tracheotomy should be performed on patients exhibiting respiratory distress. In patients with no acute breathing difficulties, a detailed history, careful physical examination and appropriate diagnostic tools should be use to differentiate the need for medical from surgical management.
Any questions?
References


