Anatomy of the larynx and benign lesions of the larynx
Anatomy of the larynx

The larynx is made of:

• **Hyoid bone**: U shaped, near C3 level
• **9 cartilages**: 3 paired and 3 single cartilages
• **Ligaments and membranes** that connects the cartilage to give it stability
• **2 set of muscles**:
  • **Intrinsic muscles** the control the tension & orientation of the vocal cords
  • **Extrinsic muscles** that adjust the position of larynx during swallowing
• **Respiratory mucosa**: covers the **interior** surface of the larynx which is continuous above with the pharynx and below with trachea
Cartilages

Single cartilages

1. **Thyroid cartilage:**
   - The most prominent & the largest laryngeal cartilage

2. **Cricoid cartilage:**
   - Located at C6
   - It has a signet ring shape
   - The only cartilage that forms a complete ring in the respiratory system

3. **Epiglottis:**
   - Thin Leaf like
   - Covered with pale mucous membrane
   - At the level of C5

Paired cartilages

1. **Arytenoid cartilage:**
   - The chief moving part of the larynx
   - Articulates with posterior superior surface of cricoid cartilage

2. **Corniculate cartilage:**

3. **Cuneiform cartilage:**
True vocal folds

Epithelium: stratified nonkeratinized squamous epithelium

Lamina propria:

- **A highly specialized** lamina propria separates the epithelium from underlying muscle.

Vocalis muscle (Medial part of the Thyroarytenoid muscle)
The larynx is subdivided into:

<table>
<thead>
<tr>
<th>Area</th>
<th>From</th>
<th>To</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supraglottic area</strong></td>
<td>Epiglottis</td>
<td>superior border of the true vocal cord</td>
</tr>
<tr>
<td>(Epiglottis, Arytenoids cartilage, Corniculate cartilage, Conieform cartilage, Aryepiglottic fold, Interartenoid notch, False vocal cord)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Glottis area</strong> (It is the narrowest part of the larynx in adults)</td>
<td>Vertical plan</td>
<td>.5-1 cm below the free border of true VC</td>
</tr>
<tr>
<td><strong>Subglottic area</strong> (It is the narrowest part of the larynx in pediatrics)</td>
<td>.5-1 cm below the free border of true VC</td>
<td>Inferior border of the cricoids cartilage</td>
</tr>
</tbody>
</table>
Nerves

2 branches of vagus nerve:

• **Superior laryngeal nerve:**
  • Supplies the **cricothyroid** muscle

• **Recurrent laryngeal nerve:**
  • Gives **motor** innervations to **all ipsilateral intrinsic** laryngeal muscles **except** cricothyroid (superior laryngeal)
HOARSENESS IN VOICE

• General term which describe abnormal voice change
• Having difficulty in producing the sound when trying to speak
• Change in a pitch and quality of the voice
• The voice may sound weak, very breathy, scratchy or husky
PHYSICAL EXAMINATION

• RHINOLOGIC & OTOLOGIC EXAMINATION.
• NECK LYMPH NODE EXAMINATION.
• VISUALIZATION OF THE LARYNX BY:
  • INDIRECT LARYNGOSCOPY.
  • FIBEROPTIC NASOPHARYNGOSCOPY.
  • RIGID LARYNGOSCOPY.
INDIRECT LARYNGOSCOPY
Flexible Fiberoptic laryngoscopy
NORMAL LARYNGEAL STRUCTURES
Causes of Hoarseness of voice

- **Congenital:** laryngeal web, cyst, laryngocele
- **Paralysis:** paralysis of recurrent laryngeal nerve, superior laryngeal or both
- **Inflammation:** acute & chronic laryngitis, laryngo-tracheo-bronchitis, diptheria, acute epiglottitis
- **Neoplastic:** vocal cord polyps, nodules, granuloma, cysts, laryngeal carcinoma, leukoplakia.
- **Neuromuscular:** vocal cord palsy, spasmodic dysphonia, movement disorder, Parkinson disease, CVA.
- **Miscellaneous:** vocal abuse, vocal cord atrophy, vocal cord scarring, hypothyroidism, Reinke’s edema, GERD, postnasal drip.
Acute Laryngitis

**Infectious** type:
• Follows URTI
• Often *viral* in origin
• **Bacterial** will act as superadded infection; strepoccus, H.influenza, haemolytic strepoccoccus & staph. Aureus.

**Non infectious** type:
• Vocal *abuse*
• Allergy
• Smoking/ alcohol
• Thermal/ chemical burn to larynx
• Laryngeal *trauma*
Presentation
• Aphonia / dysphonia
• Cough: dry, painful & irritating
• Stridor: rare but potentially serious
• Pain throat: after talking

Examination:
• Indirect laryngoscopy, shows
  • Red swollen larynx
  • Sometimes, present stringy mucus between cords

Treatment:
• Vocal rest
• Avoidance of smoking & alcohol
Chronic Laryngitis

Predisposing causes:
- Alcohol
- Habitual **shouting** / faulty voice production
  Laryngeal muscle imbalance $\rightarrow$ dysphonia
  Voice: hoarse & fatigue easily
- Continues to smoke $\rightarrow$ turn into carcinoma

Treatment:
- Voices should be **rested**
- Treat upper airway **sepsis**
- Steam inhalation
Benign lesions of the larynx: **Vocal cord nodules**

- Singer’s nodule
- Usually **bilateral** (rarely unilateral)
- small swellings (less than 3 mm in diameter)
- **Location**: the junction between the anterior 1/3 and the posterior 2/3 of the whole vocal cord
- Treatment: speech therapy is the mainstay, microlaryngoscopy and excision in refractory cases
Benign lesions of the larynx: **Vocal cord polyp**

- A true vocal polyp is a benign swelling of greater than 3 mm that arises from the free edge of the vocal fold.
- Polyps can shrink spontaneously or even be coughed up.
- **Localized** edema of the Reinke’s space.
- Most need surgical removal.
Leukoplakia (pre-malignant)

- Localized form of **epithelial hyperplasia**
- Involving upper surface of one or both vocal cord
- Appears as **white plaque** or **warty growth** on the cord without affecting its mobility
- Treatment: **stripping** of vocal cord & subjecting the tissue to histology for any malignant change
Vocal cord mobility disorders

• **Vocal cord paralysis:**
  • Iatrogenic Injury (most common cause)
  • surgery:
    • Thyroidectomy (the most common surgery)
    • ant cervical fusion
    • esophageal surgery
    • carotid endartectomy
    • Mediastinal surgery
  • Neoplastic: Bronchial 50%; Nasopharyngeal ca 20%; Esophageal 20%; Thyroid 10%; lymphoma
  • Idiopathic (50% of the cases): usually self-limiting (take up to 12 months to resolve)
  • Trauma
  • Neurological disease:
  • Infectious: Lyme disease; Syphilis; EBV; Tuberculosis; Viral
  • Systemic Diseases: Sarcoidosis; D.M
  • Toxins: lead; arsenic; quinine; Streptomyocin
Laryngomalacia

• Most common cause of stridor in infants (60% of all laryngeal problem)
• Occur due to floppy supra-glottic tissue
• Symptoms: Inspiratory stridor that starts within 6 weeks of life
• Exacerbating factors:
  • Sleeping
  • Lying supine
  • URTI
• Relieving factor:
  • lying prone
  • when the child is active
• Diagnosis: Flexible Fiberoptic laryngoscopy
• Treatment:
  • 90% will have their symptoms resolves within 12 months of age
  • Only 10% will need surgical intervention
## Acute laryngeal infections in Children

<table>
<thead>
<tr>
<th>Microorganism</th>
<th>Acute epiglottitis/ supraglottitis</th>
<th>Acute laryngotracheobronchitis (croup)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bacteria</td>
<td>H. influenza type B</td>
<td>Viral: para-influenza type 1&amp; 2</td>
</tr>
<tr>
<td>location</td>
<td>epiglottis</td>
<td>glottis and the subglottis</td>
</tr>
<tr>
<td>Onset</td>
<td>Short duration (hours)</td>
<td>Gradual (days)</td>
</tr>
<tr>
<td>Age</td>
<td>3-5 years</td>
<td>6 months-3 years</td>
</tr>
<tr>
<td>Voice</td>
<td>Muffled voice (not HOV)</td>
<td>HOV</td>
</tr>
<tr>
<td>Symptoms</td>
<td>High grade fever</td>
<td>Low grade Fever</td>
</tr>
<tr>
<td></td>
<td>odynophagia+ dysphagia+ saliva</td>
<td>Barking cough</td>
</tr>
<tr>
<td></td>
<td>drooling</td>
<td>Inspiratory stridor (early)</td>
</tr>
<tr>
<td></td>
<td>sitting upright</td>
<td></td>
</tr>
<tr>
<td>Xray</td>
<td>Thumb sign</td>
<td>Steeple sign</td>
</tr>
<tr>
<td>Treatment</td>
<td>Airway secured (priority)</td>
<td>Humidified O2</td>
</tr>
<tr>
<td></td>
<td>antibiotics (corner stone)ex:</td>
<td>Nebulized epinephrine</td>
</tr>
<tr>
<td></td>
<td>cefuroxime</td>
<td>Corticosteroid (single dose):</td>
</tr>
<tr>
<td></td>
<td>Steroid</td>
<td></td>
</tr>
</tbody>
</table>

- **Croup** is the most common airway **obstructive infection** in children
- **Epiglottitis** is inflammation of the **loosely** attached mucosa
Stridor

• is an abnormal, high-pitched sound produced by turbulent airflow through a partially obstructed airway at the level of the supraglottis, glottis, subglottis and/or trachea.

• It should be differentiated from stertor, which is a lower-pitched, snoring-type sound generated at the level of the nasopharynx, oropharynx & occasionally supraglottis.

• Stridor is a symptom, not a diagnosis or disease, and the underlying cause must be determined.
Stridor depending on its timing in the respiratory cycle may be:

1. **Inspiratory** stridor suggests a laryngeal obstruction.
2. **Expiratory** stridor implies bronchial obstruction
3. **Biphasic** stridor suggests a tracheal (subglottic or glottic anomaly).
Causes of acute stridor

1. Laryngo-tracheobronchitis (croup)
2. Aspiration of foreign body (eg. peanut, coin, toys...) a history of Choking & coughing may precedes the development on RD symptom
3. Tracheitis, bacterial cause is most common in children <3 y, mainly staph aureus, viral influenza.
4. Retropharyngeal abscess is a complication of bacterial pharyngitis, observed in children <6 y.
5. Peritonsillar abscess, an infection in the potential space between superior constrictor muscle and tonsils.
6. Spasmodic croup
7. Epiglottitis, which is a medical emergency, most commonly in children 2-7 y.
8. Allergic reaction within 30 min of adverse exposure
Causes of chronic stridor

1. Laryngomalacia
2. Vocal cord dysfunction
3. Subglottic stenosis
4. Laryngeal webs
5. Laryngeal cyst
6. Laryngeal hamangiomas
7. Tracheomalacia
8. Laryngeal papilloma