

## LARYNX I&II

429 ENT Team (F2)

Resources: Doctor's lecture, ENT team note, LECTURE NOTES ON Diseases of the Ear, Nose and Throat by P.D. BULL, Ninth Edition

### **Objectives:**

#### **Larynx I**

- anatomy and physiology of the larynx.
- gross anatomy , blood and nerve supply.
- congenital diseases of the larynx ( in brief) (laryngomalacia, web, subglottic stenosis, and hemangioma).
- benign swelling of larynx (Singer's nodule, polyps, granuloma, J. L. papillomatosis).

#### **Larynx II**

- acute and chronic laryngitis.
- non-specific laryngitis.
- specific laryngitis (acute epiglottitis, croup).
- laryngeal paralysis (unilateral and bilateral).

Done by: Sarah Al-Muneef

# Larynx

## Anatomy:

-**Histology:** ciliated columnar epithelium with goblet cells, except over vocal folds; squamous epithelium.

## -Laryngeal Neuromuscular Anatomy:

**1]Extrinsic Muscles:** move muscles up & down during swallowing:

-**Elevation:** digastrics, stylohyoid, mylohyoid, geniohyoid, stylopharyngeus, salpingopharyngeus, palatopharyngeus.

- **Depression:** sternohyoid, sternothyroid, omohyoid.

**2]Adductors** 1- lateral cricoarytenoid

2- thyroarytenoid(vocalis) (relaxing the vocal cords)

3- interarytenoid (only single muscle)

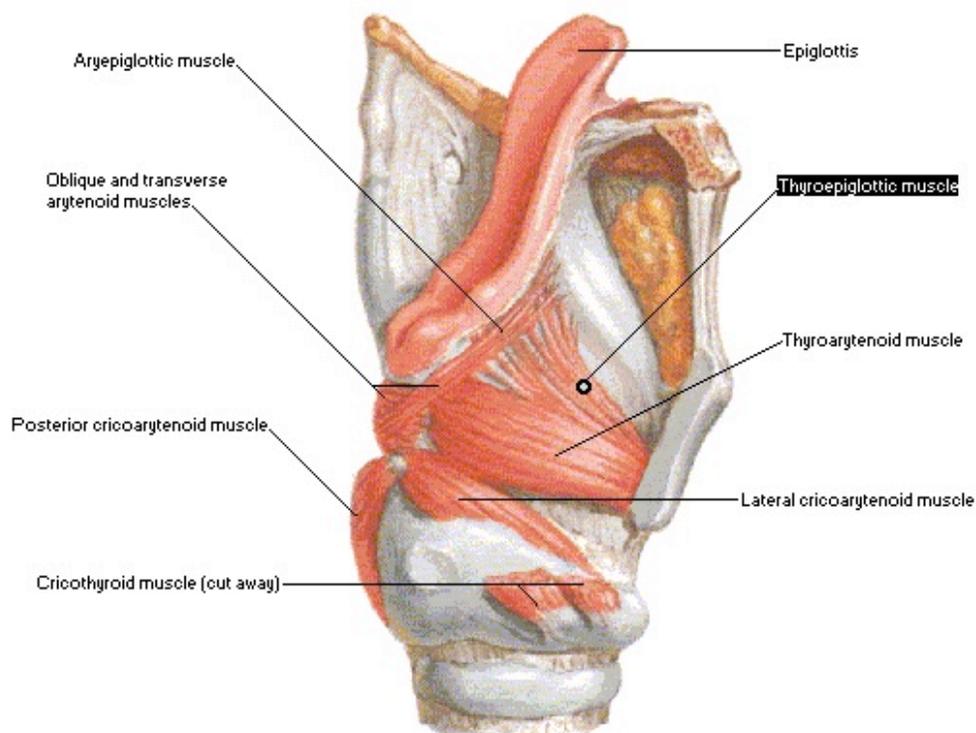
**3]Abductors:** 1- posterior cricoarytenoid (paralysis will cause asphyxia) **MCQ**

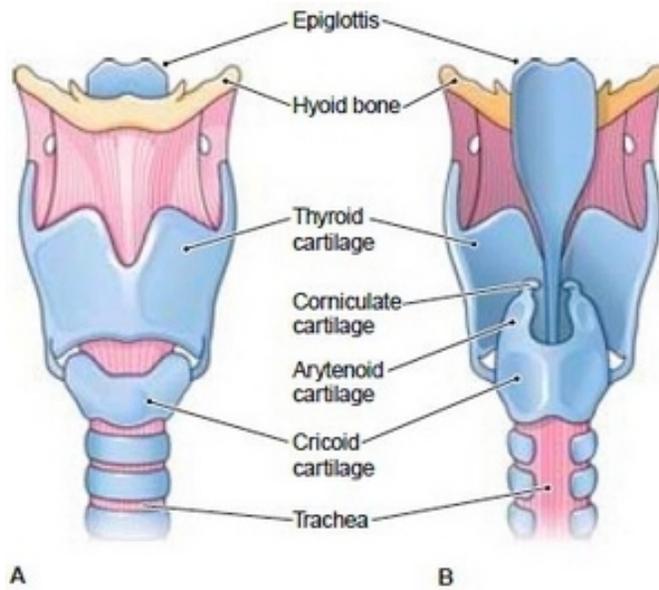
**4]Tensors:** 1-thyroarytenoid (vocalis) (relaxing the vocal cords),

2-cricothyroid (supplied by superior laryngeal nerve)

Supplied by  
recurrent  
laryngeal nerve

## Intrinsic Muscles of Larynx Lateral Dissection





**-Laryngeal Cartillages:-**

Single: 1-cricoid: complete signet ring just above the trachea

2-thyroid: largest cartilage of the larynx , felt in midline as “Adam’s Apple”

3-epiglottis. → **Elastic cartilage**

Paired: 1-cuneiform: strengthen aryepiglottic folds

2-arytenoids

3- corniculate: give attachment to aryepiglottic folds

4-trieeous

**Hyaline cartilages**

**-Laryngeal Joints:** 1-cricothyroid joints → synovial rocks (hinge)

2- cricoarytenoid joints → synovial rocking motion

**-Vocal Fold Layers:** 1- squamous epitheilium

2-superficial lamina propria (rinke’s space)

3-intermediate lamina propria

4- deep lamina propria

5-thyroarytenoid muscle complex

• **Pediatric Airway Anatomy:**

- > 90% of neonates are obligate nasal breathers until 2 months.
- 1mm of laryngeal edema in the neonate can reduce airway by 60%.

**-Sensory Innervation:**

- 1- **internal branch of superior laryngeal nerve:** above vocal cords
- 2- **recurrent laryngeal nerve:** below level of vocal cords

**Physiology:**

- 1-Phonation:voice (air passes through vocal folds→ vibration→ expiration→ voice)
- 2-Resonance: **most common pathologies**
- 3-Articulation
- 4-Respiration

**Evaluation of the Dysphonic Patient:**

**-History**

- Character of Dysphonia
- Associated Symptoms
- “KITTENS” for differential diagnosis (K:congenital, I:inflammatory,T:trauma, T:tumor, N:neurogenic, E:endocrine, S:systemic)

**-Physical Exam**

- Quality of Voice
- Indirect and Direct Laryngoscopy (Mirror, Flexible Nasopharyngoscopy, Videostroboscopy)
- Head & Neck Exam

<b>VOICE PARAMETERS :</b> Pitch. (300-500 Hz) normal speech frequency. Fundamental frequency.(men→lower frq , women) Loudness (decibels). Quality (Timbre).
---

<b>ANCILLARY TESTS</b> ▪Videostroboscopy ▪Laryngeal EMG
---

To Examine Hypernasality ask the Patient to say S. To Examine Hyponasality ask the Patient to say N (or) M , while the nose is closed
--

**DDx of Dysphonia:**

<b>Congenital</b>	<b>Inflammatory</b>	<b>Trauma</b>	<b>Tumor</b>	<b>Endocrine</b>	<b>Neurologic</b>	<b>Systemic</b>
Congenital	Laryngitis (Viral, Bacterial, Fungal)	Voice Abuse	Laryngeal Cysts, Nodules & Ulcers	Hypothyroidism (Laryngeal Myxedema)	Cerebral Palsy	GERD
Under -Developed Larynx	Vocal Cord Paralysis	Reinker’s Edema	Laryngeal Cancer	Adrenal, Pituitary, Gonadic Disorders	Extra Pyramidal Lesions (Parkinsons)	Connective Tissue Disorders (Rheumatoid Arthritis, SLE)
	Adductor Spasmodic Dysphonia	Arytenoid Dislocation	Benign Laryngeal Neoplasms (Hemangiomas, cystic Hydromas)	Pubescence	Stroke	Psychogenic
	Muscle-Tension Disorders	Caustic Inhalation Injury	Vocal Fold Granulomas			Gullian Barre
						Myasthenia Gravis
						Other Neurological Disorders

• **Benign Laryngeal Pathology:**

**1) Congenital Laryngeal Defects:**

1) Congenital Webs: bands between vocal cords, anteriorly (most commonly)

Pathophysiology: results from incomplete recanalization.

Types: supraglottic (2%) glottic (75%), subglottic (7%)

Symptoms: aphonia, stridor

Management: surgical excision by endoscopy or external approach if large.



**2) Congenital Subglottic Stenosis:** <4mm in newborn, most common disease

Pathophysiology: results from incomplete recanalization

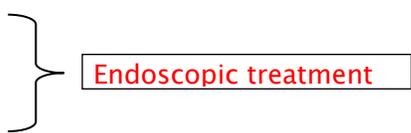
Types (based on stiffness):

1. Membranous
2. Cartilaginous
3. Mixed

Grades:

I. <50% obstruction.

II. 50–70%.



III. 70–90%

IV. > 90–Complete obstruction

Symptoms: stridor

**Open Surgery:**

- Anterior Cricoid Split
- Posterior Cricoid Split
- Laryngofissure
- Segmental Resection with End to End Anastomosis

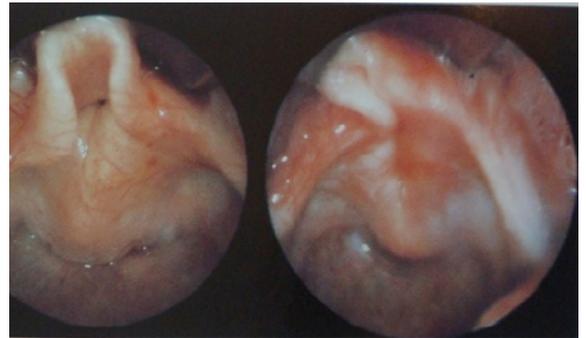
**3) Laryngomalacia:**

Most common laryngeal anomaly , Most common cause of stridor in neonate and chronic pediatric stridor

Pathophysiology: immature cartilage, omega shaped epiglottis

Symptoms: inspiratory stridor

Management: observation , epiglottoplasty , correct GERD if present.



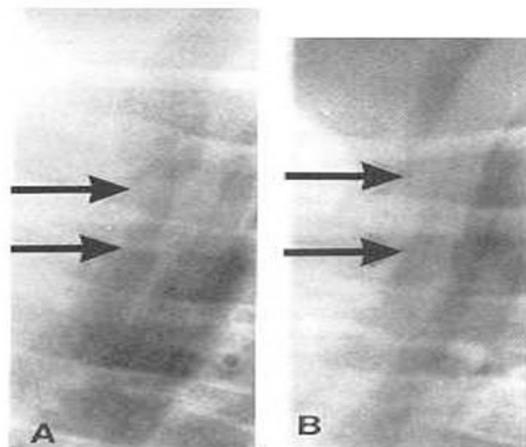
**4) Tracheomalacia:** Less common

Pathophysiology: immature laryngeal cartilage

Symptoms: expiratory stridor

Diagnosis: bronchoscopy (acollapsed area)

Management: observation.



	<u>Pathophysiology</u>	<u>Symptoms</u>	<u>Management</u>
<b><u>1-Webs</u></b>	Bands between cords Results from incomplete recanalization	Aphonia Stridor	surgical excision by endoscopy or external approach if large.
<b><u>2-Subglottic Stenosis</u></b>	results from incomplete recanalization	Biphasic Stridor: inspiratory & expiratory	*Grade I-II: Endoscopic management  *Grade III-IV: Open Procedures:  -Anterior Cricoid Split  -Posterior Cricoid Split  -Laryngofissure  -Segmental Resection with End to End Anastomosis
<b><u>3-Laryngomalacia</u></b>	Immature cartilage  Omega shaped epiglottis	Inspiratory stridor	-observation  -epiglottoplasty  -correct GERD if present.
<b><u>4-Tracheomalacia</u></b>	Immature laryngeal cartilage	Expiratory stridor	observation

## COMMON BENIGN LARYNGEAL NEOPLASMS

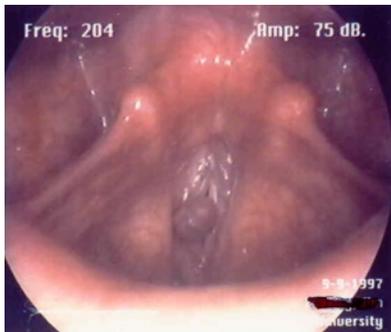
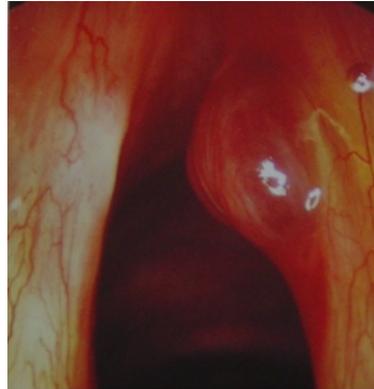
	<u>Pathophysiology</u>	<u>Appearance</u>	<u>Symptoms</u>	<u>Treatment</u>
<b>1 Recurrent Respiratory Papillomatosis</b>	-HPV (6,11) -Hormonal influence -Acquired during delivery *viral infection that affects transit zone of larynx	Wart like lesion. Irregular exophytic.	Hoarseness. (2 <sup>nd</sup> most common cause of hoarseness in children) Stridor.	-Microlaryngoscopy with laser excision. -Avoid tracheostomy. -Adjunctive therapy (a-INF)
<b>2 Systemic Diseases</b>	Sarcoidosis, wegener's granulomatosis, amyloidosis, arthritis of cricoarytenoid joint			
<b>3 Common Laryngeal Lesions:</b>	-Laryngeal -Subglottic			
1-Acquired Stenosis	-Angioedema -Reinke's edema		Common in smokers, reflux & voice abuse. Harsh voice	
2-Edema				
3-Cysts	-Laryngeal cysts -Laryngocele	Usually unilateral , on surface		
4-Ulcer	-Contact ulcer (with reflux disease)			
5-Nodules	1) Singers 2) Vocal Cord Callus	Midzone, always bilateral (pointing towards each other)  Red, soft, bilateral nodules	Hoarseness when bilateral.	-Speech therapy -Drink water to hydrate vocal cords to decrease friction.
6-Polyp	Most common benign tumor of vocal cord Subepithelial capillary breakage	Mucoid Soft, smooth, fusiform, pedunculated mass Unilateral, asymmetric	Structural manifestation of vocal cord irritants Angiomata	-observation
<b>4 Hemangioma</b>	Most common head & neck neoplasm in children -presents by 6 months and involutes by 2 years of age.	Abnormal blood vessel growth. Polypoid or sessile lesion  -most common laryngeal site is subglottis.	Biphasic stridor, worse with crying Dysphonia Dysphagia Bleeding in larynx	-Endoscopy (avoid biopsy) -Observe -Embolization -Corticosteroids or interferon -YAG lasers -Radiation therapy

\*most common tumors of vocal cords are squamous cell tumors

\*tumor of vocal cords have good prognosis because there is no lymphatic drainage, unless extended to supraglottic or subglottic regions.



**Recurrent Respiratory Papillomatosis**



**Vocal Cord Nodule**

## Laryngitis:

	<u>Pathogen/ Pathology</u>	<u>Symptoms</u>	<u>Diagnosis</u>	<u>Treatment</u>
<b>1]Acute Viral Laryngitis (Adults)</b>	Rhinovirus.	-Change in voice (aphonia, dysphonia) -Cough –painful sometimes -Sputum -Malaise -Rigor -Fever	Indirect laryngoscopy: red swollen larynx, sometimes with stringy mucus between cords.	-Conservative management: total voice rest, inhalations with steam, avoid smoking.
<b>2]Adult Supraglottitis</b>	H.influenza. S.pneumonia. S.aureus. B hemolytic streptococcus.	-Stridor change in voice airway collapse -Severe pain (worsened on swallowing)		-Evaluate airway -Humidification -Parenteral antibiotics
<b>3]Reflux-Induced Laryngitis</b>	Increase in saliva production in an attempt to overcome acid chronic inflammation.	-Dysphonia -Cough		-Avoid aggravating factors. -Elevation of head during sleep -H-1 blockers, Proton Pump Inhibitors.
<b>4]CROUP (Acute Laryngotracheobronchitis (LTB))</b>	Para influenza 1.	-Inspiratory or Biphasic stridor. -Gradual onset. -Low grade fever. -Cough (at night)	Plain neck films (steeple)  Mucosa becomes swollen & edematous.	-Assess airway. -Medical management: oral steroids, nebulized ventolin, paracetamol. -Endoscopy. -Humidification.
<b>5]Epiglottitis (Children)</b>	Bacterial H.influenza type B (uncommon due to HiB vaccine)	-Drooling saliva. -Dysphagia. -High fever. -Sniff position. -Stridor.	Plain neck films (thumbprint sign) Never examine child in ER.	-Establish emergent airway (endotracheal intubation tracheostomy). -Post op care: parenteral antibiotics & corticosteroids.

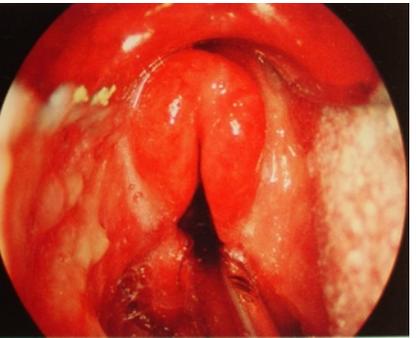
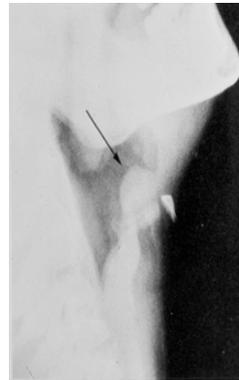
	<u>Pathogen/ Pathology</u>	<u>Symptoms</u>	<u>Diagnosis</u>	<u>Treatment</u>
<b>6]Chronic Laryngitis</b>		-Hoarseness. -Pain. -Chronic cough.	Rule out internal causes and malignancies. Laryngoscopy: cords erythematous, thickened with ulceration & granuloma formation & normal mobility	-Rest voice. -Treat upper airway sepsis. -Steam inhalations. -Voice therapy.
<b>1-TB Laryngitis</b>	Pulmonary Tuberculosis.			-Antituberculosis drugs.
<b>2-Laryngeal Diphtheria</b>		-Ill -Stridor(spread to larynx & trachea).	Membrane on pharynx.	-Hospital admission. -Antitoxin & general supportive measures. -Tracheotomy.
<b>3-Fungal Laryngitis</b>		-No fever	White membranes.	



Reflux Induced Laryngitis



CROUP



Epiglottitis

	<b>Acute LTB</b>	<b>Acute Epiglottitis</b>
<b>Pathogen</b>	Parainfluenzae virus 1	Haemophilus influenzae-B
<b>Age</b>	<5 years old	2.-6 years old
<b>location</b>	Subglottic	Supraglottic
<b>Onset</b>	Gradual (over days)	Sudden onset (hours)
<b>Cough</b>	Barky	Normal
<b>Posture</b>	Supine	Upright
<b>Drooling</b>	No	Yes
<b>Fever</b>	Low grade	High fevers
<b>Radiographs</b>	Steeple sign	Thumb printing
<b>Treatment</b>	Supportive	Airway management

## Vocal Cord Paralysis:

<u>Evaluation:</u>	<u>Causes of Vocal Fold Paralysis in Adults:</u>	<u>Causes of Vocal Fold Paralysis in Pediatrics:</u>	<u>Management:</u>	
<ul style="list-style-type: none"> <li>- History and Physical</li> <li>- Ancillary test</li> <li>- Vocal Fold Positioning:               <ul style="list-style-type: none"> <li>- Recurrent Laryngeal Nerve Paralysis: paramedian vocal folds</li> <li>- Superior Laryngeal Nerve Paralysis: bowing deformity</li> <li>- RLN &amp; SLN Paralysis: cadaveric, intermediate vocal folds</li> <li>- Bilateral Vocal Fold Paralysis: typically near midline</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>- Neoplastic</li> <li>- Iatrogenic Injury</li> <li>- Idiopathic</li> <li>- Trauma</li> <li>- Neurological</li> <li>- Infectious</li> <li>- Systemic Diseases</li> <li>- Toxins</li> </ul>	<ul style="list-style-type: none"> <li>- Idiopathic</li> <li>- Birth Trauma</li> <li>- Iatrogenic Injury</li> <li>- Infection</li> <li>- Vascular Abnormalities</li> </ul>	<ul style="list-style-type: none"> <li>- <u>Unilateral vocal cord paralysis:</u> <ul style="list-style-type: none"> <li>• Must determine if self limiting or permanent paralysis.</li> <li>• May not require a surgical management.</li> <li>• The goal is to medialize vocal folds</li> </ul> </li> </ul> <p>Surgical Management:</p> <ol style="list-style-type: none"> <li><b>1- Vocal Fold Injections.</b></li> <li><b>2- Thyroplasty</b></li> <li>3-Arytenoid Adduction</li> <li>5-Tracheotomy</li> </ol>	<ul style="list-style-type: none"> <li>- <u>Bilateral Vocal Cord Paralysis:</u> <ul style="list-style-type: none"> <li>• The goal is to lateralize vocal folds</li> </ul> </li> </ul> <ol style="list-style-type: none"> <li>1- Tracheotomy: gold standard treatment</li> <li>2-Cordotomy (Laser)</li> <li>3Arytenoidectomy</li> <li>4-reinnervation procedure</li> </ol>