



# Larynx II

## Objectives:

- Congenital diseases of the larynx.
- Benign swelling of the larynx.
- Acute and chronic laryngitis.
- non-specific and specific laryngitis.
- Laryngeal paralysis.

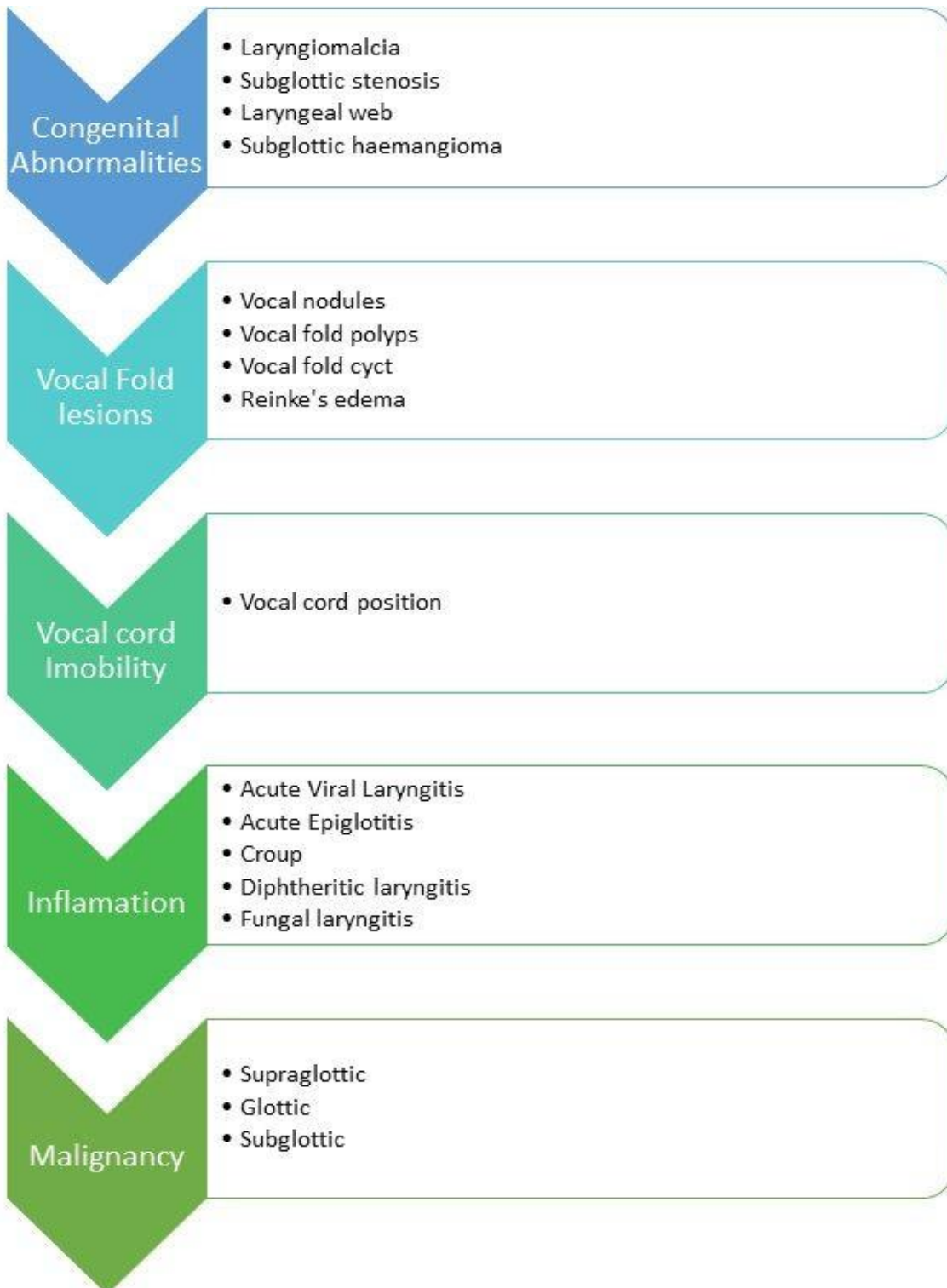
**Resources:** Slides + 435team + Notes + Lecture notes of ENT + 433team

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## Mind Map



## Introduction:

### ❖ Symptoms and signs of laryngeal disease:

- Lesions on or around the vocal cords cause hoarseness.
- Failure of the laryngeal inlet to close on swallowing causes aspiration; the patient will cough and splutter on swallowing – food ‘going down the wrong way’.
- The most dangerous laryngeal pathology is narrowing of the airway. This causes reduced air entry and turbulent flow so that the patient makes a high-pitched noise when breathing (stridor).
- Increasing difficulty causes a rise in respiratory rate (tachypnoea), and the patient will struggle to breathe and become distressed as he uses the accessory muscles of respiration to maintain airflow.
- In severe cases there may be cyanosis, cessation of air entry (apnoea) and death.

## Congenital Abnormalities:

### ❖ Laryngomalacia<sup>1</sup>:

- **Most common cause of stridor in neonate and infants very common.**

- **Laryngeal finding:**

- Inward collapse of aryepiglottic fold<sup>2</sup> (short) into laryngeal inlet during inspiration (**inspirational stridor**).
- Epiglottis collapses into laryngeal inlet.

- **SSx: Intermittent inspiratory stridor that improve in prone position.**

- **Dx:** HX and endoscopy “flexible endoscope through the nose” it can’t be diagnosed in the OR when the patient is sedated

- **Rx:**

- Observation most of the time cause the condition will improve with time.<sup>3</sup>
- Supraglottoplasty<sup>4</sup>(we will consider this surgery in case of severe laryngomalacia, when there is signs of **growth retardation**, signs of airway obstruction like: **cyanosis, sleep apnea**, and desaturation).
- **the percentage of children with laryngomalacia that will need surgical intervention is only 10%**
- Tracheostomy old method

Case scenario of 10-months baby, his mother noticed noisy voice when breathing., on laryngoscope there was an omega shape epiglottis and short aryepiglottic.

**What is the diagnosis? Laryngomalacia**

**What is the most appropriate management?**

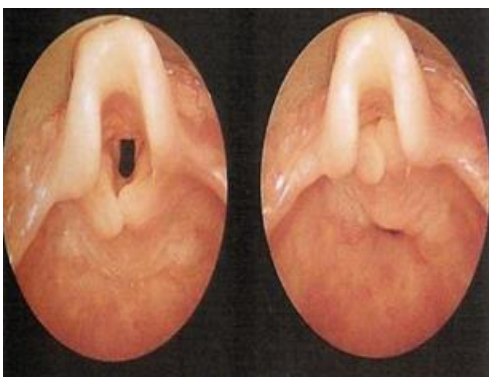
**\*If no signs of growth retardation or airway obstruction, Reassurance**

**\* If there is, then do Supraglottoplasty**

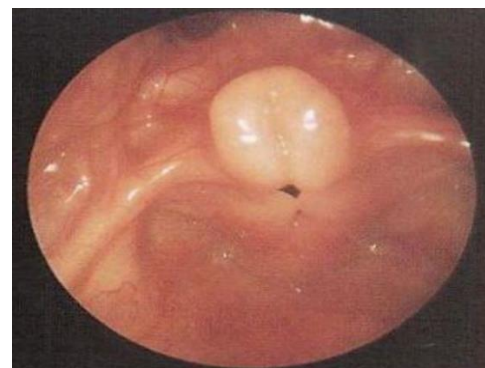
**Most common laryngeal anomaly**

**Pathophysiology: immature cartilage, omega shaped epiglottis**

**Management: observation, epiglottoplasty, correct GERD if present.**



Omega shaped epiglottis



Normally in inspiration: the epiglottis is open and vocal cords are abducted.

<sup>1</sup> ليونة الحنجرة

<sup>2</sup> supraglottic collapse when air enter (during inspiration)

<sup>3</sup> the peak of it when baby reach 2-4month why? because the RR increases so it will be more prominent after it will improve because the larynx will grow bigger and the problem will be solved (subside at 12-18 months)

<sup>4</sup> Supraglottoplasty is a microscopic surgical procedure to alter malformed structures of the upper larynx. This allows a child with certain conditions (such as severe laryngomalacia) to breathe more easily.

## ❖ Subglottic stenosis

- Incomplete recanalization, small cricoid ring
- Can be acquired or congenital, **acquired due to prolonged intubation<sup>5</sup>** and it's more common than the congenital.
- Congenital Types:
  - Membranous
  - Cartilaginous
  - Mixed

**Failure of intubation again due to a history of prolonged intubation that result as subglottic stenosis. (SAQ)**

- **Grades(Cotton-Myer grading system):**

- I <50%.
- II 51--70%.
- III 71--99%.
- IV complete obstruction (no detectable lumen).

- **SSx:**

- **Biphasic stridor** "during inspiration and expiration " because of a **fixed stenosis** unlike laryngomalacia which is dynamic.
- Failure to thrive.

- **Dx:**

- Chest and neck X-ray, flexible endoscope

- **Rx: tracheostomy** in severe cases. Or rural areas



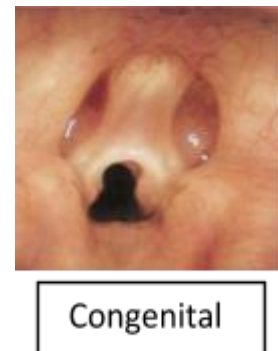
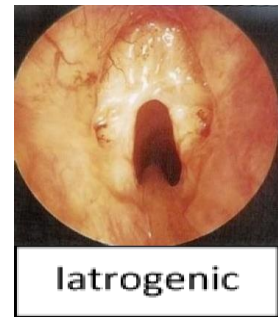
treatment depends on the symptoms not the age of the baby, the problem with subglottic stenosis is when the baby has upper respiratory tract infection, he will have airway obstruction and stridor.

Grade 1-2	Grade 3-4
<p>Endoscope (CO<sub>2</sub> or excision with <b>dilation using a balloon</b>).</p> <p>-more commonly done nowadays.</p> <p>-esophageal atresia is more common than laryngeal atresia, both same concept of treatment.</p>	<p>Open procedure:</p> <ul style="list-style-type: none"> <li>- <b>LTR (Laryngotracheal reconstruction</b></li> <li>- <b>Ant cricoid split</b></li> </ul>

<sup>5</sup> can occur especially in pediatric patients when we use a bigger tube size, it will cause pressure necrosis and will lead to scarring.

### ❖ Laryngeal web (vocal cord web) OSCE

- Incomplete canalization. (didn't open completely)
- Types:<sup>6</sup>
  - Supraglottic
  - **Glottis**
  - Subglottic
- **SSx:** 3 month baby came with abnormal noisy breath (stridor), no airway obstruction, no cyanosis, no history of previous intubation, other things are normal. The most likely diagnosis is Laryngeal Web
  - Weak cry at birth
  - Variable degrees of respiratory obstruction
  - On and off stridor
- **Dx:**
  - Flexible endoscope
- **Rx:**
  - No treatment
  - Laser excision
  - Open procedure + tracheostomy



#### ★ Patient with Anterior laryngeal web

- dysphonia

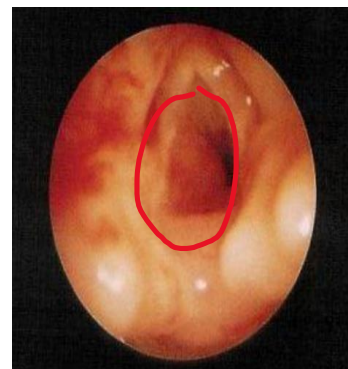
#### ★ Patient with Posterior laryngeal web

- dysphonia and stridor

**picture:** fusion of the vocal cords could be cartilaginous, membranous or mixed. how to treat? we can't do simple incision in the middle only because of high recurrence rate so we do also flap and put steroid injection.

### ❖ Subglottic hemangioma<sup>7</sup>

- The most common congenital pediatric tumor, and it is most common in subglottic space.
- 50% of subglottic hemangiomas associated with cutaneous involvement.
- Types:
  - Capillary (typically resolve)
  - Cavernous.
- **SSx:** biphasic stridor.
- **Dx:** endoscope.
- **Rx:**
  - **Observation.**
  - Corticosteroid (old treatment).
  - **Propranolol** (to decrease neovascularization).very effective.
  - CO2 Laser.



Unilateral



bilateral

<sup>6</sup> according to glottic level.

<sup>7</sup> most commonly unilateral

## Traumatic Conditions of the Larynx :

- Direct injuries (blows).
- Penetration (open). *knife*
- Burns (inhalation, corrosive fluids).
- Inhalation foreign bodies. *common in pediatric*

### → Intubations injuries:

- Prolonged intubation (more than 2 weeks in adults, more than 3 weeks in pediatrics).
- Blind intubation.
- Too large tube.

- Inhalation “sloughing and carbonized tissue”<sup>8</sup>

- Give steroid, antibiotic and Anti-Reflux Drugs



### Pathology:

- Abrasion (injury to the mucosa) → granulomatous formation<sup>9</sup> → subglottic stenosis due to scarring.
- **SSx:** hoarseness, dyspnea
- Rx:
  - Voice rest.
  - Endoscopic removal.
  - Prevention.

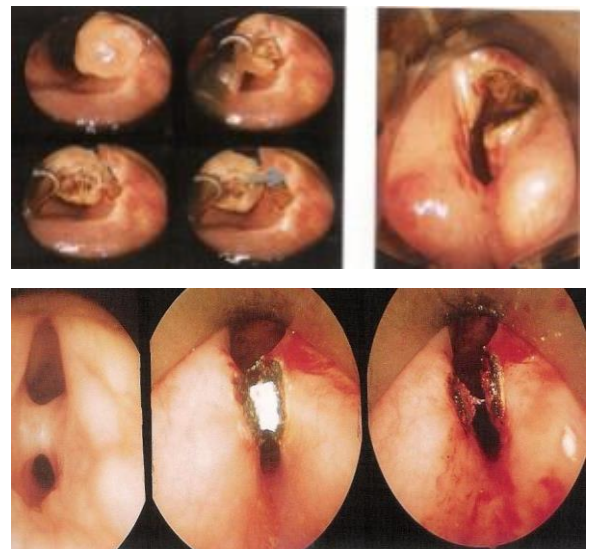
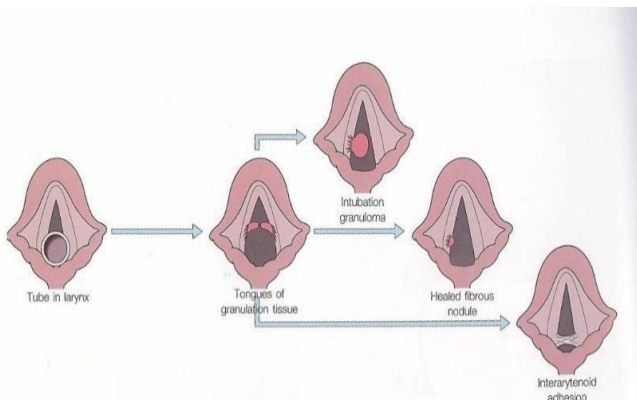
- ★ Big granuloma

- Usually they don't remove it If we remove it -> 40% recurrent.

### Treatment:

- Antireflux treatment, voice rest, lifestyle modifications, steroid therapy, no coffee or late eating.

- Granuloma, Common with intubation or reflux.
- Granulomas are benign lesions usually **located on the posterior third of the vocal fold “vocal process”**



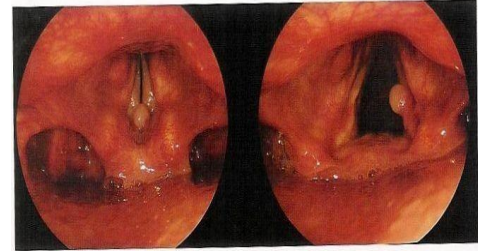
laser excision.

<sup>8</sup> could cause necrosis.

<sup>9</sup> if it is formed bilaterally it may cause adhesions.

middle picture: granuloma in one side

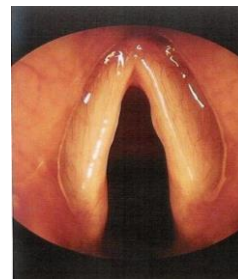
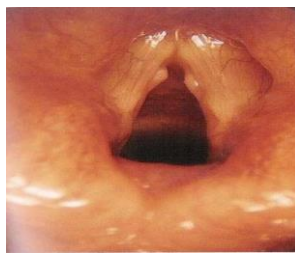
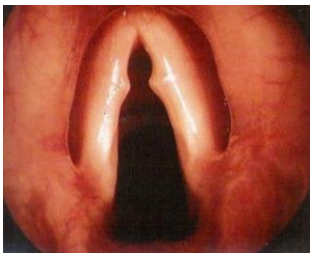
left picture: two sided adhesions.



### Vocal Fold Lesions Secondary To Vocal Abuse :

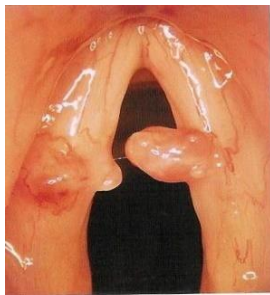
#### ❖ Vocal nodules (singer's nodules). (MCQ)

- At junction of ant  $\frac{1}{3}$  or mid  $\frac{1}{3}$ . (Ant  $\frac{1}{3}$  and post  $\frac{2}{3}$ )
- Rx :
- voice therapy refer to speech therapy to learn who to not stress on voice.
- surgical excision (microlaryngoscopy) if large but therapy is usually affective.



#### ❖ Vocal fold polyp:<sup>10</sup>

- Middle and ant  $\frac{1}{3}$ , free edge, unilateral (Usually anterior)
  - Muroid, hemorrhagic. (Vocal cord hemorrhagic polyp)
  - can occur after trauma. like concert or long speech.
  - they may present with dysphonia.
  - Rx: Conservative management first(vocal rest & good hydration & anti-reflux treatment) but if it didn't resolve we do surgical excision.
- complication: dysphonia , pain while talking , aphonia.



**Don't miss it in the exam, they'll bring a case of acute voice injury and then they will describe a lesion on the vocal cord focus on the lesion b/c the treatment depends on it. If Tiny mass, voice therapy. If it,s large mass, then the treatment is surgical excision.**

#### ❖ Vocal fold cyst:

- Congenital dermoid cyst
- Mucus retention cyst<sup>11</sup>

<sup>10</sup> it could be acute or chronic.

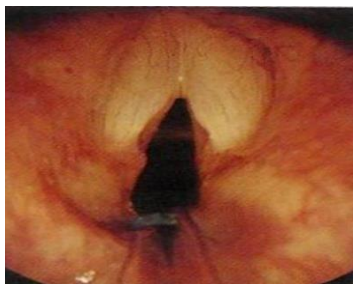
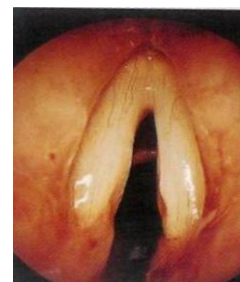
<sup>11</sup>could be in mouth , larynx or esophagus.

- Rx: **surgical excision** dissection



#### ❖ **Reinke's edema** (al pacino's voice). **OSCE**

- Rx:
  - Voice rest stop smoking.
  - **Anti-reflux therapy.**
  - Surgical excision.
  - Accumulation of fluid in Reinke's space (Common in smokers).  
spot dx in women who smoke (thick voice)



#### ❖ **Laryngocele** يجي للناس اللي بينفخوا البوق

air filled dilation in the larynx, could be intralaryngeal or extralaryngeal.

- Air filled dilation of the appendix of the ventricle, communicates with laryngeal lumen.
- Congenital or acquired.
- **Common site: ventricle.**
- it could close the airway if happened congenital in children and may even cause dysphagia or discomfort.
- **Types:**
  - **External:** through thyrohyoid membrane.
  - **Internal.**
  - Combined
- Rx: Marsupialization: **partial removal of the mass.**



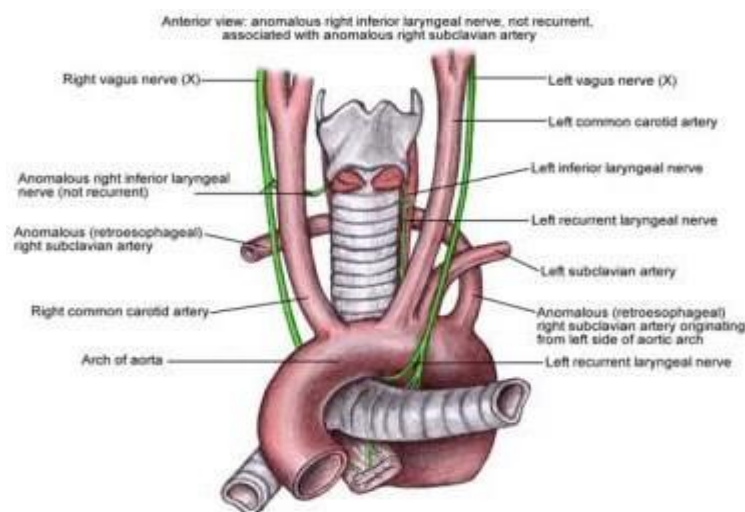


## Vocal Cord paralysis:

Vocal cord paralysis occurs when the nerve impulses to your voice box (larynx) are disrupted. This results in paralysis of the vocal cord muscles.

Vocal cord paralysis can affect your ability to speak and even breathe. That's because your vocal cords, sometimes called vocal folds, do more than just produce sound. They also protect your airway by preventing food, drink and even your saliva from entering your windpipe (trachea) and causing you to choke.

it occurs to the **left recurrent laryngeal nerve** more due to its anatomical location (pass behind aortic arch).



→ Causes of vocal cord paralysis: **Very common, know them all.**

Adult	
<b>“Iatrogenic” Trauma</b>	<b>Non-iatrogenic trauma</b>
<ul style="list-style-type: none"> <li>● cervical surgery</li> <li>● <b>Thoracic surgery</b></li> <li>● Skull base surgery (vagus nerve injury)</li> <li>● Other medical procedure:               <ul style="list-style-type: none"> <li>○ <b>Thyroidectomy.</b></li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>● Tumor</li> <li>● Medical disease <b>RA</b></li> <li>● CVD</li> <li>● Neurological (like <b>myasthenia gravis</b> , <b>neuritis MS</b>)</li> <li>● Developmental abnormalities</li> <li>● Drug neurotoxicity</li> <li>● Granulomatous disease</li> <li>● trauma <b>to neck.</b></li> <li>● Idiopathic:</li> </ul>
Children	
<ul style="list-style-type: none"> <li>● Arnold chiari malformation</li> </ul>	<ul style="list-style-type: none"> <li>● Birth trauma “<b>Forceps delivery</b>”</li> </ul>

→ **SSx:**

- Dysphonia.
- Choking in recurrent laryngeal nerve injury.
- Stridor in pediatric patients or if there's bilateral paralysis.

**In unilateral we have one that's moving and one not and that's usually give us voice problems, but if bilateral usually respiratory problem.**

### Vocal Cord Position :

→ Median, paramedian, cadaveric

- **Rx:** Self-limiting or permanent paralysis

★ For medialization: **we perform it if we have a problem in the voice. the problem in abductors**

- Vocal cord injections Gelfoam, fat, Collagen and Teflon <sup>12</sup>
- Thyroplasty type 1 (Silicon Block "Permanent")

★ For lateralization: **if the problem is respiratory. the problem in adductors**

- Cordotomy
- **Arytenoidectomy** if bilateral
- Tracheotomy

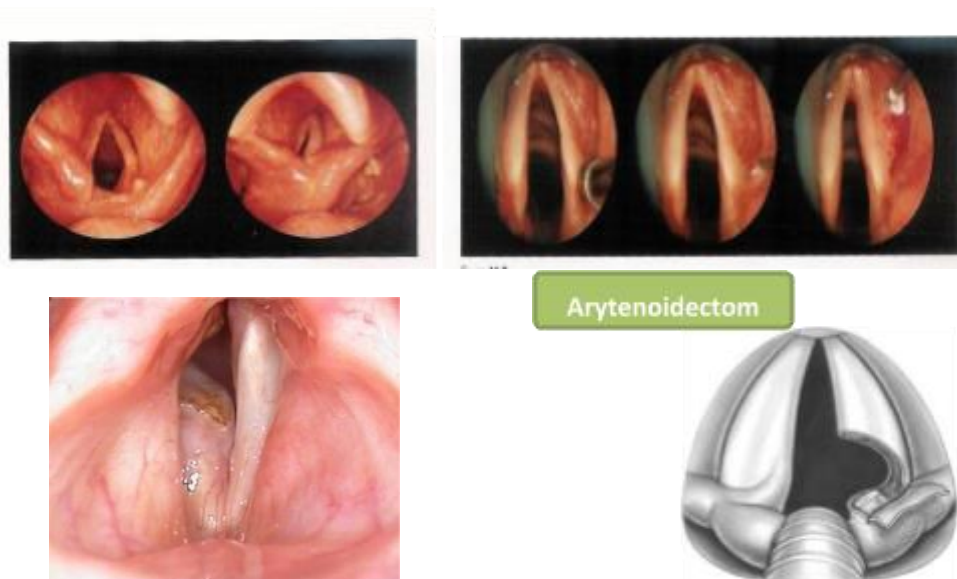
- Vocal cord paralysis can be unilateral or bilateral.

→ **Unilateral:** One work and the other is paralyzed with gap in between affects voice (Breathy).



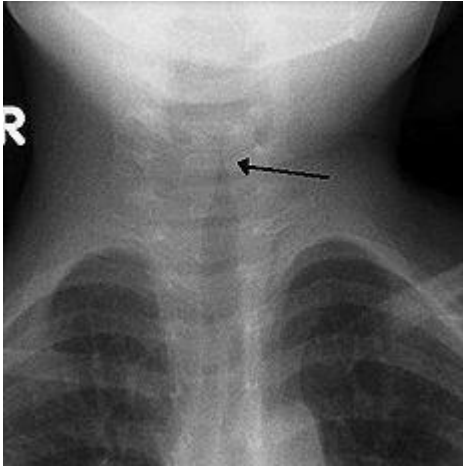
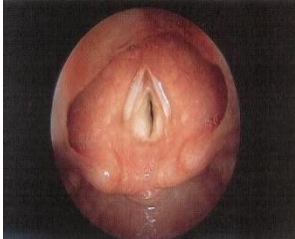
- Treatment: medialization "inject the paralyzed cord to inflate it closure of the gap.

→ **Bilateral:** Adduction of the cords can't open and it will cause stridor, and dyspnea, voice is fine.

- Treatment: lateralization.



## Inflammation of the larynx :

Acute Laryngitis	Acute Epiglottitis (IMP) (SAQ)	Croup (Laryngotracheobronchitis)
<ul style="list-style-type: none"> <li>● Rhinovirus</li> <li>● Parainfluenza</li> </ul> <p><b>SSx:</b></p> <ul style="list-style-type: none"> <li>● Dysphonia</li> <li>● Fever</li> <li>● Coughing (barking cough due to vocal cord edema).</li> </ul> <p><b>Rx:</b></p> <ul style="list-style-type: none"> <li>● Conservative</li> <li>● steroids</li> </ul>	<p>Used to be a threatening infection but now due to vaccinations it is seen less,</p> <p><b>Haemophilus influenza B</b> vaccine (2-6 year).</p> <p><b>What is the most common organism causes Acute Epiglottitis? H.influenza B</b></p> <p><b>SSx:</b></p> <ul style="list-style-type: none"> <li>● Dysphonia</li> <li>● No cough</li> <li>● Normal voice</li> <li>● Fever</li> <li>● Drooling</li> <li>● Dyspnea</li> <li>● Sniffing position</li> </ul> <p><b>Dx: Describe</b></p> <ul style="list-style-type: none"> <li>● X-ray (Thumbprint sign)</li> </ul>  <p><b>What is the best action to do?</b></p> <ul style="list-style-type: none"> <li>● Do not examine in the ER.</li> <li>● Intubate in the OR.</li> <li>● IV Antibiotics.</li> <li>● Corticosteroids (For the Edema).</li> </ul> <p>now there is vaccine for it</p> 	<ul style="list-style-type: none"> <li>● Primarily involves the subglottic region.</li> <li>● Parainfluenza (1-5 years)</li> </ul> <p><b>Pediatric.</b></p> <p><b>SSx:</b></p> <ul style="list-style-type: none"> <li>● Biphasic stridor</li> <li>● Fever</li> <li>● Brassy cough</li> <li>● No Dysphagia</li> <li>● Hoarseness</li> </ul> <p><b>Dx:</b></p> <ul style="list-style-type: none"> <li>● Xray (Steeple sign) <b>!very imp!</b></li> </ul>  <p><b>Rx:</b></p> <ul style="list-style-type: none"> <li>● Humidified O2.</li> <li>● Racemic Epinephrine (IMP).</li> <li>● Steroids.</li> </ul> 

## ❖ Diphtheric Laryngitis (rare nowadays due to vaccinations).

### → Causes:

- *Corynebacterium diphtheriae*.

### → SSx:

- Cough, stridor (suggests the spread of the membrane to the larynx and trachea), dysphonia, fever.
- Greyish –white membrane.

### → Treatment:

- Antitoxin injection.
- Systemic penicillin.
- Oxygen.
- Tracheostomy.

## ❖ Fungal Laryngitis

- seen in diabetics and Immunocompromised patients.
- Candidiasis, aspergillosis

### → SSx:

- Dysphonia.
- Cough.
- Odynophagia.

### → Rx: Antifungal regimen



## ❖ Recurrent Respiratory Papillomatosis (IMP)

- 2/3 before age 15 (juvenile).
- Rarely malignant change.
- **HPV 6-11 (common)**.
- **HPV 16-18 (malignancy)**.

### ● Risks:

- Younger first time mother (condyloma acuminata)
- Lesions: wart like (cluster of grapes). **in genital area.**

### ● Types:

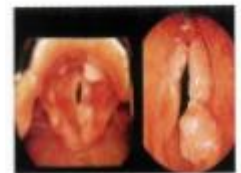
- Juvenile “affect children and it’s very aggressive”.
- Senile.

### ● SSx:

- Hoarseness, stridor.

### ● Rx:

- Laser excision, microdebrider.
- Adjunctive therapy: **Cidofovir**, acyclovir interfero(**new treatment :Avastin**)
- **on average they go to OR 4-5 times a year.**

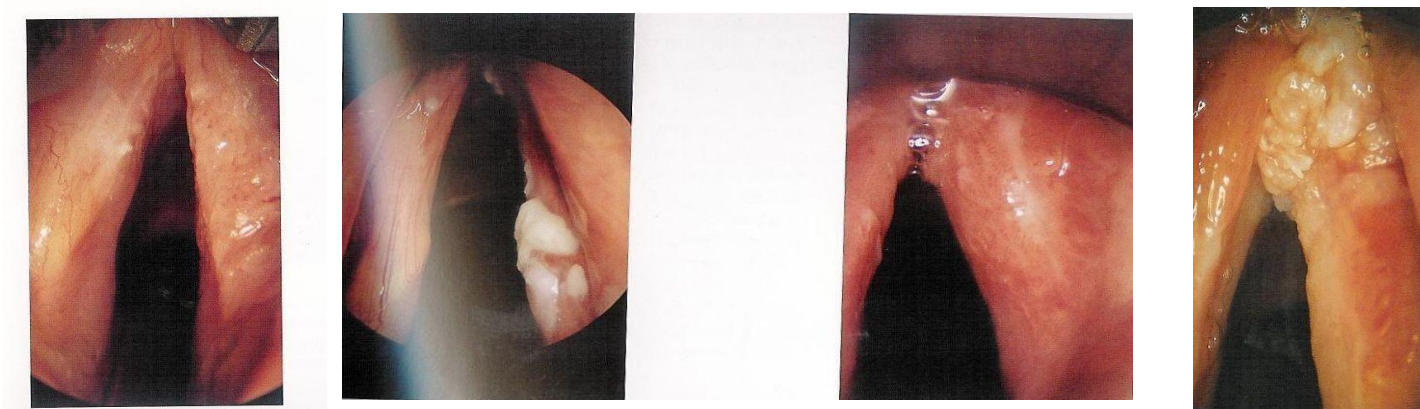


## Malignant Neoplasm Of The Larynx :

- 1-5 % of all malignancies. Of head and neck
- All are **squamous cell carcinomas**.
- **SSx**: Hoarseness, **aspiration**, **dysphagia(functional issue)**, stridor, weight lost.
- Risks: **Smoking**, alcohol, radiation exposure.
- **Rx**:  
  - **depend on stage(TNM)** Early stage, (Radio therapy). Advanced, Laryngectomy
  - **Radiotherapy**.
  - Hemilaryngectomy.
  - Total Laryngectomy + Neck dissection (lymphadenectomy).

Supraglottic	Glottic	Subglottic
<ul style="list-style-type: none"> <li>○ 30-40% of Laryngeal Ca.</li> <li>○ 25-75% Nodal metastasis.</li> </ul>	<ul style="list-style-type: none"> <li>○ 50-75%. <b>commonest</b></li> <li>○ Limited regional metastasis.</li> </ul>	<ul style="list-style-type: none"> <li>○ Rare.</li> <li>○ 20% regional metastasis.</li> </ul>

most common place is the vocal cord because it's squamous epithelium.



## Summary & Extra Notes

Congenital abnormality	Pathophysiology	Symptoms	Diagnosis	Management
Laryngomalacia	Most common cause of stridor in neonate and infants	Intermittent inspiratory stridor that improve in prone position.	HX and flexible endoscope	<ul style="list-style-type: none"> <li>- Observation</li> <li>- Supraglottoplasty</li> <li>- Epiglottoplasty</li> <li>- Tracheostomy</li> </ul>
Subglottic stenosis	Incomplete recanalization, small cricoid ring	<ul style="list-style-type: none"> <li>- <b>Biphasic stridor</b></li> <li>- Failure to thrive</li> </ul>	Chest and neck X- ray, flexible endoscope	Tracheotomy <ul style="list-style-type: none"> <li>- <b>Grade I &amp; II:</b> Endoscope (CO2 or excision with dilation)</li> <li>- <b>Grade III &amp; IV:</b> Open procedures:               <ul style="list-style-type: none"> <li>- LTR or CTR</li> <li>- Ant cricoid split</li> </ul> </li> </ul>
Laryngeal web	Incomplete decanalization	<ul style="list-style-type: none"> <li>- Weak cry at birth</li> <li>- Variable degrees of respiratory obstruction</li> <li>- On and off stridor</li> </ul>	Flexible endoscope	<ul style="list-style-type: none"> <li>- No treatment</li> <li>- Laser excision</li> <li>- Open procedure + tracheostomy</li> </ul>
Subglottic hemangioma	<ul style="list-style-type: none"> <li>- Most common in Subglottic space</li> <li>- 50% of subglottic hemangiomas associated with cutaneous involvement</li> </ul>	<b>Biphasic stridor</b>	Endoscope	<ul style="list-style-type: none"> <li>- Observation</li> <li>- Corticosteroid</li> <li>- Propranolol</li> <li>- CO2 LASER</li> </ul>

**Vocal Cords: Polyps vs. Nodules (from Toronto notes)**

Polyps	Nodule
Unilateral, asymmetric	Bilateral
Acute onset May resolve spontaneously	Gradual onset Often follow a chronic course
Subepithelial capillary breakage	Acute: submucosal hemorrhage or edema Chronic: hyalinization within submucous lesion
Soft, smooth, fusiform, pedunculated mass	Acute: small, discrete nodules Chronic: hard, white, thickened fibrosed nodules
Excision if persistent or in presence of risk factors for laryngeal cancer	Surgical excision if refractory

**Vocal Cord Paralysis:**

**Unilateral:** affected cord lies in the paramedian position, inadequate glottic closure during phonation > weak, breathy voice.

Usually medializes with time whereby phonation and aspiration improve. Treatment options include voice therapy, injection laryngoplasty (Radiessse), medialization using silastic block.

**Bilateral:** cords rest in midline therefore voice remains good but respiratory function is compromised and may present as stridor.

If no respiratory issues, may monitor closely and wait for improvement. If respiratory issues, intubate and will likely require a tracheotomy.

**Benign Laryngeal Papillomas (from Toronto notes):**

Etiology

HPV types 6, 11

- possible hormonal influence, possibly acquired during delivery

Epidemiology Biphasic distribution:

- Birth to puberty (most common laryngeal tumour) and adulthood

Clinical Features

- hoarseness and airway obstruction
- can seed into tracheobronchial tree
- highly resistant to complete removal
- some juvenile papillomas resolve spontaneously at puberty
- may undergo malignant transformation
- laryngoscopy shows wart--like lesions in supraglottic larynx and trachea

Treatment

- microdebridement or CO2 laser
- adjuvants under investigation: interferon, cidofovir, acyclovir
- HPV vaccine may prevent/decrease the incidence but more research is needed

**Laryngeal Carcinoma (from Toronto notes):**

Etiology

SCC most common 3 sites:

1. Supraglottic (30 to 35%)
2. Glottic (60 to 65%)
3. Subglottic (1%)

Mean age: 45 to 75 M:F = 10:1 Risk factors:

- Smoking/EtOH
- HPV 16 infection strongly associated with the risk of laryngeal squamous cell cancers

Clinical Features:

- Dysphagia, odynophagia, globus Otagia, hoarseness, Dyspnea/stridor Cough/hemoptysis

Cervical nodes: rare w/glottic CA

Diagnosis: Laryngoscopy CT/MRI

**Treatment:** 1ry radiation -2ry surgery -1ry surgery for bulky T4 disease



## MCQs

(from the scientific books)

**1-X- ray with steeple's sign, what is the diagnosis?**

- A- Laryngomalacia
- B- Croup
- C- laryngitis
- D- congenital incomplete canalization

Ans: B

**2- What is the percentage of children with laryngomalacia that will need surgical intervention?**

- A- 10%
- B- 30%
- C- 50%
- D- 90%

Ans: A

**3- Newborn with normal vaginal delivery, presented with cyanosis which disappears when he cries, what is your initial management?**

- A- Tracheostomy
- B- Endotracheal tube
- C- Cricothyroidotomy
- D- Oral tube

Ans: D

**4- 15 y\o boy came to the voice clinic complaining of change in voice, after laryngostroboscopy it shows bilateral small edematous vocal cord lesions at the junction of the Anterior third and the posterior 2 thirds. what is the treatment?**

- A- Voice therapy
- B- Surgical excision
- C- Observation
- D- Proton pump inhibitor

Ans: A