



433 Teams  
**ENT**

**22 & 23**

# Airway Obstruction I & II

Color index:

432 Team – **Important** – 433 Notes – Not important

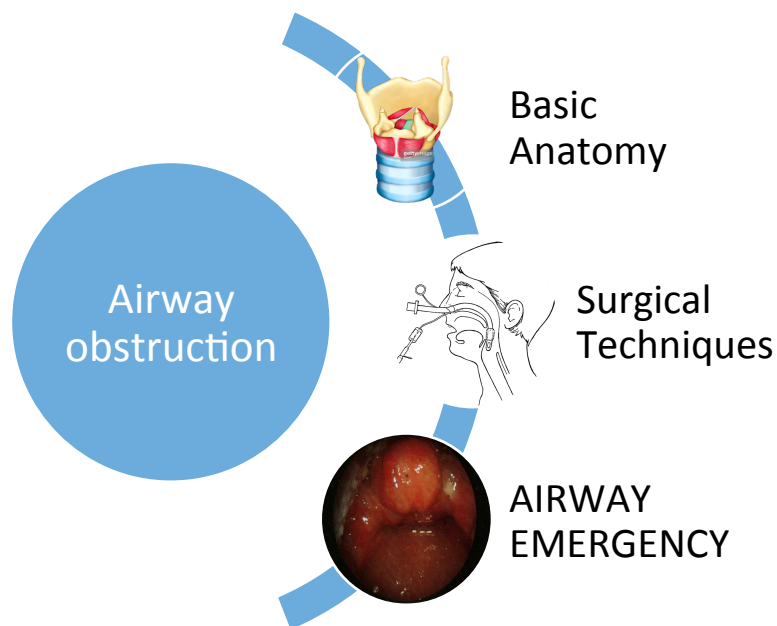
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# Objectives

- ❖ To recognize assessment and management of common airway obstruction diseases, include ability to obtain patients' history, perform comprehensive physical and mental status assessment, interprets findings.
- ❖ To know how to handle common airway emergencies.
- ❖ To be aware of common airway obstruction operations.
- ❖ Know the causes, signs and symptoms of airway obstruction.
- ❖ Know how to investigate airway obstruction.
- ❖ Know the management of airway obstruction and possible complications.

\*We recommend reading the larynx lecture before this lecture for better understanding of the anatomy and physiology.



# Basic Anatomy

## Infant & Pediatric larynx

- ❖ Position is higher at birth compared to adults.
- ❖ Epiglottis lying at the **nasopharynx**: makes the neonate an **obligate nasal breather** for 4-6 months
- ❖ Cartilage & soft tissue are **softer**.
- ❖ **Soft tissue**:
  - less adherent to the underlying cartilage “mild trauma leads to large edema”
  - susceptible to **collapse**
  - less resistant to develop submucosal edema
- ❖ Omega shape Epiglottis “**curved**”
- ❖ **Subglottis** is the narrowest part of AW in **children** and **non expandable**. In **adults** **glottis** is the narrowest. **MCQ**

## TRACHEA

- Consists of 16 to 20 **incomplete cartilaginous rings**. “complete in pediatric”
- The posterior wall is a membranous part. “helps expanding in swallowing”
- Length is approximately 11 cm.
- Diameter 19 mm male, 16 mm female.

### Pediatric trachea:

Diameter: At Birth 6 , 6 mons 7.2 mm , 1 year 7.8 mm , 4 years 11 mm .

You just need to understand that you need a smaller tube in children .

Size of the selected tube in patient **older than 2 years**  $\frac{age+16}{4}$  mm



Notice the incomplete rings

## The Upper airway extends from the nares and lip to the subglottic area

# Signs of Airway Obstruction

**Stridor:** is harsh high-pitched musical sound produced by **turbulence** of air flow through a **partial obstruction** of the **AW**.

- Stridor is a very important sign of **UAW “upper airway”** obstruction
- It indicates: pathologic narrowing of AW, potential respiratory obstruction, even death
- If **inspiratory**, the obstruction is **supraglottic** (glottis is the area between the two vocal cords), e.g: laryngomala
- If **expiratory**, the obstruction is in the **infra-thoracic trachea**
- If **biphasic**, the obstruction is **between** the two areas , most dangerous

**Flaring** of the nasal alae

Retraction of the neck, intercostal and abdominal muscles

Dyspnea

Tachypnea

Restlessness

Cyanosis

**Subcutaneous emphysema** “escaped air from the lumen of the airway”

## Diagnostic assessment

### HISTORY

Before taking history you must do “ABC” to make sure that the patient is stable. If not, you must give priority to **securing the airway**, like shallow and rapid breathing in children.

- ✓ Time of onset “immediately after birth or not”
- ✓ Possible trauma.
- ✓ Characteristic of cry “reflects the status of vocal cords”
- ✓ Relation of airway problem to feeding and position.
- ✓ History of previous intubation.
- ✓ Questions about possible aspiration of FB “high index of suspicion”

#### ❖ If stridor is present since birth:

- **congenital laryngomalacia** 60%
- subglottic stenosis
- vocal cord paralysis
- vascular rings

#### ❖ If onset of stridor is gradual and progressing:

- subglottic **hemangioma** appears between 1-3 months of age
- papilloma of the larynx appears at 6 months of age

### PHYSICAL EXAMINATION

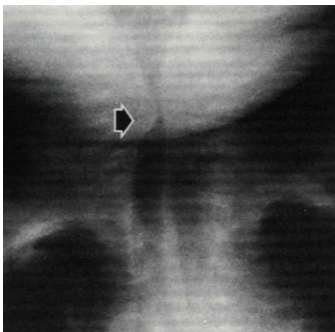
- Vital signs
- **The patient’s position “sniffing position in significant airway obstruction”**



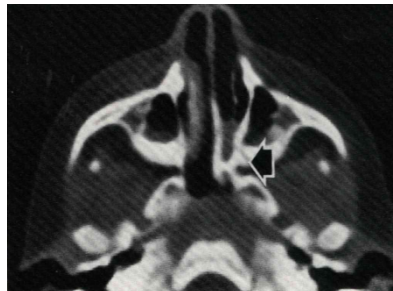
- Craniofacial anomalies
- Cutaneous hemangiomas
- Neck mass
- **Growth chart**
- Complete ENT examination
- **Flexible fiberoptic examination**
- **Endoscopy is the tool of examination**

## RADIOLOGIC EVALUATION

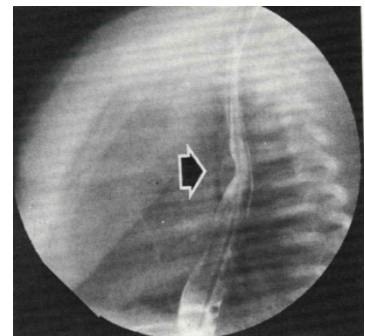
- ❖ Indicated for patient **without respiratory distress** “don’t waste time”
- ❖ In case of respiratory distress, it is an **emergency** and you have to intervene
- ❖ **Plain views** : soft tissue neck A.P. lateral and chest
  - Mobile pharyngeal tissue may bulge during expiration in normal infants
- ❖ **High-kilovoltage** technique (**croup series**) AP view assesses subglottic region
- ❖ **Flouroscopy**: **dynamic** AW changes “real time”
- ❖ **Barium swallow** :
  - Assess swallowing
  - R/O “roll out” presence of vascular rings
- ❖ **CT scan** : good in evaluating mediastinum
- ❖ MRI



High-kilovoltage technique shows signs of obstruction  
**hemangioma**



CT scan shows signs of obstruction  
**Choanal atresia**



Barium swallow shows signs of obstruction  
**apparent pulmonary artery**

If you see a brain connection do an MRI. (Homogenous opacification of sinus= fluid, polyp) (Heterogeneous with spiking = fungal “calcium and minerals” or malignancy).

- MRI is good for soft tissue and neurological tissue gives more details.
  - Remember in imaging: Bone: white, soft tissue: grey, Air: black
  - 4 sinuses: above the eye frontal, below the eye maxillary, between the eyes ethmoid, and behind the eye sphenoid. So when you see the CT scan and you don’t see the eyes it’s sphenoid NOT nasopharynx.
  - Lamina papyracea is a thin bone plate between the orbit and ethmoid.
  - On CT scan you should look for the extension of the disease and the complication on orbit or brain.
- Also look for anatomical variations
- Rx: functional endoscopic sinus surgery (FESS) NOT fibrotic Endoscopic Evaluation of Swallowing (FEES)

In vocal cord polyp, the correct answer is microlaryngoscopy polyp excision “not polypectomy!”

## ENDOSCOPIC EVALUATION

**Mirror Examination:** is **not endoscopic**. Used In older children and adults. Can provide information about **hypopharynx and larynx** and movement of vocal cords.

**Telescopic Examinations:**

❖ **Fibroptic Endoscopy “flexible”:**

excellent to assess the movement of vocal cords. “Nose, pharynx, larynx and trachea”

❖ **Rigid bronchoscopy:**

- ✓ done under GA “general anesthesia”
- ✓ may enable removal of FB “foreign body” “and taking biopsy”
- ✓ assess the AW down to the main **stem bronchi**

## OTHER DIAGNOSTIC MEASURES

- **Flow volume loop** “part of pulmonary function test”
- **ABG** “arterial blood gasses”
  - **late** indicator of AWO
  - Should not be used routinely to assess degree of obstruction

## THERAPEUTIC OPTIONS

1. Observation/Medical Support

- ✓ ICU
- ✓ Airway team availability
- ✓ Oxygenation
- ✓ Steroids “**reduce edema**”
- ✓ Antibiotics

2. **Heimlich maneuver**

3. N. P. Airway

4. Oral Airway

5. Esophageal airway

6. **Trans-oral intubation**

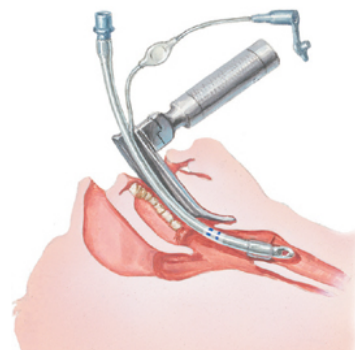
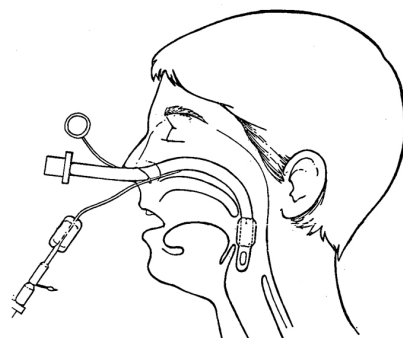
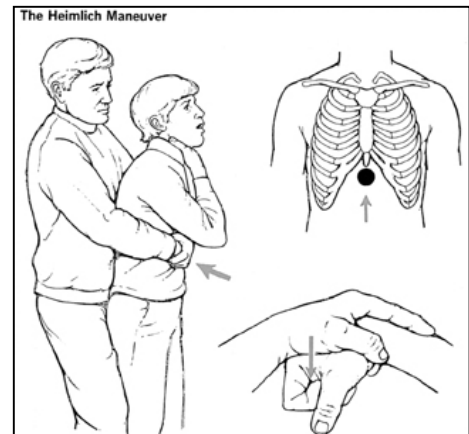
7. **Nasal intubation** “more natural, good in case of cervical neck injury “

8. Flexible fibroptic intubation

9. Trans-tracheal jet ventilation “Trans-tracheal needle ventilation “

10. Cricothyroidotomy

11. Tracheostomy



# Surgical Techniques

## Trans-tracheal needle ventilation

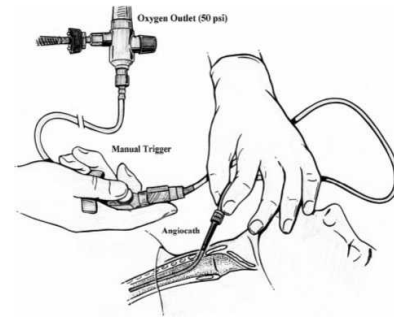
where **immediate** ventilation is required, can support ventilation for several **hours**

Technique: 12, 14 or 16 gauge cannula

& high press ventilation system (50 p.s.i) attached

### Complications:

- A. **failure to establish an AW**
- B. Misplaced catheter in **soft tissue** of the neck (**esp. in children**) “**high mobile and soft**”
  - pneumo-mediastinum
  - pneumothorax
- C. Total obstruction of the airway prevents adequate ventilation



## Cricothyroidotomy “laryngectomy”

Also called cricothyroidotomy, is a procedure that involves **placing a tube through an incision in the cricothyroid membrane** to establish an airway for oxygenation and ventilation.

### Indications:

Generally, for **emergency** upper airway obstruction (orotracheal or nasotracheal intubation is either unsuccessful or contraindicated), **elective** for head and neck or cardiovascular procedures where access to the tracheal rings is limited “**you can’t do tracheostomy**”

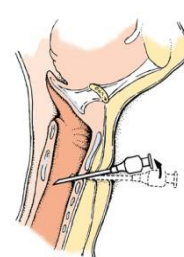
- o **Need to avoid neck manipulation**
- o **Severe maxillofacial trauma**
- o **Edema of throat**
- o Severe oropharyngeal/tracheobronchial hemorrhage
- o **Foreign body in upper airway**
- o Lack of equipment for endotracheal intubation
- o Technical failure of intubation

### Complications:

injury of anterior jugular vein, **great vessels**, or **recurrent laryngeal** nerve. Subglottic and laryngeal stenosis (**especially in children**) “**because the cricothyroid membrane not fully developed**”

Cricothyroidotomy

smartdraw



## Tracheostomy:

An operative procedure that creates a surgical airway in the cervical trachea. **In emergency tracheostomy vertical** incision is preferred

### Indications:

- Congenital anomalies like laryngeal hypoplasia
- Upper airway foreign body
- Supraglottic or glottis pathology like infection, neoplasm, bilateral vocal cord paralysis.
- Neck trauma results in severe injury to the thyroid or cricoid cartilages.
- Subcutaneous emphysema
- Facial fractures that may lead to upper airway obstruction.
- Upper airway edema from trauma, burns, or anaphylaxis.

### Complications:

#### Immediate:

- Hemorrhage, e.g. from thyroid isthmus
- Hypoxia
- Trauma to recurrent laryngeal nerve
- Damage to esophagus (dissection)
- Pneumothorax
- Subcutaneous emphysema

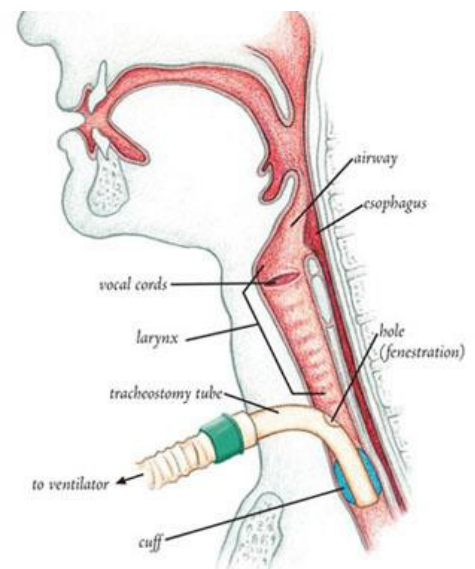
#### Early:

- Tube obstruction or displacement
- Aspiration
- Bleeding from tracheostomy site
- Infection

#### Late:

- Airway obstruction with aspiration
- Tracheomalacia
- Aspiration and pneumonia
- Fistula formation, e.g. tracheo-cutaneous or tracheo-oesophageal
- Damage to larynx, e.g. stenosis

- Also, strong ambu bagging could cause pneumothorax.



# Nasal obstruction

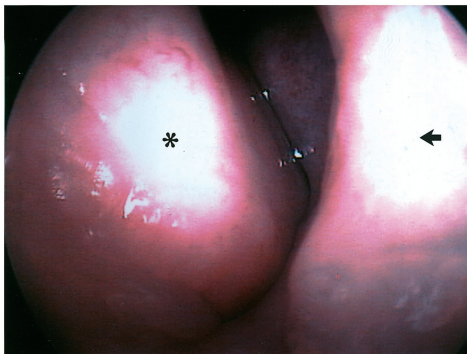
Neonates in the first 3 months are obligatory nasal breathers. Cyanosed neonates with nasal obstruction improve with crying, because when they are crying they will breath through their mouths. In neonates cyanosis improves with crying and worsens on feeding (cyclic cyanosis)

Cystic	Solid
Meningoencephalocele	Haemangioma
Meningocele	Neurofibroma
Dermoid cyst	Glioma
Epidermoid cyst	Lymphangioma
	Neuroblastoma
	Craniopharyngioma
	Rhabdomyosarcoma
	Chordoma

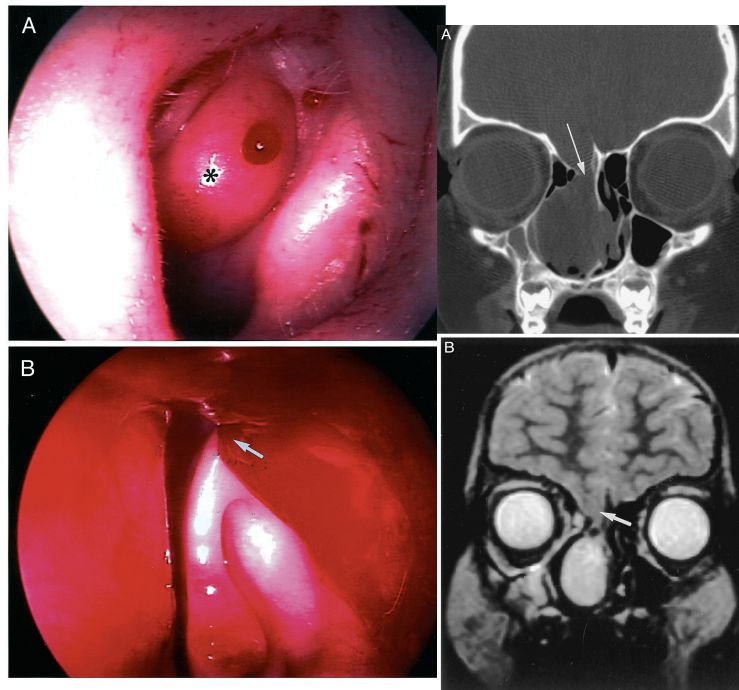
Note 432: In OSCE you would describe site, size,..etc.

DDX: Meningoancephalocele; Dermoid cyst and Epidermoid cyst.

For diagnosis do imaging then scope.



When you scope and see any mass you shouldn't grasp because it could be meningoencephalocele attached to the brain. So in pediatrics it's important to do CT and MRI. Grasping the mass risks the development of meningitis



A: coronal CT scans showing homogenous mass in the right nostrils (arrow).

B: MRI shows communication (homogenous= all the same color)



## Choanal atresia

- ❖ Lack of patency of posterior nasal aperture
- ❖ Unilateral: presents late and may be undiagnosed until later in childhood (diagnosed at 1-2 year with unilateral nasal discharge "rhinorrhea")
- ❖ Bilateral: is a birth emergency "because neonates are obligate nasal breather" (Rx:oral tube)

Could be associated with other anomalies in 20-50% of cases :

- ❖ **CHARGE** "Coloboma (a hole in one of the structures of the eye, such as the iris, retina, choroid, or optic disc), Heart anomalies, choanal Atresia, Retardation of growth and development, Genital and/or urinary abnormalities and Ear anomalies"
- ❖ **VATER** "VACTERL" "Vertebral anomalies, Anal atresia, Cardiac defects, Tracheoesophageal fistula and/or Esophageal atresia, Renal & Radial anomalies and Limb defects "
- ❖ **craniofacial anomalies**

### Types

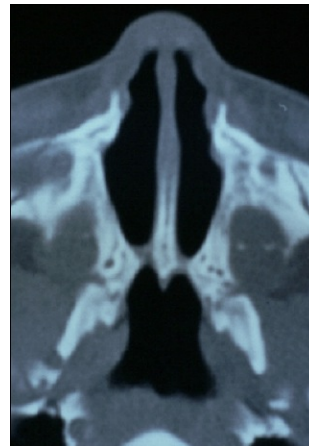
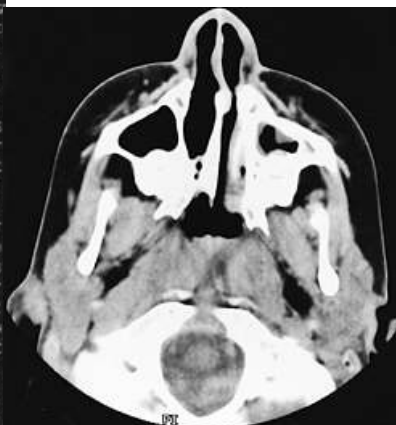
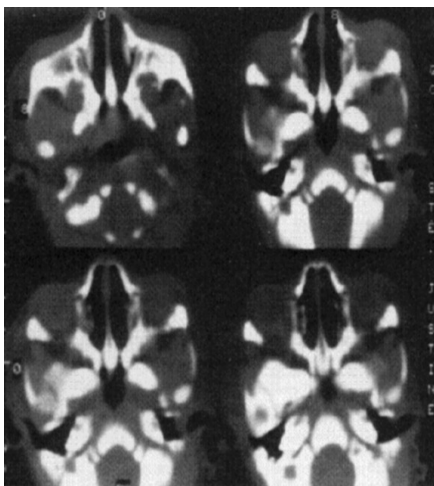
- Membranous 10%
- Bony
- Mixed (most common)

### Dx

- ❖ Cyanosis that improves with crying
- ❖ Inability to pass size 6 French catheter (In small hospital where they don't have scope)

Do CT to differentiate between the types

Axial CT showing mixed choanal atresia:



Axial CT that shows bilateral membranous choanal atresia  
Membranous=grey.  
Bone=white



Figure 1. A case of left side choanal atresia and symmetrical maxillary sinuses and no sinus disease.

Axial unilateral Bony choanal atresia

### Treatment:

- Emergency treatment is by insertion of oral tube
- Surgical treatment is by either transnasal or transpalatalchoanalatrasia repair.

# Pharyngeal obstruction

Craniofacial anomalies:

## 1. Pierre-Robin syndrome

**Glossoptosis:** airway obstruction caused by backflow displacement of the tongue base, **micrognathia:** small narrow mandible causes narrow airway, and **cleft palate.**

## 2. Treacher- Collins syndrome: (Mandibulo-facial dysostosis)

Disorder of bone development, affecting ossification. Narrow nose high arched palate

Note 432: These patients have retrognathia, tongue is big, cleft palate and they might have pharyngeal obstruction and need tracheostomy.



# Laryngeal

## Laryngomalacia:

The most common cause of congenital airway obstruction. The most common cause of **inspiratory** stridor in infancy (2nd is **Bilateral vocal cord paralysis** and 3rd **subglottic stenosis**)

Due to flaccidity or incoordination of **supra laryngeal cartilages** which are **pulled inside** the lumen during inspiration leading to UAW obstruction.

Characterized by **stridor** in the **first few weeks** “**inspiratory stridor**”

In laryngomalacia, the epiglottis or the arytenoids are soft and floppy. This floppy tissue gets pulled into the airway during inspiration, causing temporary partial blockage of the airway. This tissue is pushed back out when the infant exhales, opening the airway again.

## Symptoms:

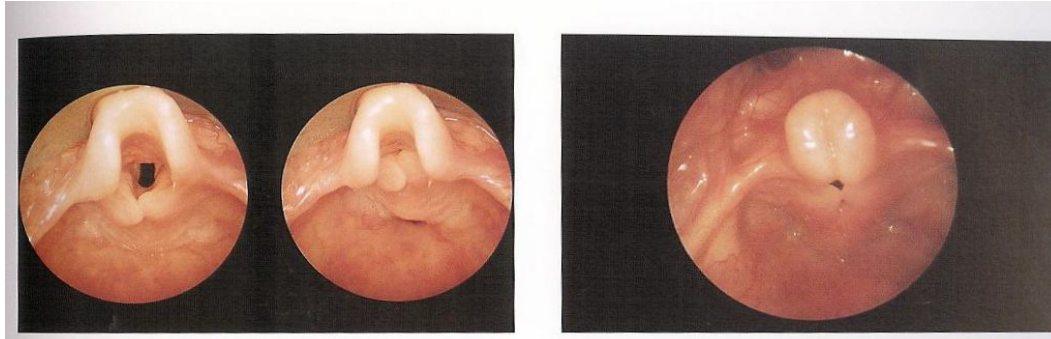
**Snoring:** is low pitch sound caused by tissue vibration of the nasopharynx pharynx and soft plate due to obstruction above the larynx

- Stridor in the first weeks of life
- Inspiratory phase

- Worse with crying, feeding and respiratory tract infection
- Improved in prone position
- DX: flexible fibrotic endoscopy

**Complication:** feeding difficulty and failure to thrive

Best way of diagnosing is fiberoptic endoscopy



**Endoscopic finding:**

- Long, omega shape epiglottis arytenoid mucosa (epiglottis is collapsing)
- Inward forward movement of (sucked)
- Short aryepiglottic fold

**Treatment :**

- Reassurance “mostly self-limited”
- Infant can outgrow this problem
- Mild cases : ( no cyanosis not affecting the child growth): Observation (it can improve with time by 12-18 months in 90% of cases)
- Sever cases: if the mother complains of bad oral intake, cyanotic child
  - **Supraglottoplasty** 'the best' (cut of the aryepiglottic fold and trimming of arytenoid mucosa)
  - Tracheostomy 'can't be used continuously'

## Vocal cord paralysis

**Note 432:** All the muscles all supplied by recurrent laryngeal nerve except Cricothyroid muscle. Diagnosed by fiberoptic endoscopy, it shows vocal cord that are not abducting. Do CT brain to exclude Arnold Chiari Syndrome. Look back to the history to see if the child was delivered by forceps and had a vagal compression Child has weak cry (weeping).

Can be unilateral or bilateral, congenital or acquired. The Congenital form may associated with abnormality of the central nervous system (Arnold Chiari syndrome) or cardiovascular anomalies.

The acquired causes: Birth trauma “forceps delivery”, cardiac surgery “Patent ductus arteriosus repair”, mediastinal or neck surgery, tracheo-esophageal fistula repair. Bilateral Vocal Cords Paralysis “Abducted type”.

**Symptoms:** High pitch inspiratory stridor

**Treatment:**

- Tracheostomy in severe cases (e.g. affect the growth)
- Spontaneous recovery occurs in half patients (Congenital have a chance of spontaneous recovery within 5 years) Surgical intervention postponed until the patient become old
- Vocal cord lateralization. Arytoidectomy and laser cordotomy



## Subglottic Haemangioma

Congenital vascular lesion Not present at birth but grow rapidly over the first few months of life

### Symptoms:

- Biphasic stridor
- Tend to involute slowly after one year
- 50% of the patients have cutaneous haemangioma in the head and neck

**Treatment:** Systemic steroid, interlesional steroid, **Propranolol**, laser ablation tracheostomy.

## Congenital Subglottic Stenosis

Subglottic area is the narrowest area in the airway. Stenosis occurs if the diameter is less than 4 mm in term infant

### Symptoms: depend on the degree of the stenosis

- Biphasic stridor
- Recurrent croup

**Diagnosis:** Bronchoscopy, plain x-ray, HKV

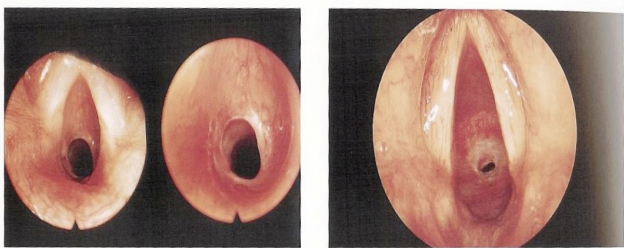
**Treatment :** Depend on the degree of stenosis

#### Grades 1 and 2:

- Tracheostomy, laser excision, balloon dilation

#### Grades 3 and 4: —

- Laryngotrachealreconstruction(LTR), Criocotrachealresection(CTR)



■ The maximum percentage of airway obstruction is determined and assigned a grade:

- Grade I <50% obstruction
- Grade II 51-70% obstruction
- Grade III 71-99% obstruction
- Grade IV no detectable lumen

## Laryngeal web

Small web just has dysphonia

- Weak cry
- Stridor

### Treatment:

- Laser excisions
- Tracheostomy



## Extratracheal Compression

### Cystic hygroma:

Difficult to intubate sometimes to maintain the airway by oxygenate through the blood. Born with it diagnosed by antenatal US and emergency debulking surgery after delivery



Mass compressing the floor of the mouth, tongue

**Definition:** lymphatic malformation arising from vestigial lymph channels of neck

#### Clinical features:

- Usually present by age 2
- Thin walled cyst extending from floor of mouth to mediastinum, in posterior triangle or supraclavicular area
- Painless, soft, compressible
- Infection causes a sudden increase in size

**Diagnoses:** intranatally by ultrasound

**Treatment:** surgical excision (debulking) if it fails to regress- difficult dissection due to numerous cyst extensions cystic hygroma is consisting of lobulated masses when they open one another one appear

## Acquired upper airway obstruction

Acquired upper airway obstructions are more common than congenital type. Subglottic area is the narrowest area.

#### Causes:

##### Infectious

- Peritonsillar abscess
- Retropharyngeal abscess
- Epiglottitis
- Croup
- Bacterial tracheitis

##### Noninfectious

- Foreign body aspiration
- Acquired vocal cord paralysis
- Acquired subglottic stenosis

- Adenotonsillar enlargement
- Respiratory papillomatosis
- Malignancy
- Angioedema
- Caustic ingestion
- Trauma
- Laryngospasm

## Peritonsillar abscess

- Common deep infection in late childhood
- **Symptoms:** low grade fever severe sore throat, muffled voice, drooling, trismus

Case: child had tonsillitis and treated with antibiotic for 3 days then stopped, after 2 days he started getting worse drooling of saliva, can't open the mouth (trismus) and hot potato voice? Peritonsillar abscess (quinsy) (one of the indication of tonsillectomy )

**Diagnosis:** —

- Clinical diagnosis —
- CT scan

**Treatment:**

- Aspiration
- Excision and drainage
- Later tonsillectomy
- IV ABX



Bulging pushing the tonsil to the other side

## Retropharyngeal abscess

**Symptoms:**

Fever, cervical adenopathy, stridor torticollis, drooling

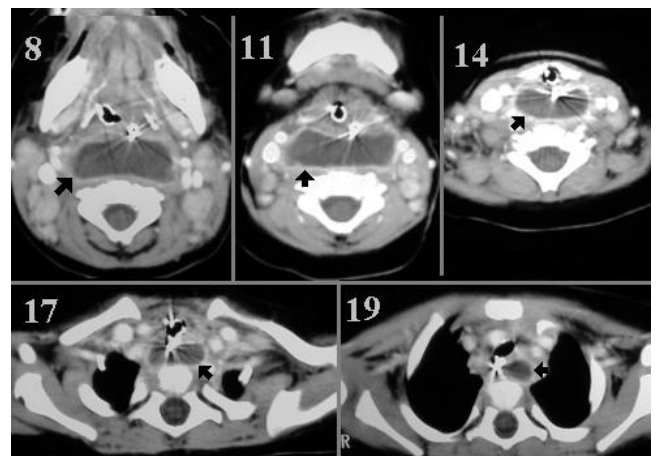
**Causes:** Progressive pharyngitis S.aureus, Haemophilus, group A beta haemolyticsterptococcus, bacteroides

**Treatment:** Intraoperative to reduce risk of swallowing and aspiration

- Transoral excision and drainage
- IV ABX
- INTUBATION
- Tracheotomy



Lateral x---ray shows the diameter of the soft tissue is more than the diameter of the vertebrae (Retropharyngeal)



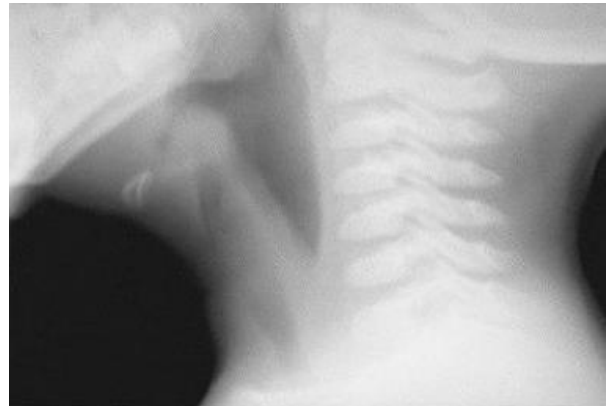
# Epiglottitis

Definition: It is an **acute inflammation in the supraglottic region of the oropharynx** (less acute in adults) with inflammation of the epiglottis, vallecula, arytenoids, and aryepiglottic folds. It is a life threatening rapidly progressive condition.

Causes: **Haemophilus influenzae type B**. Age: 2-7 years.

## Signs and Symptoms

- High fever
- Drooling
- Stridor
- **Sore throat**
- **Odynophagia/dysphagia**
- **Muffled voice**
- “Hot potato voice”, as if the patient is struggling with a mouthful of hot food.
- Adults may have preceding upper respiratory tract infection (URTI) symptoms. **No examination should be done in the ER. (take to the OR and examine)**



## Investigation:

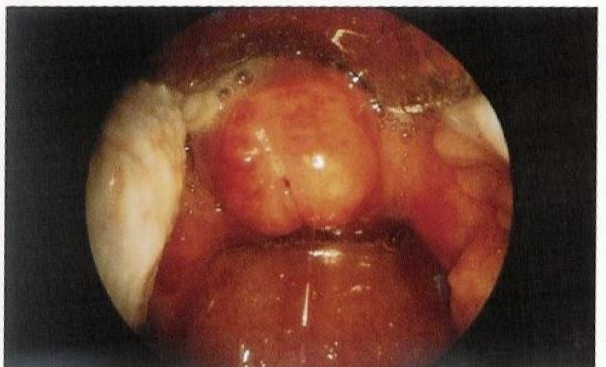
1. Airway management “**secure the airway!**”
2. Direct visualization of the epiglottis using nasopharyngoscopy/laryngoscopy after stabilizing the patient. “**the preferred method of diagnosis**”
3. Lateral neck soft-tissue x-ray. “**useful screening tool**”

The classic lateral neck radiographic findings are a swollen epiglottis (ie, a **thumb sign**), thickened aryepiglottic folds, and obliteration of the vallecula (vallecula sign).

## Management:

1. Artificial airway “endotracheal intubation, tracheostomy, or cricothyrotomy”.
2. Empiric IV antimicrobial therapy.

We don't see it now because vaccination reduced the incidence of epiglottitis.



# Croup “Laryngotracheobronchitis

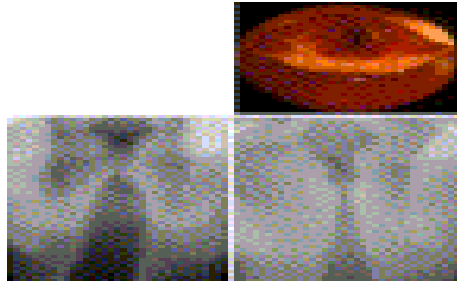
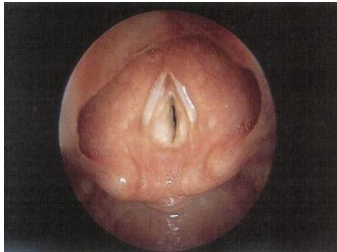
Definition: It is a common, **primarily pediatric** viral respiratory tract illness generally affects the trachea and the larynx and may extend to the bronchi. Morbidity is secondary to **narrowing of the larynx and trachea below the level of the glottis (subglottic area)**, causing the characteristic audible inspiratory stridor.

Causes: Parainfluenzae viruses (types 1, 2, 3)

**Symptoms:**

- Biphasic stridor “stridor present during inspiration and expiration”, hoarseness, fever, brassy cough “loud metallic barking cough”, no dysphagia.

Investigation: It is mainly a clinical diagnosis, chest x-ray is only indicated when the diagnosis is suspicious, or the course is atypical. A posterior-anterior chest radiograph demonstrates subglottic narrowing commonly called “steeple sign”.



**Steeple sign**

Management:

- Vital signs assessment.
- 100% humidified oxygen and ventilation support in case of severe respiratory distress.
- Steroids, nebulized racemic epinephrine.

## AIRWAY EMERGENCY

### Tumor

commonly tumors of aero-digestive tract or thyroid

typically present with gradual airway obstruction

**initial management :**

O<sub>2</sub>, humidification, steroids “for edema” and IV antibiotics “secondary infections”

**Airway stabilization :**

- organization between Surgeon and Anesthetist “make a plan”
- avoid blind attempt of intubation “it will make it worse”
- if available, fiber-optic intubation (experience)
- percutaneous jet ventilation to stabilize patient “might be used”
- elective awake tracheostomy under local anesthesia is the safest method to secure the airway
- precipitation of complete obstruction necessitates emergent cricothyroidotomy or tracheostomy

### TRAUMA

**Presenting signs and symptoms :**

- |                    |                            |
|--------------------|----------------------------|
| a. Hoarseness      | d. Dysphagia               |
| b. Pain tenderness | e. Sub-cutaneous emphysema |
| c. Hemoptysis      | f. Impaired respiration    |

## g. Haematoma

**Classification of Laryngeal Trauma & Treatment: “you don’t need to memorize it”**

	Type I	Type II	Type III	Type IV
Definition	<ul style="list-style-type: none"> <li>Minor endolaryngeal haematoma or laceration</li> <li>absence of detectable fracture of laryngeal skeleton</li> </ul>	<ul style="list-style-type: none"> <li>edema, haematoma, mucosal disruption</li> <li>no exposed cartilage, no displaced fracture</li> </ul>	<ul style="list-style-type: none"> <li>massive edema with large mucosal laceration, exposed cartilage, displaced fracture</li> <li>vocal cords motion impairment</li> </ul>	<ul style="list-style-type: none"> <li>same as III but more severe</li> </ul>
Management	<ol style="list-style-type: none"> <li>24 / 48 hours observation in ICU</li> <li>head of bed elevated</li> <li>humidification &amp; systemic steroids</li> </ol>	<ol style="list-style-type: none"> <li>tracheostomy under local anesthesia</li> <li>CT scan to R/O displaced fracture</li> </ol>	<ol style="list-style-type: none"> <li>Tracheostomy</li> <li>Laryngoscopy</li> <li>exploration and repair</li> </ol>	<ol style="list-style-type: none"> <li>explore and repair</li> <li>require endolaryngeal stent</li> </ol>

## Thermal Injury

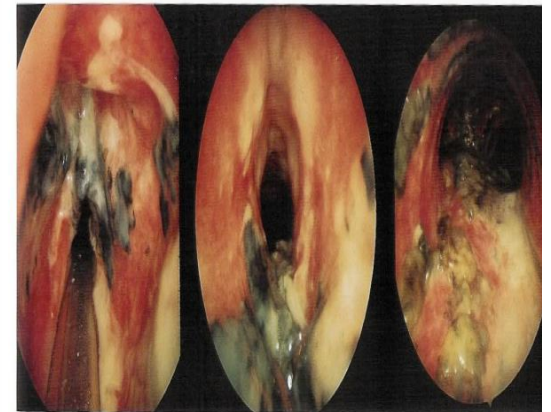
It is caused by aspiration of hot liquid or caustic fluid. **Alkali is more dangerous of acids.**

Because of the risk of rapidly developing airway edema, the patient’s airway and mental status should be immediately assessed and continually monitored.

The treatment starts with securing the airway “intubation”, tracheostomy and IV antibiotics.

### Tracheostomy

- ❖ Reported to have **higher mortality** rate as a result of **infectious** complication (**pulmonary sepsis, necrotizing tracheitis, mediastinitis**)
- ❖ Bleeding, pneumothorax, tracheal stenosis
- ❖ Edema of the neck results in
  - difficult procedure
  - inadvertent **removal of the tube**
- ❖ **Cricothyroidotomy**, may establish the airway more **easily**



### Stabilization of airway is indicated for :

- I. **thermal** injury of trachea, and **extensive burns** of the **face** or **oropharynx**. Where **impending UAWO** necessitates **intubation**
- II. **Intubation** for assisted ventilation is required for **inhalation injury** with changes in ABG, O2 sat, and increase CO

### Once decision of intubation is made:

- 1) **ET** “endotracheal tube” should be attempted **initially**
- 2) if necessary, leave it for 3-4 wks
- 3) utilize this time for grafting neck burns
- 4) **shift to tracheostomy after that if necessary**



## FOREIGN BODY

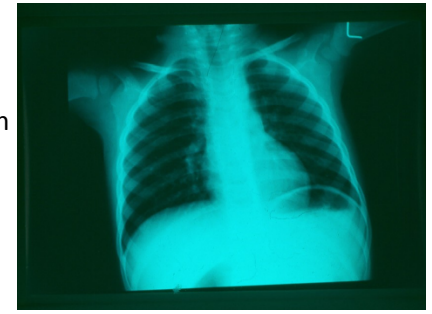
Complete AW obstruction may be recognized in the **conscious child** as sudden to **speak or cough** . “do Heimlich maneuver as ABC”

**Types of Foreign Bodies “FB”:** “affect diagnosis and treatment “

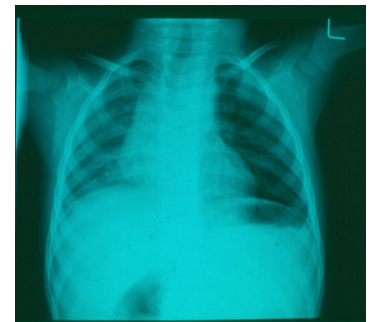
- **vegetable** matters are the **most common** in the **children’s AW**
- metal
- plastic

**Location of FB in the AW :**

- commonly the final destination is one of the **main bronchi**  
**right more common than left** “more vertical and wider”
- Larynx in case of sharp objects
- **Trachea** if there is **narrowing** in the trachea



Chest X-ray inspiratory phase  
Shows normal lungs



Chest X-ray expiratory phase  
Shows entrapped air in L lung  
FB in the L main bronchi

**That is why you must take two x-rays  
inspiratory and expiratory**

## PRESENTATION

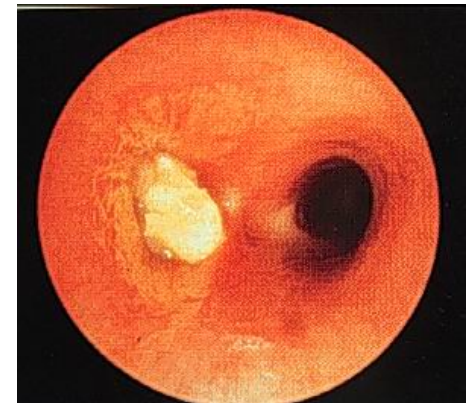
- **Acute:** Usually **coughing**, choking, gagging and wheezing
- No symptoms or signs “incidental”
- **Subacute stage:** **Mimic** different acute or chronic disease of lungs  
e.g. croup, bronchial asthma.
- **Stage of complications** “abscess or perforation”

## DIAGNOSIS

**Radiologic:**

- ✓ extended soft tissue neck
- ✓ PA, lateral chest **most efficacious**
- ✓ It can demonstrate FB, Emphysema, atelectasis of the lung
- ✓ A lack of findings upon physical examination does not preclude the possibility of an airway foreign body.

Foreign body in the main bronchi



**Management “gold standard”**

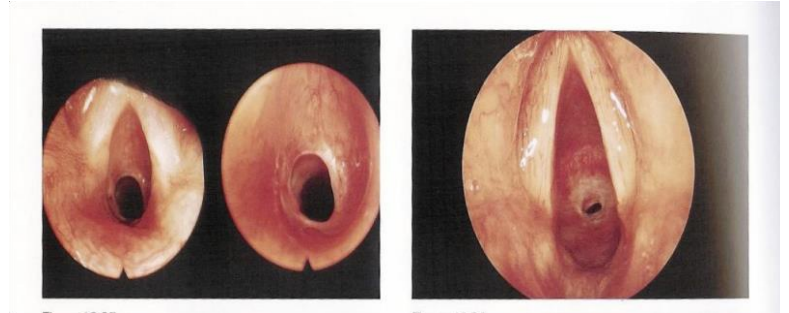
**Endoscopic** removal is **both diagnostic and therapeutic**

# Acquired Subglottic Stenosis

Definition: It is a partial or complete narrowing of the subglottic area.

Risk factors: (imp)

- Prolong intubation
- Size of the tube
- Care of intubated patient
- High pressure cuffs tube
- Difficult intubations
- Multiple intubation
- GERD
- Tracheobronchial infection



Causes:

- 90%: trauma from endotracheal intubation. The duration of intubation and the tube size are important.

- 10%: secondary to foreign body, infection, inflammation or irritation.

432 Explanation: Usually, injury is caused by endotracheal intubation or high tracheostomy tube placement. If irritation persists, the original edema and inflammation progress to ulceration and granulation tissue formation.

When the source of irritation is removed, healing occurs with fibroblast proliferation, scar formation, and contracture, leading to stenosis or complete occlusion of the airway.

Symptoms:

- Dyspnea (may be on exertion or rest depending on the degree of stenosis), stridor, hoarseness, brassy cough, recurrent pneumonitis, cyanosis.

Investigation:

- Chest x-ray, MRI, Videostrobolaryngoscopy

- Visualization of the larynx by flexible fiberoptic or rigid telescopic.

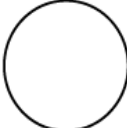




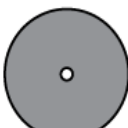
Cotton-Myer Grading of Subglottic Stenosis

**Management of grade I and II:**

- Observation, balloon dilatation, laser excision

**Management of grade III and IV:**

- Tracheostomy, laryngotracheal reconstruction, Cricotracheal resection

Classification	From	To
Grade I	 No Obstruction	 50% Obstruction
Grade II	 51% Obstruction	 70% Obstruction
Grade III	 71% Obstruction	 99% Obstruction
Grade IV	No Detectable Lumen	



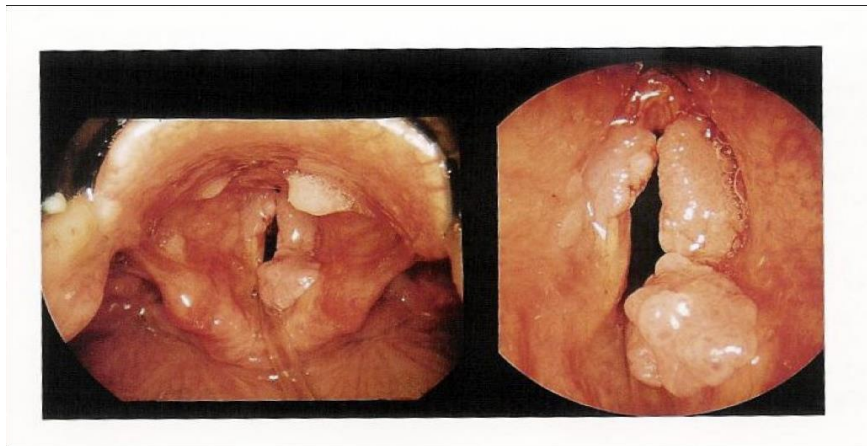
# Respiratory Papillomatosis

Caused by human papilloma virus (HPV) types 6 and 11, vary from hoarseness and breathing difficulty to AWO

Risk factors: of juvenile-onset respiratory papillomatosis are firstborn child, vaginal delivery, and the mother being younger than 20 years + the presence of genital warts “condyloma acuminata”.

Symptoms: Symptoms of upper airway obstruction predominate because the larynx is usually affected in both types: Hoarseness, voice changes (dysphonia) initially they come with only dysphonia when obstruction happens the other symptoms starts to appear. Choking episodes, foreign body sensation in the throat, cough, dyspnea, inspiratory wheeze, stridor.

Management: Laser excision or microdebrider, adjuvant therapy: Cidofovir.



## MCQs

**1- A 12-year-old girl is complaining of left unilateral nasal obstruction worse on expiration for 5 months. Examination of the nose showed a single pale grayish glistening pedicled mass in the posterior part of the left nasal cavity. A CT showed pacification of the left nasal cavity, maxillary sinus and the nasopharynx.**

**What is the most likely diagnosis?**

- A. Antro-choanal polyp
- B. Inferior turbinate enlargement
- C. Mucocele

**2- A 4-years-old child presented in the ER with mild respiratory distress. On laryngoscopy, she was diagnosed with multiple juvenile papillomatosis of the larynx.**

**Next line of management is:**

- A. Tracheostomy
- B. Microlaryngoscopy
- C. Steroids
- D. Antibiotics

**3- A patient presented with stridor and dyspnea which he developed after attack of upper respiratory tract infection. On examination he was found to have a 3-mm glottis opening.**

**All of the following are used in the management except:**

- A. Tracheostomy
- B. Arytenoidectomy
- C. Teflon injection
- D. Cordectomy

**4- Steeple sign seen on posteroanterior view of neck in a child with stridor is indicative of:**

- A. Acute epiglottitis
- B. Acute laryngotracheobronchitis
- C. Laryngeal papillomatosis
- D. Bilateral abductor paralysis

**5- A 3-year-old boy came to the ER with abrupt onset of fever "40 degrees", respiratory distress and stridor. On examination, the boy appears actually ill. He is sitting, leaning forward with her mouth open and drooling.**

**What's the most likely diagnosis?**

- A. Epiglottitis
- B. Pneumonia
- C. Adenoiditis
- D. Asthma

Answers:

- 1- A
- 2- A
- 3- C
- 4- B
- 5- A

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