AIRWAY OBSTRUCCTION I-II

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.

Airway Obstruction

The First Part About:

- Signs and symptoms
- Causes of airway obstruction (congenital and acquired)

The Second Part About:

- Investigation of airway obstruction
- Radiology illustration
- Medical and surgical treatment
- Operations (indication, procedure and complication) tracheostomy, cricothyroidectomy, intubation, choanal atresia repair etc.

Upper airway extend from the nares and lip to the subglottic area.

Sign and symptoms of (Upper Airway Obstruction)

- **Stridor**
- **flaring of the nasal alae**
- **retraction of the neck, intercostal and abdominal muscles**
- **Dyspnea**
- **Tachypnea**
- **Restlessness**
- **Cyanosis**
- **Subcutaneous emphysema**

If a patient presented with most of these sign and symptoms then he is mostly in Respiratory Distress which require medical intervention immediately and do not wait for investigation.

What is Stridor?

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

It's very important because it indicate pathological narrowing and possibly AWO (airway obstruction).

Types of stridor?

- **Inspiratory stridor:** supraglottic, glottis (the area between the two vocal cords) obstruction
- **Expiratory stridor:** trachea (lower) (in the intrathoracic trachea)
- **Biphasic stridor:** subglottic obstruction (below the vocal cord or upper trachea) the most dangerous

Congenital upper Airway Obstruction

Upper airway obstruction:

- Congenital
- Acquired

From birth to the first few weeks

- Nasal obstruction
- Nasal masses
- Choanal atresis and stenosis
- Pyriform aperture stenosis
- Pharyngeal
- Craniofacial anomalies
- Laryngeal
- Laryngomalacia
- Vocal cord paralysis
- Subglottic haemangioma
- Subglottic stenosis
- Laryngeal web
- Laryngeal lymphangioma
- Saccular cyst

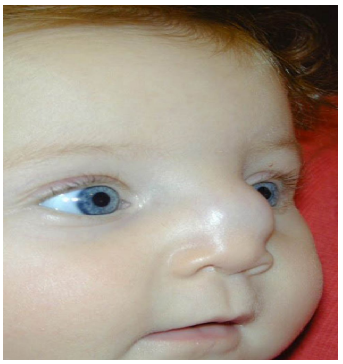
Nasal obstruction

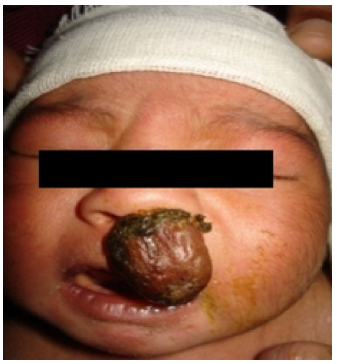
Neonates in the first 3 months are obligatory nasal breathers (can not breath through mouth).

Cyanosed neonates with nasal obstruction will 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)**

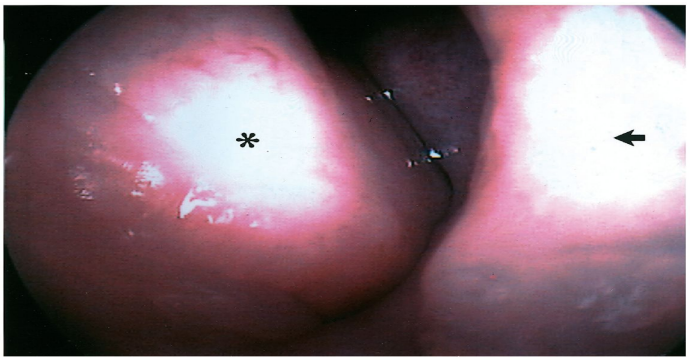
Types	
cystic	**solid**
Meningoencephalocele **Meningocele** **Dermoid cyst** **Epidermoid cyst**	**Haemangioma** **Neurofibroma** **Glioma** **Lymphangioma** **Neuroblastoma** **Craniopharyngioma** **Rhabdomyosarcoma** **Chordoma**

- Note 432: In OSCE you would describe site, size,..etc.
- DDX: Meningoencephalocele; Dermoid cyst and Epidermoid cyst
- For diagnosis do imaging then scope.



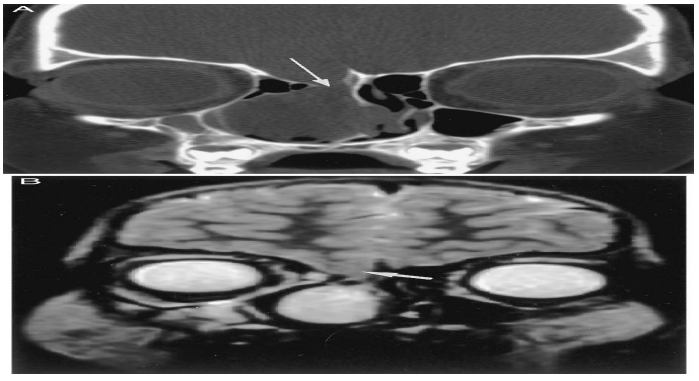


When you scope and see any mass you shouldn't grasp because it could be meningoencephalocele attached to the brain. So in pediatrics it's important to do CT and MRI. Grasping the mass risks the development of meningitis



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

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



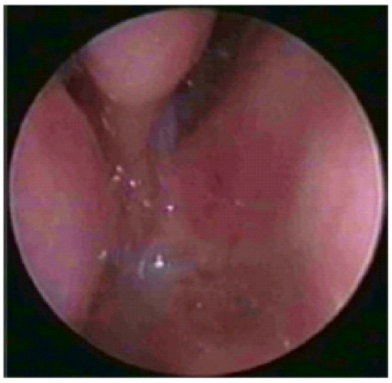
If you see a brain connection do an MRI. (Homogenous opacification of sinus= fluid, polyp) (Heterogeneous with spiking = fungal"calcium and minerals" or malignancy).

- 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 its 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 if you write polypectomy zero! The correct answer: Microlaryngoscopy polyp excision.

Choanal atresia

- Lack of patency of posterior nasal aperture
- Bilateral atresia presents soon after birth with severe respiratory Distress (Top emergency Rx:oral tube)
- Unilateral atresia may undiagnosed until later in childhood (rhinorrhea) (diagnosis at1-2 year with one side nasal discharge)

Note 431: The commonest cause for unilateral obstruction is foreign body (purulent, foul smelling discharge).



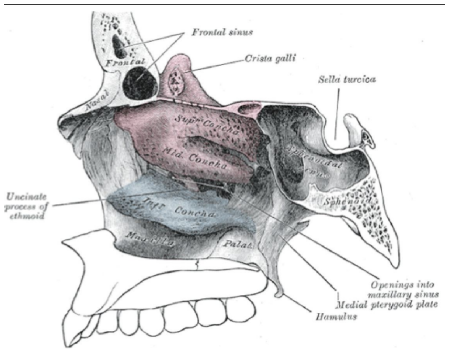
Types

- Membranous 10%
- Bony
- Mixed

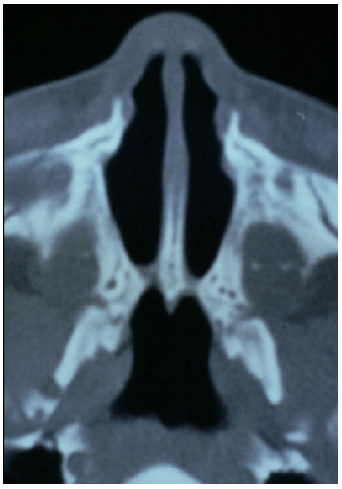
Dx

- Cyanosis improved 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 that shows bilateral membranous choanal atresia
Membranous=grey.
Bone=white



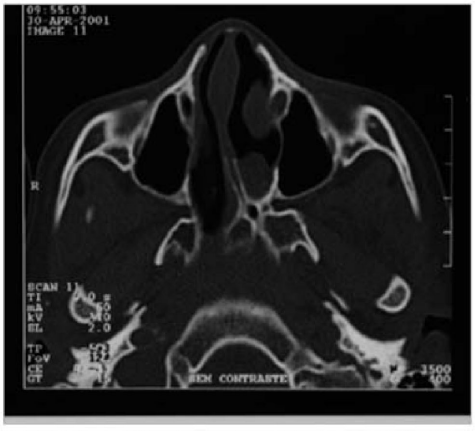
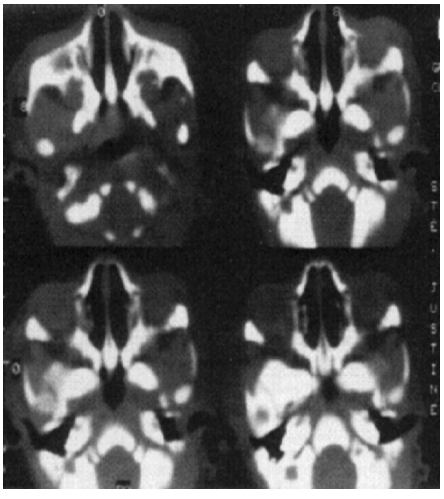


Figure 1. A case of left side choanal atresia and symmetrical maxillary sinuses and no sinus disease.



Axial CT Mixed choanal atresia

70% of choanal atresia associated with CHARGE syndrome: 'Important MCQ'

C-coloboma (a hole in one of the structures of the eye, such as the iris, retina, choroid, or optic disc.)

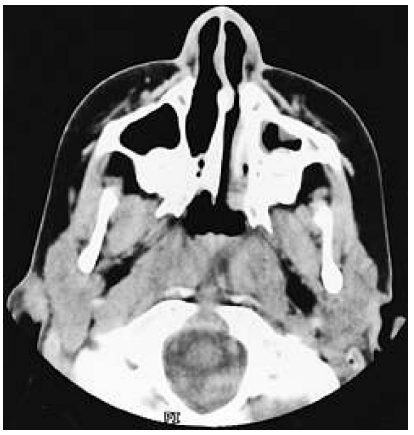
H-heart disease

A-atrasia

R-retarded growth

G-genital hypoplasia

E-ear deformity



Axial unilateral Bony choanal atresia

Treatment:

- Emergency treatment is by insertion of oral tube
- Surgical treatment is bye either transnasal or transpalatal choanal atresia repair

Note 432: In our hospital go through the scope and use the drill to puncture and widen the area and apply mitomycin to prevent pre stenosis

Pharyngeal obstruction

Craniofacial anomalies:

Pierre–Robin syndrom

Glossoptosis

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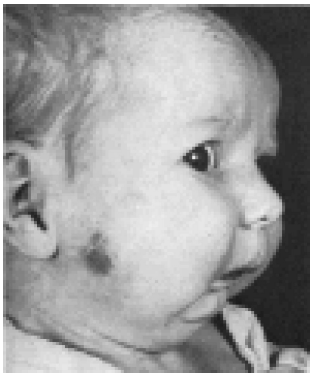
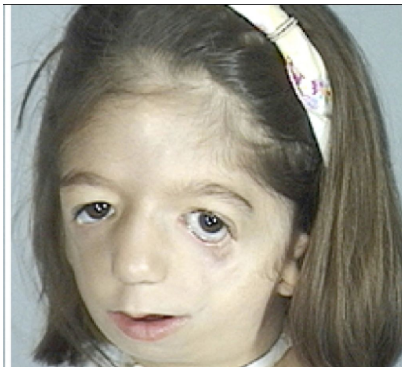


Airway obstruction caused by backflow displacement of the tongue base

Micrognatheia

Small narrow mandible, causes narrow airway



Cleft palate

Treacher- Collins syndrome:

Mandibuofacia; dystosis

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 cold paralysis and 3rd subglottic stenosis)

In laryngomalacia, the epiglottis or the arytenoids that 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.

the larynx

- Inspiratory
- Expiratory
- Biphasic

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

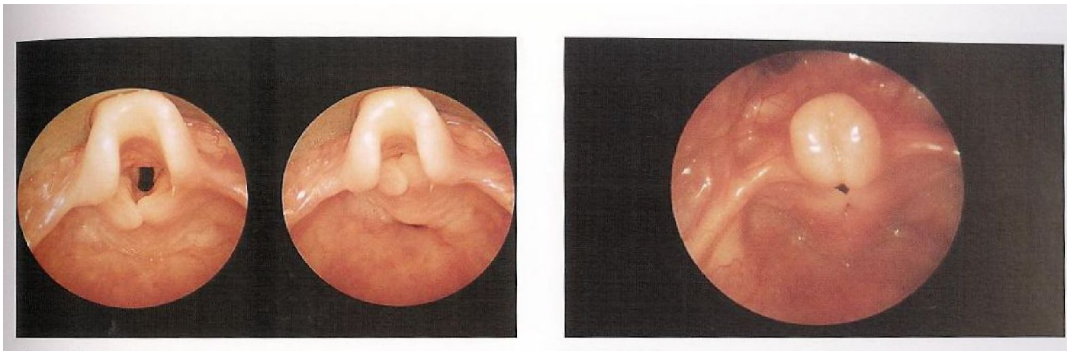
Symptoms:

- 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

Note 431: While the child is awake to visualize the pattern of breathing



Endoscopic finding:

- Tall, omega shape epiglottis arytenoid mucosa (epiglottis is collapsing) —

- Inward forward movement of (sucked) —
- Short aryepiglottic fold

Treatment :

Any airway abnormality we need to evaluate how bad it's affecting the child's feeding and measuring the child on growth chart

A. Mild cases :(no cyanosis not affecting the child growth): Observation (it can improve with time by 12-18 months in 90% of cases)
B. 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 Cricothyoid muscle. Diagnose by fiberoptic endoscopy. Vocal cord 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

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

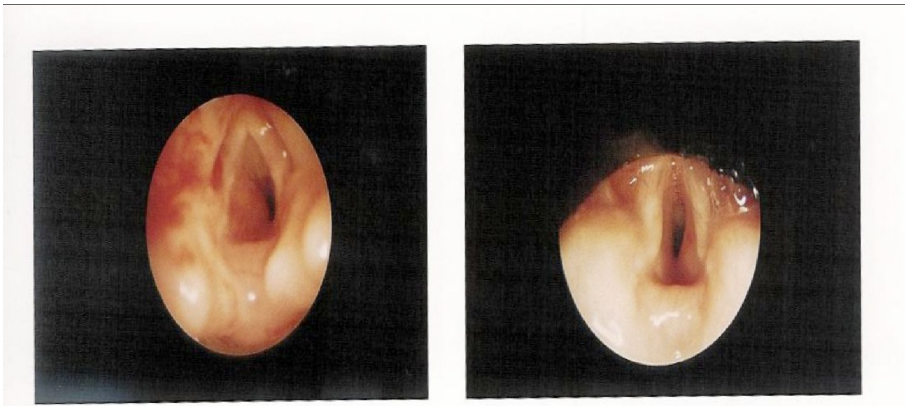
Subglottic Haemangioma

—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



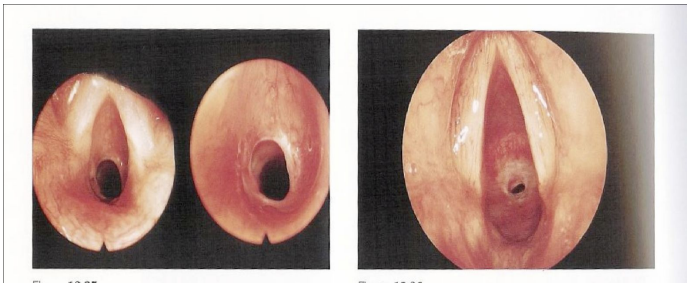
Congenital Subglottic Stenosis

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

Symptoms: depend on the degree of stenosis

- Biphasic stridor
- Recurrent croup

Diagnosis: Bronchoscopy, plain x--ray, HKV



- 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

Treatment : Depend on the degree of stenosis

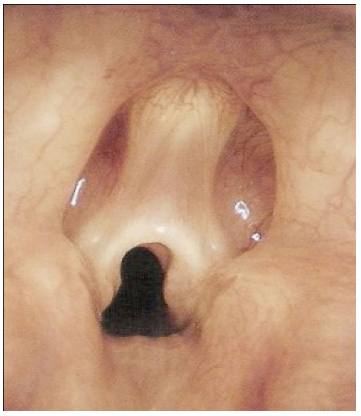
Grades 1 and 2:

- Tracheostomy
- Laser excision
- Balloon dilation

Grades 3 and 4: —

- Laryngotrachealreconstruction(LTR) —
- Criocotrachealresection(CTR)

Laryngeal web



Small web just has dysphonia,

-Weak cry

- Stridor

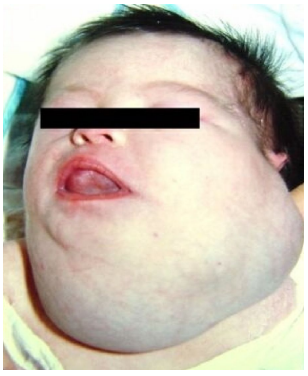
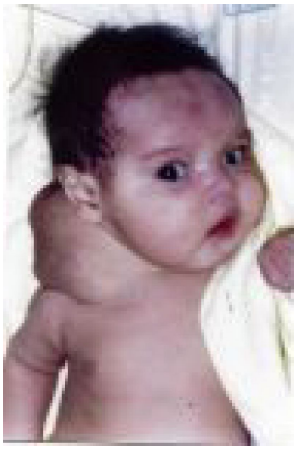
Treatment: —

- 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 debunking 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 duo 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
- Epiglottis
- Croup
- Bacterial tracheitis

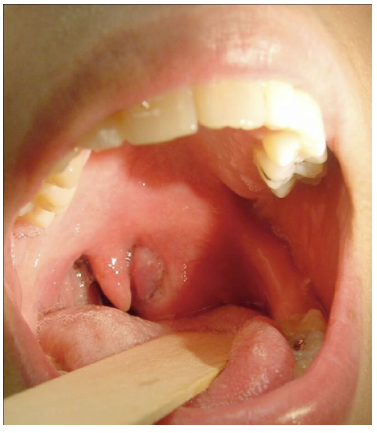
Noninfectious

- 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 sever sore throat, muffled voice, drooling, trismus

Bulging pushing the tonsil to the other side



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

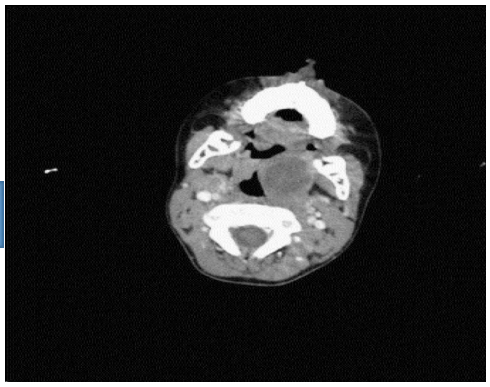
mouth (trismus) and hot potato voice? Peritonsillar abscess (quinsy) (one of the indication of tonsillectomy)

Diagnosis: —

- Clinical diagnosis —
- CT scan

Treatment:

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



Axial CT shows a mass compressing the airway

Retropharyngeal abscess

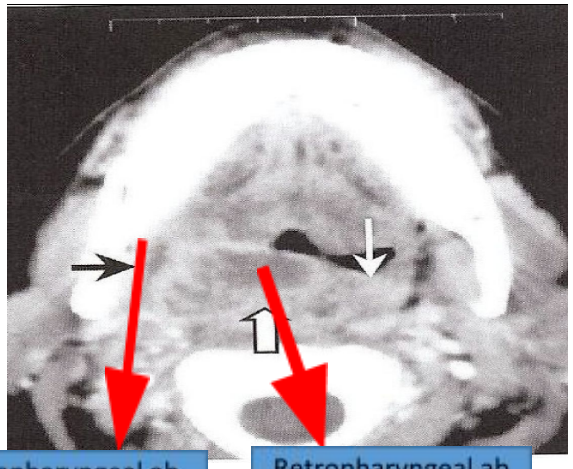
Symptoms: —

Fever, cervical adenopathy, stridor torticollis, drooling

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

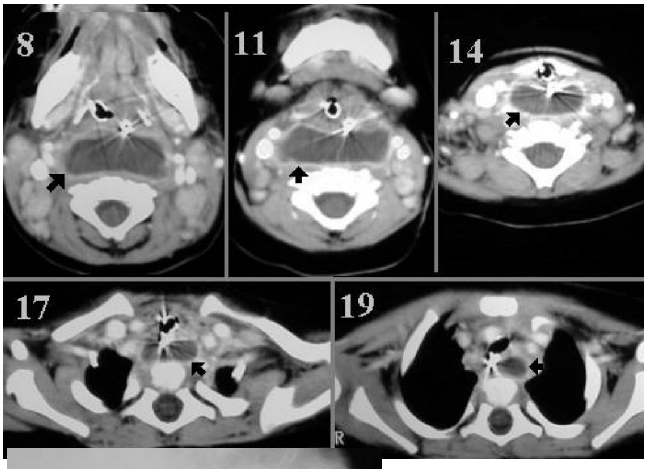
Treatment: Intraoperative to reduce risk of swallowing and aspiration

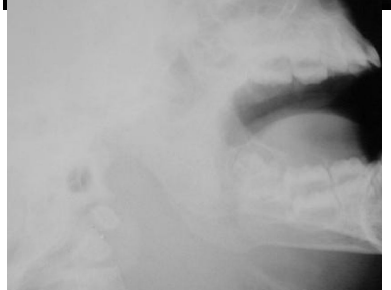
- Transoral excision and drainage
- IV ABX
- INTUBATION
- Tracheotomy



Parapharyngeal ab

Retropharyngeal ab





Lateral x---ray shows the diameter of the soft tissue is more than the diameter of the

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 influenza 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)

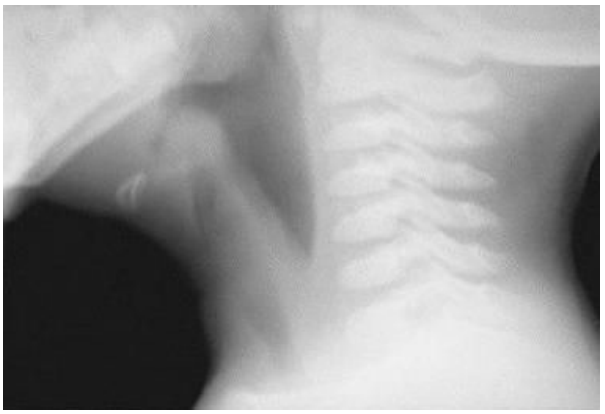
Investigation:

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).

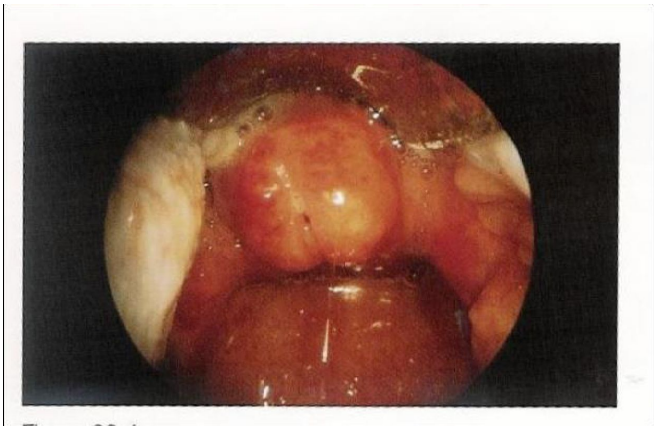


Management:

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”

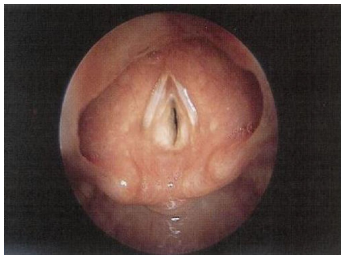
- Hoarseness

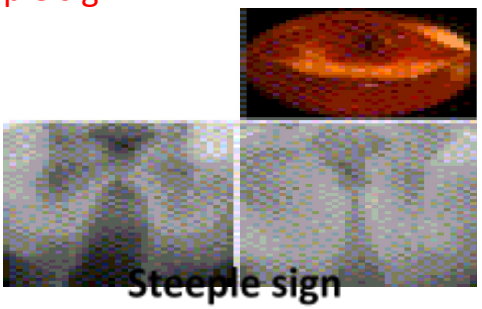
- Fever

- Brassy cough “loud metallic barking cough”

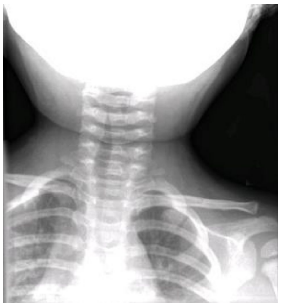
- No dysphagia

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



- Vital signs assessment.

- 100% humidified oxygen and ventilation support in case of severe respiratory distress.

- Steroids

- Nebulized racmic epinephrine

Foreign Body Aspiration

Clinical presentation:

Acute episode: period of chocking, gagging, wheezing, or hoarseness.

Asymptomatic period: cough or wheezing are possible.

Complications: pneumonia, obstructive emphysema and bronchiectasis.

Physical examination:

Major findings include new abnormal airway sounds, such as wheezing, stridor, or decreased breath sounds. These sounds are often, but not always, bilateral.

A lack of findings upon physical examination does not preclude the possibility of an airway foreign body.

- The most common objects aspirated by young children are food products (peanuts, seeds).
- Beans and seeds absorb water over time.
- Inert FB (Pieces of toys causes less reaction).
- Right bronchus affected more commonly than left bronchus (the right is shorter , wider and more vertical)

Investigations:

Radiography: A plain x-ray can reveal an area of focal overinflation or an area of atelectasis, depending on the degree of obstruction.

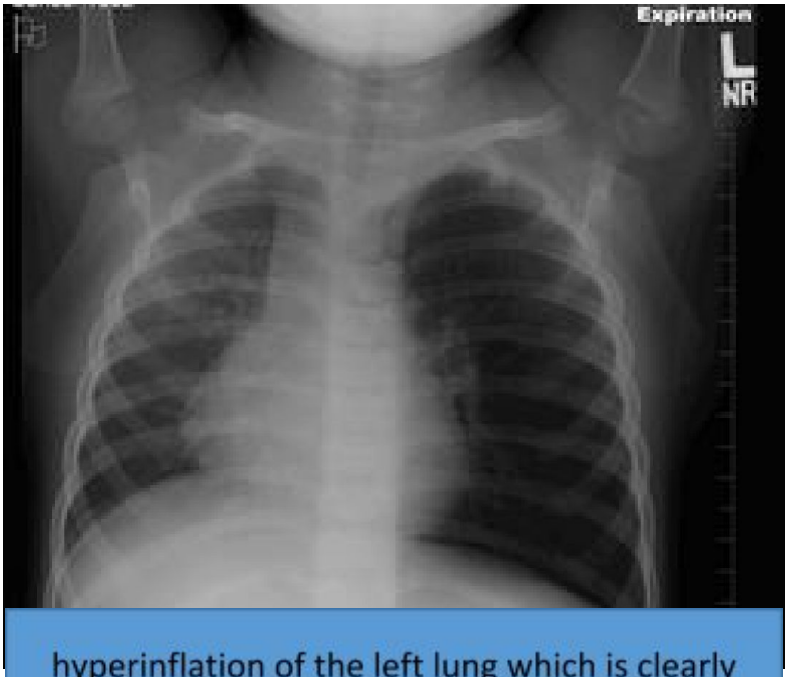
If the plain radiography findings are not diagnostic, remember that an affected lung portion does not completely empty. If the child cooperates, an anteroposterior expiratory radiograph may reveal trapped air in the affected portion of the lung. In those children who cannot cooperate with the maneuver, lateral decubitus radiographs may reveal the trapped air.

Fluoroscopy and CT scanning may be used as well. If the index of suspicion is high, we can proceed to bronchoscopy. (Bronchoscopy is the gold standard, because x-ray is normal most of the time because the majority of foreign bodies are plastic toys that can't be shown on x-ray)

Airway foreign bodies are removed most safely under general anesthesia using the ventilating rigid bronchoscope. (Diagnostic and therapeutic)

- Telescopic forceps can be used for foreign bodies removal and biopsy.

- Medical history is the key for diagnosing.



hyperinflation of the left lung which is clearly more lucent than the right. Shift of mediastinum and flattening of the hemidiaphragm are signs secondary to air trapping.

Acquired Vocal Cord Paralysis “AVCP”

Could be unilateral or bilateral.

Causes:

1. Birth trauma “forceps delivery”
2. Cardiac surgery “Patent ductus arteriosus repair”
3. Mediastinal or neck surgery
4. Tracheo-esophageal fistula repair

Bilateral Vocal Cords Paralysis “Abducted type”

Causes:

- Surgical trauma
- Malignancies
- Endotracheal intubation
- Neurological diseases
- Idiopathic

Physical examination:

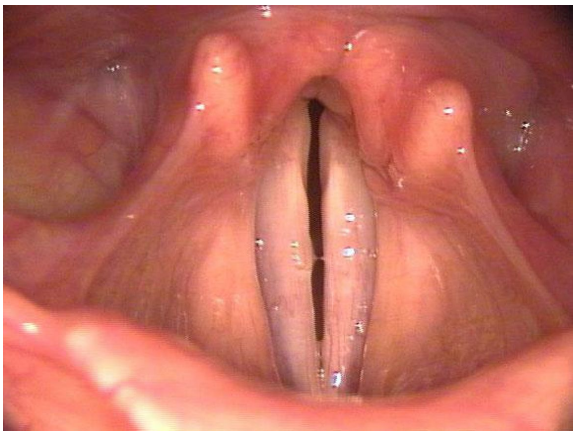
- The voice can be breathy or normal.

- Airway findings arrange from biphasic stridor to normal.

Management:

- Tracheostomy
- Posterior cordotomy (unilateral or bilateral)
- Arytenoidectomy (endoscopic or external, partial or complete)
- Cordopexy, lateralization of the vocal cords.

Note 432: - Arytenoidectomy: partial removal of the arytenoid cartilage.
- Cordotomy: removal of the entire membranous vocal fold with the vocalis muscle.
- Bilateral vocal cords paralysis will cause obstruction, whereas unilateral paralysis will affect the voice.
- Any lesion along the course of the recurrent laryngeal nerve could cause AVCP.



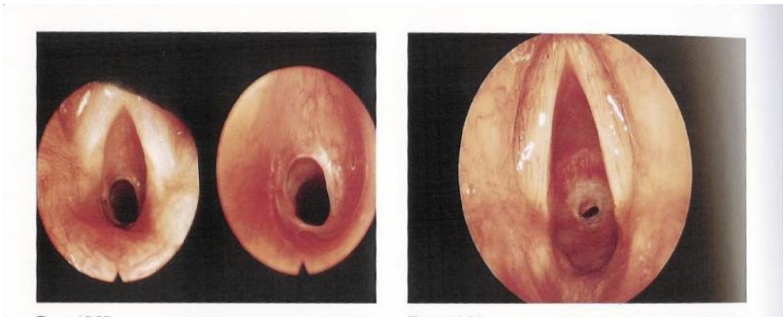
Acquired Subglottic Stenosis

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.

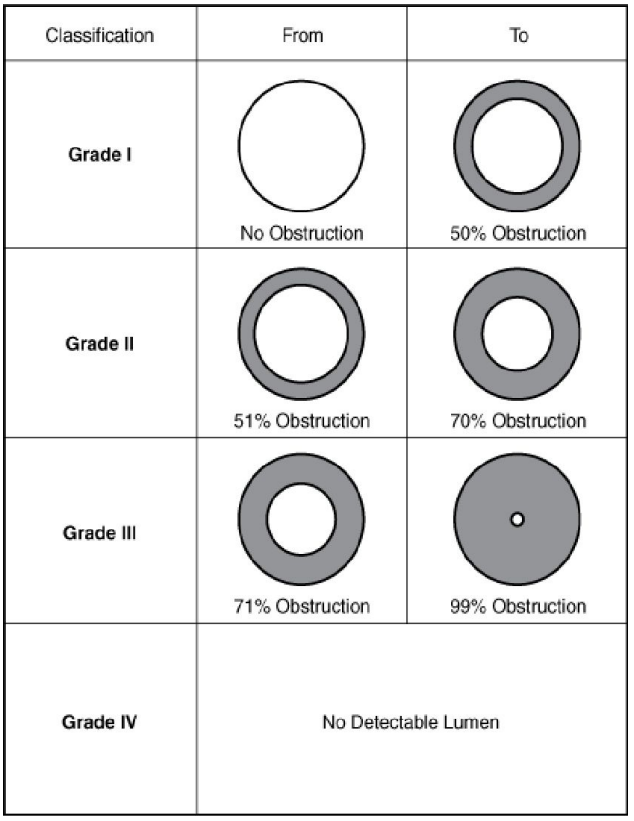
Cotton-Myer Grading of Subglottic Stenosis

Management of grade I and II:

- Observation
- Balloon dilatation
- Laser excision

Management of grade III and IV:

- Tracheostomy
- Laryngotracheal reconstruction
- Cricotracheal resection



Respiratory Papillomatosis

Definition: It is a disease caused by human papilloma virus (HPV) types 6-11. The commonest 16 and 18, associated with malignancies. Two-thirds before the age of 15 years. **Has two types juvenile and senile.**

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.

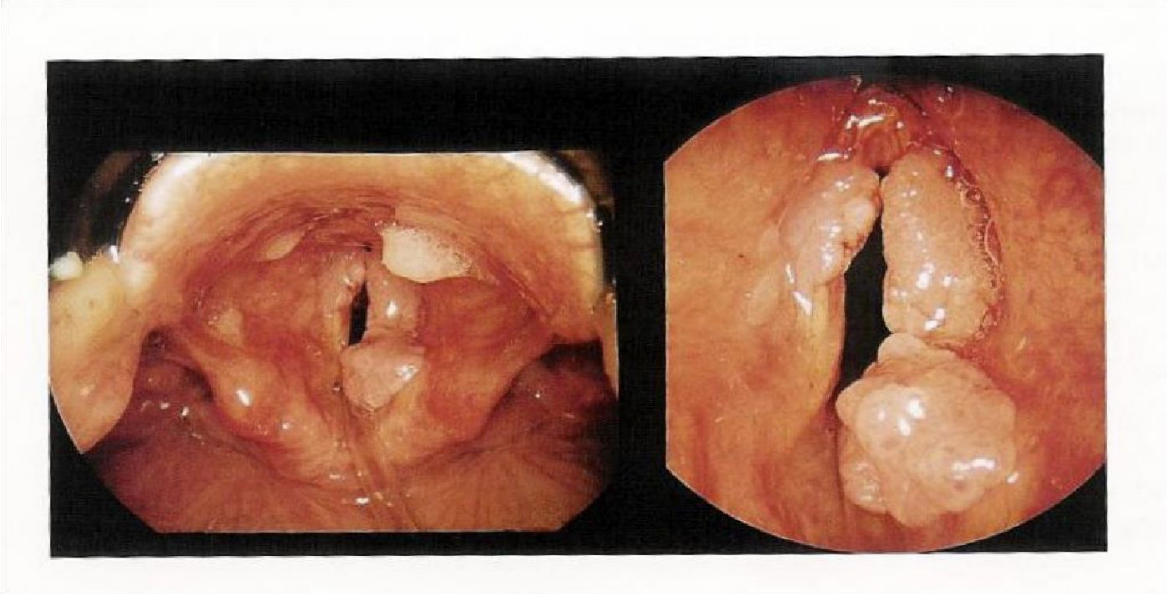
- Hoarseness
- Voice changes (dysphonia) initially they come with only dysphonia when obstruction happens the other symptoms starts to appear.
- Choking episodes
- Foreign body sensation in the throat
- Cough
- Dyspnea
- Inspiratory wheeze

- Stridor

Investigation : Laryngoscopy or bronchoscopy.

Management:

- Laser excision or microdebrider
- Adjuvant therapy: Cidofovir, Acyclovir, Interferon

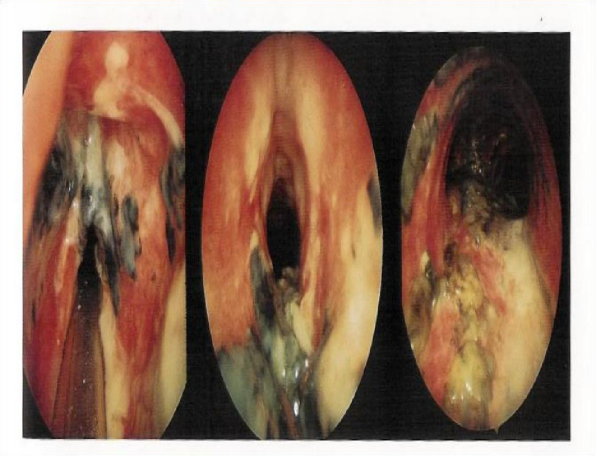


Thermal Injury

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 securing the airway tracheostomy and



starts with "intubation", IV antibiotics.

Cricothyroidotomy

Definition: Cricothyrotomy (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: Cricothyrotomy is indicated when an emergency airway is required and orotracheal or nasotracheal intubation is either unsuccessful or contraindicated.

o Intubation is not possible (difficult intubation)

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

There are no absolute contraindications.

Relative contraindications: possible or known traction of the trachea, laryngotracheal disruption with traction of the distal trachea into the mediastinum, and fractured larynx.

Complications:

Emergency surgical cricothyrotomy has a much higher complication rate than elective cricothyrotomy. This is likely because emergency cricothyrotomy is performed on critically ill patients with difficult airways under emergency conditions.

- Laceration of the thyroid cartilage, cricoid cartilage, or tracheal rings.

- Perforation of the posterior trachea

- Unintentional tracheostomy

- Passage of the tube into an extratracheal location (ie, false tract)

- Infection

Intra/postoperative bleeding

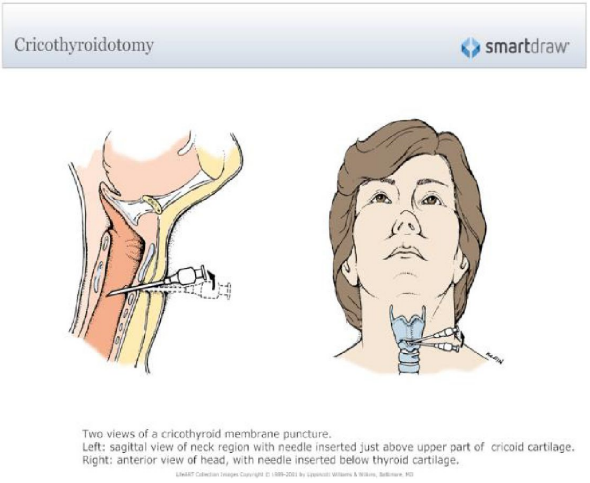
Subglottic stenosis

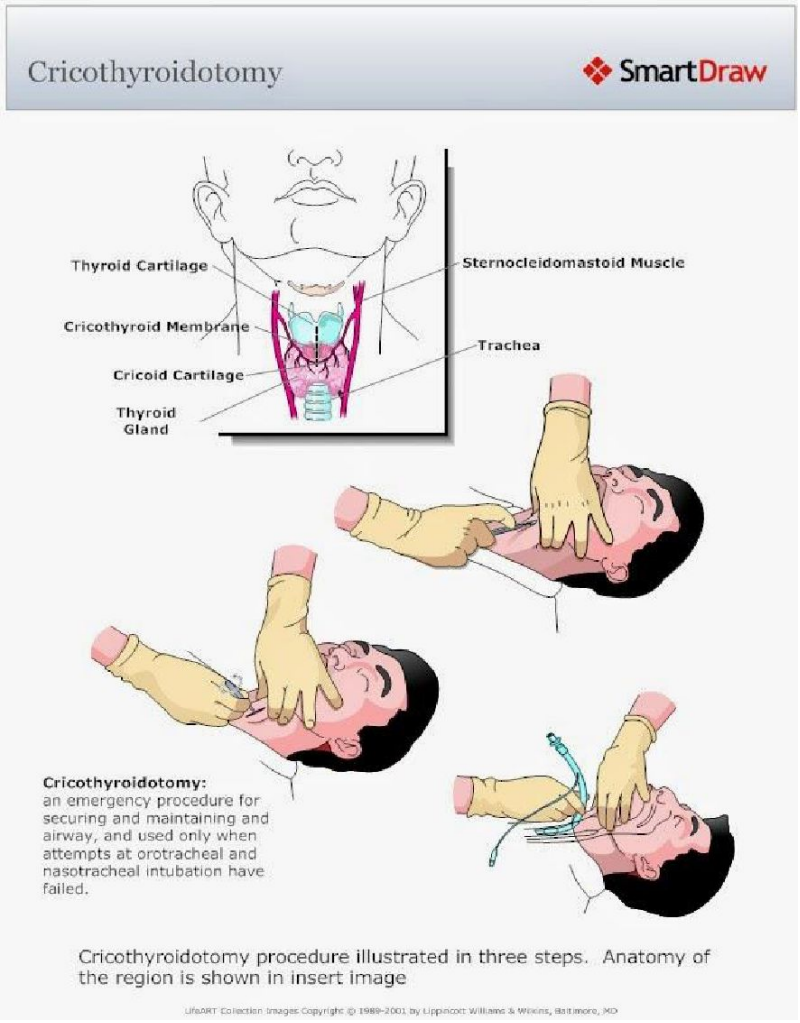
Dysphonia/hoarseness

Pulmonary aspiration

Tracheal stenosis

Recurrent laryngeal nerve injury





Tracheostomy

Definition: Tracheostomy is an operative procedure that creates a surgical airway in the cervical trachea.

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

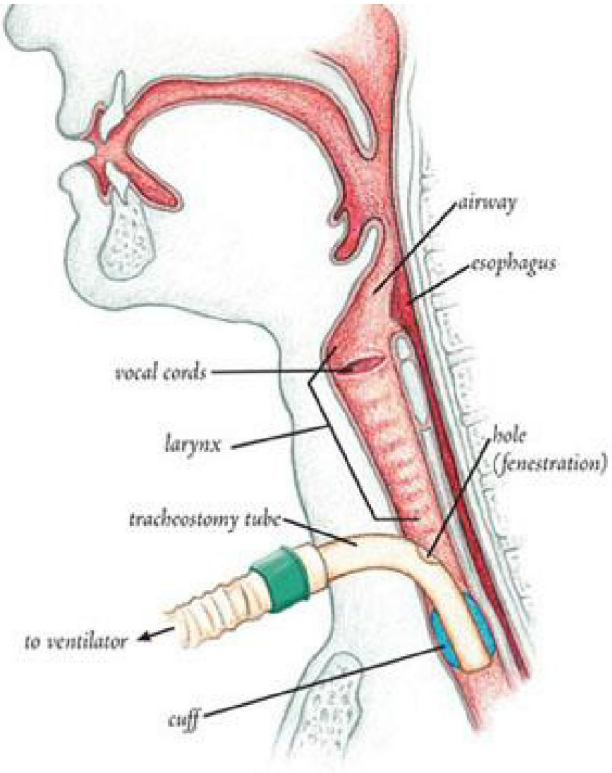
Late:

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

432 notes- Imperfect positioning and suturing could lead to the development of subcutaneous emphysema and pneumothorax. So, you should suture the trachea from outside.

- Big skin incision + big tracheal incision = increased risk of emphysema.

- Also, strong ambu bagging could cause pneumothorax.



Assessment of Child with Upper Airway Obstruction

1. Rapid airway assessment: to identify those who needs resuscitation depending on the presenting signs and symptoms of: complete upper airway obstruction, rapidly progressing partial airway obstruction, or respiratory failure.

2. History:

- Age
- Speed and onset of precipitating event
- Associated symptoms (fever, drooling, hoarseness)
- Feeding difficulty
- Past medical history (birth trauma, intubation)

3. 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

4. Physiological studies:

- ABG
- Spirometry

5. Imaging:

- Chest x-ray (foreign bodies)
- High kilovoltage imaging (subglottic stenosis)
- CT scan (Choanal atresia, retropharyngeal abscess, tumor)
- Barium swallow (vascular ring)

- Shallow rapid breathing >>>patient about to collapse
- The characteristic of cry reflects the integrity of vocal cord
- ABG usually is for chronic conditions
- Epiglottitis and subglottitis caused by H.influenzae type B
- Dynamic obstruction >>> use fibrotic endoscopy

Summary

The Upper airway extended from the nares and lip to the subglottic area.

Airway obstruction causes congenital and acquired.

- Congenital upper Airway Obstruction Nasal, pharyngeal and laryngeal.
  - Nasal: nasal mass, choanal stenosis and stenosis
  - Laryngeal: laryngeal web, laryngomalacia, vocal cord paralysis, subglottic haemangioma and congenital subglottic stenosis
  - Pharyngeal: Pierre –Robin syndrome and Treacher-Collins syndrome
- Acquired upper airway obstruction
  - Infectious
  - Non infectious

Epiglottitis:

Acute inflammation in the supraglottic region of the oropharynx

Causes: Haemophilus influenza type B.

Signs and Symptoms:

- High fever

- Drooling

- Stridor

- Sore throat

- Odynophagia/dysphagia

Investigation: bronchoscopy (no examination done in ER)

2. Direct visualization of the epiglottis using nasopharyngoscopy/laryngoscopy after stabilizing the patient.

3. Lateral neck soft-tissue x-ray. “Useful screening tool” The classic lateral neck radiographic findings are a swollen epiglottis (ie, a thumb sign).

Management:

1. Artificial airway “endotracheal intubation, tracheostomy, or cricothyrotomy”.

2. Empiric IV antimicrobial therapy.

Croup:

Primarily pediatric viral respiratory tract illness generally affects the trachea and the larynx and may extend to the bronchi

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

Symptoms:

- Biphasic stridor “stridor present during inspiration and expiration”

- Hoarseness

- Fever

- No dysphagia

Investigation: It is mainly a clinical diagnosis; a posterior-anterior chest radiograph demonstrates subglottic narrowing commonly called “steeple sign”.

Management:

- 100% humidified oxygen and ventilation support in case of severe respiratory distress.

- Steroids

- Nebulized racmic epinephrine

Foreign body aspiration:

Clinical presentation:

Acute episode: period of chocking, gagging, wheezing, or hoarseness.

Asymptomatic period: cough or wheezing are possible.

Complications: pneumonia, obstructive emphysema and bronchiectasis.

Examination:

Abnormal airway sounds, such as wheezing, stridor, or decreased breath sounds.

Investigation: bronchoscopy (goldstandard)

Treatment: Airway foreign bodies are removed most safely under general anesthesia using the ventilating rigid bronchoscope.

Acquired vocal cord paralysis: (could be unilateral or bilateral)

Causes:

1. Birth trauma "forceps delivery"
2. Cardiac surgery "Patent ductus arteriosus repair"
3. Mediastinal or neck surgery
4. Tracheo-esophageal fistula repair

Management:

Tracheostomy

Posterior cordotomy (unilateral or bilateral)

Arytenoidectomy (endoscopic or external, partial or complete)

Cordopexy, lateralization of the vocal cords.

Acquired Subglottic Stenosis:

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

Risk factors:

1- Intubation (Prolonged, inappropriate size, inadequate care, high pressure cuffs tube, difficult intubation and multiple intubation)

2- GERD

3- Tracheobronchial infection

Causes:

90% is a result of traumatic endotracheal intubation and 10% is secondary to foreign body, infections, inflammation and irritation.

Symptoms:

Dyspnea, stridor, hoarseness, brassy cough, recurrent pneumonitis and cyanosis.

Investigation: XRAY, MRI, videostrobolaryngeoscopy, visualizing the larynx by fiberoptic or rigid telescope

Grading is done by Cotton-Myer grading

Management:

- Grade I and II (Observation, balloon dilation, laser excision)
- Grade 3 and 4 (Tracheostomy, laryngyotracheal reconstruction, cricotracheal resection)

Respiratory Papillomatosis:

It's a disease caused by HPV types 6-11 and has two types: Juvenile and Senile onset

Risk factors for juvenile onset papillomatosis:

Firstborn child, vaginally delivered, and the mother being younger than 20 y/o + the presence of genital warts "Condyloma Acuminata"

Symptoms:

Symptoms of upper airway obstruction predominate

Hoarseness, dysphonia, choking episodes, foreign body sensation, cough, dyspnea, inspiratory wheeze and stridor.

Investigation:

Laryngeoscopy or bronchoscopy

Management:

Laser excision or microdebrider\adjuvant therapy: Cidofovir, Acyclovir Interferon

Thermal injury:

Caused by aspiration of hot liquid or caustic fluid. Alkali is more dangerous than acids.

Treatment starts with securing the airway "intubation", tracheostomy and IV antibiotics.

Cricothyroidotomy:

A procedure that involves placing a tube through an incision in the cricothyroid membrane to establish an airway for oxygenation and ventilation.

Indications:

When an emergency airway is required and orotracheal or nasotracheal intubation is either unsuccessful or contraindicated.

o Difficult intubation, need to avoid neck manipulation, severe maxillofacial trauma, edema of throat, severe oropharyngeal/tracheobronchial hemorrhage, foreign body in upper airway, lack of equipment for endotracheal intubation, technical failure of intubation

-There's no absolute contraindication, relative: possible or known traction of the trachea, laryngotracheal disruption with traction of the distal trachea into the mediastinum, and fractured larynx.

Complications: more in emergency than elective cricothyroidotomy

-Laceration of the thyroid cartilage, cricoid cartilage, or tracheal rings

-Perforation of the posterior trachea

-Unintentional tracheostomy

-Passage of the tube into an extratracheal location (ie, false tract)

-Infection - Intra/postoperative bleeding

-Subglottic stenosis

- Dysphonia/hoarseness

-Pulmonary aspiration - Tracheal stenosis

-Recurrent laryngeal nerve injury

Tracheostomy:

Tracheostomy is an operative procedure that creates a surgical airway in the cervical trachea.

Indications:

- 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.

- Facial fractures that may lead to upper airway obstruction.

- Upper airway edema from trauma, burns, or anaphylaxis.

Complications:

Immediate: (hemorrhage, hypoxia, trauma to RL nerve, esophageal dissection, pneumothorax and subcutaneous emphysema)

Early: (Tube obstruction or displacement, aspiration, bleeding from tracheostomy site And infection)

Late: (Airway obstruction with aspiration, tracheomalacia, aspiration pneumonia fistula formation, damage to larynx "stenosis")

Assessment of child with upper airway obstruction:

1- Rapid airway assessment "to identify who needs resuscitation"

2- History:

Age, speed and onset of precipitating event, associated symptoms "fever", feeding difficulty, past medical history "birth trauma, intubation"

3- Physical examination:

Vital signs, patient's position, craniofacial anomalies, cutaneous hemangiomas, neck mass, growth chart, complete ENT examination, flexible fiberoptic, endoscopy is the tool of examination

4. Physiological studies:

- ABG

- Spirometry

5. Imaging:

- Chest x-ray (foreign bodies)

- High kilovoltage imaging (subglottic stenosis)

- CT scan (Choanal atresia, retropharyngeal abscess, tumor)

- Barium swallow (vascular ring)

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. Microlarynoscopy
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 laryngotrachacheobronchitis
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:

- **A**
- **A**
- **C**
- **B**
- **A**