Airway Obstruction I-II

Objectives:

- Causes of airway obstruction (congenital and acquired)
- Signs and symptoms
- Investigations of airway obstruction
- Radiological illustration
- Medical and surgical treatment
- Operations (indication, procedure, and complication): tracheostomy, cricothyroidotomy, intubation, choanal atresia repair, etc..

Resources: Slides, 436, 435
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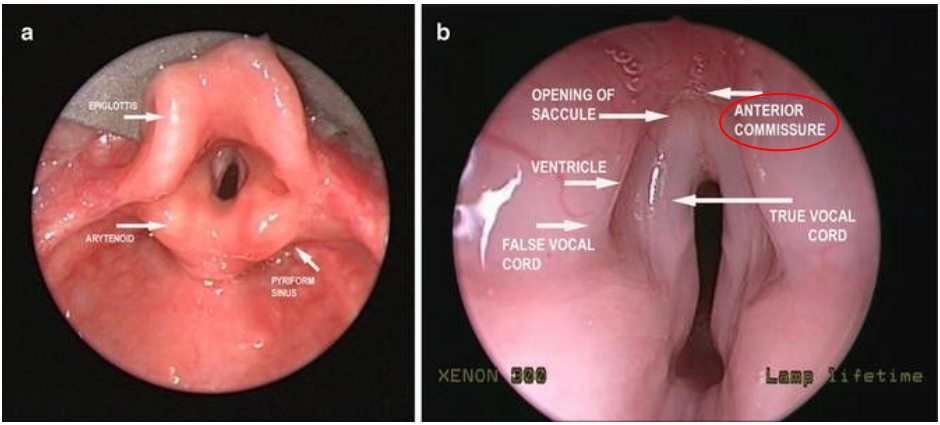
[Color index: Important | Notes | Extra]

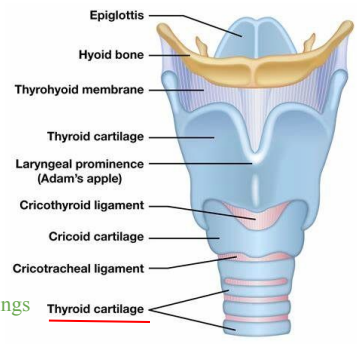
Basic anatomy

Airway anatomy is important because we can get a question as identify

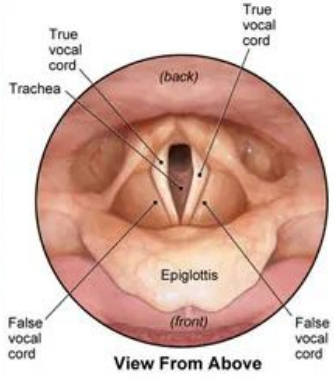


Laryngoscopy: Endoscopic view, during OR we see:

- Epiglottis
- **Aryepiglottic fold (imp for cases of laryngomalacia), between epiglottis and arytenoid**
- **Arytenoid**
- Inter-arytenoid area (posterior glottic space)\ (posterior commissure) at level of vocal cord
- **Junction of the two vocal cords (anterior commissure) (imp)** many student don't know where is it.
- Space between true and false vocal cords is called **ventricle**



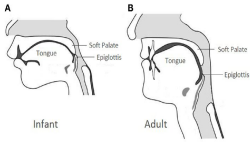
tracheal rings



- Between hyoid bone and thyroid cartilage: thyrohyoid membrane (imp)
- Between thyroid and cricoid cartilages: cricothyroid membrane\ ligament (imp)
- Important to know because of procedures done in this area (cricothyroidotomy)

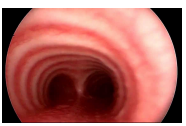
Infant & Pediatric Larynx:

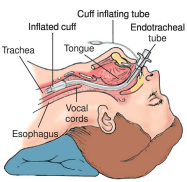
- Position is higher at birth compared to adults. what is the benefit? to suck "eat" and breath at the same time) (C1-C4)
- Epiglottis lying at the nasopharynx behind the soft palate: makes the neonate an obligate nasal breather for 4-6 months. any nasal pathology at this age will cause airway obstruction. (ex choanal atresia)
- Cartilage & soft tissue are soft. (susceptibility for laryngomalacia)
  - Soft tissue:
    - less adherent to the underlying cartilage
      - ➢ "mild trauma leads to large edema"
    - susceptible to collapse
    - less resistant to develop submucosal edema
  - Omega shaped Epiglottis "curved"
  - **Subglottis** is the narrowest part of AirWay in children and non-expandable.
  - In adult's **glottis** (at level of vocal cords) is the narrowest.



Trachea

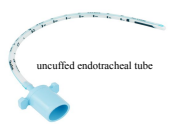
- Consists of 16 to 20 incomplete cartilaginous rings
  - (cartilage from the front and muscles behind). "complete in pediatric"
- The posterior wall is a membranous part.
  - what is the value of it ? helps expanding in swallowing
- Length is approximately 11cm. in neonates it's smaller around 4.
- Diameter 19mm male,16mm female.
- The trachea bifurcates at the carina into right and left main bronchus.





Pediatric trachea: Just know that it is smaller

- Diameter:
  - At Birth: 6 mm
  - 6 months: 7.2 mm
  - 1 year: 7.8 mm
  - 4 years: 11 mm



Endotracheal tube:

- Uncuffed endotracheal tube
  - In adult we use cuffed tube (we inflate it) ,**In pediatrics we usually use uncuffed tube** because the narrowest area is the subglottic area> if we used cuffed tube risk of subglottic stenosis due to irritation and trauma of subglottic area

You need a smaller endotracheal tube in children undergoing GA **according to their age** (neonates: size 3, 6 month: size 3 1⁄2, 1 year: size 4) and there is a general equation that will help us choosing the size: **(age+16)/4mm**

Table 7. Formulas For Endotracheal (ET) Tube Sizing And Depth Of Insertion[67,68]

Sizing for cuffed ET tube: (Age in years ÷ 4) + 3 (eg, 8 years ÷ 4 = 2 + 3 = 5)
Sizing for uncuffed ET tube: (Age in years ÷ 4) + 4
Suggested lip-to-tip distance: ETT tube size × 3

Airway obstruction

Upper airway obstruction could be from nose to larynx or trachea. we will focus mostly on larynx

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

Upper airway obstruction:

- Congenital
- Acquired

Signs & Symptoms of (Upper Airway Obstruction):

1. Stridor (usual presentation, very IMP)
    - What is Stridor? We always ask about the difference between stridor and **stertor**: (low pitched sound associated with nasal obstruction)
        - Stridor is harsh high-pitched musical sound produced by turbulence of air flow through a partial obstruction of the airway (AW).
        - Audible sound produce during breathing due to air-flow change within the larynx.
        - Stridor is a very important sign of UAW obstruction It indicates:
            1. Pathologic narrowing of AW
            2. Potential respiratory obstruction
            3. Even death
        - The most common cause of stridor in pediatrics is Laryngomalacia

Other signs of UAW obstruction:

2. Flaring of the nasal alae
3. Retraction of the neck, intercostal and abdominal muscles
4. Dyspnea
5. Tachypnea
6. Restlessness (they are fighting to get air so you have to do something)
7. Cyanosis, easily detected in children perioral or finger tips
8. Subcutaneous emphysema "Escaped air from the lumen of the airway" there is a break in the continuity of airway, there will be crackling under skin. In trauma 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.

Types of stridor:

(we need to know if inspiratory or expiratory → tells you location of pathology)

- **Inspiratory (extrathoracic) stridor:**
    - The obstruction is supraglottic, glottic (glottis the area between the two vocal cords) e.g: Laryngomalacia the vocal cords and above (supraglottic).
- **Expiratory (intrathoracic) stridor:**
    - The obstruction is in the trachea (lower) (in the intrathoracic trachea)
- **Biphasic (fixed in middle of trachea) stridor:**
    - The obstruction is between the two areas: subglottic obstruction (below the vocal cord or upper trachea) the most dangerous

Diagnostic assessment

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. If the patient is unstable or in distress first thing to do is to stabilize him (securing airway)

History:

- Age
- Speed and onset of precipitating event "immediately after birth or not"
- Associated symptoms (fever, drooling, hoarseness)
- Time of onset
- Possible trauma
- Relation of airway problem to feeding and position → Feeding difficulty (this is very important for treatment decisions), ex: laryngomalacia improve with prone position
- Past medical history (birth trauma, intubation)
- Characteristic of cry "reflects the status of vocal cords"imp to ask about the nature of it (forceful, weak,..)
- History of previous intubation (causes trauma to the airway), prolonged intubation> subglottic stenosis
- Questions about possible aspiration of foreign body "high index of suspicion"

If stridor is present since birth: (Congitial)

- Congenital laryngomalacia 60% (present 2-3 weeks from birth not immediately)
- Subglottic stenosis (can be congenital or acquired)
- Vocal cord paralysis (unilateral or bilateral), can be due to birth trauma or post thyroidectomy
- Vascular rings (malformation can press on trachea)

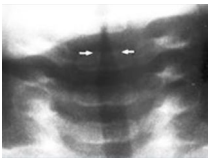
If onset of stridor is gradual and progressing:

- Subglottic hemangioma
  - Appears between 1-3 months of age
  - Most common infant tumor in 1st year
  - Treated medically by beta-blocker
  - Present initially > progress > plateau > regress
- Papilloma of the larynx (rare) appears at 6 months of age

Physical examination (from 435):

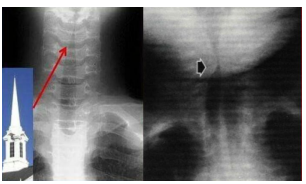
* Vital signs, The patient's position (sniffing position in significant airway obstruction), Craniofacial anomalies, Cutaneous hemangiomas, Neck mass, Growth chart, Complete ENT examination, Flexible fiberoptic examination, Endoscopy is the tool of examination.

Radiological evaluation:

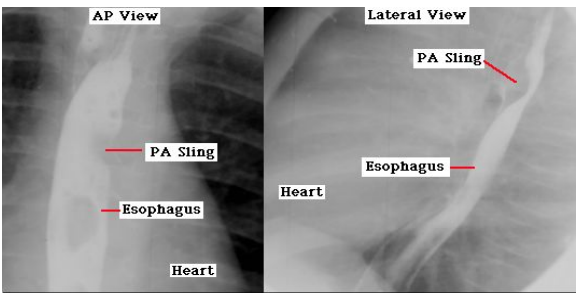


Indicated for patient without respiratory distress, you must stabilize the patient first

- Plain views x-ray
  - Soft tissue neck A.P. lateral
  - Chest
  - If you suspect forign body in stable patient
- Mobile pharyngeal tissue may bulge during expiration in normal infants
- **High - kilovoltage technique** (Croup series) AP view assesses subglottic region
  - Look for steeple sign the left picture (narrow trachea) indicating acute laryngitis → seen in ER a lot in winter and diagnosed by x ray. The right picture is for a patient with subglottic hemangioma it is unilateral .



- **Fluoroscopy**: dynamic AW changes
- Barium swallow
  - Assess - swallowing
  - R/O - presence of vascular rings we see indentation

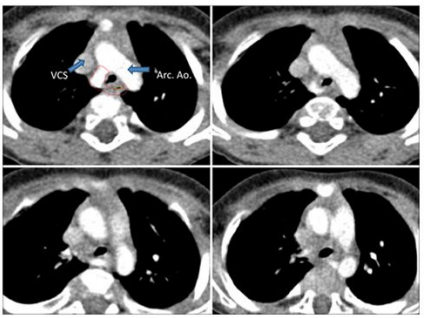


Vascular Ring Barium Swallow : This shows an example of a pulmonary artery ring or sling caused by the anomalous origin of the left pulmonary artery from the right pulmonary artery. Notice the filling defect in the barium column on the left in the AP view and anteriorly on the lateral view.

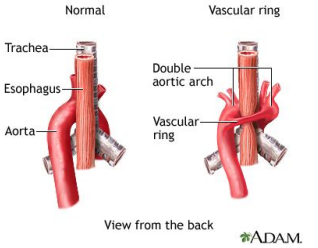
Radiological evaluation cont:

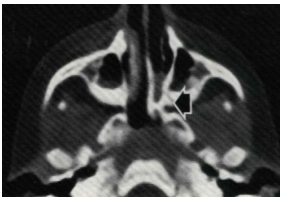
- CT scan and MRI: good in evaluating mediastinum
  - CT scan (Choanal atresia, retropharyngeal abscess, tumor), nowadays we use it more than x ray. It gives more information and details. It is for nasal oropharyngeal or airway sometimes
  - MRI (hemangioma, lymphatic malformation)

Figure 1. Computed tomographic angiography image of a double aortic arch. Hypoplastic aortic arch marked in red circle, compressed esophagus circled in yellow.

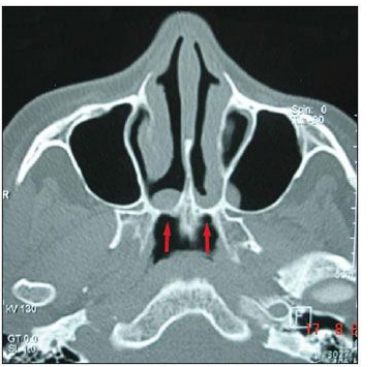


Vascular rings (CT-ANGIO), Double aortic arch, Compress esophagus, can present with airway obstruction

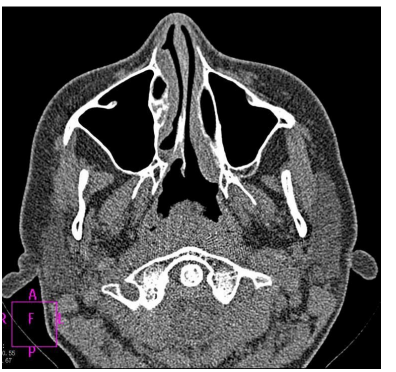




Choanal atresia



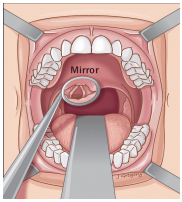
CT scan: Bilateral choanal atresia. Complete airway obstruction because neonate are obligate nasal breathers. Emergency intubation & relieve the obstruction in the OR



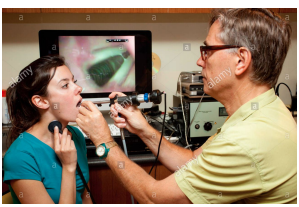
CT scan: Axial cut, unilateral choanal atresia, present late in life, unilateral airway obstruction. Not an emergency and can be corrected later

Endoscopic Evaluation:

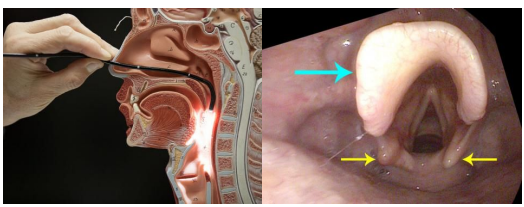
Indirect laryngoscopy



- **Mirror examination** (useless now, we don't do it now a days):
  - Not endoscopic
  - In older children and adult can provide information about hypopharynx and larynx.
- **Telescopic examination:**
  - Flexible Fiberoptic endoscope:
    - Excellent to assess the movement of vocal cord, (supraglottic lesion)
    - Done in clinic + pt awake
  - Rigid bronchoscopy:
    - Done under GA
    - May enable removal of foreign body
    - Assess the airway down to the main stem bronchi (subglottic area) and we can take culture if the case requires
    - **Diagnostic**: subglottic stenosis , hemangioma
    - **And therapeutic**: foreign body
  - Remember: it is important to do **both** rigid (while the pt is asleep), and Fiberoptic (while the pt is awake) to see the vocal cord movement



Rigid endoscope



Flexible fiberoptic endoscope

Others:

- ABG:
  - Late indicator of airway obstruction,
  - should not be used routinely to assess degree of obstruction (ABG usually is for chronic conditions)
- Flow volume loop to assess inhalation and exhalation, see if there is obstruction.

Therapeutic option:

1. Observation/medical support:
   - ICU
   - Airway team availability
   - Oxygenation
   - Steroid to reduce edema
   - Antibiotic
2. Heimlich maneuver → when someone is choking (foreign body)
3. N.P. (nasopharyngeal) airway
4. Oral airway
5. Esophageal airway
6. Transoral intubation
7. Nasal intubation
8. Flexible fiberoptic intubation
9. Trans-Tracheal jet ventilation
10. Cricothyroidotomy
11. Tracheostomy

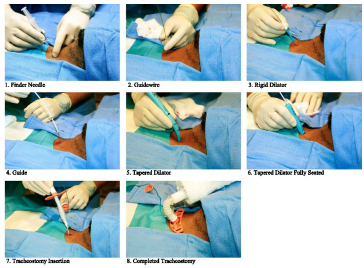
Surgical Techniques:

1. **Transtracheal needle ventilation** don't do it anymore, similar to cricothyroidotomy
   - 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.
     - Done by emergency or ICU
   - Complications:
     - Failure to establish an AW
     - Misplaced catheter in soft tissue of the neck (esp. in children):
       - Pneumomediastinum
       - Pneumothorax, the trachea and airway is highly mobile slippery and soft in children and you find airway is slipping from you and you are passing the cannula around the trachea
     - Total obstruction of the airway prevents adequate ventilation

Surgical Techniques Cont..:

2. Percutaneous tracheostomy usually used in ICU

- Passing needle, guide wire, series of dilators, the tube.
- Complications:
  - Difficulty with dilatation
  - Failed intubation
  - Excessive bleeding
  - Pneumothorax
  - False passage of the tube
  - Accidental decannulation
  - Tracheoesophageal fistula

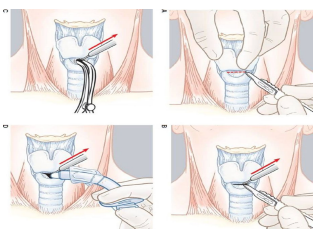


3. Cricothyroidotomy imp

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:
  - Generally for ***emergency*** upper airway obstruction when intubation is failed or contraindicated.
  - ***Elective*** for head & neck or cardiovascular procedures " where you can't do tracheostomy" (usually tracheostomy is better) (best for short period)
  - Where access to the tracheal rings is limited
  - Stenosis / epiglottis

  Other indications (from 435):
  - Intubation is not possible (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.



- Procedure:
  - May utilize horizontal or vertical incision.
  - Use small tracheal tube or endotracheal tube.
- 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.
  - Injury of anterior jugular vein (acceptable, in the area), great vessels (not acceptable because it is located laterally
  - Injury of recurrent laryngeal nerve
  - Subglottic and laryngeal stenosis (especially in children) contraindicated in pediatric and it can collapse

4. Tracheostomy very imp

Definition:

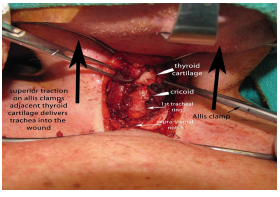
- Tracheostomy is an operative procedure that creates a surgical airway in the cervical trachea. It bypass all the upper airway
- For emergency or elective-airway obstruction, acute or chronic-airway obstruction
- **In emergency tracheostomy:**
  - vertical incision (slash tracheostomy) is preferred because there are no vessels in the midline
  - Hemostasis after establishing airway obstruction
  - hyperextension then done between the second and third tracheal ring or third and forth

Indications (important, question: what is the indications for tracheostomy):

- Prolonged (more than 2 weeks) mechanical ventilation: pulmonary dysfunction, neuromuscular diseases, infections
- Upper airway obstruction: subglottic stenosis, bilateral vocal cord paralysis, hemangioma
- Elective for major head and neck surgery oral surgery (tongue cancer excision and reconstruction)

From 435: every exam includes the indications and complications 435dr notes

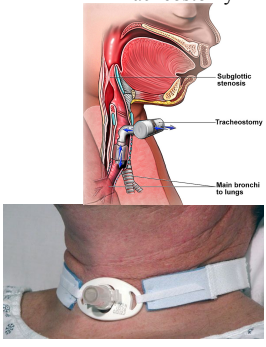
- Congenital anomalies like laryngeal hypoplasia.
- Upper airway foreign body.
- Supraglottic or glottis pathology like infection, neoplasm, bilateral vocal cord paralysis.
- Neck trauma results in severe injury to the thyroid or cricoid cartilages.
- Subcutaneous emphysema.
- Facial fractures that may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



Surgical Tracheotomy

Transverse incisions , 2 fingers from sternal notch usually between 2-3 or 3-4 tracheal rings to avoid the cricoid, high tracheostomy will cause subglottic stenosis, low which will affect the artery.

Tracheostomy



Incisions:

	Vertical incision	Horizontal incision
Advantage	- limited injury of vascular and neural structure, - improve access of trachea (easy retraction of soft tissue)	- improve cosmetic appearance, - may avoid neck dissection wound
Disadvantage	- potential scar formation, - risk of communication with neck wound (apron flap).	- risk of neurovascular injury, - may limit tracheal elevation during swallowing

"Important, example question > identify the picture: tracheostomy tube, mention 3 complications"

Tracheostomy Complications:

- Immediate:
  - Bleeding
  - Tracheal tube obstruction
  - Pneumomediastinum
  - Pneumothorax
  - Loss of airway
  - Injury to thyroid or nearby structures
- Late:
  - Infection
  - Granulation tissue formation
  - Tracheal tube displacement or malposition
  - Tracheo-esophageal fistula
  - Tracheo-vascular fistula

Immediate	Early	Late
- Hemorrhage, e.g. from thyroid isthmus. - Hypoxia - Trauma to recurrent laryngeal nerve.(through lateral dissection) - Damage to esophagus (dissection). - Pneumothorax. - Subcutaneous emphysema.	- Tube obstruction or displacement. - Aspiration. - Bleeding from tracheostomy site. - Infection.	- Airway obstruction with aspiration. - Tracheomalacia. - Aspiration and pneumonia. - Fistula formation, e.g. tracheocutaneous or tracheoesophageal. - Damage to larynx, e.g. stenosis.

Acquired airway obstruction

Airway Emergency :

A. Tumor: (most common adult laryngeal tumor is **squamous cell carcinoma**)

- Smoking is the main cause in oropharynx and laryngopharynx. Epstein–Barr virus in nasopharyngeal.
- Commonly tumors of aerodigestive tract or thyroid. typically present with gradual airway obstruction
- Initial management
  - O2 humidification
  - Steroids and IV antibiotics.

- Thyroid cancer (direct compression on trachea or recurrent laryngeal nerve invasion cause vocal cord paralysis and airway obstruction)
- Airway stabilization in tumor:
  - Organization between surgeon and anaesthetist
  - Avoid blind attempt of intubation
  - If available, fiberoptic intubation (experience)
  - Percutaneous jet ventilation to stabilize patient, for patient with total obstruction
  - Elective awake tracheostomy under local anesthesia is the safest method to secure the airway, usually patients with tumors, trismus that prevents intubation. (in cases of predicted difficult airway)
  - Precipitation of complete obstruction necessitates emergent cricothyroidotomy or tracheostomy

B. Trauma to neck and larynx **:**

- Presenting symptoms:
  - Hoarseness (means at the level of vocal cord)
  - Pain tenderness
  - Hemoptysis
  - Dysphagia
  - Subcutaneous emphysema IMP (it is air in subcutaneous tissue)
  - Impaired respiration
  - Haematoma

The doctor said its not important at your leve

Classification of Laryngeal Trauma & Treatment: (Called Schaefer classification)

Groups	Severity of injury in ascending order
Group 0	Normal larynx
Group 1	Minor endolaryngeal hematomas or lacerations without detectable fractures. No airway compromise
Group 2	More severe edema, hematoma, minor mucosal disruption without exposed cartilage, or nondisplaced fractures. Varying degrees of airway compromise
Group 3	Massive edema, large mucosal lacerations, exposed cartilage, displaced fractures, or vocal cord immobility. Airway compromise
Group 4	Same as group 3, but more severe, with disruption of anterior larynx, unstable fractures, two or more fractures lines, or severe mucosal injuries. Requires the use of a mold for stabilization
Group 5	Complete laryngotracheal separation

Source: Modified after Schaefer et al. [2] and Fuhrman et al. [39].

Type		Management
Type-I	minor endolaryngeal haematoma or laceration absence of detectable fracture of laryngeal skeleton	- 24 / 48 hours observation in ICU - Head of bed elevated - Humidification & systemic steroids
Type-II	edema, haematoma, mucosal disruption no exposed cartilage, no displaced fracture	- CT scan to R/O displaced fracture - Tracheostomy under local anaesthesia
Type-III	Massive edema with large mucosal laceration, exposed cartilage, displaced fracture (unstable airway) V.C. motion impairment	- Tracheostomy - Laryngoscopy - Exploration and repair No intubation b/c may cause more trauma
Type-IV	Same as III but more severe	- Explore and repair - Require endolaryngeal stent

C. Supraglottitis / Epiglottitis دائما تجي بالاختبارات imp

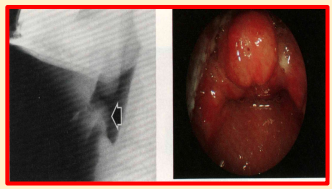
Acute inflammation of the epiglottis, very common in the past and almost eradicated but coming back..

Paediatric: by H. influenza type B

- Sudden onset
- Rapidly progressive course
- More acute than adults
- High fever, respiratory distress
- Drooling, painful swallowing, sitting on edge of seat

Adult: by staph aureus, more stable

- Dysphagia, severe sore throat
- Fever, stridor, voice change "Hot potato voice", as if the patient is struggling with a mouth full of hot food.
- may have preceding upper respiratory tract infection (URTI) symptoms



Thumb sign

What is the **diagnosis**? acute epiglottitis
What is the **organism**? H. influenza
Management? Take the patient to OR for possible intubation or **tracheostomy** (never examine the patient in clinic or ER)

Management:

Never examine a patient in acute epiglottitis in ER or clinic, take the patient to OR because it may precipitate complete airway obstruction.

- Children:
  - Secure airway → ET tube, tracheostomy after that give IV Abx and steroids and do culture
- Adult:
  - Frequently observed in an ICU, may need intubation.

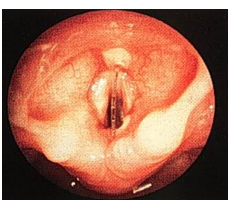
D. Foreign Body Aspiration

- Death from foreign body aspiration in USA is about 3000 per year for all ages.
  We see it mainly in the extreme ages: very young (children) and very old (geriatric).
- Complete airway obstruction may be recognized in the conscious child as:
  - Sudden respiratory distress
  - Inability to speak or cough
- Types of foreign body:
  - Vegetable matter (most common in children's airway) (peanut)/ مكسرات
  - Metal (coin)
  - Plastic (toys)
  - The most common objects aspirated by young children are food products (peanuts, seeds,Corn , فصفص). Most imp thing is vegetable matter because if it stay there, it will cause infections. And the most dangerous is battery because of chemical leakage which can cause erosion and perforation.
- Clinical presentation:
  - Immediate stage: Usually coughing, choking, gagging, and wheezing (we mostly catch patients here)
  - The intermediate stage: No symptoms or signs,
  - Third stage: Mimic different acute or chronic disease of lungs e.g. recurrent croups, bronchial asthma.
  - Stage of complications: pneumonia, obstructive emphysema and bronchiectasis.

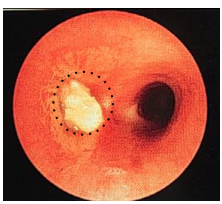
E. Foreign Body Aspiration cont:

- Sudden choking, cyanosis, coughing
- Chronic chest infection not resolving
- Location of FB in the AW:
  - Commonly the final destination is one of the main bronchi→right bronchus affected more commonly than left bronchus (the right is shorter, wider and more vertical)
  - Larynx in case of sharp objects (fish bone)
  - Trachea if there is narrowing in it, might lead to death if complete obstruction
- Diagnosis: Medical history is the key for diagnosing (clinical)
  - Radiologic: x-ray
    - 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).
    - Extended soft tissue neck, PA, lateral chest (most efficacious)
    - It can demonstrate: foreign body, emphysema of lung, atelectasis of the lung.
  - Bronchoscopy is the gold standard
  - 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)*
- Management:

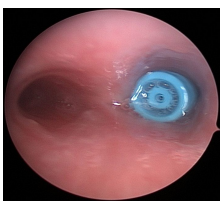
  Endoscopic removal is both diagnostic and therapeutic (airway foreign bodies are removed most safely under general anesthesia using the ventilating rigid bronchoscope). Optical Telescopic forceps can be used for foreign bodies removal and biopsy.



Fish bone in glottic area

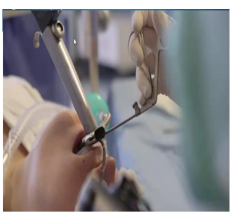


complete right main bronchus obstruction

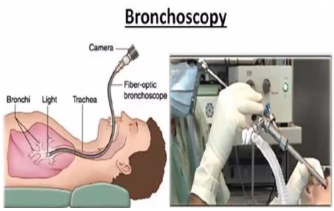


X-ray shows: hyperinflation of the left lung which is clearly more lucent than the right and shift of mediastinum and flattening of the hemidiaphragm are signs secondary to air trapping.

the FB is in the left lung and one way to know where is the FB is to do inspiratory and expiratory x-rays to know the location



Laryngoscopy: In case of foreign body in larynx



F. Burn patient

- Airway management is controversial → some say intubate and some say don't.
- Considering the choice of airway **Oral or Nasal Endotracheal Tube**
    - May exacerbate existing thermal injury
    - Inadvertent extubation is a potential disaster
    - When facial grafting is necessary tube and ties will limit the access
    - Tube obstruction occur more frequent (due to secretions and sluff)
- **Tracheostomy**
    - Reported to have higher mortality rate as a result of infectious complication (pulmonary sepsis, necrotizing tracheitis, mediastinitis steroid) so we prefer not to do it.
        - Bleeding, pneumothorax, tracheal stenosis, Edema of the neck results in difficult procedure.
        - Inadvertent removal of the tube
    - Cricothryroidotomy, may establish the airway more easily
    - Stabilization of airway is indicated for thermal injury of trachea, and extensive burns of the face oropharynx. Where impending UAWO necessitates intubation
    - Intubation for assisted ventilation is required for inhalation injury with: changes in ABG, O2 sat, and increase CO .
    - Once decision of intubation is made:
        - ET should be attempted initially
        - If necessary, leave X 3-4 wks
        - Utilize this time for grafting neck burns
        - Shift to tracheostomy after that if necessary

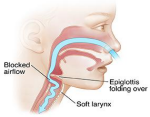
G. Thermal injury

- It is caused by aspiration of hot liquid or caustic fluid.
- Alkali is more dangerous than 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.

H. Peritonsillar abscess (from 435)

- Common deep infection in late childhood
- Symptoms: low grade fever, Severe sore throat, Muffled voice, Drooling, Trismus
- Diagnosis: Clinical diagnosis, CT scan
- Treatment:
    - Aspiration
    - Excision and drainage
    - Later tonsillectomy
- 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 indications of tonsillectomy) IV ABX

Congenital upper airway obstruction



1. Laryngomalacia:

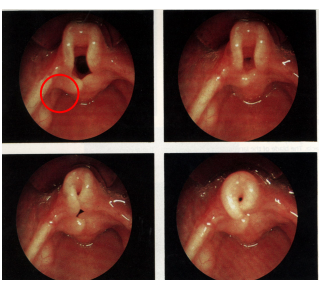
- Accounts for 60% of laryngeal problems in newborn.
- Due to flaccidity or incoordination of supra laryngeal cartilages which are pulled inside the lumen during inspiration leading to Upper Airway (UAW) obstruction.
- Characterized by stridor in the first few week, commonly associated with reflux. The most common cause of inspiratory stridor in infancy (1st is laryngomalacia, 2nd is bilateral vocal cord 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.

Cause is unknown:

- Edema of the Aryepiglottic folds and loose suspension of the epiglottis, fall inside airway with inspiration.
- Embryologically: rapid growth of the third branchial arch causes the epiglottis to curl open itself forming an omega shape.
- Neurological immaturity of brainstem & vagus > infolding of the aryteroids in the AW

Diagnosis:

- Symptoms: snoring is low pitch sound caused by tissue vibration of the nasopharynx pharynx and soft palate due to obstruction above the larynx. Stridor inspiratory phase worse with crying, feeding and respiratory tract infection, improved in prone position.
- Can only be confirmed by direct observation of movement of supraglottis during respiration.
- Fiberoptic evaluation (imp) is the most appropriate method of visualization.
- Radiologic evaluation (not done anymore, done to exclude other causes in case of severe symptoms not explained by laryngomalacia) (By high voltage X-ray PA lateral) may help in excluding the presence of associated AW problem: e.g. - Subglottic stenosis.
- Innominate artery compression.



Short aryepiglottic fold starting to collapse during inspiration > Blocking the airway "airway obstruction" > Stridor

Complication of laryngomalacia:

- Feeding difficulty
- Failure to thrive sensitive indicator for **severe** obstruction

Endoscopic finding (types of laryngomalacia):

- Tall, omega shaped epiglottis arytenoid mucosa (epiglottis is collapsing)
- Inward forward movement of (sucked) = floppy epiglottis
- Short aryepiglottic fold

Treatment: depending on severity of symptoms, if stridor is improved in prone position, if child is thriving

- Reassurance + treat GERD (95% associated with GERD)
  - 85% will recover spontaneously by one year of age
- Infant can outgrow this problem:
  - They could reach 18 month - 2 years and their problem would resolve
- Tracheostomy for severe cases.
  - Rarely done. Not good in pediatrics, high mortality rate up to 5%
  - This only done if we did the supraglottoplasty and the child is cyanotic, so we perform the tracheostomy and leave it temporarily until the child gets better.
- Epiglottoplasty, For severe cases → supraglottoplasty 'the best for severe cases
  - Cut of the aryepiglottic fold, or trimming of arytenoid mucosa, or fix the epiglottis to the tongue to decrease falling inside
  - Usual management for severe cases/pt present with complications.

2. Subglottic Stenosis (imp)

- A narrowing of the subglottis; in newborn subglottic diameter of less than 3.5 mm is abnormal.
- Two types:
  - Congenital pt born with complete narrowing of cricoid
  - Acquired - the commonest
  - We rarely see Congenital Subglottic Stenosis, it is mostly acquired due to prolonged intubation (EXAM). Also in pediatric with inappropriate ETT size.

Risk Factors of Acquired (from 435)

- Prolong / incorrect intubation duration and size of tube are important.
- Size of the tube
- Care of intubated patient.
- High pressure cuffs tube.
- Difficult intubations.
- Multiple intubation.
- GERD.
- Tracheobronchial infection.

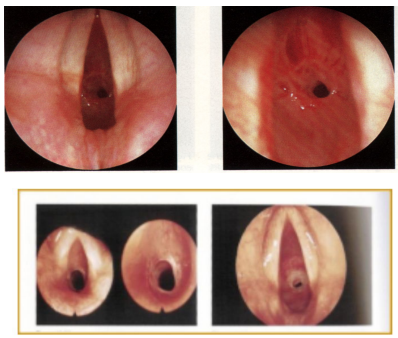
Edema and inflammation progress to ulceration and granulation tissue formation.When the source of irritation is removed, healing occurs with fibroblast proliferation, scar formation, and contracture, leading to stenosis or complete occlusion of the airway.

Presentation:

- Mild cases may present as recurrent croup secondary to URTI.
- Generally present with symptoms and signs of URT obstruction.
- Symptoms: dyspnea (may be on exertion or rest depending on the degree of stenosis), stridor, hoarseness, brassy cough, recurrent pneumonitis, cyanosis.

Diagnosis:

- Plain film of the neck (high KV) - not done anymore.
- Confirm the diagnosis by rigid endoscopy under GA (check a picture of the rigid bronchoscope they love to bring it in the exam).
- MRI - for difficult cases.



Cotton-Myer classification of subglottic stenosis:

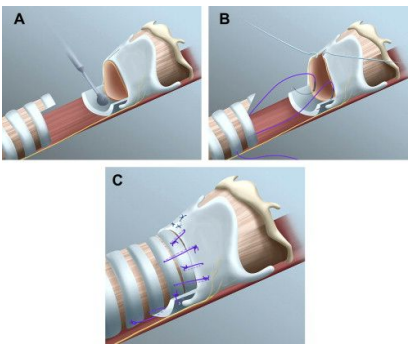
dr said its important for exam, example question : what is diagnosis ? subglottic stenosis , what is the grading system? mention the grade and percentage

Classification	From	To	Endoscopic appearance
Grade I	No Obstruction	50% Obstruction	
Grade II	51%	70%	
Grade III	71%	99%	
Grade IV	No detectable lumen Complete obstruction		

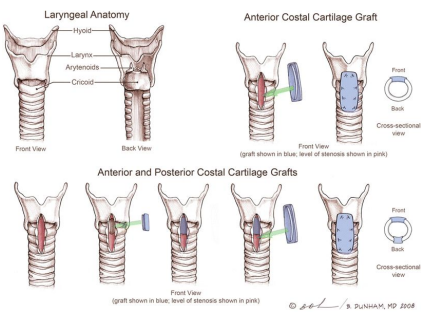
Management:

- Endotracheal intubation: usually it is difficult
- Emergency situations
  - Tracheotomy the best to secure airway because it is under stenosis level
  - Cricothyroidotomy
- Endoscopic techniques: (grade 1, 2)
  - Dilation (insert balloon)
  - Laser
- Open surgical technique: (grade 3, 4), through the neck
  - Cricoid split
  - Laryngotracheoplasty + rib graft + stent
  - Cricotracheal Resection and primary anastomosis (remove stenotic part and reanastomose the rest)

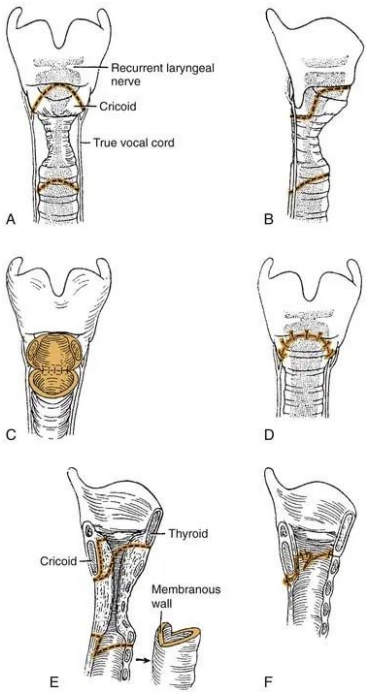
Cricotracheal resection



Laryngotracheoplasty + Rib graft open larynx and expand narrowing part by rib cartilage.



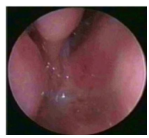
Cricotracheal resection resect the stenotic part then reanastomose



3. Choanal Atresia

- Uncommon anomaly 1 / 5000 - 8000.
- Lack of patency of posterior nasal aperture (complete closure)
- Bilateral atresia → birth emergency! Presents soon after birth with severe respiratory distress *"because neonates are obligate nasal breathers"* The first thing to do is oral tube then do a CT scan and any other thing you would like to do <emergency>.
- Stridor improves when the baby cry
- Unilateral atresia present late (may be undiagnosed until later in childhood w/ rhinorrhea). Note 431: The commonest cause for unilateral obstruction is foreign body (purulent, foul smelling discharge)
- Mixed bone-membranous choanal atresia account for 90%, remaining bony CA
- Choanal atresia may be associated with other anomalies in 20-50% of cases:
  - 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.) cranial nerves anomaly
    - H-heart disease
    - A-atresia
    - R-retarded growth
    - G-genital hypoplasia
    - E-ear deformity

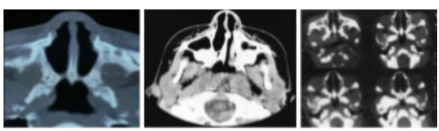
    This is why we need to do a chromosomal analysis to look for everything.



  - VATER "VACTERL" syndrome
    - "Vertebral anomalies, Anal atresia, Cardiac defects, Tracheoesophageal fistula and/or Esophageal atresia, Renal & Radial anomalies and Limb defects "
  - Craniofacial anomalies

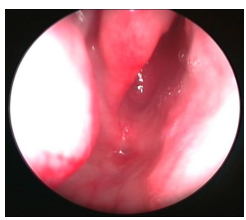
Types: do CT to differentiate between the types

- Membranous
- Bony
- Mixed (commentest) accounts for 90%.



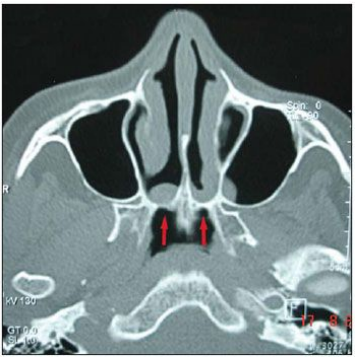
Diagnosis:

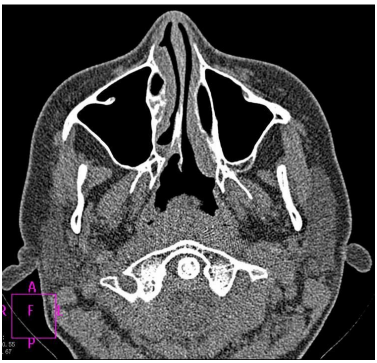
- Cyanosis improves with crying.
- Infants: failure to pass #6 - 8 catheter: (usually size 7)
  - Pyriform aperture stenosis
    - if you can't pass the catheter beyond 1 cm
    - at nasal entry, rare
  - Choanal atresia
    - if you can't pass the catheter beyond 3.5 cm



- Fiberoptic nasoscope

CT scan choanal atresia: for knowing the types





Treatment (surgical repair):

- If bilateral: done within 10 days. Unilateral: postponed to one year
- Emergency treatment is by insertion of oral tube.
- Many surgical approaches:
  - Transpalatal, Transnasal, Transantral, Transseptal.
  - Surgical treatment is by either transnasal or transpalatal choanal atresia repair.
- Endoscopic repair is the commonest
  - Outcome is variable
  - Success rates reported to range between 20-80%,It is the favorable method
  - With the scope if it is membranous →cut it. if it is bony →drill it

4. Subglottic Haemangioma (imp for SAQ)

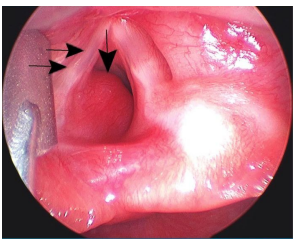
- Congenital vascular lesion
- Not present at birth but grow rapidly over the first few months of life.
  - Progress > plateau > regress
- Hemangioma is the most common tumor in the pediatric can be anywhere in the body.
- Common in subglottic region
- 50% of subglottic hemangiomas associated with cutaneous involvement.

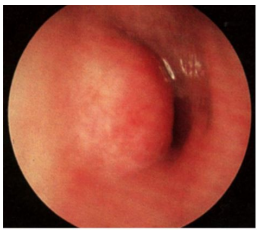
- Symptoms:
  - Biphasic stridor.
  - You want to insert a scope, and it is inserted while the child is awake because you want to observe the dynamic movement which will help you with the diagnosis. so you will see the vocal cords moving ok but there is a mass that is reddish or purplish in color.
  - Tend to involute slowly after one year.
  - 50% of the patients have cutaneous haemangioma in the head and neck
  - Present at age of 3 months with progressive dysphonia

Question: a 2 years old boy with history of progressive **stridor**, patient is having **cutaneous discoloration**, looks like vascular malformation, what is the possible diagnosis? **Subglottic hemangioma**

Treatment: management depend on severity

- Observation if no symptoms
- Tracheostomy if causing airway obstruction
- Steroids
- Beta blockers- propranolol main management nowadays
  - The first line of treatment is Propranolol (beta blocker) but it needs to be administered under the guidance of a pediatric cardiologist.
- Surgical excision

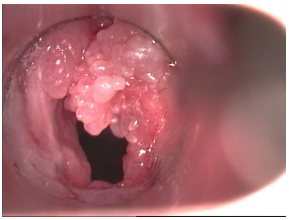
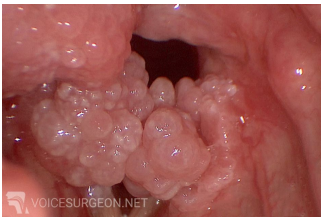


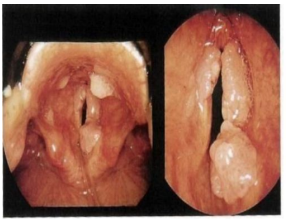


5. Recurrent respiratory papillomatosis (common question)

- It is a disease caused by Human papillomavirus (HPV) type 6,11 (Non cancerous)
- Two-thirds before the age of 15 years.
- Rare risk of malignancy type 16,18
- Types: Juvenile and senile
- Risk factor: Mother having genital warts
  - 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: presentation depend on involvement (nasopharynx, oral cavity, hypopharynx, larynx, trachea, lung)
  - Symptoms of upper airway obstruction predominate because the larynx is usually affected in both types.
  - Recurrent respiratory distress
  - Hoarseness and 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.
- Treatment:
  - Surgical debulking and cidofovir injection if needed
    - Laser excision or microdebrider (Debulking)
    - Cidofovir, Acyclovir, Interferon Adjunctive therapy in severe cases where there are areas we cannot remove the papillomas from. Such as anterior commissure > if you touch this area will lead to hoarseness)
  - Avoid tracheostomy papilloma might grow around it (spread to skin)

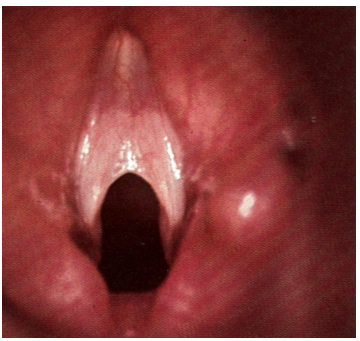





6. Glottic web Usually present as voice problem (weak voice)

- Adhesion of the two vocal cords (congenital)
- Hoarseness and difficulty breathing
- Small web just has dysphonia.
- Weak cry
- Stridor (more common with posterior webs)
- Sometimes associated subglottic stenosis

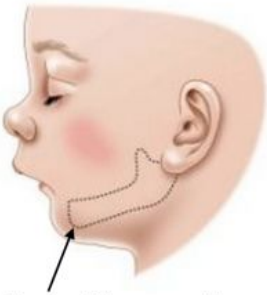
- Treatment: Endoscopic release of vocal cords (put sometimes stent)
  - Tracheostomy (any airway obstruction first thing to do is secure the airway).
  - Resection
  - Laser excisions
  - Laryngofissure for high grade with subglottic stenosis



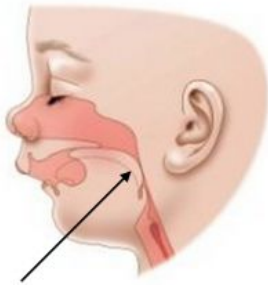

Endoscopy showing Adhesion of the two vocal cords

7. Micrognathia - difficult intubation:

- **Small jaw + receding chin** > tongue will be up > compress oropharynx > block airway > chronic airway obstruction
- **Difficult intubation**
- Severe case needs elective tracheostomy



Micrognathia - a small jaw with a receding chin



Tongue that is large compared to the jaw, resulting in airway obstruction

8. Pierre robin syndrome:

- Small jaw
- Large tongue
- Cleft palate
- Grade: mild, moderate, severe
- Need elective tracheostomy after growing jaw(improve)

GOLDEN NOTES MCQs

1. A child was playing with his toys when he suddenly started choking and coughing and cyanosed. His airway is patent. His parents took him to the hospital. What is the best management?
   A. Bronchoscope.
   B. Cricothyroidotomy.
   C. Tracheostomy.
   D. Observe

2. 27-years old male had rod traffic accident with history of intubation at that time in the ICU for two months. Multiple trails of extubation were done but they failed. A tracheostomy was done for him. What is the most likely underlying cause for failure of intubation?
   A. Laryngomalacia.
   B. Subglottic stenosis.
   C. Tracheomalacia.
   D. Vocal cord paralysis.

3. A New born child had cyanosis and difficulty breathing immediately after delivery. The cyanosis improves with crying. Which of the following is the most likely diagnosis?
   A. Enlarged Adenoid
   B. Laryngomalacia
   C. Laryngeal web
   D. Bilateral choanal atresia

4. A 3 months old baby brought to the emergency department by his parents because of noisy breath (stridor) which is not affected by position. No cyanosis, no history of previous intubation and the voice is normal. Systemic review revealed cerebral palsy. What's most likely diagnosis?
   A. Laryngeal web
   B. Laryngomalacia
   C. Subglottic stenosis
   D. Bilateral vocal cords paralysis.

5. A young patient presented with sore throat for which he took antibiotics and it did not work. Examination showed temperature of 38.9c and swollen tonsillar lymph nodes. CBC showed lymphocytosis. What is the diagnosis?
   A. Infectious mononucleosis
   B. Acute diphtheria
   C. Vincent's angina
   D. Quinsy abscess

1. C
2. B
3. D
4. A (not sure)
5. A

6. A 28 year old female complaining of right neck mass. Clinically euthyroid, on examination 4 cm right solid nodule, 3 cm left nodule. FNA shows follicular carcinoma, What is the recommended treatment?
   A. Thyroid replacement therapy
   B. Thyroidectomy
   C. Repeated aspiration
   Answer: B

SAQs

7. Case: picture of baby with skin rash "hemangioma" and history of stridor?
   1. What is the diagnosis?
   2. How would you investigate it?

8. Picture of tracheostomy tube:
   1. Identify it?
   2. Indications?

9. Foreign body (dysphagia, odynophagia)
   A. Site in the pic?
   B. Management?

10. Bilateral choanal atresia
    A. Diagnosis?
    B. Management?