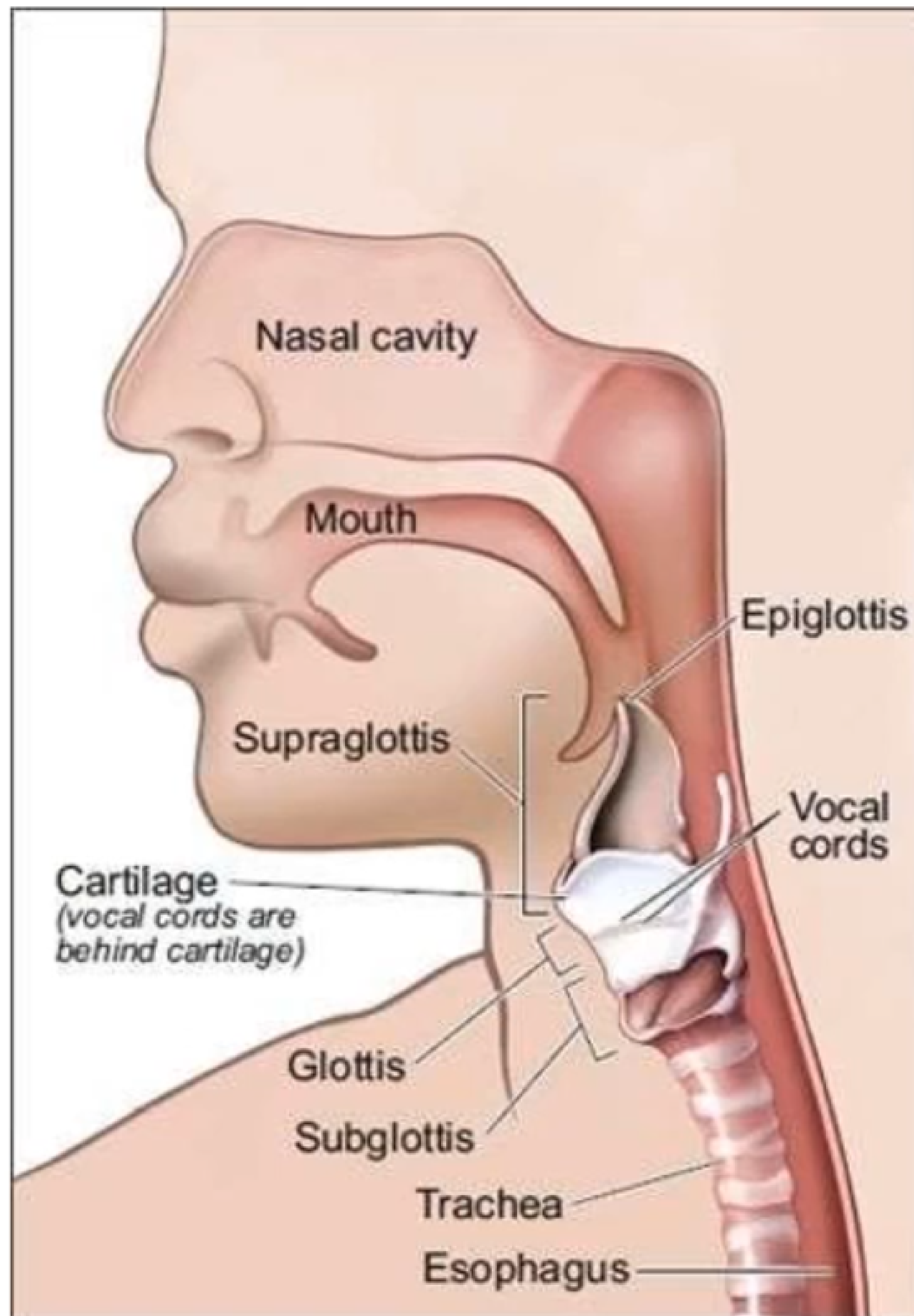


WHAT IS STRIDOR?



Stridor is an abnormal, high-pitched breath sound produced by turbulent airflow through a partially **obstructed** airway at the level of the **supraglottis, glottis, subglottis, or trachea.**

Stertor

heavy snoring inspiratory sound occurring in coma or deep sleep sometimes due to obstruction of the larynx or upper airways.

Causes of sterter : choanal stenosis, enlarged tonsils and/or adenoids, and redundant upper airway tissues.

TYPES OF STRIDOR

1. INSPIRATORY STRIDOR

Suggests an airway obstruction at or above the level of vocal cord

2. EXPIRATORY STRIDOR

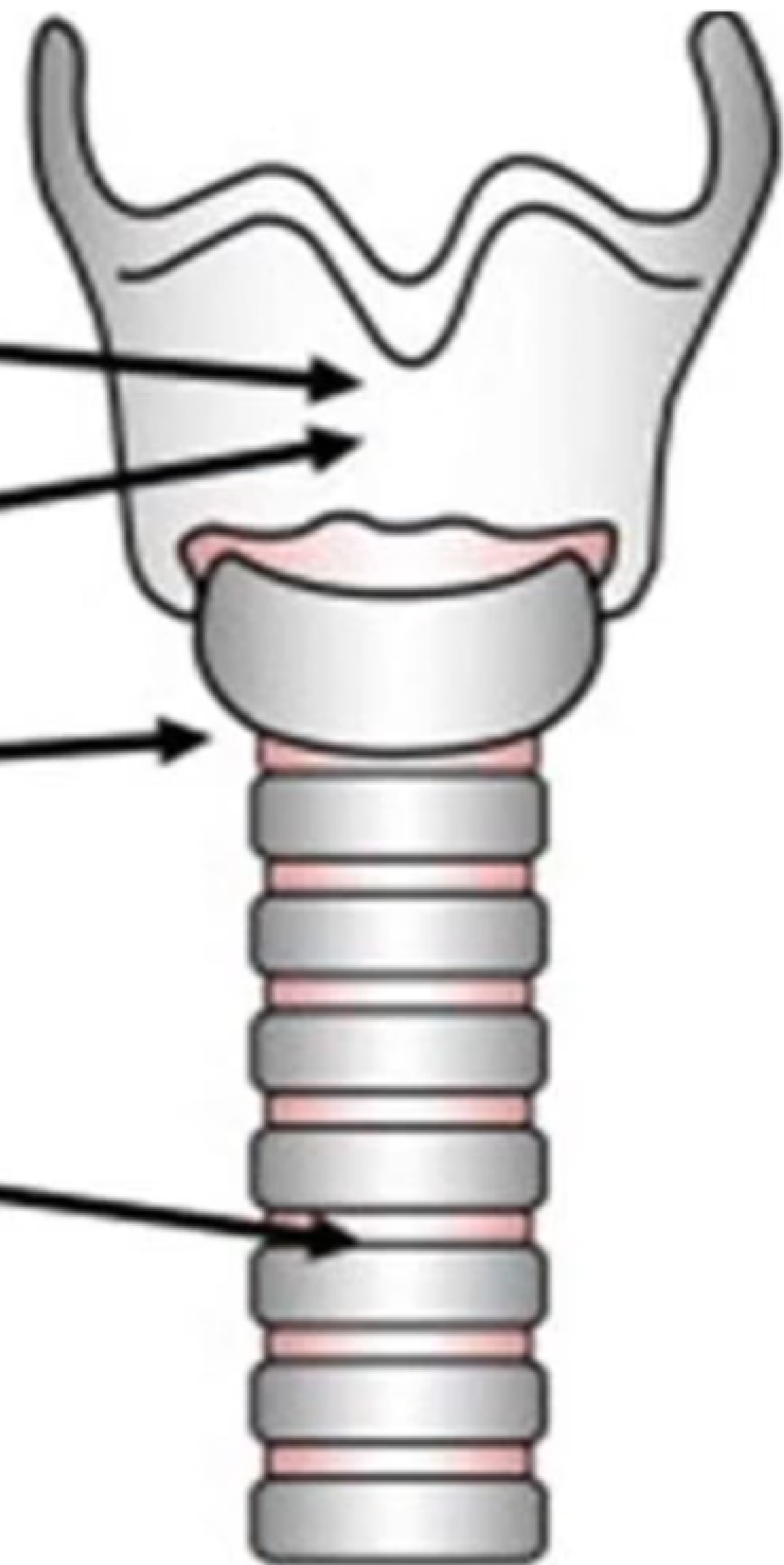
Suggests airway obstruction at the level of trachea and bronchioles. Commonly referred as wheeze.

3. BIPHASIC STRIDOR

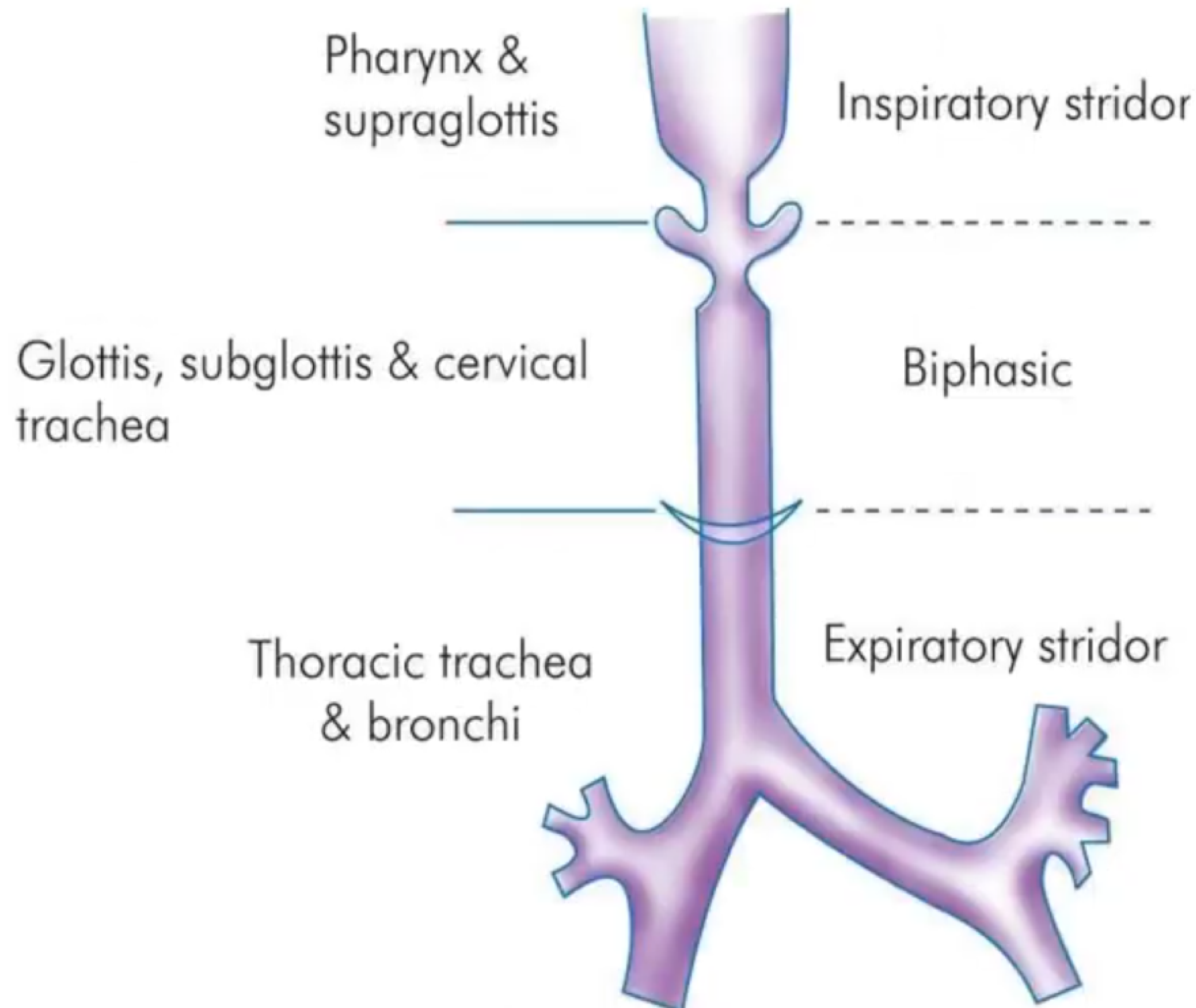
Suggests a supraglottic or glottic airway obstruction

TYPES OF STRIDOR

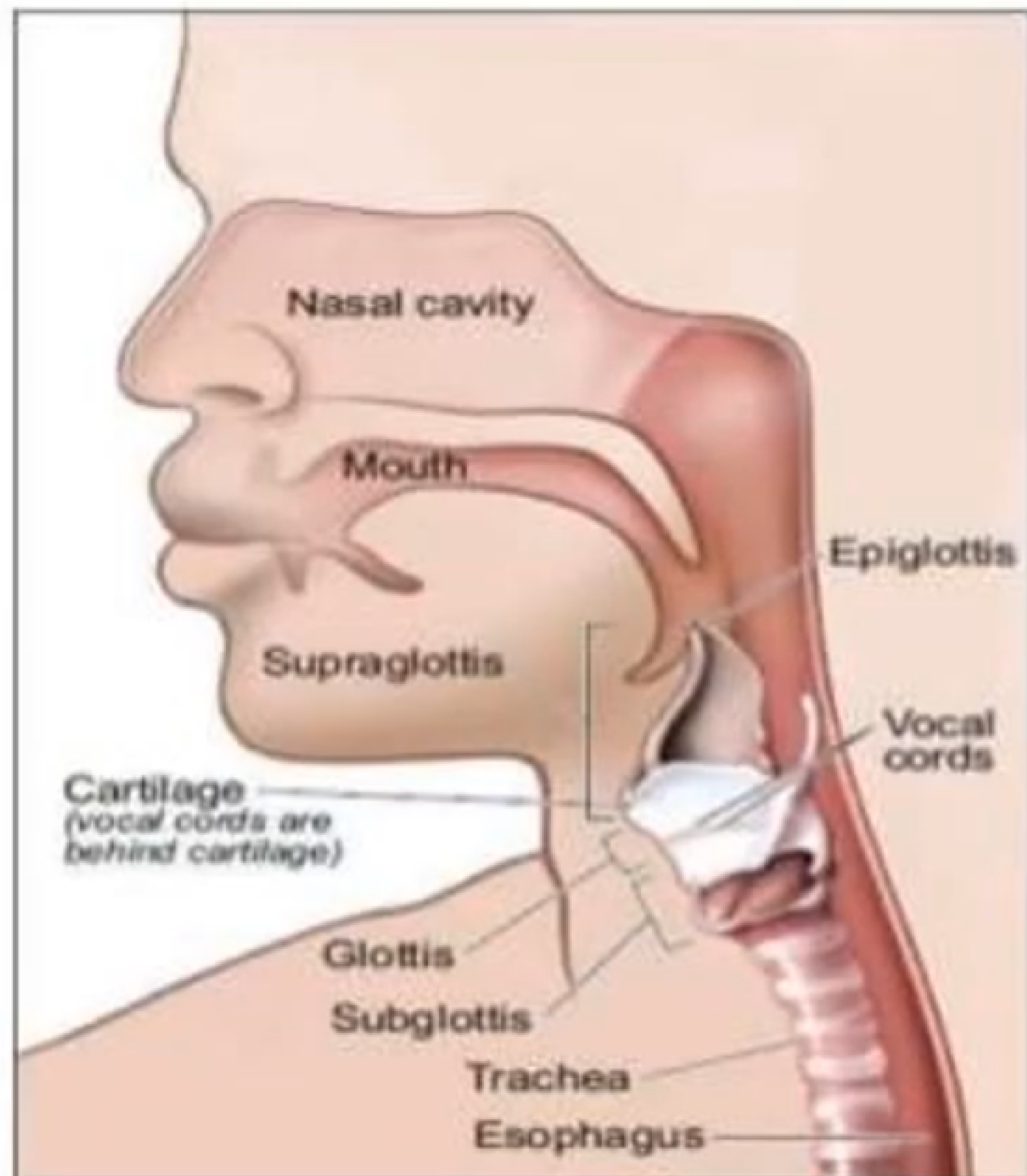
- **Inspiratory**
 - Supraglottic/Epiglottic
 - Vocal cords/glottic
- **Biphasic**
 - Glottic
 - Subglottic
- **Expiratory**
 - Tracheal
 - Bronchial



TYPES OF STRIDOR

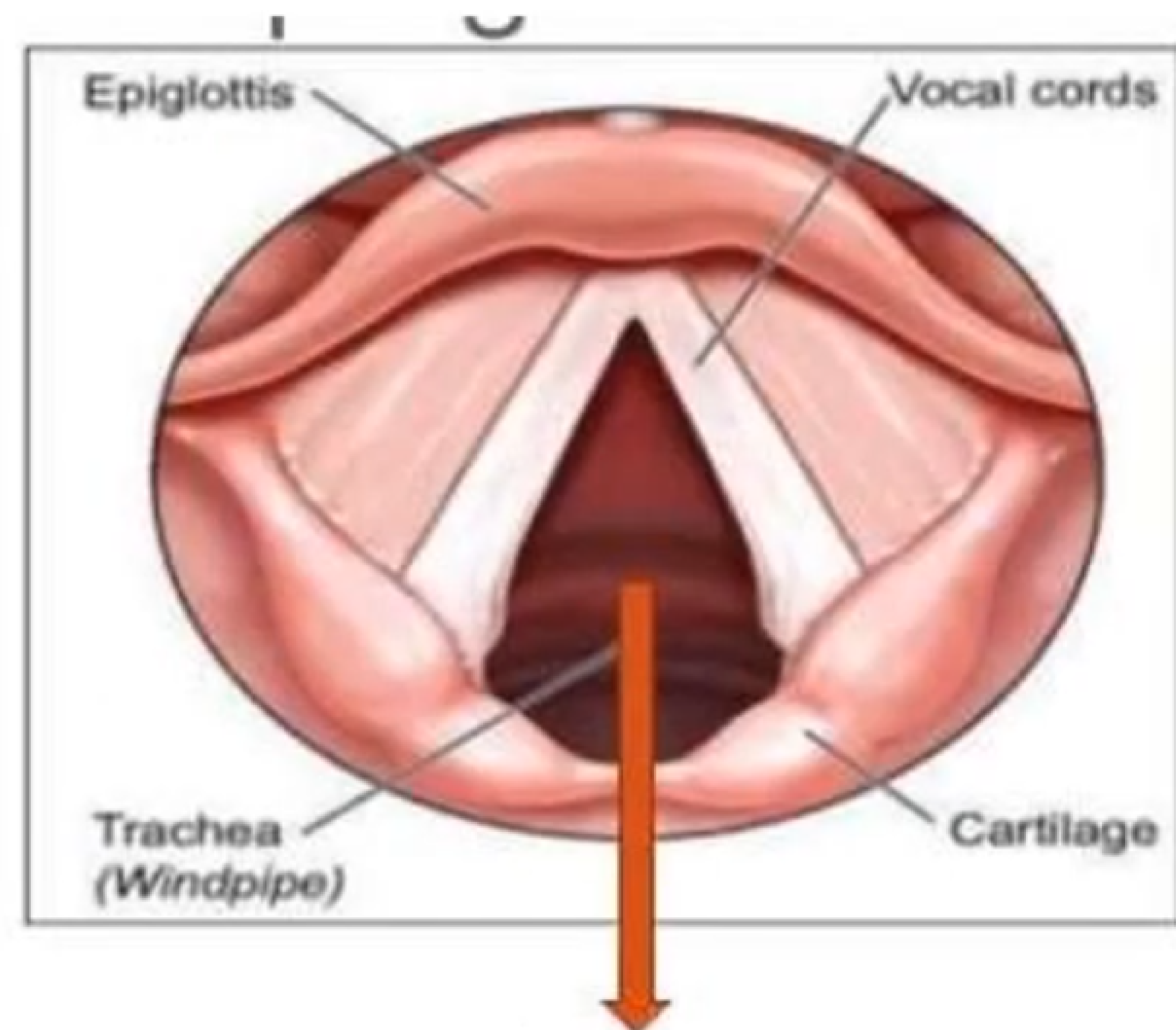


MECHANISM OF DEVELOPING STRIDOR



Stridor can occur at the following places:

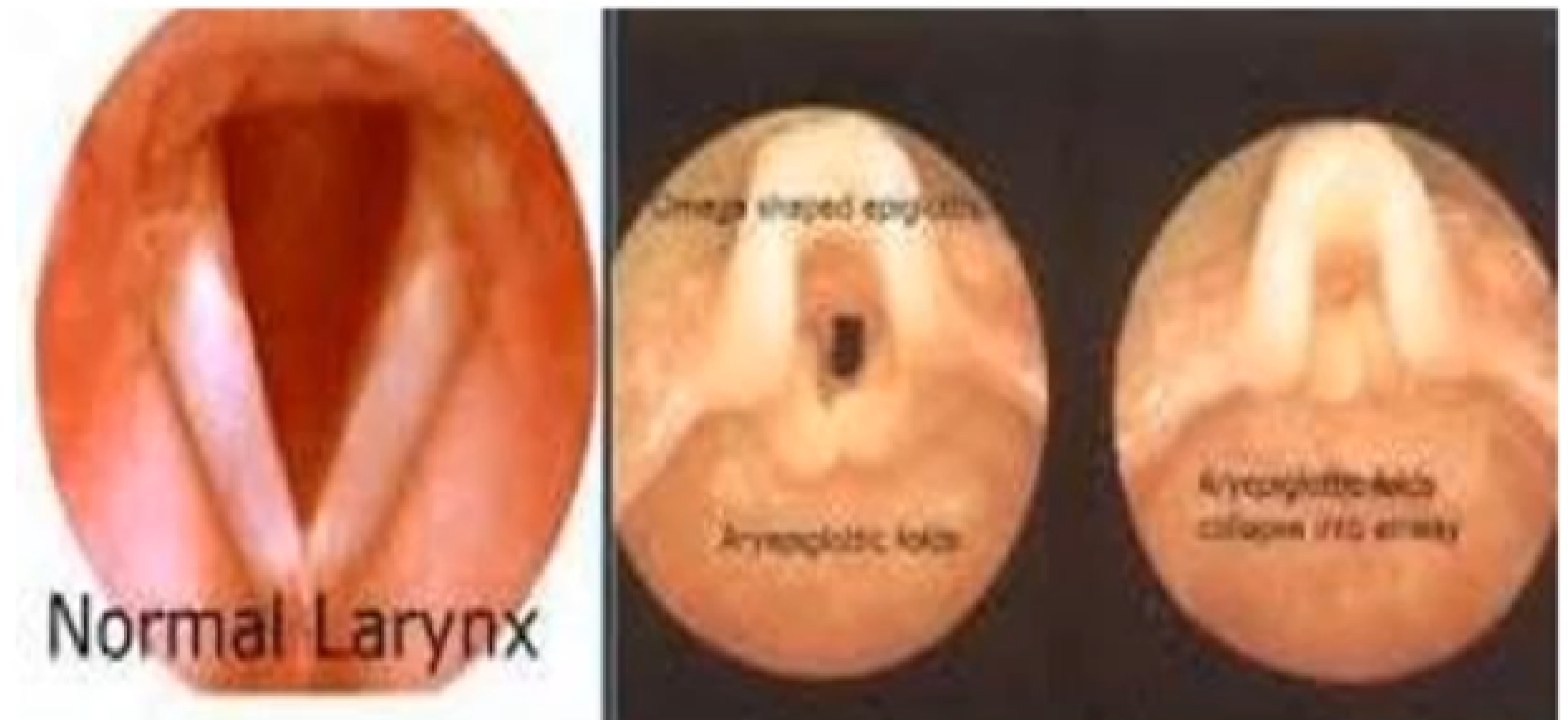
1. **Nose & Mouth**
2. **Larynx** (Epiglottis, Supraglottis, Glottis, Subglottis)
3. **Trachea.**



- An infant or child's airway lumen is naturally narrower/smaller than adults.
- Therefore, any minor reductions to this airway diameter (such as inflammation, mucosal edema, foreign object, collapsing epiglottis) can result in further narrowing or obstruction of the airway.
- Due to this narrowing, it causes an exponential increase in airway resistance which makes it significantly difficult for the child to breathe.

CONGENITAL CAUSES

1. Laryngomalacia >70%
2. VC paralysis
3. Subglottic stenosis
4. Cysts
5. Web
6. Vascular anomaly
7. Cleft larynx
8. Lymphangioma
9. Subglottic haemangioma



140001



140002



140003



140004

ACQUIRED CAUSES

TRAUMA

Thermal or chemical, iatrogenic (intubation)

INFLAMMATORY

Ac epiglottitis, Ac laryngitis, ALTB, Retropharyngeal abscess, Diphtheria

FOREIGN BODY

In the larynx, trachea or bronchus & external compression from oesophageal foreign body

ALLERGY

Angioneurotic oedema of larynx or trachea

NEOPLASIA

Benign e.g. laryngeal papillomatosis
Malignant e.g. laryngeal or bronchial carcinoma

IN CHILDREN / INFANT

STRIDOR

CONGENITAL

- Laryngomalacia
- Laryngeal web
- Subglottic stenosis
- Haemangioma
- Vocal cord paralysis
- Tongue and jaw abnormalities

ACQUIRED

AFEBRILE

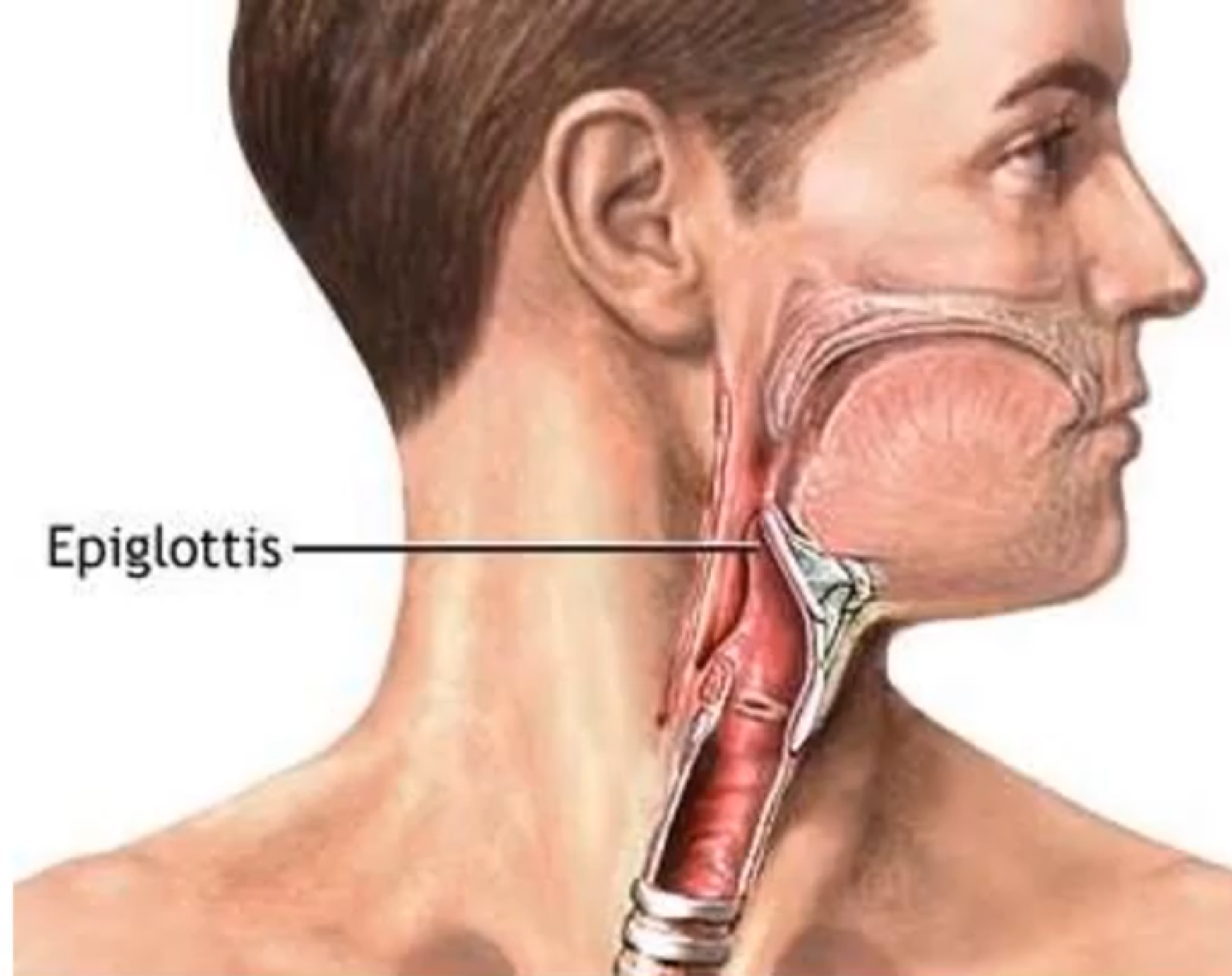
- Papillomatosis
- Injury
- Foreign body
- Laryngeal edema
- Adenotonsillar hypertrophy

FEBRILE

- Epiglottitis
- Acute laryngitis
- Laryngotracheitis
- Diphtheria
- Retropharyngeal abscess
- Infectious mononucleosis
- Peritonsillar abscess

COMMON CAUSES

1. *Acute epiglottitis*
2. *Acute laryngeotracheobronchitis (croup)*
3. *Retropharyngeal abscess*
4. *Foreign body aspiration*



ACUTE EPIGLOTTITIS

ACUTE EPIGLOTTITIS

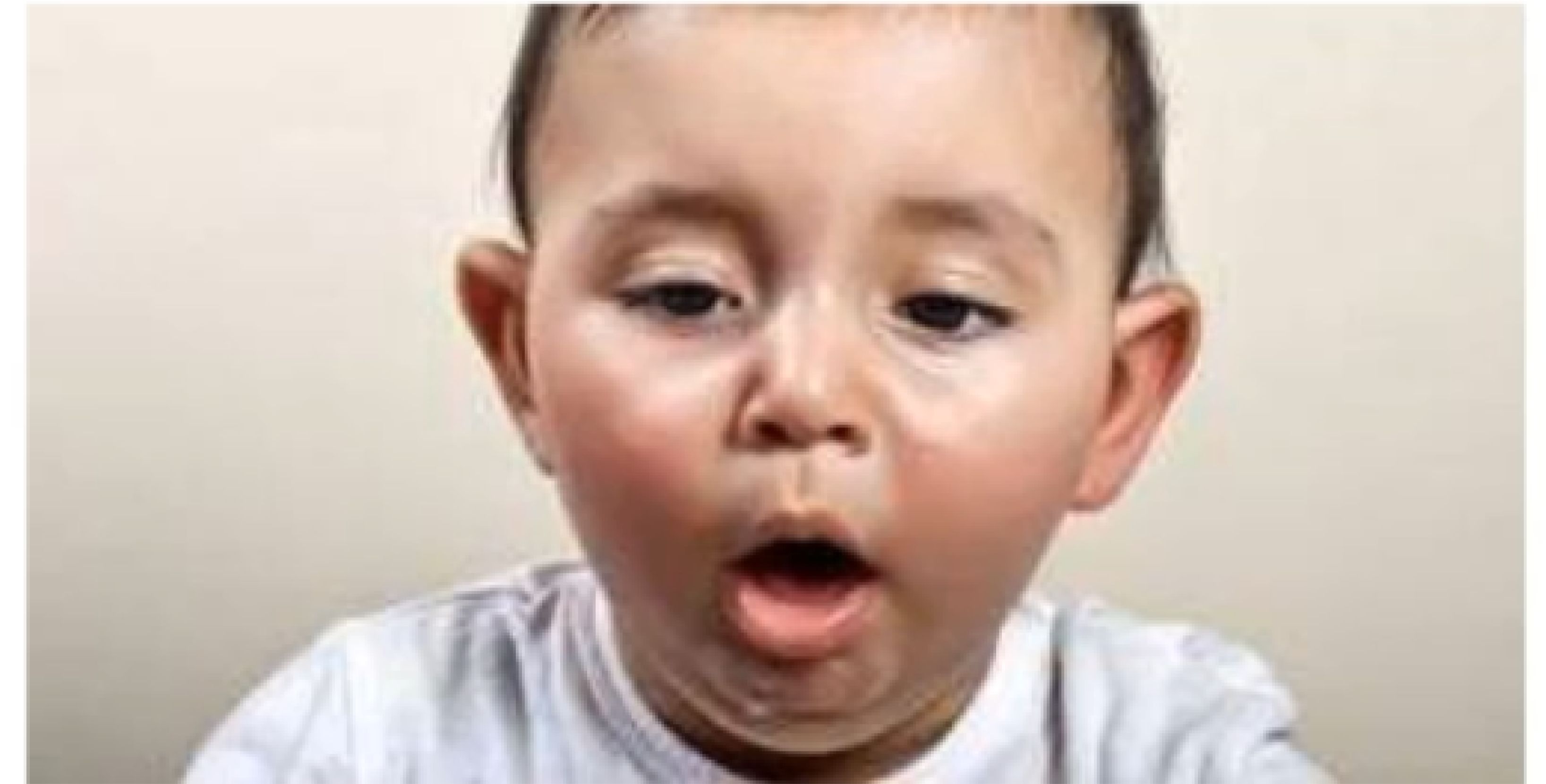
- It is an acute inflammation in the supraglottic region of the oropharynx with inflammation of the epiglottis, vallecula, arytenoid and aryepiglottic.
- It is rapidly progressive
- Common in children (2-7 y/o)
- It is emergency case as the time interval from start of symptom to total respiratory obstruction may be extremely short

CAUSES

1. H. influenza type B
2. Streptococcus pneumonia
3. Group A streptococci
4. Burn/ Trauma

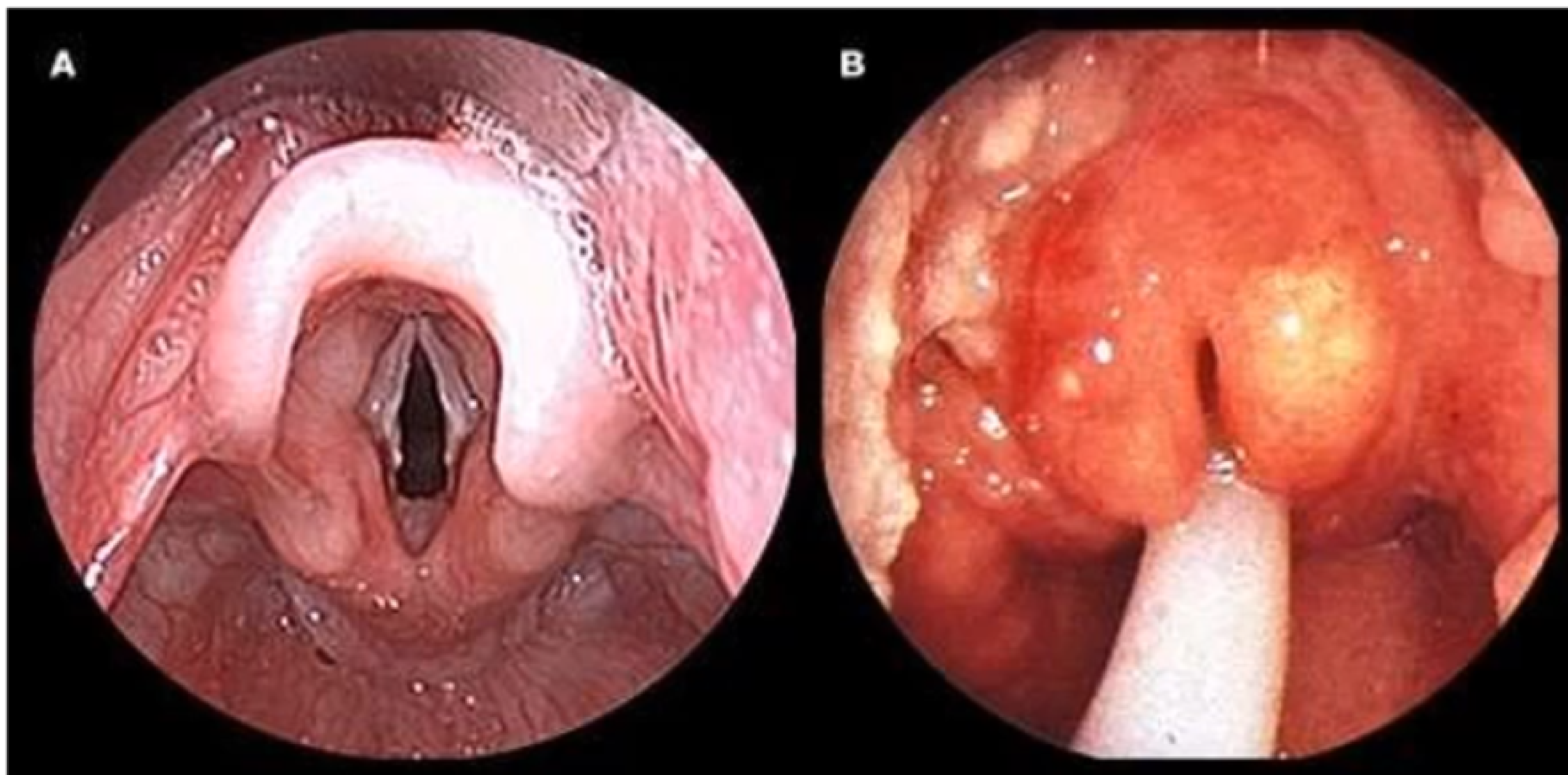
SYMPTOMS

1. Stridor
2. Dyspnea
3. Fever
4. Odynophagia/Dysphagia
5. Severe sore throat
6. Drooling
7. Tripod position
8. Muffle voice



SIGNS

- Epiglottitis is swollen red mass
- Surrounding areas in the larynx and pharynx also congested and swollen



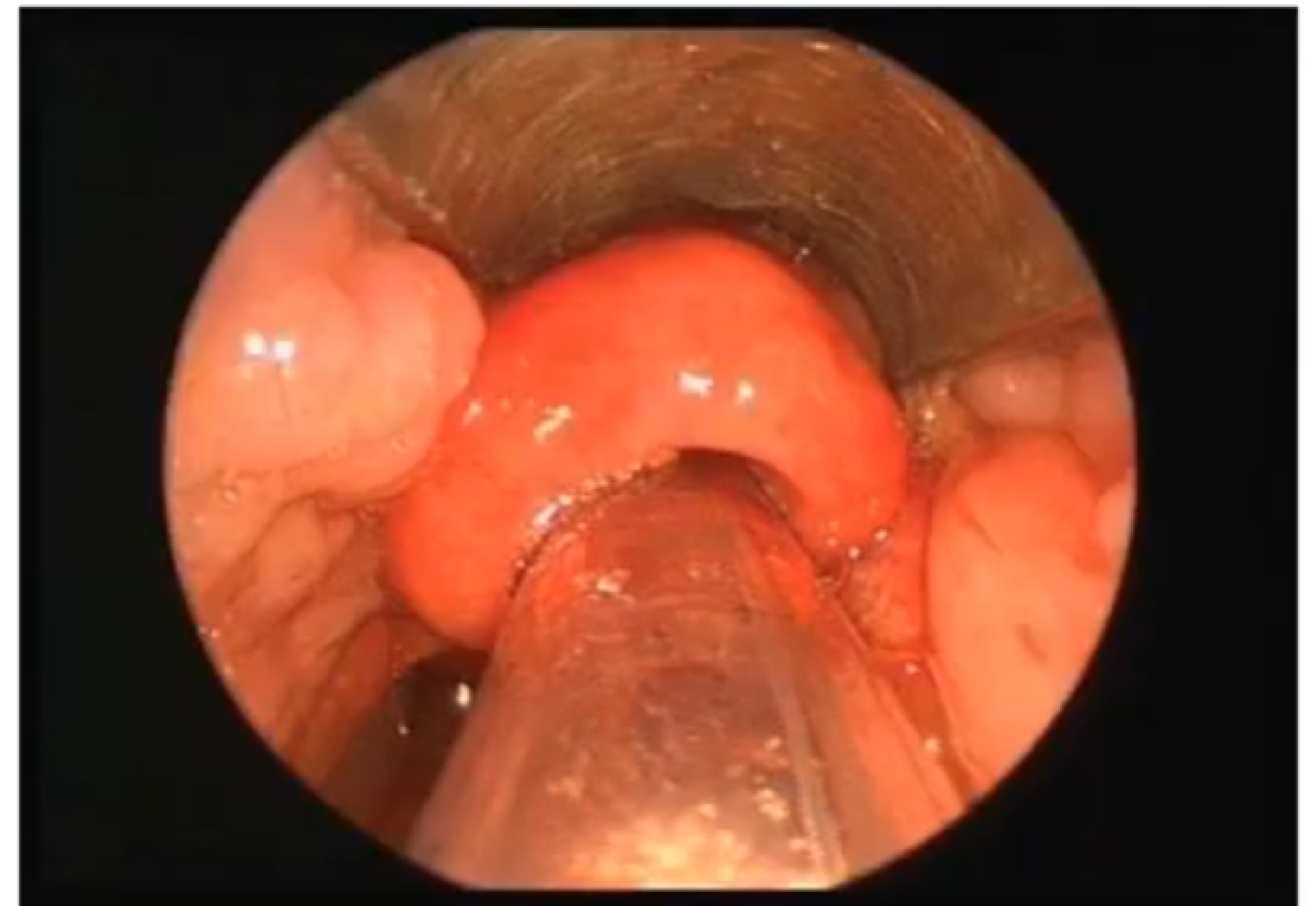
INVESTIGATIONS

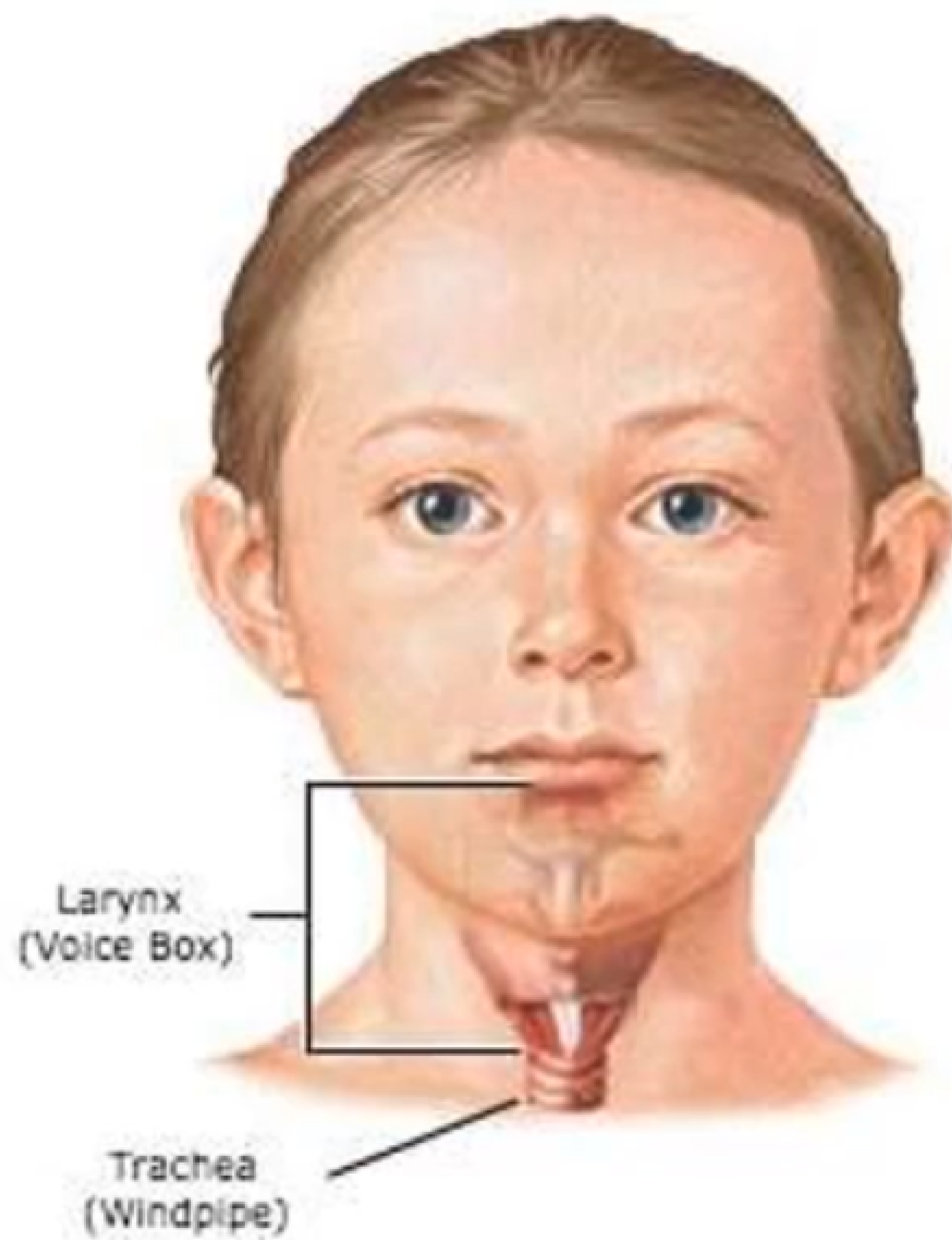
- Blood culture
- X ray lateral view will show large swollen epiglottis (**thumb sign**)



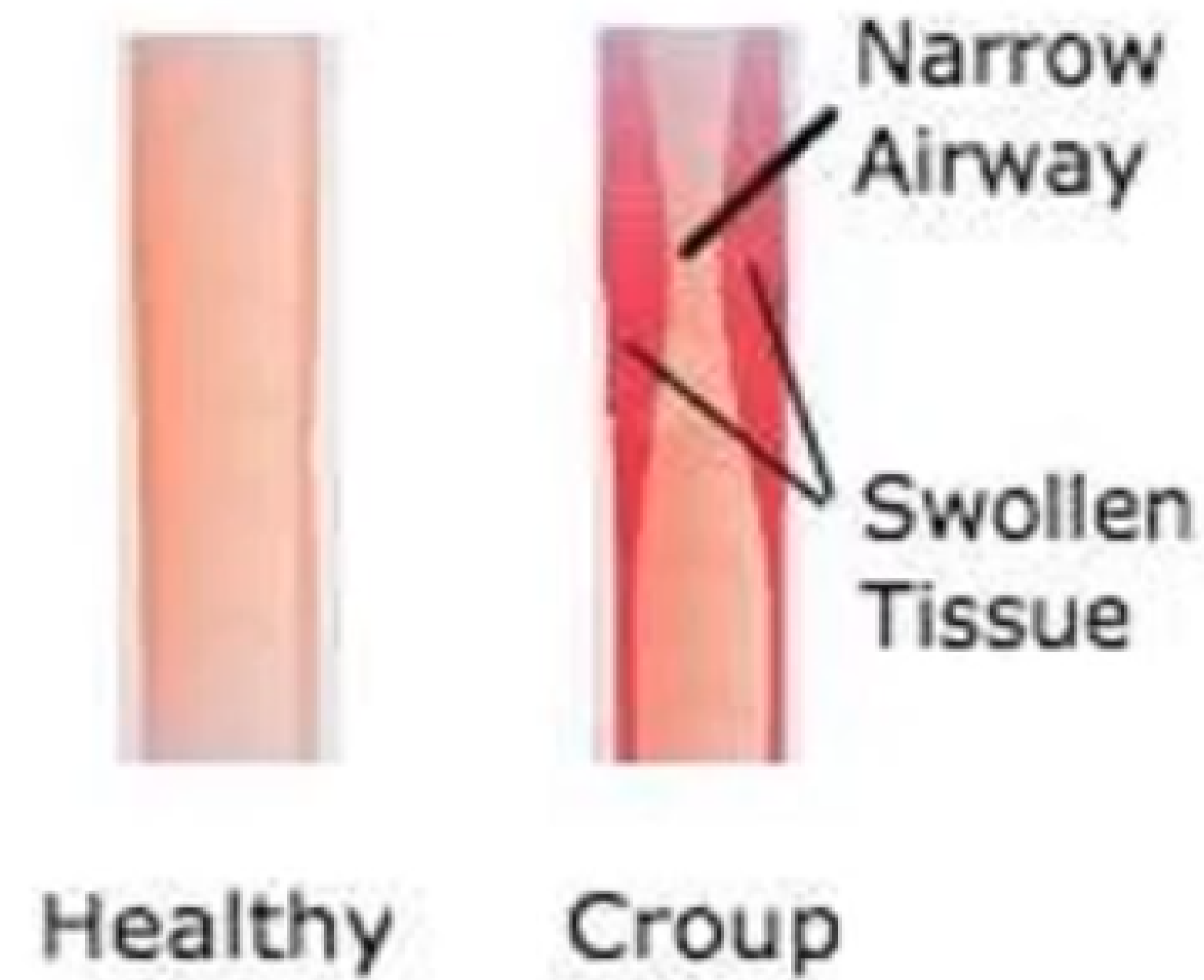
TREATMENT

1. IV antibiotic
2. Steroid
3. Hydration with parenteral fluid
4. Intubation





Inside the Trachea



ACUTE LARYNGOTRACHEOBRONCHITIS (CROUP)

OVERVIEW

- Acute laryngotracheobronchitis or **croup** is an acute infection involving the larynx, trachea and bronchus.
- Commonly seen in the children up to age of 7 years old.
- Parainfluenza viruses (types 1, 2, 3) are responsible for about 80% of croup cases.
- Spread through either direct inhalation from a cough and/or sneeze, or by contamination of hands
- Most likely to occur during the winter and early spring.

PATHOPHYSIOLOGY

Inhalation of virus through nose or the nasopharynx.



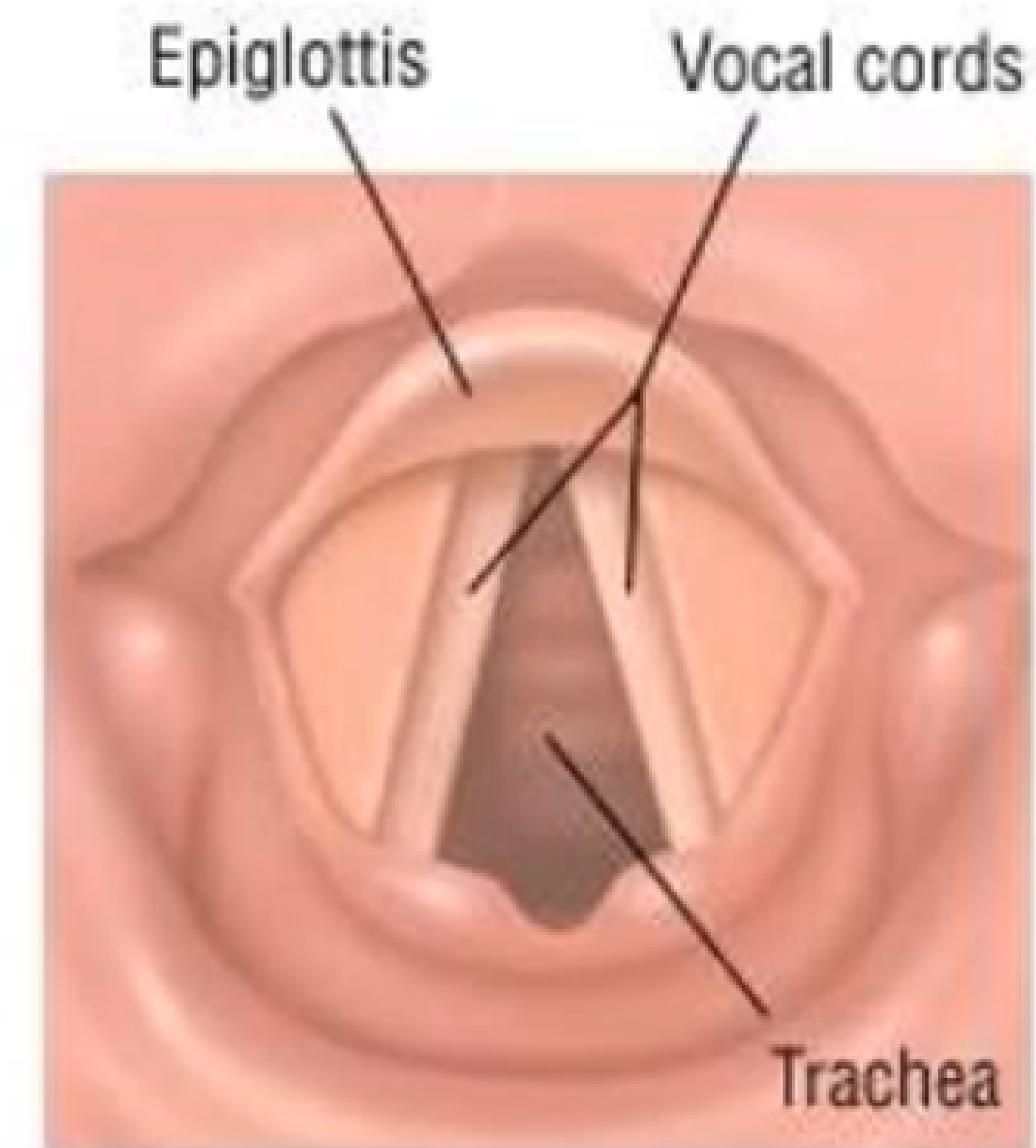
Respiratory epithelium becomes inflamed and edematous.



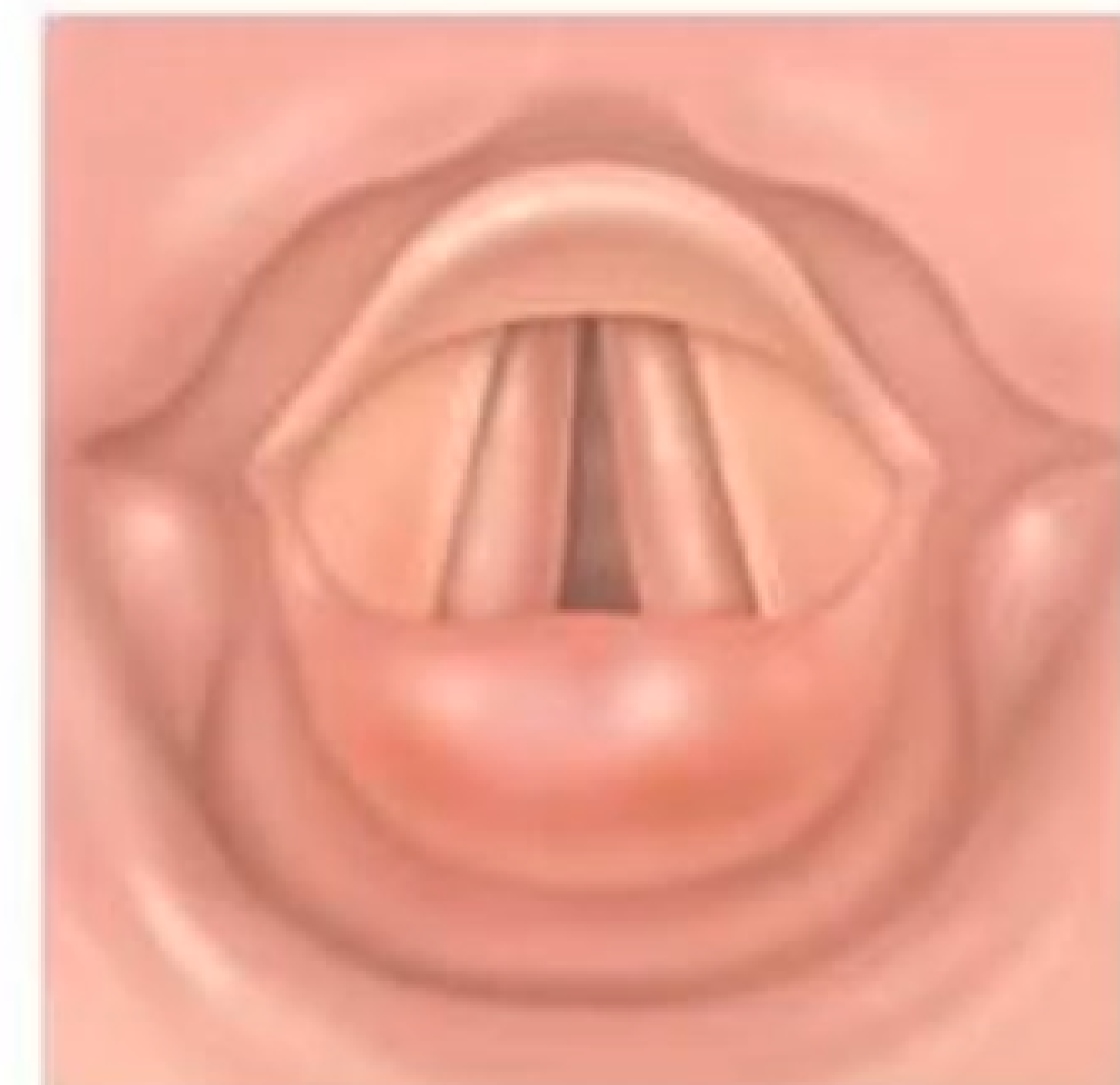
Airway narrowing



Airflow through the airway becomes turbulent (stridor)

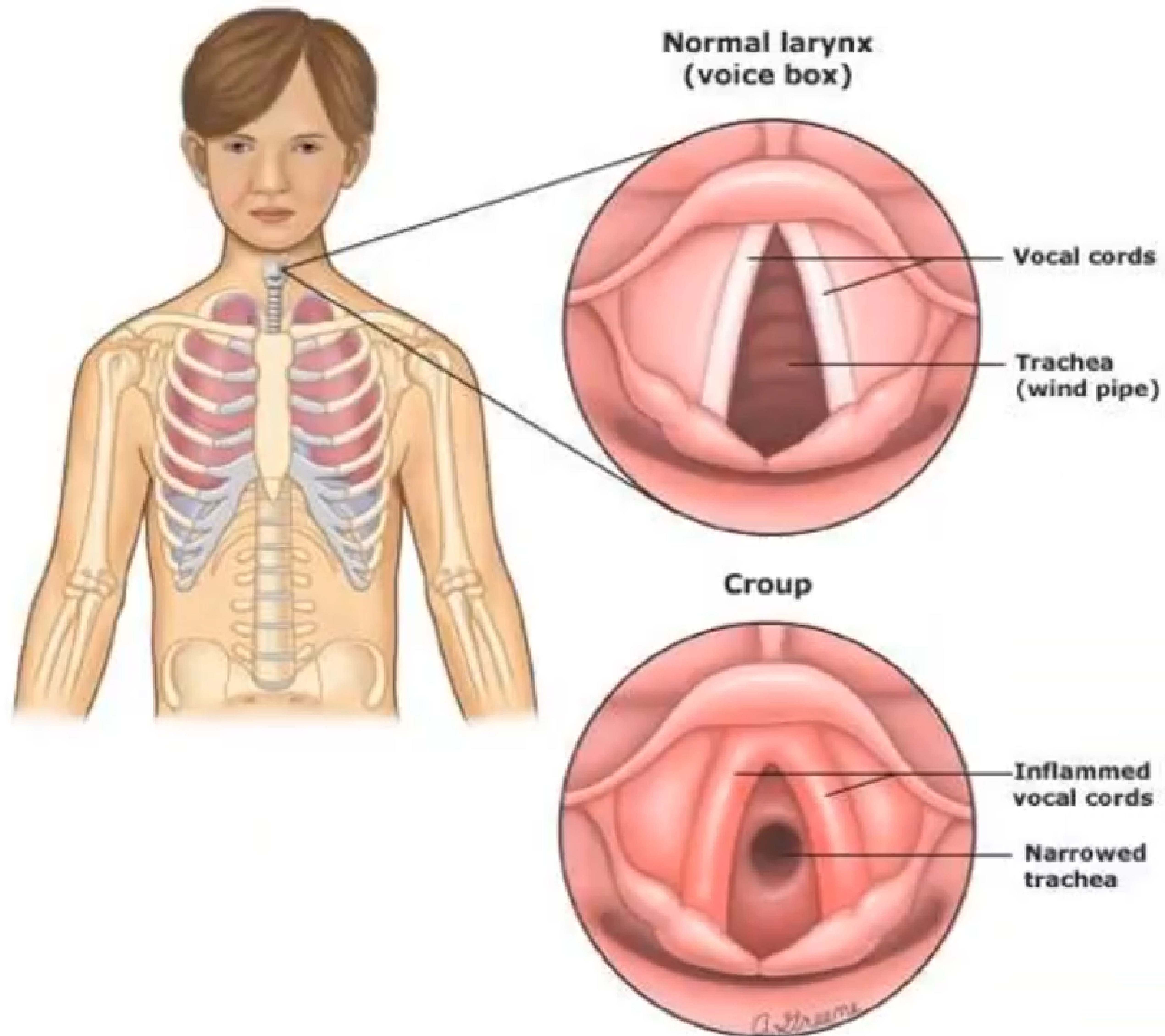


Normal larynx

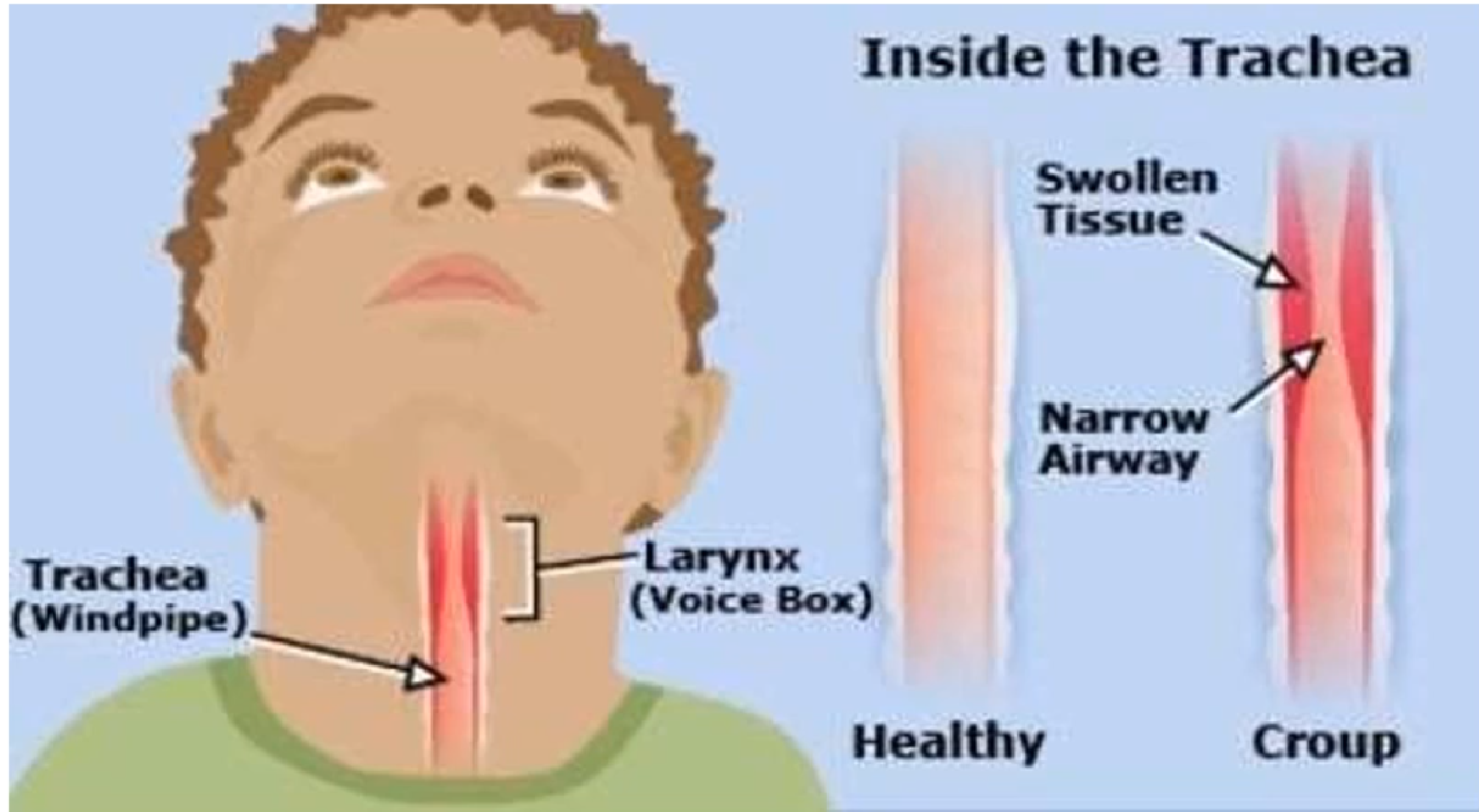


Inflamed larynx

PATHOPHYSIOLOGY



PATHOPHYSIOLOGY



CLINICAL FEATURES

1. Non-specific respiratory symptoms (rhinorrhea, sore throat, cough)
2. Fever (generally low grade but may exceed to 40°C)
3. Hoarseness of voice
4. Barking cough
5. Stridor
6. Chest retraction

SCORING SYSTEM

Table 2. The Westley Croup Score^a

Symptom	0	1	2	3	4	5
Level of consciousness	Normal, including sleep	NA	NA	NA	NA	Disoriented
Cyanosis	None	NA	NA	NA	With agitation	At rest
Stridor	None	With agitation	At rest	NA	NA	NA
Air entry	Normal	Decreased	Markedly decreased	NA	NA	NA
Retractions	None	Mild	Moderate	Severe	NA	NA

^a The score is obtained by grading each symptom and totaling all of the symptom scores.

NA: not applicable.

Source: Reference 5.

WESTLEY SCORING

Croup scores have been developed to assist the clinician in assessing the patient's degree of respiratory compromise.

The final score sum has a range of 0 to 17.

A. MILD DISEASE

- ✓ Sum score of less than 2
- ✓ Occasional barking cough, hoarseness, no stridor at rest, and mild or absent suprasternal or subcostal retractions.
- ✓ Specific respiratory symptoms (rhinorrhea, sore throat, cough)
 - Fever (generally low grade but may exceed to 40°C)
 - Hoarseness of voice
 - Barking cough
 - Stridor
 - Chest retraction

WESTLEY SCORING

B. MODERATE DISEASE

- Sumscore of 3 – 5 indicates moderate disease.
- Frequent cough, audible stridor at rest, and visible retractions, but little distress or agitation.

C. SEVERE DISEASE

- Sumscore of 6 – 11.
- Prominent inspiratory (and, occasionally, expiratory) stridor; frequent cough, marked chest wall retractions, decreased air entry on auscultation, significant distress and agitation.

WESTLEY SCORING

D. IMPENDING RESPIRATORY FAILURE

- Sum score of ≥ 12
- At this point, a barking cough and stridor may no longer be prominent.
- Lethargy, cyanosis, and decreasing retractions are harbingers of impending respiratory failure.

INVESTIGATIONS

1. **Full blood count**
 - Lymphocytosis
2. **ABG**
 - Hypoxia and hypercapnia in respiratory failure
3. **X-ray :**
 - Steeple sign (signifies the subglottic narrowing)
4. **Laryngoscopy**

INVESTIGATIONS

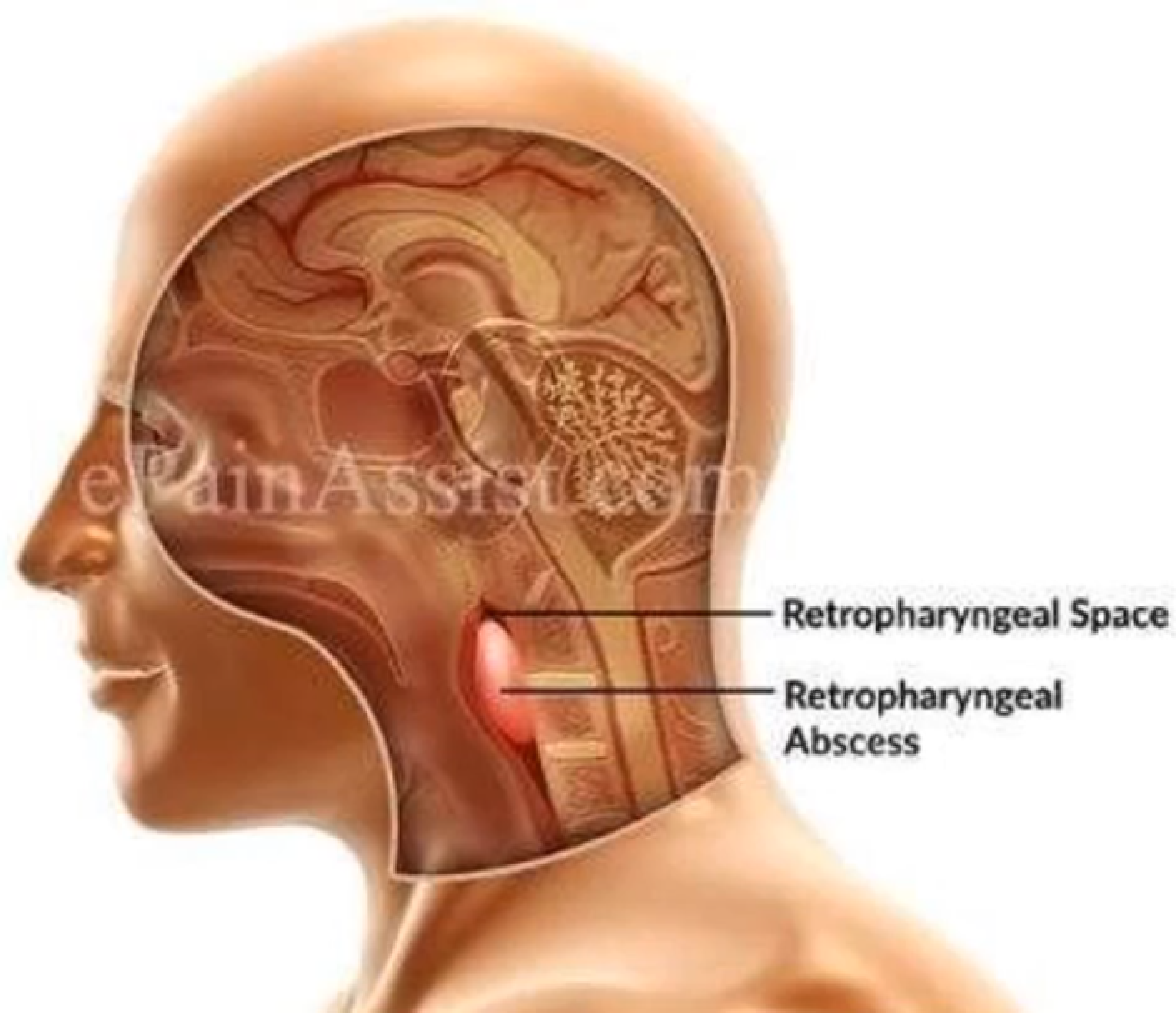


MANAGEMENT

- In mild croup, a child may just require parental guidance
- Keep the child's head elevated.
- Antipyretic
- Mucolytic agent
- Corticosteroid
- Nebulized epinephrine

DIFFERENCES

Characteristic	Epiglottitis	Croup
Appearance	toxic and unwell	well looking
Onset	abrupt onset	viral prodrome, slower onset
Fever	high fever ($>38.5^{\circ}\text{C}$)	moderate fever
Stridor	usually moderate-severe	usually mild-moderate
Cough	minimal or absent	barking, seal-like quality
Speech	unable to speak	hoarse voice
Secretions	unable to swallow, drooling of saliva	able to swallow



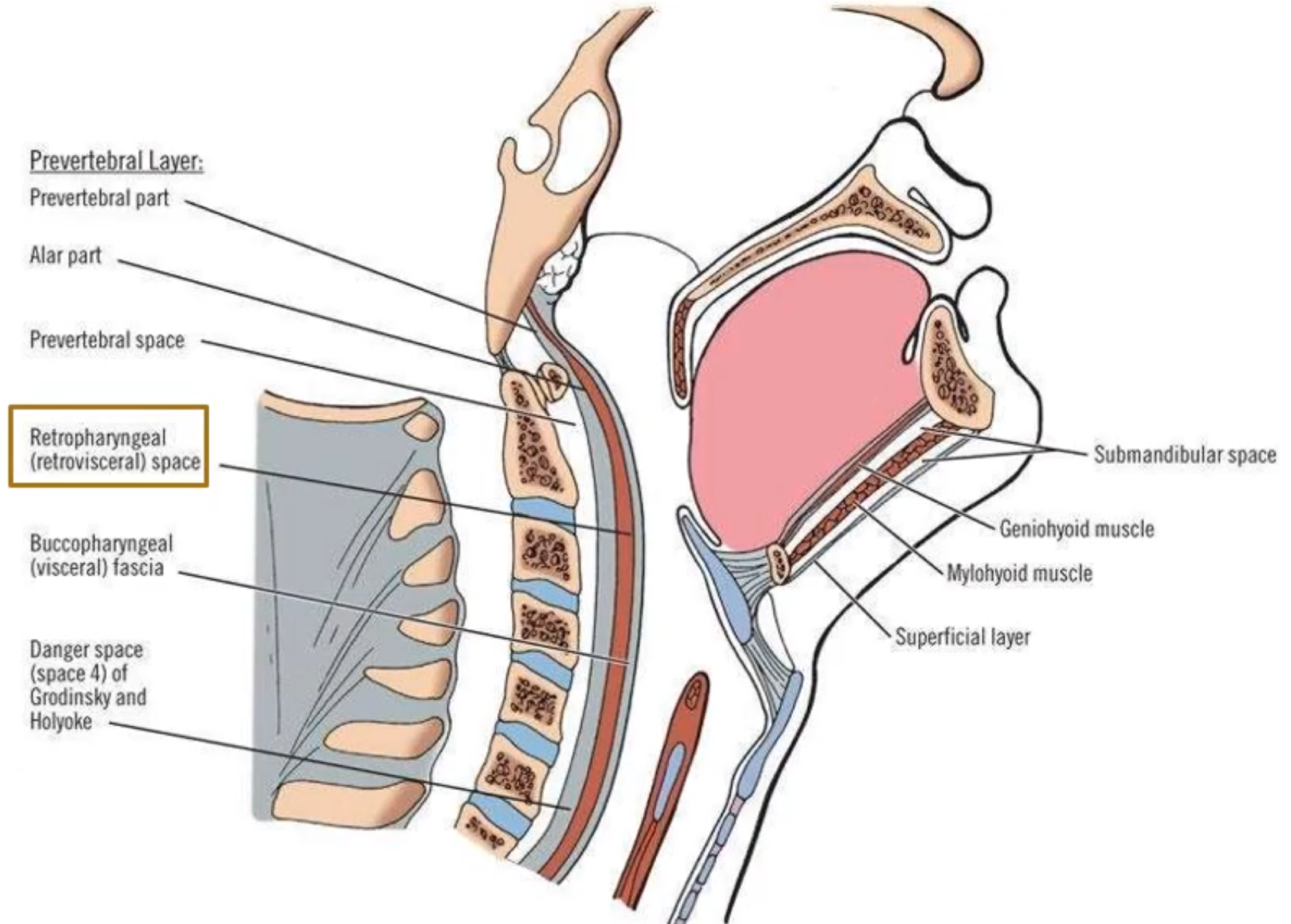
RETROPHARYNGEAL ABSCESS

ANATOMY

RETROPHARYNGEAL SPACE

- Bounded anteriorly by visceral layer of pretracheal fascia and posteriorly by alar fascia of the deep layer of deep cervical fascia.
- Situated posterior to the pharynx and the esophagus extending from base of skull to T4 vertebra level.
- Contains lymph nodes (lymph nodes of rouviere) that disappear by 3-4 years of age

ANATOMY



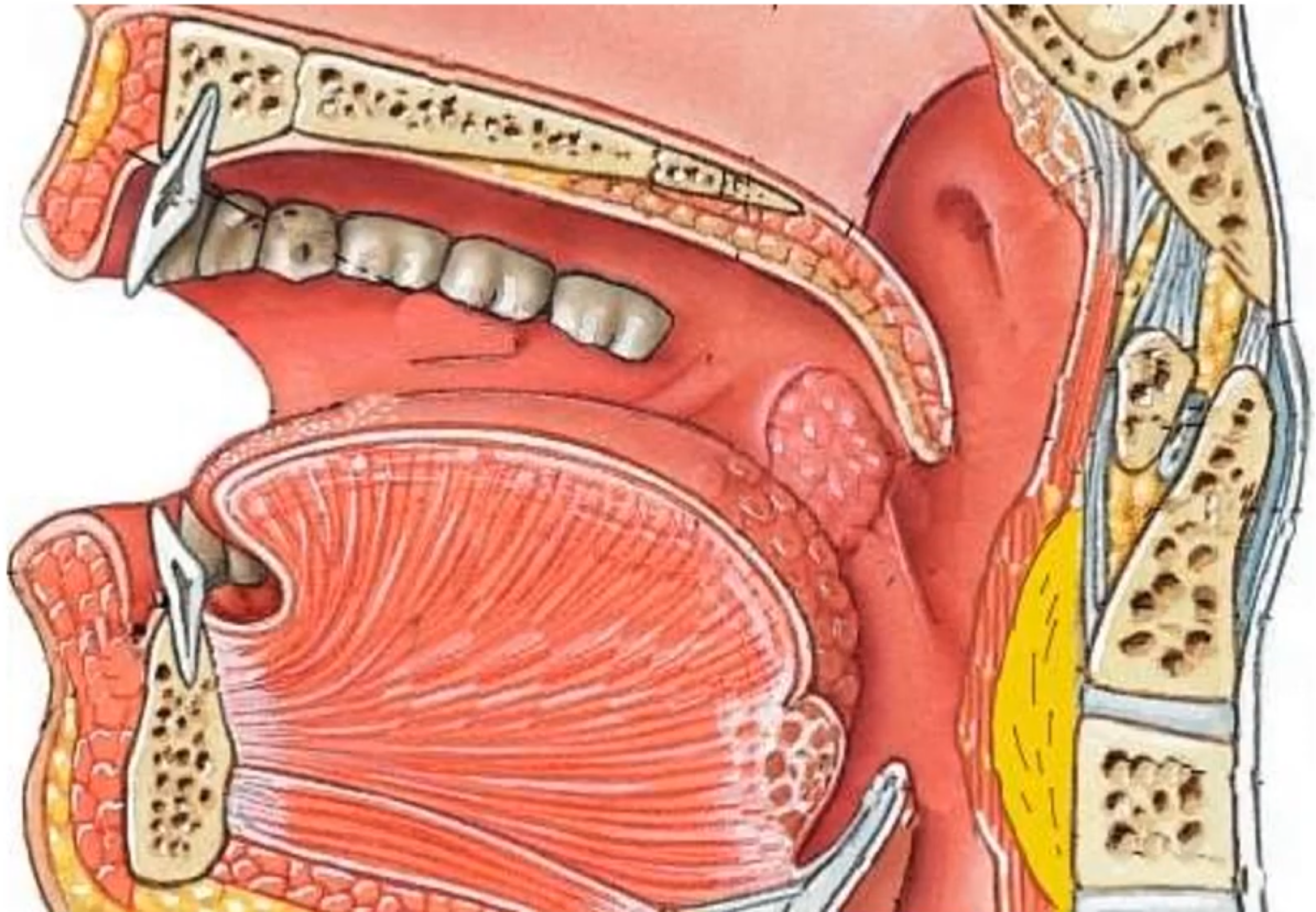
RETROPHARYNGEAL ABSCESS

Is a collection of pus at the retropharyngeal space secondary to infection.

There are 4 different ways in which it can occur:

1. Suppuration of retropharyngeal lymph nodes of rouviere
2. Spread of infection from parapharyngeal abscess
3. Trauma causing perforation of the posterior pharyngeal wall leading to infection.
4. Tuberculosis of cervical spine.

RETROPHARYNGEAL ABSCESS



CLINICAL FEATURES

1. Breathing difficulty
2. Dysphagia
3. Drooling
4. High fever
5. Stridor
6. Intercostal retraction
7. Severe sore throat
8. Difficulty turning the head

DIAGNOSIS

1. X-RAY



Figure 4. Lateral XR Showing Retropharyngeal Abscess

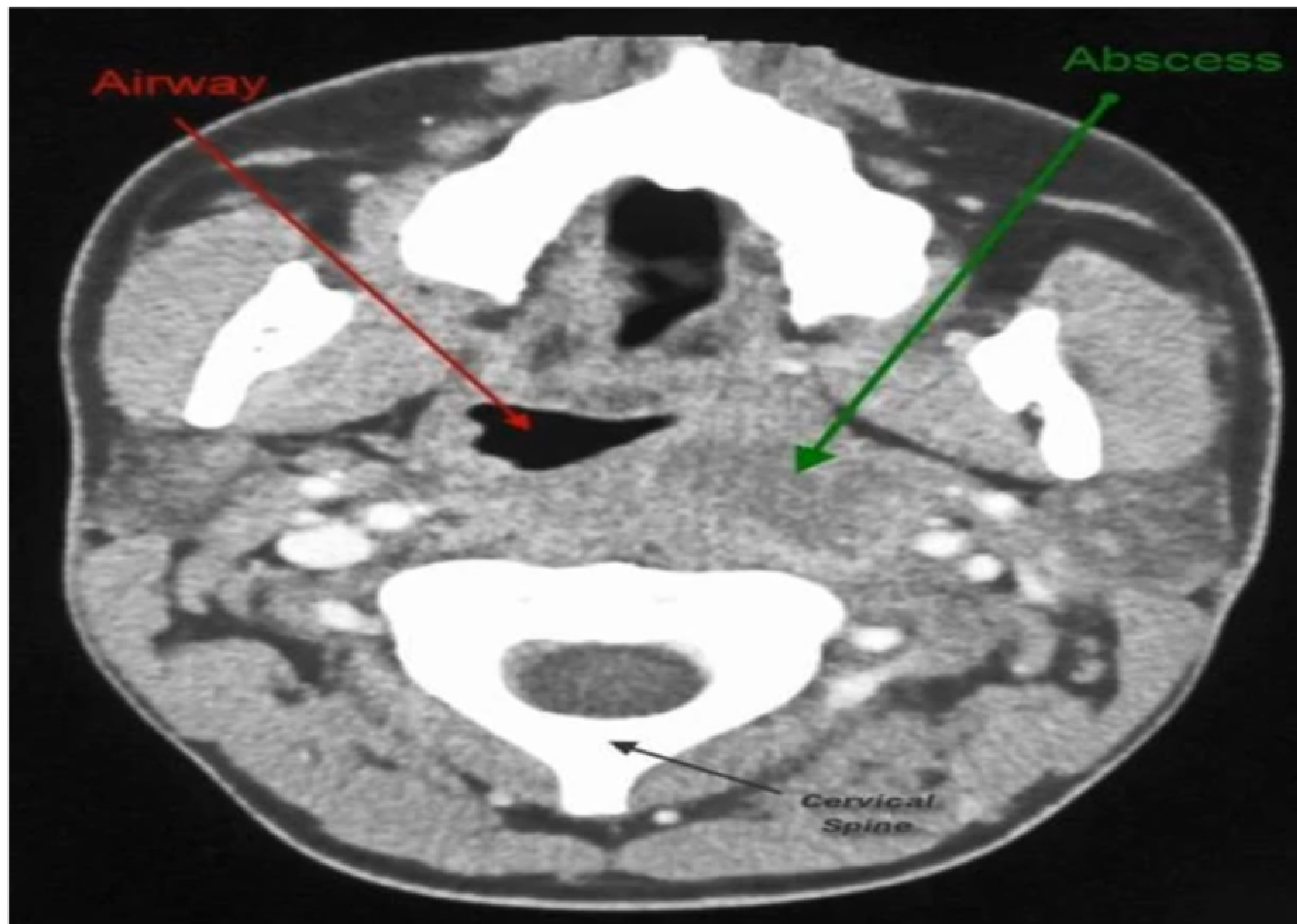


Note the widening of the prevertebral soft tissue spaces at the level of the upper cervical vertebrae

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DIAGNOSIS

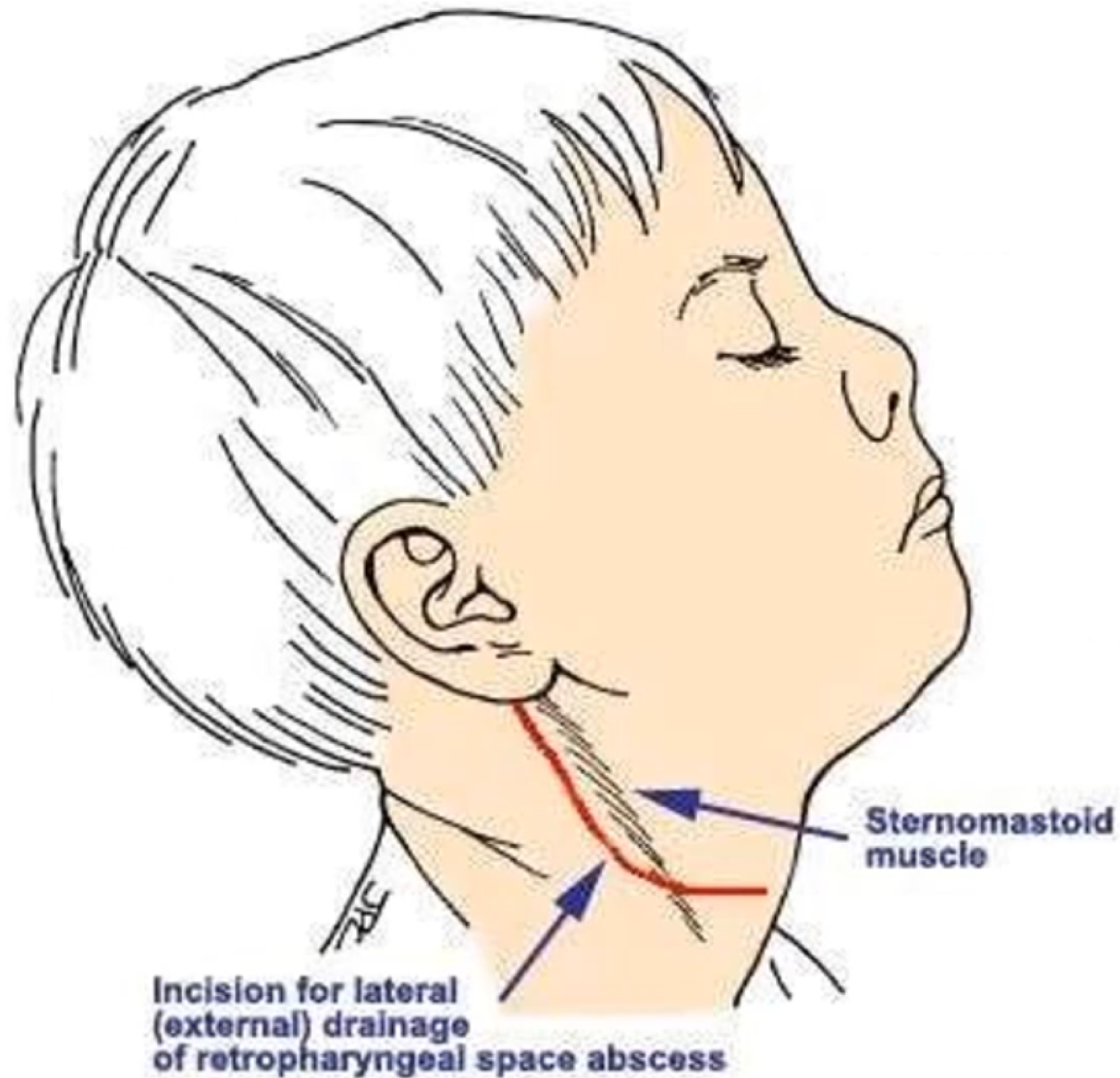
2. CT SCAN



TREATMENT

- IV broad spectrum antibiotics and drainage by an incision in the posterior pharyngeal wall through oral cavity.
- Adults with tuberculous abscess are treated with anti tuberculous drugs, drainage through an external neck incision when required.

TREATMENT



Obstruction

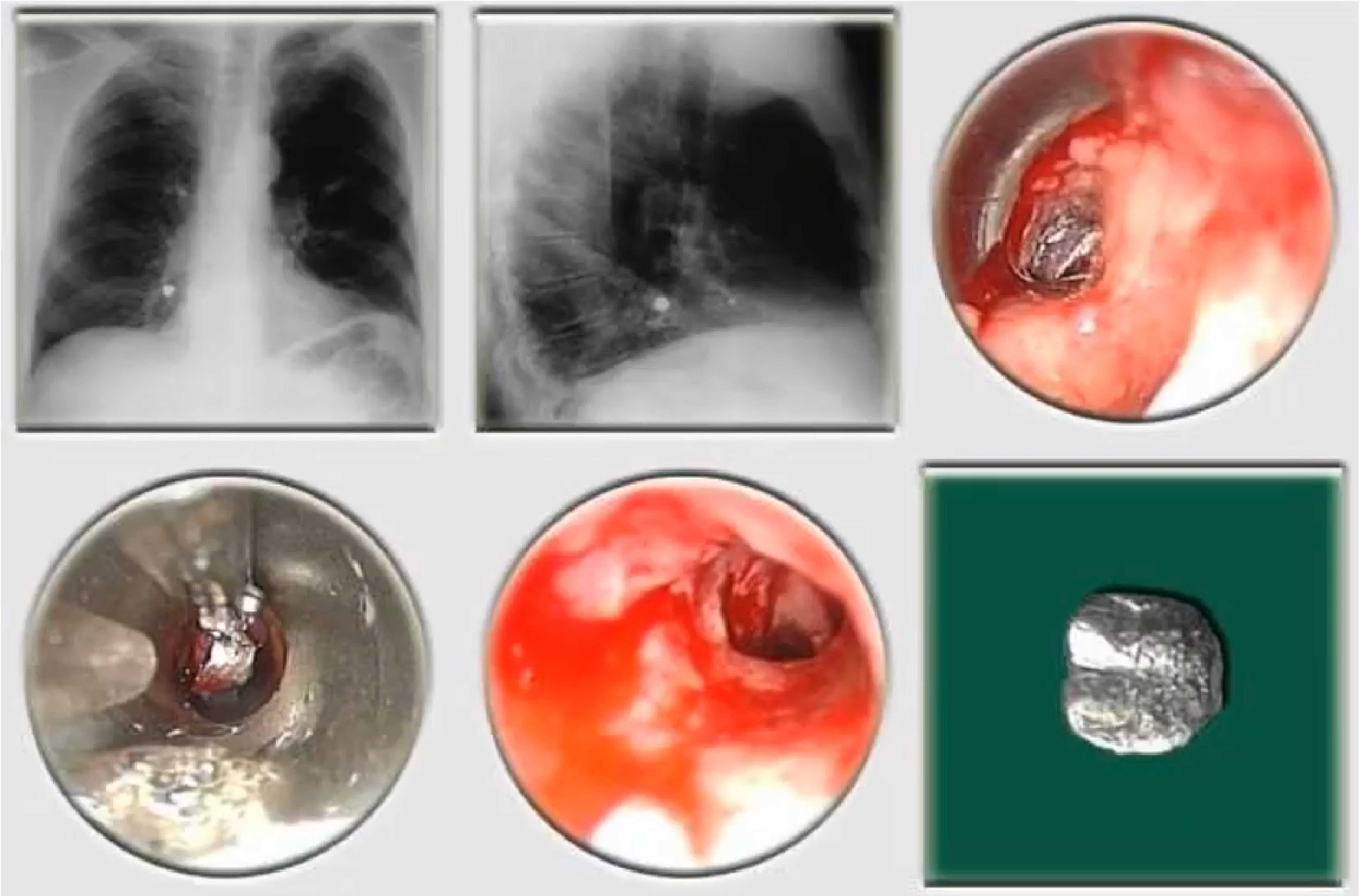


FOREIGN BODY ASPIRATION

INTRODUCTION

- Foreign body aspiration is a common cause of acute stridor.
- The peak incidence is between one and two years of age because children have the habits of putting small objects into the mouth.
- The site where the foreign body gets lodged depends on the size and nature of the foreign body.
- The foreign body can be anything, but the most common is food.
- A history of aspiration or choking can be obtained in 90 percent of cases.

INTRODUCTION



CLINICAL FEATURES

It depends on the site where the foreign body get stuck.

Foreign body in larynx:

Cough, stridor, dyspnea and rarely aphonia.

Foreign body in tracheobronchial:

Symptoms:

- Sudden onset of choking (early stage), productive cough and fever (later stage).

Signs:

- Unilateral wheezing, poor chest movement and reduced breath sound.
- Organic FB (vegetables, foods) may produce a severe mucosal reaction, while non-organic FB (coins, toys) produce little or no mucosal reaction.

INVESTIGATIONS

1. X-RAY OF THE NECK - lateral view



INVESTIGATIONS

2. CHEST X-RAY

- Will initially show collapse beyond the obstructed bronchus and later consolidation
- Look for unilateral hyperinflation, lobar or segmental atelectasis or mediastinal shift.
- On chest radiographs, **children have air trapping** more often, while **adults have atelectasis** more often
- A normal finding on chest radiographs does not exclude the diagnosis
- Foreign body can only be visualized on x-ray if it is **radio-opaque**. (E.g. vegetables foreign body is **not** radio-opaque)



INVESTIGATIONS

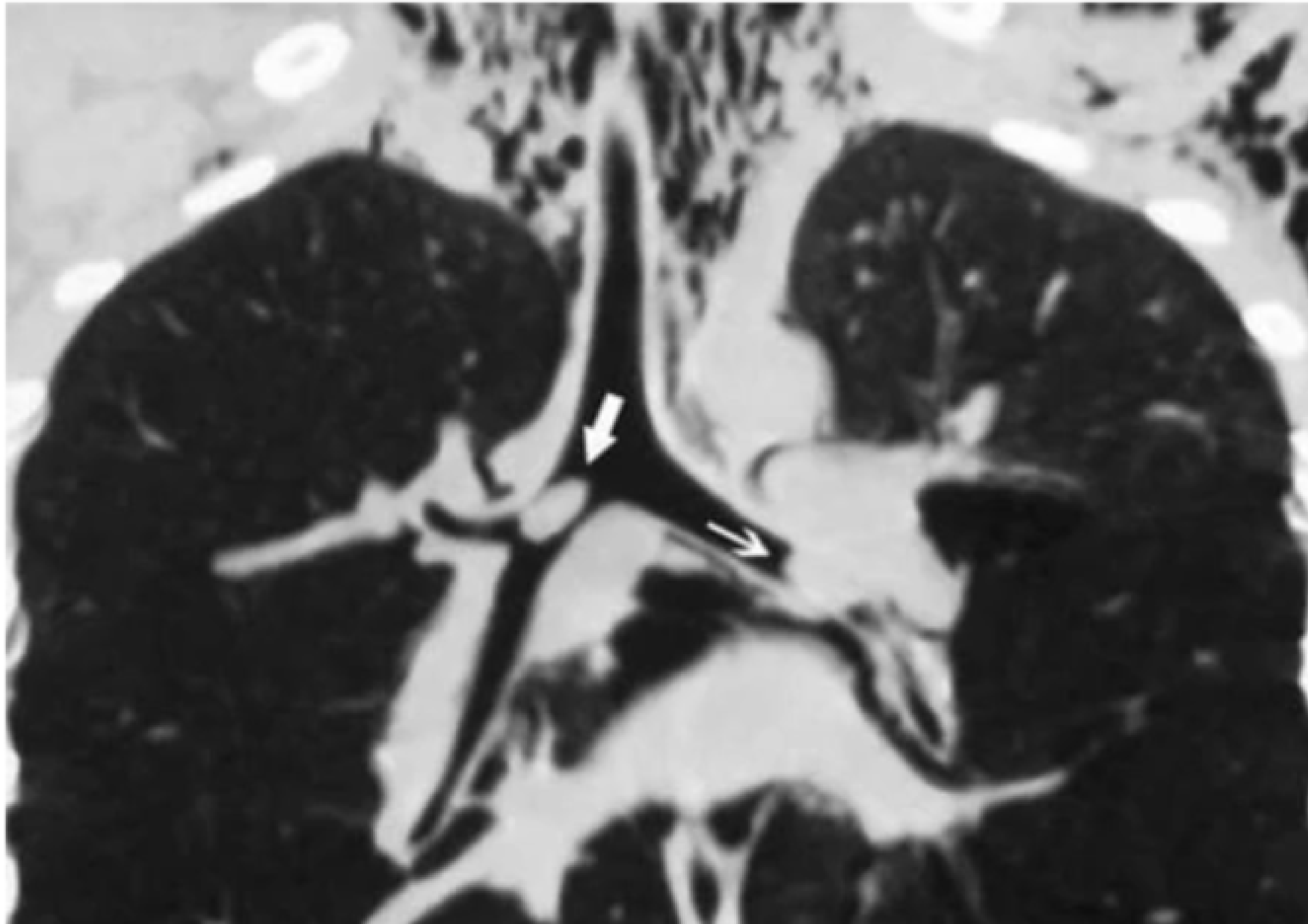
3. BRONCHOSCOPY OR LARYNGOSCOPY

- Both rigid and flexible can be both **diagnostic** and **therapeutic**

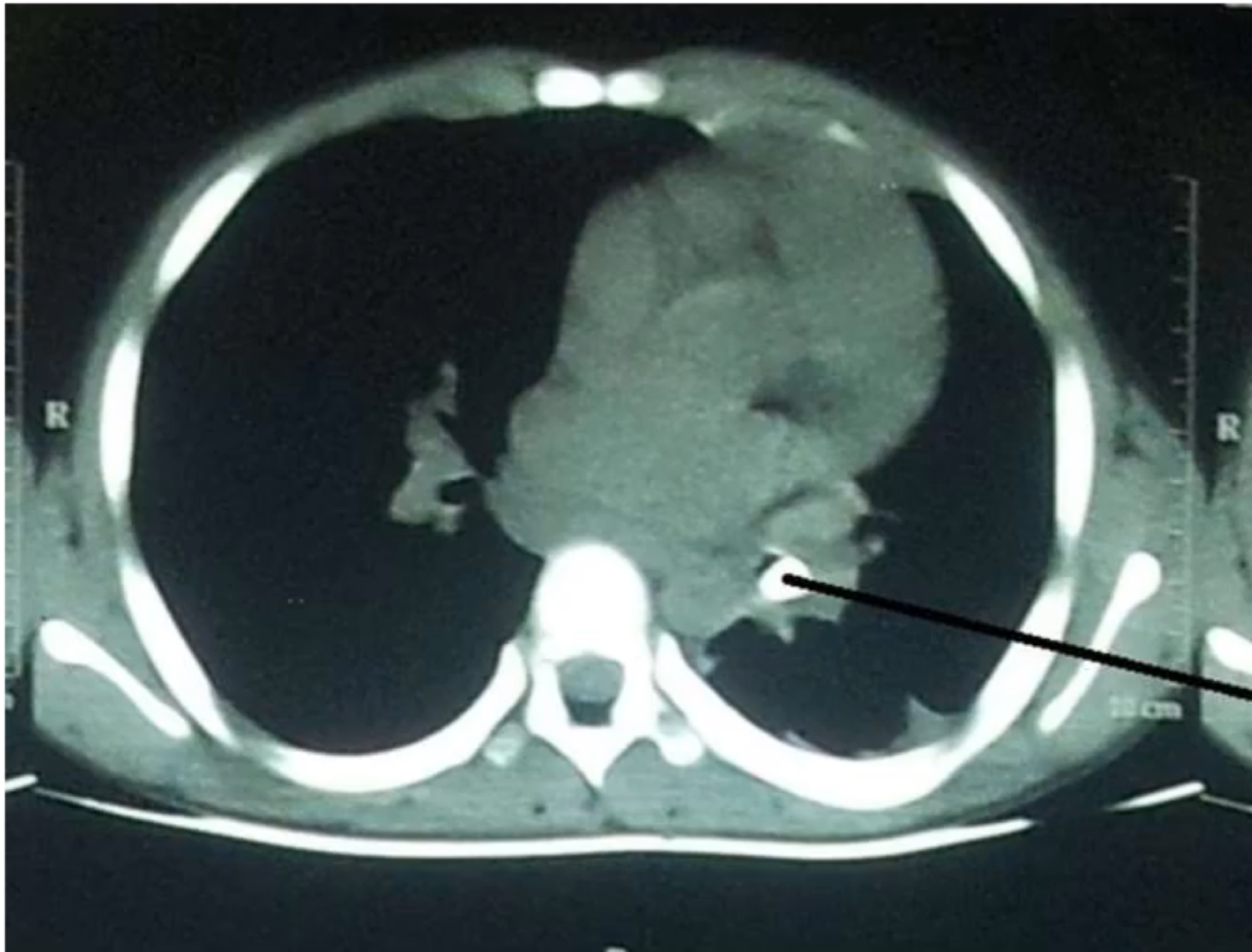
4. CT SCAN

- Show the object and may identify localized air trapping
- CT scanning supplemented with **virtual bronchoscopic imaging** may further provide such useful information prior to an attempt at bronchoscopy.
- Attempting to pass a flexible bronchoscope beyond the first object encountered is not an advisable course of action

INVESTIGATIONS



INVESTIGATIONS



TREATMENT

1. HEIMLICH MANEUVER

2. LARYNGOSCOPY OR BRONCHOSCOPY

- Depends on the location of foreign body.
- Removal of the foreign body by an experienced surgeon assisted by anaesthetist.
- Flexible laryngoscopy or bronchoscopy can be done under the LA.
- Rigid direct laryngoscopy or bronchoscopy is performed under GA using small endotracheal tube.
- The patient lies supine position with the neck flexed on an extended head (barking dog position)

3. OPEN THORACOTOMY

- If the FB impacted deeper:

TREATMENT

1. HEIMLICH MANEUVER

Heimlich Maneuver



1. Lean the person forward slightly and stand behind him or her.



2. Make a fist with one hand.



3. Put your arms around the person and grasp your fist with your other hand near the top of the stomach, just below the center of the rib cage.



4. Make a quick, hard movement, inward and upward.

Place the infant stomach-down across your forearm and give five thumps on the infant's back with heel of your hand



ADAM



Place fist above navel while grasping fist with other hand. Leaning over a chair or counter-top, drive your fist towards yourself with an upward thrust

TREATMENT

1. HEIMLICH MANEUVER



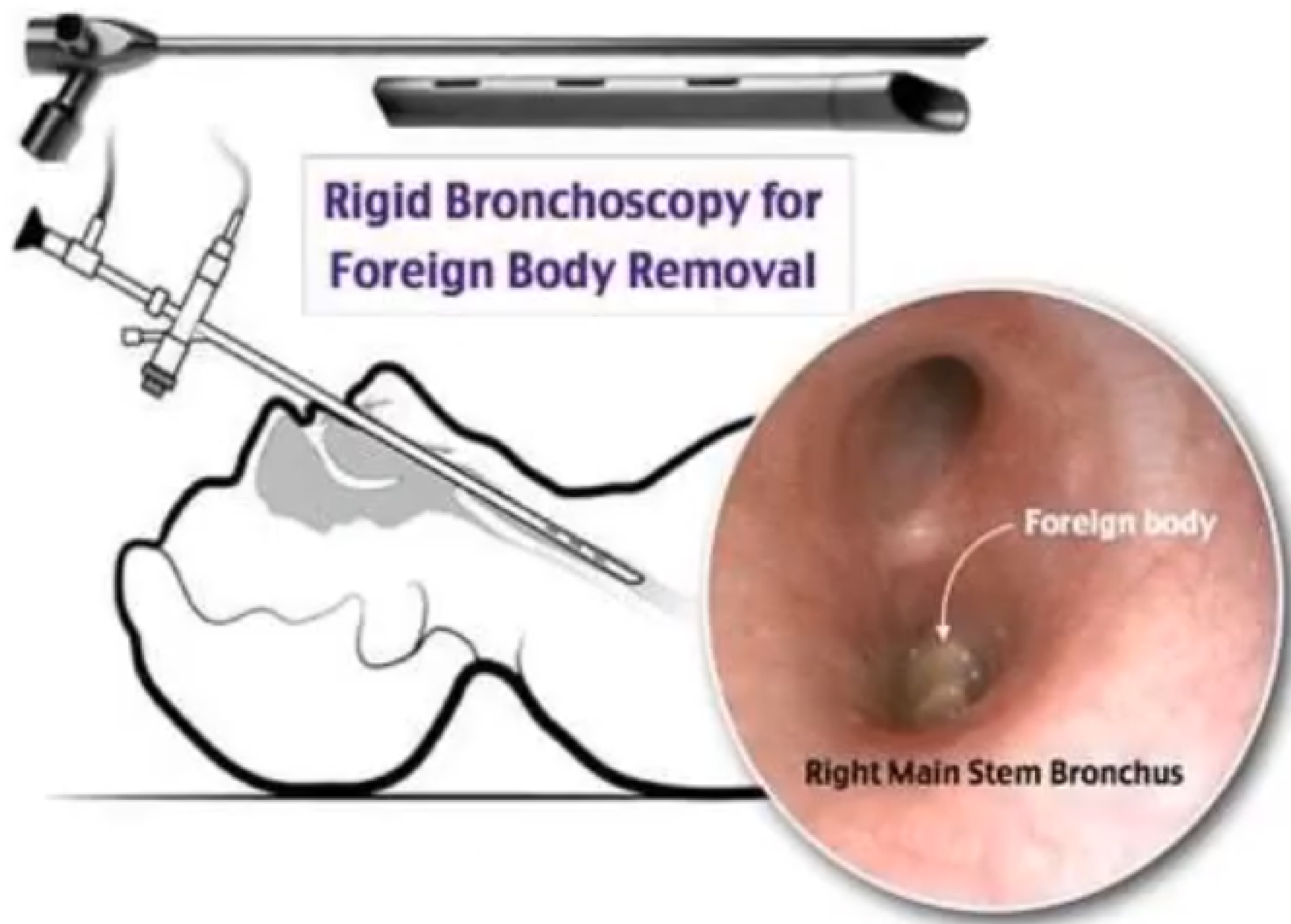
TREATMENT

1. HEIMLICH MANEUVER



TREATMENT

2. LARYNGOSCOPY OR BRONCHOSCOPY



The patient lies supine position with the neck flexed on an extended head (barking dog position)

HOW TO APPROACH?

HISTORY

Stridor is a physical sign and not a disease. Attempt should always be made to discover the cause. It is important to elicit:

1. **TIME of Onset** – To elicit the cause is from congenital or acquired.
2. **MODE of Onset** – Sudden onset (foreign body, oedema), gradual and progressive (laryngomalacia, subglottic haemangioma, juvenile papillomas).
3. **DURATION** –
 - Short: foreign body, oedema, infections
 - Long: Laryngomalacia, laryngeal stenosis, subglottic haemangioma, anomalies of tongue and jaw

HOW TO APPROACH?

HISTORY

Stridor is a physical sign and not a disease. Attempt should always be made to discover the cause. It is important to elicit:

4. **RELATION to feeding** – Aspiration in laryngeal paralysis, oesophageal atresia, laryngeal cleft, vascular ring, foreign body oesophagus.
5. **CYANOTIC SPELLS** – Indicate need for airway maintenance
6. **ASPIRATION OR INGESTION of a foreign body**
7. **Laryngeal TRAUMA** – Blunt injuries to larynx, intubation, endoscopy

Figure 6: Respiratory Distress
Signs of respiratory distress include tripod position, nasal flaring, retractions

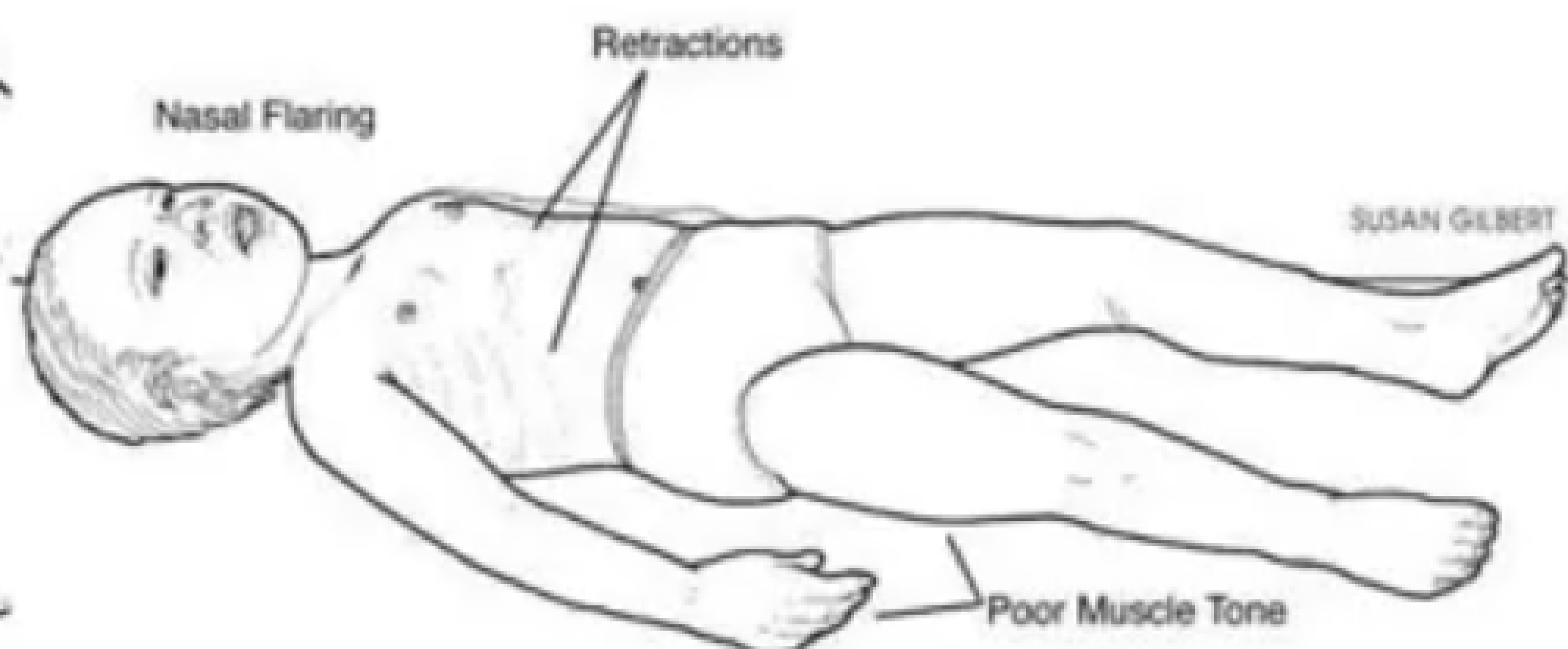
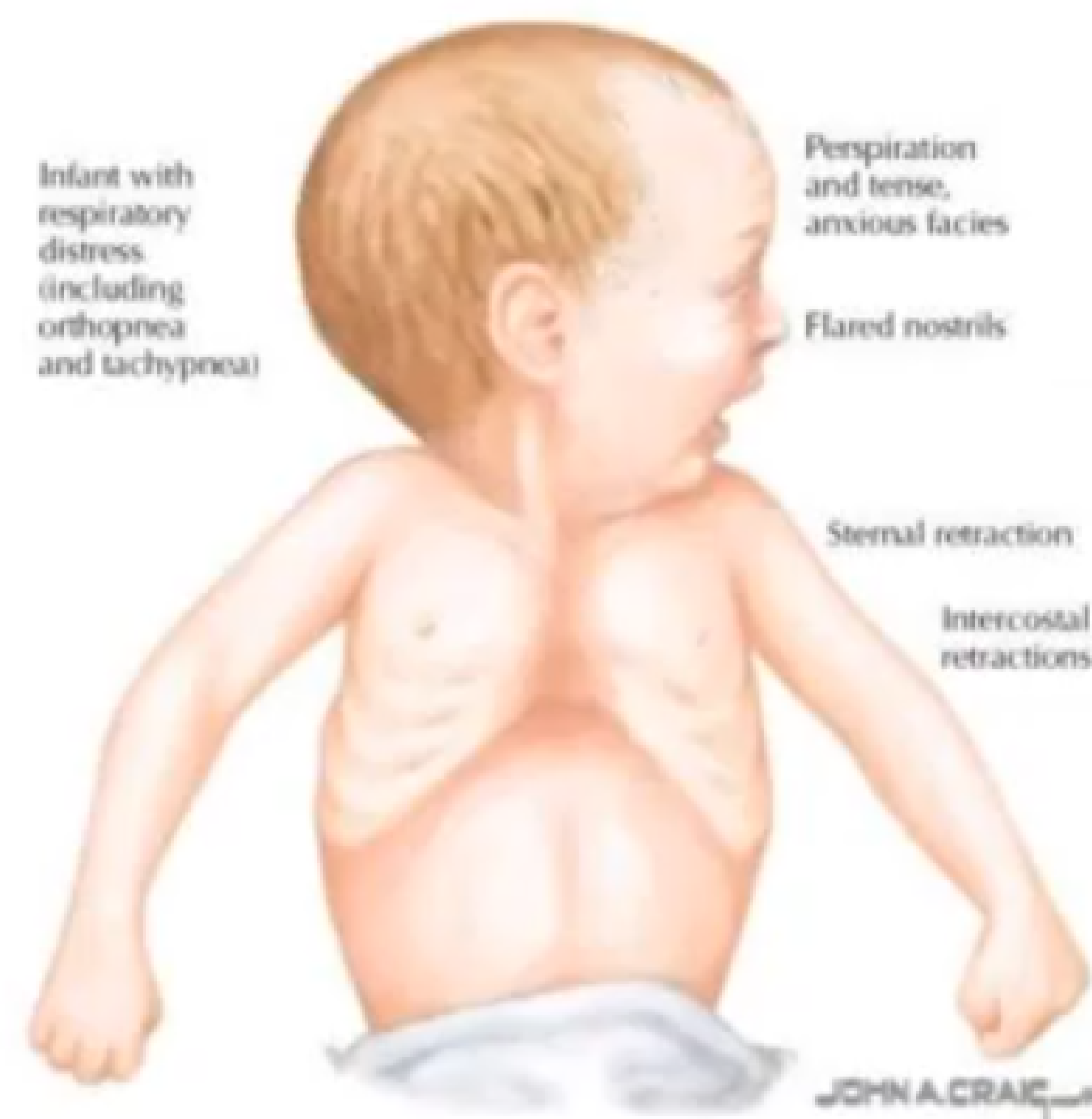


Figure 4: Child, Poor First Impression
Sick child with poor muscle tone, nasal flaring, retractions



PHYSICAL EXAMINATION

1. Stridor always assoc. with respiratory distress. There may be recession in suprasternal notch, sternum, intercostal spaces and epigastrium during inspiratory efforts.
2. Note whether stridor is inspiratory, expiratory or biphasic - probable indicates the site of obstruction.
3. Note assoc. characteristics of stridor:
4. Assoc. fever indicates infective condition, e.g. acute laryngitis, epiglottitis, croup, or diphtheria
5. Stridor of laryngomalacia, micrognathia, macroglossia and innominate artery compression disappears when baby lies in prone position.

HOW TO APPROACH?

PHYSICAL EXAMINATION

6. Sequential auscultation with unaided ear and with stethoscope over the nose, open mouth, neck and the chest helps to localize the probable site of origin of stridor.
7. Examination of nose, tongue, jaw, and pharynx and larynx can exclude local pathology in these areas. In **adults**, indirect laryngoscopy can be done easily while **infants and children** require **flexible fiberoptic laryngoscopy**.



FLEXIBLE FIBREOPTIC LARYNGOSCOPY

- Can be done under topical anaesthesia as an outpatient procedure
- Allow examination of nose, nasopharynx and larynx
- Helps in dx of laryngomalacia, vocal cord paralysis, laryngeal papillomas, laryngeal cysts and congenital anomalies of larynx, e.g. laryngeal web or clefts

HOW TO APPROACH?

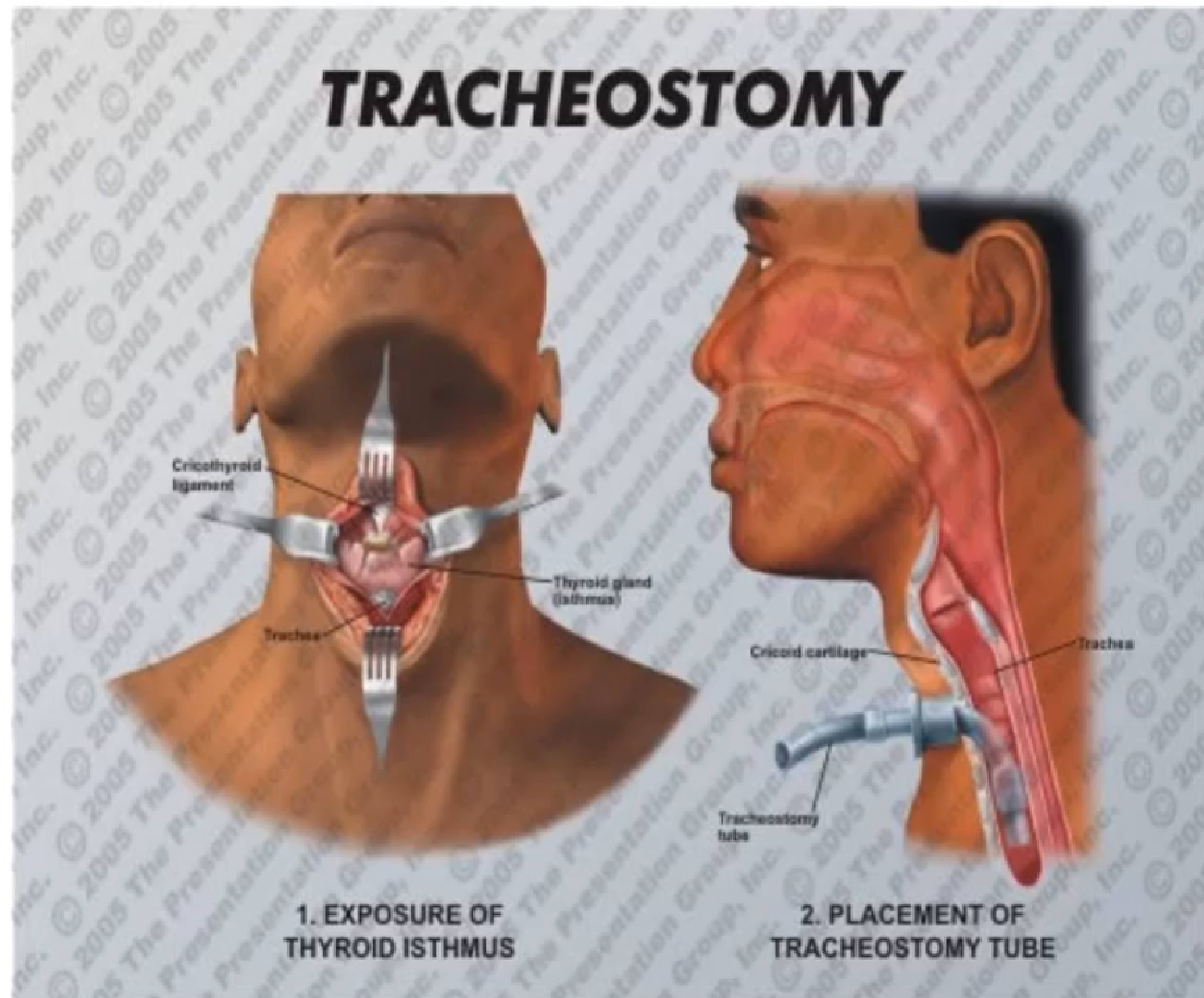
INVESTIGATION

History and clinical examination will dictate the type of tests required.

1. **Soft tissue lateral and PA view of neck & X-Ray chest in PA and lateral view** help in diagnosing the **foreign bodies** of the airway.
2. X-Ray chest in respiratory & expiratory phases or a fluoroscopy of chest help to diagnose radiolucent foreign bodies.
3. CT scan with contrast is helpful for mediastinal mass and other congenital vascular anomalies innominate artery, double aortic arch or an anomalous left pulmonary forming a sling around the trachea.
4. Angiography may be need for above vascular anomalies before operation.
5. Oesophagogram with contrast may be needed for tracheobronchial fistula or aberrant vessels or oesophageal atresia.

Tracheostomy

✓ The making of an opening into the trachea, is one of the oldest operations in surgery. It can be life-saving. If the operation involves the creation of a stoma i.e. a connection between the tracheal edges and the skin, this is **a tracheostomy**.



Tracheostomy

Indications for tracheostomy

- To bypass upper airway obstruction.
- To protect the tracheobronchial tree.
- To facilitate artificial ventilation.

Tracheostomy

Complications

- Bleeding.
- Pneumothorax.
- Obstruction of the tube or trachea by crusts of inspissated secretion may be fatal.
- Complete dislodgement of the tube if it is not adequately fixed.
- Partial dislodgement of the tube is more difficult to recognize and may be fatal.
- Surgical emphysema.
- Perichondritis and subglottic stenosis especially if the cricoid cartilage is injured.

cricothyrotomy

A **cricothyrotomy** is an incision made through the skin and cricothyroid membrane to establish a patent airway during certain life-threatening situations, such as airway obstruction by a foreign body, angioedema, or massive facial trauma.

