Doctor.021

no. 2

# RS P.B.L

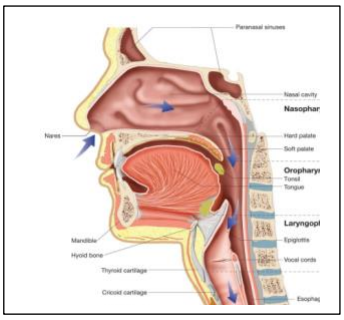

**Writer:** Noor Abu Hantash

**Corrector:** Leen Aburumman

**Doctor:** Montana Al- lede

# Upper Airway Obstruction in Children

## Anatomy



- **Upper airway includes:**
- ✓ **Nose**
- ✓ **Pharynx**
- ✓ **Larynx**
- ✓ **Trachea**
- Any partial obstruction at the level of any of these anatomical regions might cause a partial obstruction to the entire upper airway leading to significant clinical symptoms.
- The partial obstruction of the upper airway in children leads to what's called ''stridor''.
- **stridor is a high-pitched breath sound (noisy) resulting from turbulent airflow in the upper airways.**
- Stridor in children is classified to **acute and chronic** (chronic if it lasts more than 6 Weeks)
- It also has 3 types according to the level of the partial obstruction:

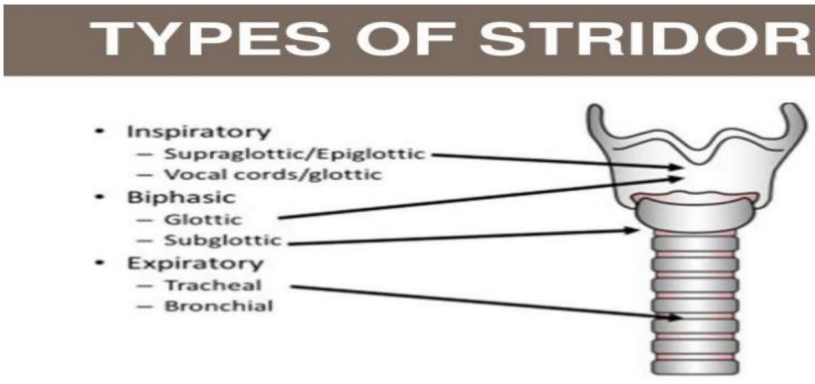
1-inspiratory: **the most common in children**: usually appears during inspiration, usually happens due to supraglottic or epiglottic obstructions, or if there is a lesion at the vocal cord level.

2-expiratory: appears during expiration, the partial obstruction will be at the level of the trachea or even lower, at the level of the bronchi.

3-biphasic: the stridor happens during both inspiration and expiration, the partial obstruction will be at the level of glottis or sub-glottis.

**Extra**: If you're wondering what does stridor sound like, these videos will help you

1- First video
2- Second video



## Causes of Stridor in Children

***Acute Stridor**

**1-Infectious Causes:** more common compared with foreign body aspiration.

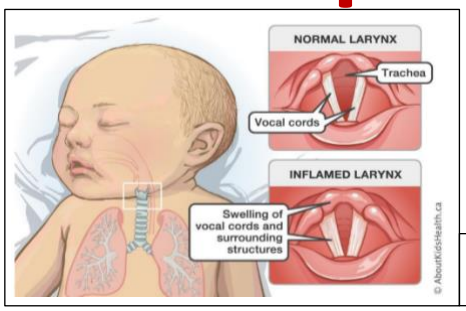
- **Croup: most common cause of acute stridor.**
- **Tracheitis**
- **Epiglottitis**
- **Retropharyngeal Abscess**

**2- Foreign Body Aspiration:** it is considered acute, because children with foreign bodies aspiration come with acute symptoms without any infectious suggestive diagnosis.

***Chronic Stridor**

- **Laryngomalacia:most common cause of chronic stridor**, رخاوة الحنجرة
- **Vocal cord palsy:** which is usually bilateral in children, caused by neurological disorders.

# 1-Croup




Extra: Croup sound

- In croup, the larynx is swollen, and the upper part of the trachea may be inflamed and swollen also.
- Again, it is the most common cause of acute stridor in children.

## Clinical Manifestations

▪The usual clinical presentation is a mother comes to the ED with her baby who suffered from acute onset of stridor for few hours or days. These manifestations **Usually starts with minor respiratory symptom: non-specific cough, rhinoorhea and fever**

▪ **Barking cough,** then **stridor, and resp distress that develops suddenly during the evening or at night,**

- The clinical presentation depends on the severity of the croup, if it is mild the patient might not have respiratory distress, but if it is moderate or severe, the patient will usually present with increased work of breathing (WOB).
- In some severe cases he might look sick to the point that you will think of other more severe diagnosis than croup like tracheitis or epiglottis.

▪Croup is characterized by **stridor typically occurs during inspiration.** It is **Biphasic with more severe cases,** which reflects the severity of the case but it is usually very brief.

▪ **Hoarseness of voice**

▪So, if a mother comes with her previously healthy baby telling you that the baby woke up at night or early morning with barking cough, stridor and hoarseness of the voice, and that these symptoms were preceded by runny nose and respiratory symptoms, you should think of acute stridor, more commonly croup.

## Key Points

• **Croup is a common cause of airway obstruction in young children**, and it is the most common cause of acute stridor, it is usually caused by viral illness -parainfluenza-.

• **Symptoms are usually mild to moderate (worse at night and on day two) and self-limiting but can be severe and rarely, life-threatening.**

• **Avoid distressing a child with croup as this may exacerbate symptoms!**

-NOTICE this AP-CXR:

-Side note: the diagnosis of croup in children is clinical, it is not based on investigations, so CXRs aren't required, however, this is a neck XR.

-Neck XR is performed in radiology by taking whole CXR with the upper airways and the doctor focuses on the investigated part.

Steeple sign on CXR

-Returning to our image, notice the larynx, and bellow it there is the trachea, the black tube (black: air), the white arrows point to the narrowing in the trachea, reflecting an edema, wide soft tissue swelling, mucosal swelling and inflammation secondary to the viral infection, which lead to partial obstruction of the upper airway→ this is what we call steeple sign on XR indicating croup.

Micro-slide

## Management

**• Recommended management includes:**

1st-we always start with **ABC**, and check **a**irways for secretions, **b**reathing, and then **c**irculation.

-When talking about croup, stick with B (the problem is in breathing), because the patient usually presents with low-grade fever, with sometimes respiratory distress, barking cough, and voice hoarseness in addition to acute stridor.

-so, you need to stabilize the patient by O2 supplement in case of hypoxia, suctioning airways in case of excessive secretions, and so on.

2nd: take the history according to pre-mentioned symptoms

**3rd The appropriate use of** systemic **corticosteroids (**dexamethasone 0.3mg /kg once) **and nebulised adrenaline.** (**extra**: Nebulization involves converting a liquid medication into a fine mist or aerosol that can be inhaled into the lungs)

-We give nebulized adrenaline once then we wait at least 4 hrs, to check whether the patient can go home (if he stays calm with no stridor at rest) or need to be admitted (if the one nebulization wasn't enough, and he needs more), in severe cases, you may need to send him to the ICU.

**-These interventions have been shown to reduce the need for, and duration of endotracheal intubation, length of stay, and representation rates to emergency services.**

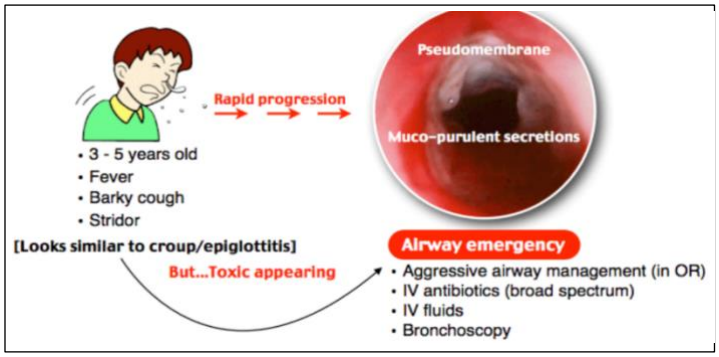
**• Nursing the child upright on carer's lap**

# 2-bacterial tracheitis

-The 2nd acute infectious cause of acute stridor in children is bacterial tracheitis, which usually happens between the age of three and five years

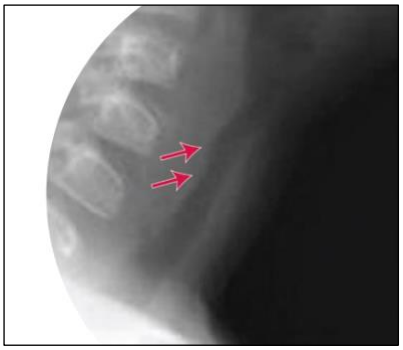
-The presentation is an acute onset of stridor usually the clinical picture for a patient with bacterial tracheitis is more severe than a patient with croup, usually they're present with high-grade fever because the causative agent most likely to be staph. aureus so we are talking now about bacterial infection rather than viral infection so these patients usually present with high-grade fever, increase secretions from the trachea they look usually sick with fever barking cough in addition to the stridor.

-This picture shows a bronchoscopy done on a patient with tracheitis for the diagnosis (we don't usually do investigations to diagnose bacterial tracheitis, usually we diagnose this patient clinically) but if you do a flexible bronchoscopy, you will see edema, swelling, and there is a lot of secretion sitting there so this reflects an infection in the trachea.




-Another way to diagnosis is **direct laryngoscopy** which can be done by the ENT team, but again we don't ask for it to diagnose.

- The other way is **Characteristic x-ray findings**: if you would like to confirm your diagnosis you can do a lateral x-ray for the neck by looking at the trachea but usually, we don't do an investigation, we diagnose acute tracheitis clinically.



-The white rim line, pointed by the red arrows, should be straight but here there's a pump that reflects a swollen mucosa of the trachea

-Also the black tube (trachea) is narrowed indicates an inflammation or edema of the mucosa which reflects an infection. So, in addition to the clinical situation with findings in the chest in the chest x-ray, this can confirm your diagnosis of tracheitis

## Management

• Stick with ABC :Adequate **airway ensured,** breathing (if the parentis hypoxic → provide oxygen, Stridor → adrenaline nebulizer, Secretions → Suctioning the airway) then circulation.

• If the fever is high, a lot of secretion, the patient is unwell, and bacterial infection is suspected, use **Antibiotics effective against S. aureus and streptococcal species**

• **Initial antibiotics should cover S. aureus, including methicillin-resistant S. aureus (MRSA), and streptococcal species** (less commonly); **IV vancomycin and ceftriaxone** (Rocephin), or any 2nd,3rd generation of cephalosporine should be enough (wide spectrum) **may be appropriate empirically.**

# 3-Epiglottitis

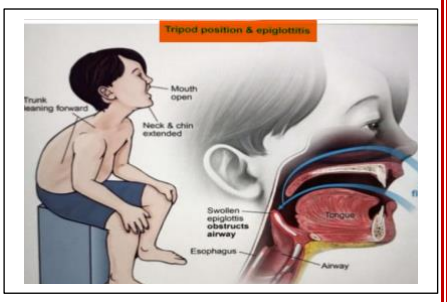
-The third infectious cause of acute stridor in children.

-The causative agent is typable Hemophilus influenza.

-Rare to see, thanks to vaccines.

**-Severe Clinical presentation:**

- ✓ **Drooling:** because of difficulty of swallowing of the saliva
- ✓ **Sick looking**
- ✓ **Hyperextended neck**: the child comes with characteristic posturing with a sniffing position leaning forward and trying to hyperextend the neck to keep the airway open




- ✓ **Stridor**
- ✓ **Cough is unusual**
- ✓ High-grade fever

- Take home message: if you come across a patient with acute onset of stridor with high-grade fever and looking unwell then please keep in mind epiglottitis.

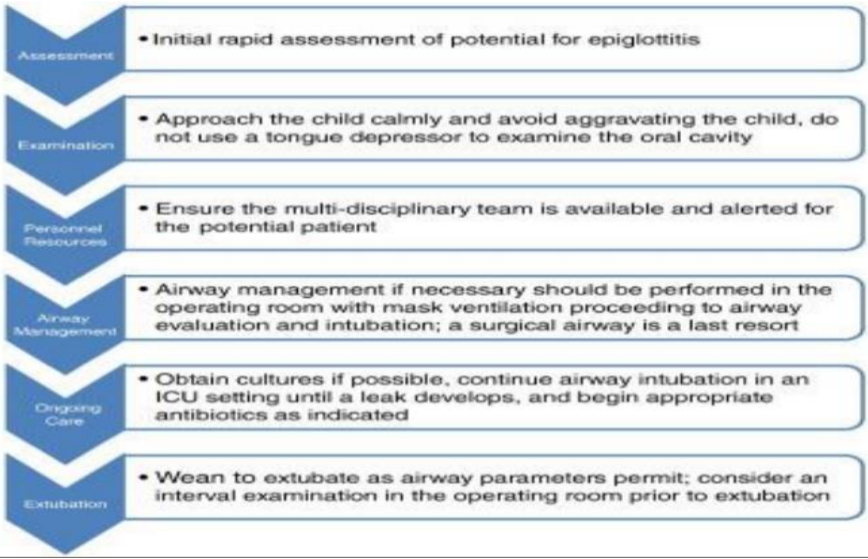
- Warning: despite the severe presentation, the treatment is very easy for pediatricians, you don't need to touch the patient with epiglottitis, because epiglottis usually gets swollen, edematous, and very big in this situation, impairing the patient's breathing, who already presents with a grunting and severe respiratory distress. So, he won't tolerate your irritation to the patient, otherwise the epiglottis can close the vocal cord and this will lead to respiratory compromise.

- The problem with that you might not be able to intubate your patient if this happens in an emergency, why? because when we intubate usually, we insert the endotracheal tube through the vocal cord, but to see the vocal cord, for better visualization, you wait until the patient breathes and the epiglottis moves up then to be able to visualize the vocal cord and insert the endotracheal tube

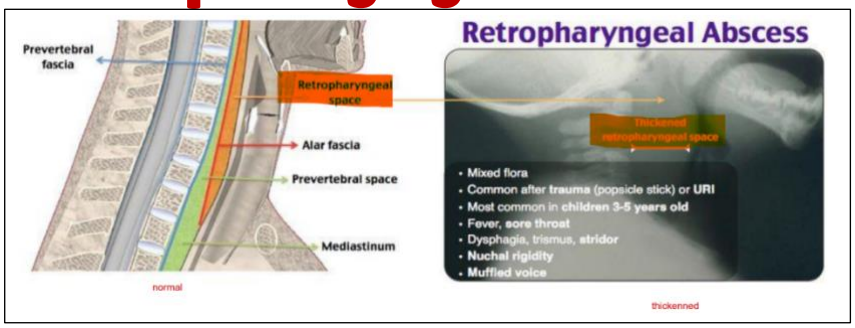
-In patients with epiglottitis, the swelling will harden the vocal cords visualizing, prohibiting intubation. In this situation, you should call ENT and anesthesia and take the child with his mother to the theater where the anesthesia team should anesthetize the child, as they are the best team to intubate by using a fibreoptic scope and just in case the intubation fails, ENT should be available to do tracheostomy to secure airway and to keep the patient alive.


The arrows point the very swollen epiglottis which called thumb sign reflecting edema in the epiglottis leading to narrowing of the airway.

-normally the epiglottis should be third the size of this inflamed epiglottis and you can see how the airways ( the black line is narrowed)



# 4-Retropharyngeal Abscess




- It is one of the infectious cases of stridor.
- **Retropharyngeal abscesses are uncommon but potentially life-threatening diagnoses.**
- Usually, patients come with high-grade fever, high inflammatory markers with drooling because they cannot swallow and sometimes with neck or throat pain.
- When you examine the throat, you can see bulging and deviation of the uvula, here you need to ask the ENT to come and examine this patient and this abscess should be drained and you start a broad-spectrum antibiotic.
- **They can occur at any age, although are most commonly found in children under the age of five.**
- **Without proper treatment, retropharyngeal abscesses can lead to upper airway obstruction and asphyxiation.**
- **Retropharyngeal abscesses are often polymicrobial infections.**
- **Bacteria that commonly contribute to these infections include Group A Streptococcus pyogenes, Staphylococcus aureus, Fusobacterium, Haemophilus species, and other respiratory anaerobic organisms** -note that all of them can be treated with broad-spectrum antibiotic -.

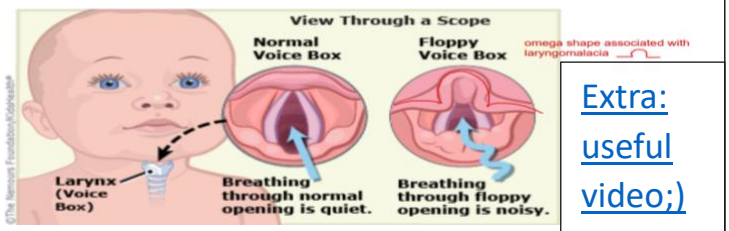
## Treatment

- **Hospital admission.**
- **ABC: as mentioned before**
- **Intravenous antibiotics: to cover upper respiratory organisms including anaerobic organisms.**

• **Patients presenting airway compromise should have immediate surgical incision and drainage performed to relieve their upper airway obstruction,** you have to consult the surgical or ENT team to drain the abscess, if you don't the patient will keep the spiking fever and the inflammatory markers will take age to improve and decline to normal, so taking the abscess out is part of the treatment.

Now let's see the chronic stridor briefly:

# Laryngomalacia




Extra: useful video;)

**-M/C cause of chronic stridor**

- so how can we diagnose this patient?

Usually, the clinical presentation is a normal child of full-term pregnancy, delivered normally without any respiratory compromise or symptoms during the first month of life, so the symptoms usually start as noisy breathing and then inspiratory stridor around age six and 8 weeks, usually this stridor is exaggerated with infection. Crying, agitation, or any stimulation that can provoke or aggravate the stridor in case of laryngomalacia.

-The Omega-shaped epiglottis is diagnostic for laryngomalacia.

Omega-shaped epiglottis in laryngomalacia

## Signs/Symptoms

- high **pitched inspiratory stridor**

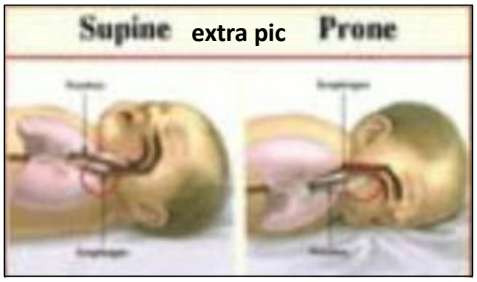
**- Peaks at 6-9 months**

**- Positional variation**

**- Exacerbated by activity (feed, exertion), supine position, and during viral illnesses.**

**- appears within the first 2 weeks of life**

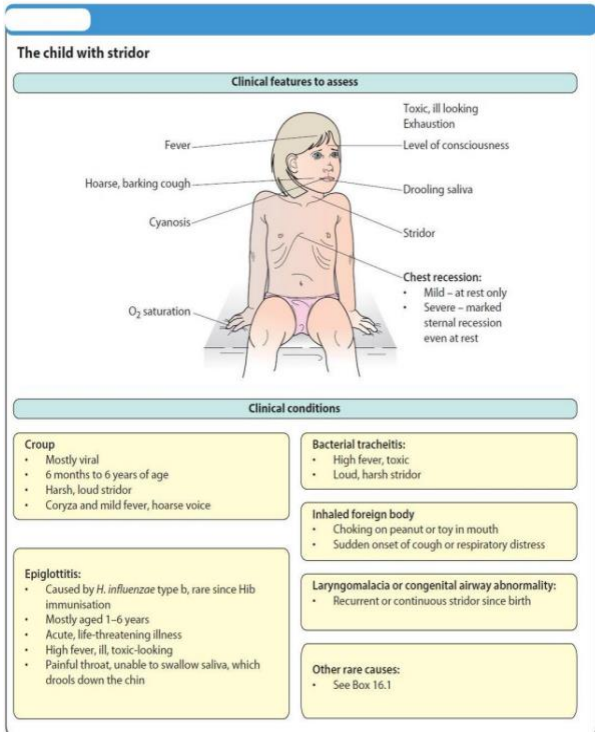
**- diminishes by rest, prone position and sleeping**



▪ **Rarely produces cyanosis**

-Stridor starts to appear at 6-8 weeks, it peaks at 6-9months, around a year and a half (19 months) stridor starts to improve until disappears totally and 2 years.

-The occasional clinical scenario: a mother comes with her baby, telling you that when he is sleeping, he is quiet, but when he starts crying for different reasons as above or infected with viral illnesses, the stridor starts.




-in case of child patient with the stridor, you need to take a brief history, you need to think of the Infectious causes because this infectious causes are the most common causes of acute stridor and particularly croup, bacterial tracheitis, epiglottitis, you need to think of laryngomalacia or any congenital airway abnormalities if the history of stridor is chronic so here just to summarize all the diseases that we mentioned previously

**Summary** of the important points as mentioned by the doctor:

1-What you need to know is that stridor is noisy breathing caused by a partial obstruction of the upper airway

2-You need to know that any disease can obstruct the upper Airway at any level from the nose to the carina can cause stridor, usually upper part of the trachea can cause stridor

3-The most common cause if we are talking about an acute stridor is croup

4- If we are talking about chronic stridor is laryngomalacia

5-You need to be able to differentiate between the different infectious causes of chronic and acute stridor

6-You need to know the course and history of laryngomalacia.

**The end**

## E-learning questions

•A 4-year-old child with a harsh, honking cough, inspiratory stridor, and increased respiratory effort presents to the clinic. The child's parent reports a recent upper respiratory infection. What is the most likely cause?

A. Viral croup
B. Epiglottitis
C. Bacterial tracheitis
D. Tracheomalacia
E. Laryngomalacia

**Answer: A**

• Which viral infection is commonly associatedwith croup?

A. Parainfluenza virus
B. Influenza
C. Respiratory syncytial virus (RSV)
D. Human metapneumovirus
E. Adenovirus

**Answer: A**

## Past papers

• A 5-year-old child present with high grade fever for 5 days, shortness of breath and cough, physical examination revealed decreased air entry, bronchial breathing sound and dullness percussion on the right side of his chest, what's the most appropriate treatment of his condition?

A. Inhaled corticosteroid
B. Intravenous corticosteroid
C. Intravenous ceftriaxone
D. Inhaled gentamycin
E. Inhaled salbutamol

**Answer: C**

it is pneumonia:)

• 2 years child presents to the pediatric clinic with dry barking cough and loud breathing sound during inspiration. This was associated with low grade fever and nasal discharge. On physical examination, the child had inspiratory stridor, hoarseness of voice, and signs of respiratory distress. According to this clinical profile, which part of the respiratory system is likely to be affected by this pathology?

A. Terminal bronchioles
B. Lung parenchyma
C. Larynx and upper trachea
D. Lung interstitial tissue
E. Paranasal sinuses

**Answer: C**

v2:page 10:it is a mistake in the slide, stridor is high pitch, we double checked that with the doctor