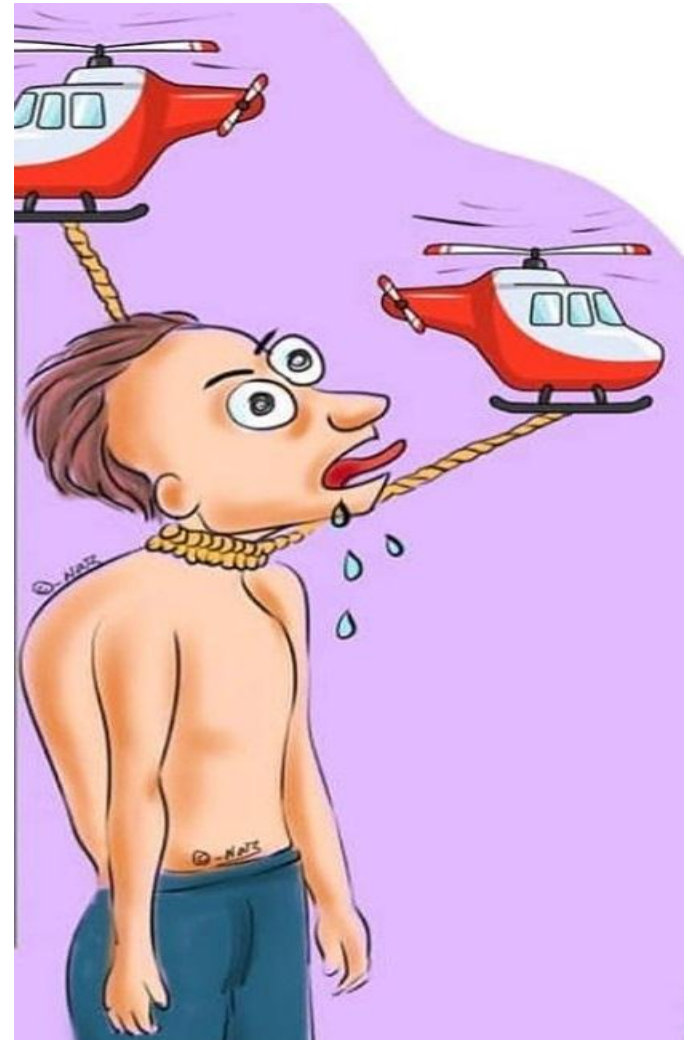


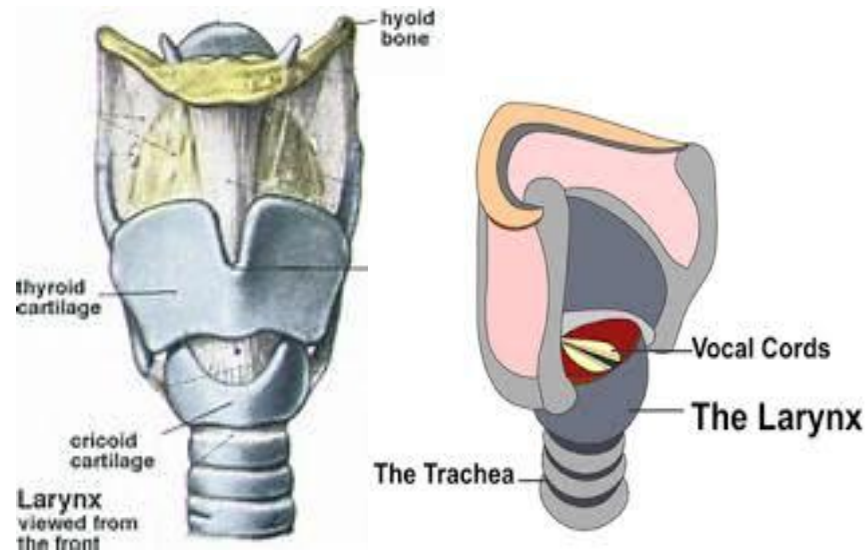
Acute Inflammatory Upper Airway Obstruction

Dr Ashkan Moslehi

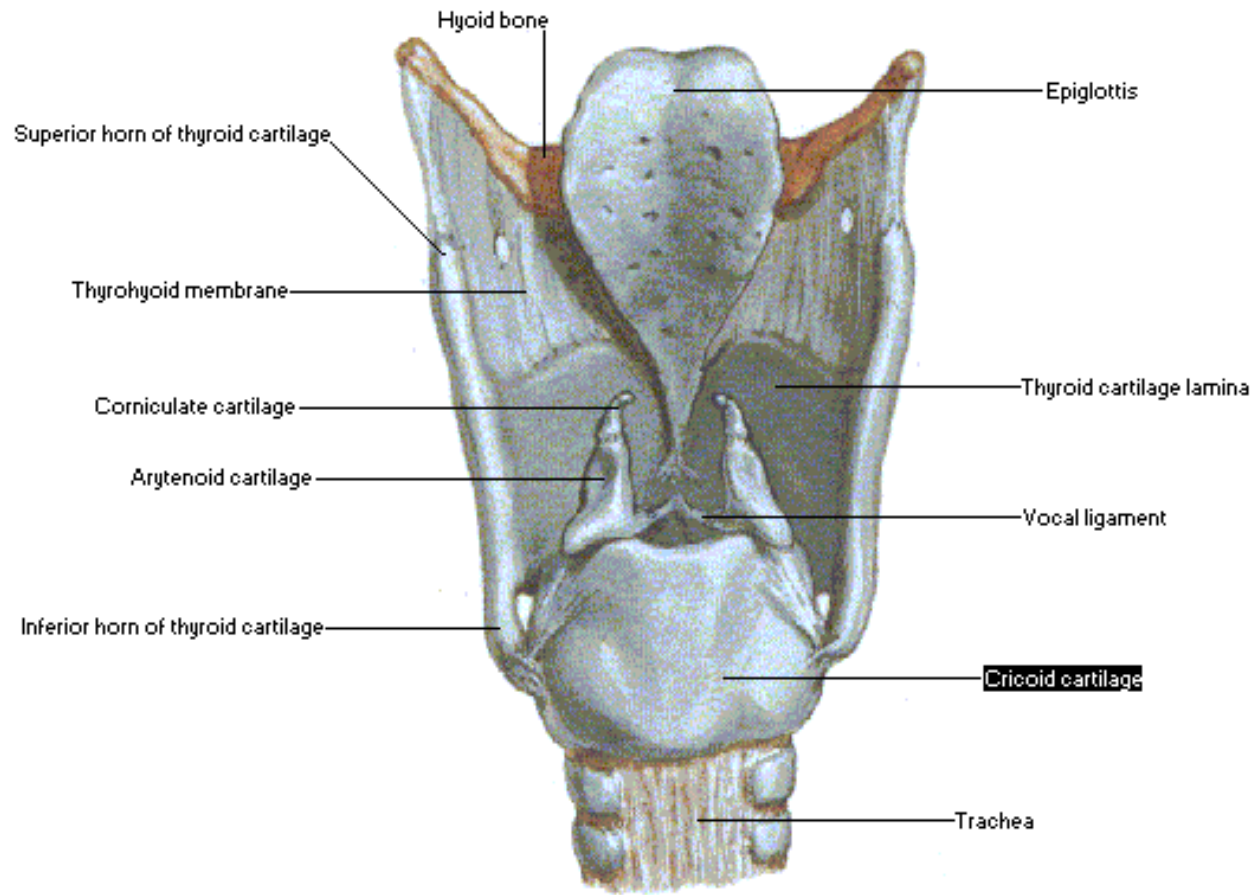
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- Airway resistance is inversely proportional to the 4th power of the radius
- The larynx is composed of 4 major cartilages (ordered from superior to inferior)
 - ✓ epiglottis,
 - ✓ arytenoid,
 - ✓ thyroid,
 - ✓ cricoid



Cartilages of Larynx Posterior View



- Inflammation involving the vocal cords and structures inferior to the cords is called laryngitis, laryngotracheitis, or laryngotracheobronchitis = **croup** characterized by a **bark or brassy** cough and may be associated with **hoarseness**, inspiratory **stridor** and respiratory **distress**
- Inflammation of the structures superior to the cords(i.e., arytenoids, aryepiglottic folds [“false cords”], epiglottis) is called **supraglottitis**.

- **Stridor** is a harsh, high-pitched respiratory sound, which is usually inspiratory but can be biphasic and is produced by turbulent airflow

Infectious Etiology

- **Most** acute infections of the upper airway are caused by **viruses** (**parainfluenza** viruses (types 1, 2, and 3= **75%** of case)
- **exceptions** of diphtheria, bacterial tracheitis, and epiglottitis
- other viruses include influenza A and B, adenovirus, respiratory syncytial virus, measles
- Mycoplasma pneumoniae has **rarely** been isolated from children with croup and causes **mild disease**

Croup

- Most patients with croup are between the ages of 3 mo and 5 yr,
- with the peak in the 2nd yr of life.
- The incidence of croup is higher in boys.
- It occurs most commonly in the late fall and winter
- Recurrences are frequent from 3-6 yr of age and decrease with growth of the airway.
- 15% of patients have a strong family history of croup.

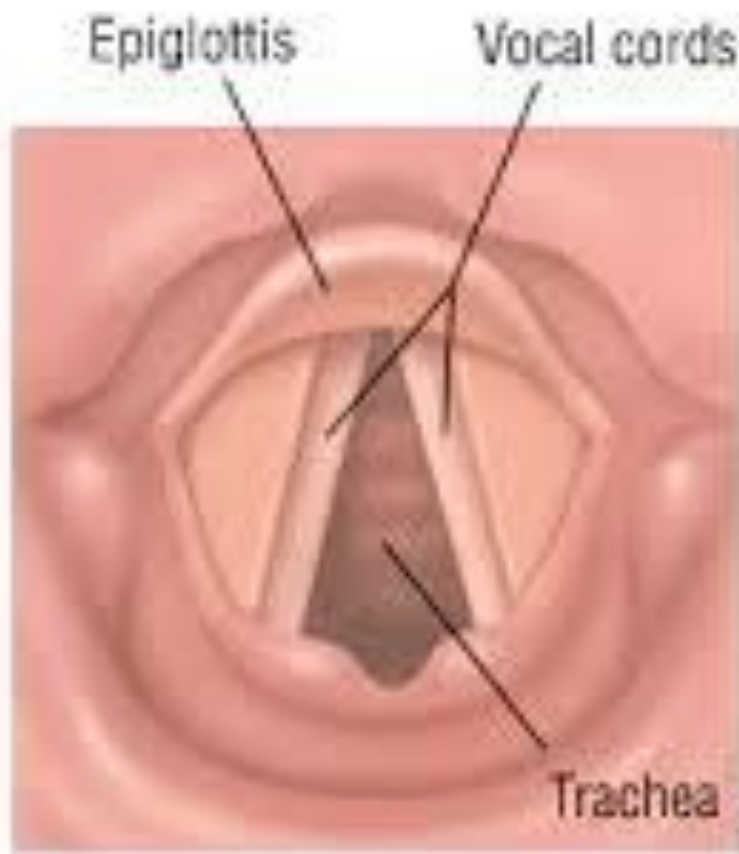
- Recurrent croup is defined as **2 or more** croup-like episodes.
- Patients with recurrent croup have a **higher** incidence of
 - **Asthma**
 - **Allergies**
 - **Gastroesophageal reflux**
- **less than 9%** of patients with recurrent croup demonstrate clinically significant findings on bronchoscopy (e.g., subglottic stenosis, reflux changes, broncho/tracheomalacia).

Croup

- The most common form of acute upper respiratory obstruction.
- Viruses typically cause croup
- **Laryngotracheobronchitis** refers to viral infection of the glottic and subglottic regions.
- **Laryngotracheitis** for the most common and most typical form of croup
- **Laryngotracheobronchitis** extension of **LT** associated with bacterial superinfection that occurs 5-7 days

Croup

- Rhinorrhea, pharyngitis, mild cough, and low-grade fever for 1-3 days before the signs and symptoms of upper airway obstruction
- The child then develops the characteristic “barking” cough, hoarseness, and inspiratory stridor.
- temperatures may occasionally reach 39-40°C
- some children are afebrile.
- Symptoms are characteristically worse at night resolve completely within a week.



Normal larynx



Inflamed larynx







- Agitation and crying greatly aggravate the symptoms and signs.
- The child may prefer to sit up in bed or be held upright.
- Older children usually are not seriously ill.
- Other family members might have mild respiratory illnesses
- Most young patients with croup progress only as far as stridor and slight dyspnea before they start to recover.

Physical Examination

- Hoarse voice, coryza, normal to moderately inflamed pharynx, and a slightly increased respiratory rate.
- Rarely, the upper airway obstruction progresses and is accompanied by an increasing respiratory rate; nasal flaring; suprasternal, infrasternal retraction
- Croup is a disease of the upper airway, and alveolar gas exchange is usually normal.

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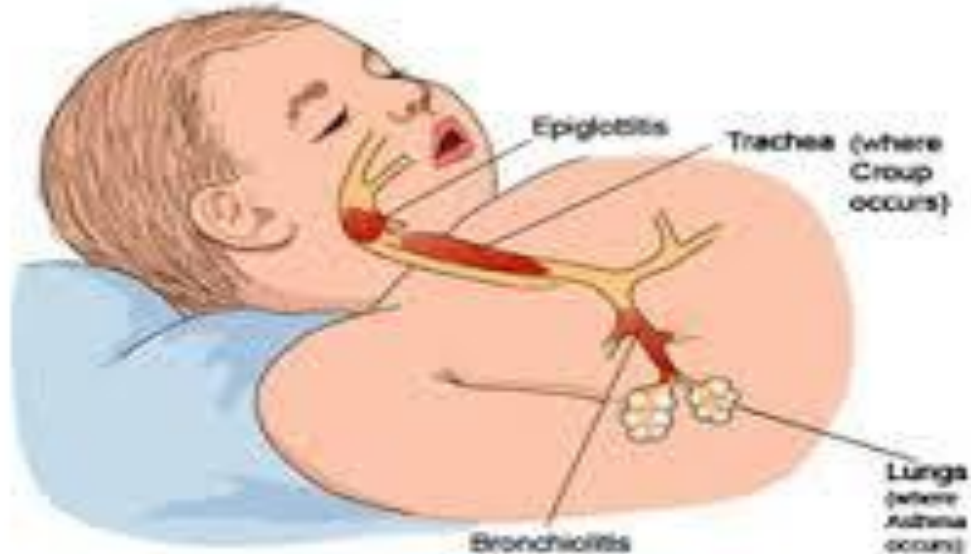


Figure 30-10 Location of airway obstruction in epiglottitis, acute laryngotracheobronchitis (croup), and bronchiolitis. (Courtesy of Carol Russell-Riley, C.M.L.)

- The child who is **hypoxic, cyanotic, pale,** or **obtunded** needs immediate airway management.
- Croup is a clinical diagnosis and **does not require** a radiograph of the neck.
- Radiographs of the neck can show the typical subglottic narrowing, or steeple sign, of croup on the posteroanterior view

- Steeple sign may be absent in patients with croup,
- May be present in patients without croup as a normal variant, and **may rarely** be present in patients with **epiglottitis**.
- The radiographs do not correlate well with disease severity.
- Radiographs should be considered only after airway stabilization in children

- Radiographs may be helpful in distinguishing between severe *laryngotracheobronchitis* and *epiglottitis*, but airway management should always take priority.

DIFFERENTIAL DIAGNOSIS

- **Bacterial tracheitis** is the most important DDx
- **Diphtheritic croup**: pharyngeal examination reveals the typical graywhite membrane, forcible attempts to remove it cause bleed, obstruction can occur suddenly.



DDx

- **Foreign body:** The child is usually 6 mo-3 yr of age. Choking and coughing occur suddenly, usually without prodromal signs of infection, although children with a viral infection can also aspirate a foreign body.
- **A retropharyngeal or peritonsillar abscess** can mimic respiratory obstruction ,CT scans
- **extrinsic compression** of the airway (vascular ring) and **intraluminal** obstruction from masses (laryngeal papilloma,Subglottic hemangioma)

DDx

- **Epiglottitis**:the **characteristic** manifestations of **drooling** or **dysphagia** and **stridor**, can also result from the accidental ingestion of very **hot liquid**
- **Angioedema**
- Endotracheal intubation
- Hypocalcemic tetany
- Infectious mononucleosis
- Trauma
- Early sign of asthma or Vocal cord dysfunction

COMPLICATIONS

- occur in approximately **15%** of patients with viral croup.
- The **most common is extension** to the **middle ear, the terminal bronchioles, or the pulmonary parenchyma.**
- **Bacterial tracheitis** may have a 2-phased illness the 2nd phase after a croup-like illness associated with high fever, toxicity, and airway obstruction.
- Pneumomediastinum and pneumothorax are the most common complications of tracheotomy.

Spasmodic Croup

- Occurs most often in children 1-3 yr of age
- Similar to acute laryngotracheobronchitis, except the history of a viral prodrome and fever in the patient and family
- The cause is viral in some cases, but allergic and psychologic factors may be important in others.
- Occurring most commonly in the evening or nighttime,
- begins with a sudden onset
- May be preceded by mild to moderate coryza and hoarseness.

Spasmodic Croup

- The patient is usually afebrile.
- The severity of the symptoms generally diminishes within several hr,
- In the following day, the patient often appears well except for slight hoarseness and cough.
- usually less severe attacks can occur for another night or two
- Allergic reaction to viral antigens than direct infection, although the pathogenesis is unknown

Treatment

- The mainstay is airway management and treatment of hypoxia priority over any testing
- Mostly can be managed safely at home.
- No evidence supporting the use of cool mist in the emergency department for the treatment of croup.(but + in home)
- **Nebulized racemic epinephrine** is an accepted treatment for moderate or severe croup.
- The symptoms of croup might reappear, but racemic epinephrine does not cause rebound worsening of the obstruction.

Treatment

- A dose of 0.25-0.5 mL of 2.25% racemic (L&D) epinephrine in 3 mL of normal saline can be used as often as every 20 min
- There is evidence that L-epinephrine (5 mL of 1 : 1,000 solution) is equally effective as racemic epinephrine and does not carry the risk of additional adverse effects.
- The indications for the administration of nebulized epinephrine include
 - ❖ Moderate to severe stridor at rest, the possible need for intubation, respiratory distress, and hypoxia.
- The duration of activity of racemic epinephrine is <2 hr.
- **observation is mandated (2-3H)**

Treatment

- Discharge after observation if:
 - ✓ have no stridor at rest
 - ✓ have normal air entry
 - ✓ normal pulse oximetry
 - ✓ normal level of consciousness
 - ✓ have received steroids

Treatment

- Nebulized epinephrine Should still be used cautiously in tachycardia, tetralogy of Fallot, or ventricular outlet obstruction
- *The effectiveness of **oral** corticosteroids in viral croup is well established*
- **Oral** steroids are beneficial, even in **mild** croup, as measured by
 - ✓ reduced hospitalization,
 - ✓ shorter duration of hospitalization
 - ✓ reduced need for subsequent interventions such as epinephrine administration.

Treatment

- Single Oral dexamethasone (0.6mg/kg = 0.15mg/kg and PO=IM) are beneficial, even in mild croup
- Intramuscular dexamethasone and nebulized budesonide have an equivalent clinical effect
- A single dose of oral prednisolone is less effective
- Corticosteroids should not be administered to children with varicella or tuberculosis (unless the patient is receiving appropriate antituberculosis therapy)

Treatment

- **Antibiotics** are not indicated in croup.
- **Nonprescription cough and cold medications should not be used in children younger than 6 yr (4 yr in nelson 2016) of age.**
- helium-oxygen mixture (heliox) may be considered in the treatment of children with severe croup for whom intubation is being considered

Hospitalize

- Hospitalized for any of the following:
 - Progressive stridor
 - Severe stridor at rest,
 - Respiratory distress, hypoxia, cyanosis,
 - Depressed Mental status,
 - Poor oral intake,
 - Need for reliable observation

Home



Home



THE END

