Acute Inflammatory Upper Airway Obstruction

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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

- Hyoid bone
- Epiglottis
- Superior horn of thyroid cartilage
- Thyrohyoid membrane
- Corniculate cartilage
- Arytenoid cartilage
- Inferior horn of thyroid cartilage
- Thyroid cartilage lamina
- Vocal ligament
- Cricoid cartilage
- Trachea
• 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.
• **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.
• 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 gray-white 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