Acute Upper Airway Obstruction in Pediatrics

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Croup

Epiglottitis

RSV
Introduction

• Upper airway obstruction is a common cause of pediatric emergency department visits, accounting for approximately 15% of all critically ill patients.

• Infectious etiologies account for 90% of these, with viral croup accounting for 80%.
Introduction

- Epiglottis accounts for 5% of severe cases.
- Other significant causes include other infections etiologies (bacterial tracheitis, tonsillar pathology, mononucleosis, and diphtheria)
Diphtheria - notice the pseudomembrane in the posterior pharynx. It can become very large and may obstruct the airway.
Introduction

• Traumatic etiologies must also be considered, including foreign bodies, external trauma to the neck, burns, and iatrogenia (ex. Postintubation)

• Congenital etiologies must be considered in young infants, and less common causes are tumors, and edema secondary to severe allergic reaction.
What is the difference between peds and adult airways?

- The tongue is larger, easily displaced, and the most common cause of airway obstruction in the obtunded child.

- The narrowest portion of the pediatric airway is at the cricoid ring, making obstruction with subglottic pathology more likely than adults.
• The most significant contribution to increased resistance with obstruction is the small radius of the pediatric larynx.

• **REMEMBER** – 1mm of swelling in an infant airway causes BIG problems!!!

• A healthy child easily tolerates moderate to severe airway obstruction and will maintain his or her tidal volume almost to the point of exhaustion, at which time hypoxia, hypercapnia, and acidosis progress rapidly, leading to cardiac arrest.
How can you tell where the problem is?! 

- Stridor, which is derived from Greek, meaning “creaking,” is caused by rapid turbulent flow through a narrowed airway.

- The sound generated depends on the degree of constriction and the localization of the obstruction.

- Observation of the child often offers the best clue to localization, before a cold stethoscope ever touches the chest.
How can you tell where the problem is?!

- Supraglottic lesions, such as epiglottitis, present with inspiratory stridor, a prolonged inspiratory phase, and a muffled cry or voice.

- Glottic lesions also lead to high-pitched inspiratory stridor and a weak or hoarse voice.

- Subglottic lesions cause expiratory stridor with a normal voice and a brassy cough.
How can you tell where the problem is?!

• A child who assumes the “sniffing position” has significant upper airway obstruction, as does a child who is dysphagic or drools.

• **REMEMBER** – expiration should be passive and that active expiration with a prolonged expiratory time, recruitment of the accessory muscles, wheezing, and a “tripod” position is significant for severe lower airway obstruction.

• All that breathes noisily does not have asthma, and a few seconds of observation should make differentiation between upper and lower airway obstruction easily.
Signs and symptoms of respiratory distress ...........

• Tachycardia

• Tachypnea – RR above 40 in an infant and above 30 in a child.

• Suprasternal retractions indicate more severe obstruction than intercostal and subcostal retractions.
• **WARNING SIGNS** of impending respiratory failure include: marked retractions, decr. Or absent breath sounds, increasing tachycardia decreasing respiratory effort or rate, decreasing stridor, and a worried or unsettled appearance.

Ominous signs are decr. Level of conc., extreme pallor, head-bobbing with each breath, and decr. Heart rate.
Sign and symptoms con’t…..

• Cyanosis is an extremely late sign in upper airway obstruction.

• The clinical state of the child should dictate intervention, with the most important parameter being mental status.

• A CHILD WHO DOES NOT CRY IS NOT BEING GOOD. THE CHILD IS IN BIG TROUBLE.
Remember

• Failure to manage the airway is the leading cause of preventable deaths in children.
General Treatment

• Airway, airway, airway
• Supplemental oxygen
• Position of comfort
• **REMEMBER** – almost all children with an U.A.O. can be bag-valve-mask ventilated, and this should always be tried first in a respiratory failure situation.
• Advanced airway management, IV, cardiac monitor, Pulse ox, etc.
General Treatment con’t…..

- Always have a smaller ET tube readily available because of the possibility of significant airway edema.

- Watch for aspiration
Croup

- Also called laryngotraceobronchitis

- Most common cause of infectious acute upper airway obstruction.

- Approx. 10% of children seen with croup require admission, 1-5% require intubation, and 10 cases are seen for each case of epiglottitis.
Croup - Ant/Posterior X-ray shows classic steeple sign with narrowing of the tracheal air column at the larynx and distension of the hypopharynx.
Pathophysiology

- Transmitted via the respiratory route.
- Initial port of entry is the nose and nasopharynx.
- Begins with a prodrome of a few days of mild URI with nasal congestion, sore throat and cough.
- As the infection spreads distally, so does the edema.
- A hoarse voice and harsh, brassy, bark like cough (barking like a seal).
- Stridor usually develops at night.
Croup

- Viral etiologies include parainfluenza virus type 1, influenza, respiratory syncytial virus (RSV), rhinoviruses and measles.

- Mean age of affected patients is 18 months, with a slight male predominance, and there is a seasonal increase in cases in autumn and early winter.
Croup

- May have elevated temperature.
- Drooling is uncommon.
- May have mild expiratory wheezing
- Inspiratory stridor at rest with nasal flaring, suprasternal and intercostal retractions.
- Poor air entry
- Lethargy + agitation = HYPOXIA
- Dehydration
Treatment of Croup

• Humidified air or oxygen
  – Provides H2O and penetrates the area of inflammation and add moisture to the mucosa. Decrease the viscosity of the secretions in the trachea which facilitates clearance of the airways.

• Steroids are controversial

• Albuterol treatment via HHN. 2.5mg in 3cc NS.

• Racemic epi., given via HHN, is indicated for children with stridor at rest or marked increase in work of breathing. It has been shown to decrease airway obstruction. Max. effect is seen in 30 min. with rebound in 2 hours.
Epiglottitis
Epiglottitis

- Also known as supraglottitis

- First described in 1878, was thought to be disease of adults. "angina epiglottidea anterior"

- 60% male dominance
Epiglottitis

- Occurs in children from 3-7 yrs in age with only 4% under the age of 1.

- *Hemophilus influenzae* (bacterial infection) is the most common etiology. (some viruses, allergic reactions and physical and thermal injuries can play a part also)

- 1985 – vaccine….but things mutate.
Pathophysiology

• Local invasion of the epiglottis occurs followed by bacteremia.

• The epiglottis, aryepiglottic folds, false vocal cords, and supraglottic structures become inflamed and edematous, leading to narrowed airway and respiratory compromise.

• Inspiratory airway occlusion often occurs prior to total occlusion from supraglottic edema.
Pathophysiology con’t…..

• Ingesting hot liquids may develop s/s of epiglottitis.
• Scald burns to the face.
• Caustic ingestions
• Foreign bodies
• Inhalation injuries
• Sidestream exposure to crack cocaine
• Burns from a crack cocaine pipe screen filter.
The evidence.....

- Swollen epiglottis (the thumb sign)
- Thickened aryepiglottic folds
- Obliteration of the vallecula
Lateral X-Ray of Epiglottitis showing the enlarged epiglottis. This is also known as the thumb sign.
Kehlkopf (Epiglottis)
Signs and symptoms

• Very sudden onset and progresses rapidly
• Muffled voice or cry (in croup it is more hoarse)
• Minimal cough
• Sore throat, fever, hoarseness
• Drooling caused by difficulty swallowing saliva
• Intercostal muscle retractions
• Noisy, high-pitched, squeaky inhalations
• Purple skin and nails
• Odd head posture. (sniffing position), tripod position
Why do children with epiglottitis have airway obstruction?

• Fatigue
• Laryngospasm
• Progressive swelling of the supraglottic structures
• Pooled secretions
Treatment of epiglottitis

- DO NOT AGITATE THE CHILD IN ANY WAY

- Airway mgmt. Done in OR
- Administer high flow humidified oxygen in order to obtain maximal alveoli oxygen saturation.
- If there is an obstruction – BVM ventilation.
- Position of comfort

- Run like hell..................
Treatment controversy

• To look or not to look
  – Visualization may cause vasovagal episode, respiratory obstruction, and cardiovascular collapse
Review

• Croup
  • Voice – hoarse
  • Cough – barking
  • Fever – yes
  • Saliva – minimal
  • Neck swelling – little
  • Begins – slowly
  • Season – autumn
  • Time – evening/night

• Epiglottitis
  • Voice – muffled
  • Cough – usually none
  • Fever – yes
  • Saliva – lots
  • Neck swelling – lots
  • Begins – suddenly
  • Season – all year
  • Time – all day
Respiratory Syncytial Virus
RSV

• Causes approx. 100,000 hospitalizations and 4,500 deaths each year in infants and young children.

• Most common lower resp. tract pathogen of infants and small children (peak at 2-8 months)

• In older children and adults, causes URI involving the nose, throat or sinuses.
RSV

• Manifests primarily as bronchiolitis and/or viral pneumonia.

• Virtually all children have had at least 1 RSV infection by their 3rd birthday.

• Causes repeated infections throughout life.

• Mortality rate is less than 1%.
  – Necrosis of small airway epithelium, plugging of the lumens with exudate and edema, atelectasis and hyperinflation.
RSV History

• Was described at least 100 years ago.

• There is currently not a vaccine available.
The RSV Virus

• Negative-sense, enveloped RNA virus.
  – Subtype A: predominate in most outbreaks
  – Subtype B: asymptomatic strain that the majority of the population experiences.

• Variable in shape and size

• Unstable in the environment.
  – Survives only a few hours on the surface

• Readily inactivated with soap/water and disinfectants.
Pathophysiology

• Limited to the respiratory tract.

• Spread = cell-to-cell transfer of the virus along the (syncytia) from URT to the LRT.

• Spread from respiratory secretions, through close contact with infected persons or contact with contaminated surfaces or objects.
Pathophysiology con’t…. 

- Usually occur during annual community outbreaks, often lasting 4-6 months, during the late fall/winter or early spring months.

- The illness may begin with URT symptoms and progress rapidly over 1-2 days to the development of diffuse small airway disease.
  - Cough, wheezing, rales, fever, decr. PO intake, etc.
Those infants and young children most at risk for severe RSV infection include:

- Those with a history of prematurity
- Infants less than six weeks of age
- Those with congenital heart disease
- Those with chronic lung conditions including bronchopulmonary dysplasia and cystic fibrosis
- Those who suffer from immunodeficiency (e.g., HIV, AIDS, cancer, transplants)
Risk factors con’t…..

- Infant placed in daycare
- Crowded household (more than 4 people in the home)
- School age brothers and sisters
- Exposure to tobacco smoke
- Multiple births (such as twins)
- Male sex
- Not breast feeding
- RSV disease occurs most often during the months from Fall through Spring.
Signs and symptoms

- Lethargy and inactivity
- Irritability
- Poor feeding
- Episodes of apnea (more common in infants)
- Nasal discharge that is usually clear
- Fever
- Chest may be hyperexpanded and hyperresonant to percussion
Signs and symptoms con’t…..

- Wheezing and or rales
- Tachypnea
- Cough
- Retractions (intercostal, subcostal, sternal)
- Nasal flaring
- Rattling in the chest that may be felt over an infant's back or chest
- Nailbed cyanosis
Treatment

- High flow oxygen
- IV (to keep hydrated)
- Cardiac monitor
- Pulse ox.
- Advanced airway management
- Bronchodilators – act to decrease muscle tone in the small and large airways in the lungs, thereby increasing ventilation. (Albuterol, Racemic Epi)
Any Questions?

Thank You!