Upper Respiratory Urgencies and Emergencies in Children

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Clinical Scenario

• A mother brings her 3 year old girl for evaluation of difficulty breathing. The child is normally a healthy girl.

• Four days ago, she developed some URI symptoms with a low grade fever (not measured).

• She had a runny nose and cough (non-barking).

• Yesterday, the child developed some swelling of the left side of her neck.

• She began complaining of a sore throat and had difficulty swallowing.

• Today, she is having lots of drooling and difficulty breathing.
Clinical Scenario

- On exam, the child has an axillary temperature of 39.5°C. Heart rate is 140; respiratory rate is 28, with mild intercostal retractions.
- She is drooling. She has visible swelling of her left neck just below the angle of the jaw. The region is mildly pink compared to the rest of the skin.
- The child cries and withdraws as your hand approaches the left side of her neck for palpation.
- The child is warm and well perfused. She has a Grade 1/6 systolic murmur at the upper left sternal border.
- She has a nondistended abdomen. She has normal bowel sounds. Her abdomen does not appear to be tender on palpation.

Clinical Scenario: Pertinent Anatomy

- Supraglottic region:
  - Nasopharynx, epiglottis, larynx, aryepiglottic folds and false vocal cords

- Glottic and subglottic region
  - Below vocal cords, extrathoracic trachea

- Narrowest portion of airway at birth is the subglottic region of trachea
Differential of Upper Respiratory Problems

- Age

- Acuity of symptom onset

- Severity of symptom onset

Differential of Upper Respiratory Problems – The Importance of Age

- Laryngomalacia is most common cause of extrathoracic airway obstruction in infants

- Foreign body aspiration and croup occur most commonly from 6 - 36 months of age

- Most retropharyngeal abscess occur at < 4 years of age

- Peritonsillar abscess occurs typically > 10 years of age

- Lemierre’s Syndrome occurs almost exclusively in adolescents
Laryngomalacia

Note nearly total collapse of airway lumen on inspiration

From teaching slides, Amer. Acad. Otolaryngology

Differential of Upper Respiratory Problems - Importance of Acuity and Severity of Onset

• Very sudden onset in toddler to older child
  – Consider foreign body aspiration (usually without fever or other findings) or allergy induced lingual or supraglottic edema

• Combination of fever, respiratory distress, hoarseness
  – Likely infectious process

• Bacterial process may be rapidly progressive

• Viral process more gradual progression

• Viral croup
  – Accounts for greater than 90% of stridor in young children
Laryngotracheobronchitis (Croup)

- Very common childhood illness
- Most commonly affects children between 6 months and 5 years of age
- Most common cause is parainfluenza viruses Types 1,2,3
- May also be caused by respiratory syncytial virus, influenza viruses, corona viruses and rhinoviruses
- Seasonal – almost exclusively fall and winter months
- Classic disease
  - 6 to 36 month old child with URI prodrome who develops a barky cough and stridor at night (dependent position)

Epiglottitis

- Cellulitis of upper airway
- Classic presentation
  - 4 to 6 year old child with prodromal URI symptoms who developed a hoarse voice, severe sore throat and rapidly progressive, life threatening upper airway obstruction
- Classic disease
  - Hemophilus influenza type b in >90%
  - Greater than 70 % bacteremic with H. influenza type b
- Therapeutic approach
  - Safeguard airway, usually endotracheal intubation
  - Antibiotics directed at Hemophilus influenza type b
Physical Examination

• Mental status
  – Alert, anxious, lethargic

• Observation of child at rest
  – Drooling, apparent pain with swallowing, amount of respiratory effort (use of accessory muscles, retraction, nasal flaring)

• Presence of erythema or edema in neck, face

• Presence of masses on inspection (nodes or abscesses)

• Auscultation of airway path
  – Nasopharynx, neck, chest
  – Where is the source of the noise? (Usually site of any obstruction)
  – How much air is moving?

Physical Examination

• Examine oropharynx by inspection
  – Ask child to open mouth if he/she is cooperative
  – If non-cooperative, observe as much as possible while child crying, screaming, yawning

• Audible phonation (of any sort) implies that some air is moving
**Physical Examination**

- Drooling and a muffled voice suggest a supraglottic obstruction

- Drooling and dysphagia suggests a foreign body in the trachea or a mass compressing the anterior esophageal wall

- Change in voice quality implies a laryngeal obstruction or process

**Physical Examination - Signs of Impending Respiratory Failure**

- Fatigue
- Diaphoresis
- Agitation
- Anxiety, fearfulness
- Terrified look
- Flaring alae nasae
- Severe chest wall retractions
- Tachypnea, bradypnea, apnea,
- Breathless speech
- Pronounced wheezing
- Expiratory grunting
- Decreased or absent breath sounds
Respiratory Failure In Children

• Grunting occurs when premature glottic closure is accompanied by active chest muscle contraction during early expiration.

• This maneuver occurs reflexively to increase airway pressure, thereby preserve or increasing functional residual capacity

• Cyanosis is a very late and inconsistent sign of respiratory failure. Intervention should be taken before it is seen.

Respiratory Failure In Children – Signs of Difficult Airway

• Short muscular neck
• Receding lower jaw (micrognathia)
• Long high arched palate
  — Associated with long narrow mouth
• Small glottic opening
• History of tracheal stenosis
• Poor mobility of cervical vertebrae
Classification of Potential Difficult Airway

Mallampati et al

Diagnostic Evaluation

- Do not send children with potential life-threatening obstruction anywhere without trained individual capable of dealing with acute obstruction and the equipment necessary to do so. If such people are unavailable, get them to child as fast as possible.

- Do not force children into positions that increase potential obstruction
Airway Evaluation

• Airway examination offers chance for definitive diagnosis

• Nasopharyngoscopy with aerosolized local anesthetic can frequently be accomplished at bedside in patients who are stable and not significantly compromised

• Full airway examination should be done in place where airway experts, specialized equipment and full sedation and anesthesia services are available

Epiglottitis
Diffuse Erythema, Edema, Pustular Exudate

Exudate
Endotracheal tube

From teaching slides, Amer. Acad. Otolaryngology
**Croup**

- Very common clinical illness
  - Typically seen in children from 6 months to 5 years of age
- > 85% of cases due to parainfluenza viruses
  - Respiratory syncytial virus, influenza virus, rhinoviruses, human metapneumovirus and other agents may also be cause
- Most cases in fall and early winter
- Though parainfluenza virus infections are ubiquitous, clinical syndrome of croup occurs in less than half of children infected (rates variable - 15 - 50%)
- Predisposing factors leading to more trouble
  - Younger age (< 12 months), laryngomalacia, subglottic stenosis (prior intubation), congenital anomalies of airway, neuromuscular disease

**Croup – Clinical presentation**

- Typically gradual onset of symptoms
  - Low grade fever
  - Rhinorhea
  - Nasal congestion at outset, progressing over 12 – 48 hours to barky cough, hoarse voice and stridor
- Mucosa of subglottic region or airway becomes edematous during infection
  - Leads to stridor and increased work of breathing
- Amount of stridor is variable
  - Stridor at rest (without crying/agitation) implies more obstruction
Croup – Physical Exam

• Assessment of amount of work of breathing is very important

• Amount of retractions

• Handling of secretions

• Amount of air entry into lungs relative to the level of work of breathing

• State of hydration

Croup - Therapy

• Racemic epinephrine or L-epinephrine aerosols provide relatively rapid partial relief of obstruction by reducing airway mucosal edema transiently
  – Racemic epinephrine 0.05 mL/kg/dose maximum 0.5 mL
  – L-epinephrine 1:1000 0.5 mL/kg/dose maximum 5 mL
  – Each delivered by nebulizer over 15 minutes
  – Duration of effect is variable; may last only 15-20 minutes
  – Repeat as necessary every 15-20 minutes

• Common practice is to observe any child who has received even a single dose of nebulized racemic epinephrine or L-epinephrine for 4 to 6 hours before discharging home
**Croup - Therapy**

- Glucocorticoids clearly efficacious in reducing mucosal edema over longer term
  - Improve clinical scoring
  - Less stridor, less work of breathing, improved air entry
  - Decrease rate of hospitalization and emergency room visits
  - Typically take 2 - 6 hours to have effect
  - Quite safe: many children only require one or two doses

- Most commonly used glucocorticoid is dexamethasone
  - Dose is 0.25 -0.3 mg/kg/dose, maximum 5 mg
  - May be given PO, IM or IV
  - Very bitter tasting
    - Oral preparation only 1 mg/mL - may use IV preparation (4 mg/mL) mixed with syrup for oral use

- Potential risk of secondary or reactivated infection (TB) with repeated dosing

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**Summary**

- Laryngomalacia is most common cause of extrathoracic airway obstruction in infants

- Epiglottitis has become fortunately quite rare with widespread use of Hemophilus influenza type b conjugate vaccine

- Other causes of upper airway distress
  - Retropharyngeal and peritonsilar abscess, foreign body aspiration (typically < 3 years of age), congenital anomalies, Lemierre’s syndrome (adolescents)

- Croup typically a mild disease
  - Epinephrine aerosols and glucocorticoids for relief of airway edema and symptoms
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Every life deserves world class care.