Upper Airway Obstruction

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Objectives

- Differentiate between upper and lower airway obstructions based on clinical basis.
- Know the “ABCD” (the priorities of airway, breathing, circulation) assessment.
- Know the initial emergency management of upper airway obstruction.
- Recognized clinical presentation, radiological features, and management of foreign body aspiration.
- Recognize the signs and symptoms associated with croup and epiglottitis.
- Know the management of croup and epiglottitis.
Upper / Lower Airways

- **Upper respiratory tract**
  - Nasal cavity
  - Pharynx
  - Larynx

- **Lower respiratory tract**
  - Trachea
  - Primary bronchi
  - Lungs
Upper airway obstruction

Causes:

- FB aspiration: (e.g., food or a small object)
- Airway swelling
  - Anaphylaxis
  - Tonsillar hypertrophy
  - Croup
  - Epiglottitis
- Mass that compromises the airway lumen
  - Pharyngeal, peritonsillar abscess
  - Retropharyngeal abscess
  - Tumor
- Thick secretions obstructing the nasal passages
- Congenital airway abnormality: congenital subglottic stenosis, laryngomalasia
- Iatrogenic: subglottic oedema post ET intubation
Upper airway obstruction

**Signs:** Mostly during inspiration

- Change in voice: hoarseness, barking cough.
- Inspiratory stridor.
- Cyanosis, drooling.
- Nasal flaring.
- Tachypnea (mild).
- Retractions: suprasternal, supraclavicular.
- Poor chest expansion.
- Poor air entry on auscultation.
- Prolonged inspiratory phase.
Lower airway obstruction

Causes:
- Asthma
- Bronchiolitis

Signs:
Mostly during expiration.
- Cough.
- Retractions: intercostal, subcostal.
- Tachypnea.
- Wheezing.
- Nasal flaring.
- Prolonged expiratory phase.
- Pulsus paradoxus.
Lung tissue disease

Causes:
- Pneumonia (viral, bacterial, chemical)
- Pulmonary edema (heart failure, ARDS)
- Pulmonary contusion (trauma)
- Allergic reaction
- Toxins
- Vasculitis
- Tumor

Signs:
- Marked tachypnea
- Retractions, nasal flaring
- Grunting
- Crackles
- Decrease breath sound
- Tachycardia
- Hypoxemia
ANY LIFE-THREATENING
HOW TO APPROACH?

- Always----Emergency, get consultant.
- Universal Precautions.
- ABCDE approach.
ABCDE Approach

- Airway
- Breathing
- Circulation
- Disability
- Exposure
Airway Assessment

- Patent
- Maintainable
Airway Assessment
Breathing
Breathing

- RR
- Respiratory distress (signs)
  - Retractions, Accessory Muscles use and Nasal Flaring
  - Head Bobbing
  - Grunting
  - Stridor
  - Wheezing

- Air Entry
  - Chest Expansion
  - Breath Sounds
- Color
  - Blue = Cyanosis
  - Pink = Normal
Circulation

- Heart rate
- BP
- Peripheral pulses
- Skin perfusion
- Cap. refill time
- Color
Foreign Body Aspiration (FBA)

- Life-threatening
- 80% of pediatric FBA episodes < 3 years of age
- Peak incidence 1-2 years
- Aspirated FBs in children: Peanuts, seeds, popcorn, food particles, hardware, and pieces of toys, coins, paper clips, pins, pen caps.
Location of FBA

- Bronchial- common.
- Laryngo-tracheal (high mort).
- Tracheal.
- Lung.
FBA
Clinical Presentation

Depends on:

- History of choking (Sudden onset of cough + dyspnea + cyanosis).
- Age of the child
- Type of object aspirated
- Degree of airway blockage
- Location of the object.

50-75% of cases will present and diagnosed within 24 h of aspiration.
FBA
Clinical Presentation

**Laryngotracheal:** acute respiratory distress, stridor, hoarseness, or complete airway obstruction

**Tracheal FBs:** stridor, wheeze, and dyspnea.

**Bronchial FBs:** coughing and wheezing, hemoptysis, dyspnea, respiratory distress, decreased breath sounds, fever, and cyanosis.

**If Delayed diagnosis** (days or weeks after the aspiration)

Symptoms due to complications: Pulmonary abscesses and bronchiectasis
FBA
Diagnosis

Inspiratory chest + Lateral soft tissue x-ray:
- A normal chest radiograph does not rule out FBA
- Radioopaque (10% of FBs)
- Radiolucent (eg, nuts, food particles)

Expiratory chest x-ray or fluoroscopy:
For children with a suggestive presentation and normal inspiratory chest x-ray.
Radiopaque foreign body in the airway

Radiopaque foreign body retrieved from the airway of a one-year-old child.
FBA Diagnosis

Bronchial FBA

Findings in chest x-ray:

- Hyperinflated lung
- Atelectasis
- Mediastinal shift
- Pneumonia
- Pulmonary abscesses and bronchiectasis (late)
Obstructive emphysema in a child following foreign body aspiration

Normal inspiratory chest x-ray in a child following right-sided foreign body aspiration (top). Obstructive emphysema is noted during expiration only (bottom).
Obstructive emphysema in a child due to foreign body aspiration

Inspiratory and expiratory chest radiographs from a two-year-old child with a radiolucent foreign body in the left mainstem bronchus. There is marked hyperlucency in the left lung during expiration (right image) compared with inspiration (left image).
Natural course of foreign body aspiration

Acute choking episode

Foreign body
- Expectorated
- Expectorated and swallowed

Death from suffocation
- Complete airway obstruction
- Reflex laryngospasm

Persisting symptoms
- Unexplained dyspnea
- Recurrent wheezing
- Chronic cough

Symptom-free period

Complications
- Acute pneumonia
- Recurrent pneumonia
- Lung abscess
- Bronchiectasis
- Hemoptysis
MANAGEMENT OF FBA

Choking

Apply ABCDE

Life-threatening FBA (complete UAO....unable to speak or cough).

- Visualize → remove
- No finger sweep

Infant

- 5 back blow follow 5 chest thrust
MANAGEMENT OF FBA
Child:

- Conscious  ➔  Heimlich maneuver
- Unconscious ➔  Chest compression
**Heimlich Maneuver**

1. Lean the person forward slightly and stand behind him or her.

2. Make a fist with one hand.

3. Put your arms around the person and grasp your fist with your other hand near the top of the stomach, just below the center of the rib cage.

4. Make a quick, hard movement, inward and upward.
If cyanosed & can't ventilate or intubate consider needle cricothyrotomy
FBA Management

If Suspected FBA:

- Rigid bronchoscopy with ventilation under general anesthesia.
- Flexible bronchoscopy.
Acute Epiglottitis was most common in children aged 2-4 years.
Since the Hib vaccine (1991), Epiglottitis become rare.
Streptococci (strept pneum+ group A strept) are the major pathogens.
Incidence in adult has remained constant and still Haem Inf is the most common organisms.
Clinical Presentation

- Febrile toxic child
- Sore throat
- Drooling
- Can’t talk, can’t swallow
- No cough
- Respiratory distress
- Stridor is a late presentation indicating advanced airway obstruction.
- Sniffing / Tripod posture
Child with classic presentation of acute epiglottitis

This four-year-old girl has epiglottitis caused by *Haemophilus influenzae* type b.
(A) She prefers to sit and appears anxious.
(B) The child assumes the characteristic sniffing position to maximize the patency of her airway.

This child's "tripod" positioning (trunk leaning forward, neck hyperextended, chin thrust forward) is indicative of epiglottitis. Note the child's toxic appearance.
Epiglottitis Diagnosis

- Lat neck soft-tissue x-ray (portable)
  - Positive in 80%
  - Unnecessary if clinically is suspected
  - Thumb sign
Direct visualization of epiglottis by laryngoscopy is the preferred method of diagnosis.
Epiglottitis: Direct visualization

A swollen, cherry-red epiglottis with an endotracheal tube passing posteriorly.
Bacterial tracheitis: Endoscopy

Note the adherent mucopurulent membranes within the trachea.
Peritonsillar abscess

A large unilateral abscess is visible in the pharynx of a patient examined in the Emergency Department. Prominent swelling of the anterior pillar and soft palate is present.
Peritonsillar abscess with exudate

Note the bulging of the soft palate and increased tonsillar hypertrophy on the left.
EPIGLOTTITIS

Diagnosis

- Bedside U/S is an alternative.
- Blood + epiglottic cultures if the airway is secured.
EPIGLOTTITIS

Management

- Advice to not irritate the child, keep on parent's lap
- Avoid therapy – sedation, inhalers or neubulizer
- Humidified O2 if possible
- Airway management is the most urgent consideration:
  - Assess for level of distress before any other workup
  - Ensure that ENT, Anesthesiologist are available before tracheal Intubation
  - Airway equipments including that for cricothyrotomy and tracheotomy
All patients should be monitored in ICU

Ceftriaxone or cefotaxime + clindamycin or vancomycin If:
community or hospital Staph Aureus

Rifampin for close contacts
Croup (Laryngotracheitis)

Inflammation of the larynx and trachea characterized by:
- Inspiratory stridor
- Barking cough
- Hoarseness.

- Children 6 mo - 3 years of age.
- Usually is a mild and self-limited illness

Etiology
- Parainfluenza virus type 1 is the most common cause.
- Respiratory syncytial virus and influenza virus.
Croup
clinical presentation

Symptoms

- The onset is usually gradual, beginning with nasal irritation, congestion, and coryza.
- Symptoms generally progress over 12 to 48 hours:
  - Fever, hoarseness, barking cough, and stridor.
  - Respiratory distress increases as upper airway obstruction becomes more severe.
Croup
clinical presentation

Points in the history that are helpful in distinguishing croup from other causes of acute upper airway obstruction (Differential diagnosis):

- Absence of fever from onset of symptoms to the time of presentation is suggestive of:
  - Spasmodic croup or
  - Noninfectious etiology (eg, FBA)

- Absence of Hoarseness and barking cough
  - Acute epiglottitis
  - FBA
  - Angioneurotic edema.
Croup
Clinical Presentation

Points in the history

- Difficult swallowing
  - Acute epiglottitis
  - FBA.
- Drooling
  - Peritonsillar abscesses
  - Retropharyngeal abscesses
  - Retropharyngeal cellulitis
  - Epiglottitis.
- Throat pain and dysphagia
  Common in epiglottitis.
Croup
Assessment of severity

Clinical scoring systems (the Westley croup score).

- **Level of consciousness**: Normal = 0  disoriented = 5
- **Cyanosis**: None = 0  With agitation = 4  At rest = 5
- **Stridor**: None = 0  With agitation = 1  At rest = 2
- **Air entry**: Normal = 0  Decreased = 1  Markedly decreased = 2
- **Retractions**: None = 0  Mild = 1  Moderate = 2  Severe = 3
Assessment of severity

**Mild croup**
- Westley croup score of $\leq 2$
- Barking cough and hoarse cry
- No stridor at rest.

**Moderate croup**
- Westley croup score of 3 - 7
- Stridor at rest
- Mild retractions.

**Severe croup**
- Westley croup score of $\geq 8$
- Significant stridor at rest
- Decreased air entry
- Severe retractions
- Anxious, agitated, or fatigued.
- Cyanosis
Diagnosis

Clinical diagnosis:
Presence of a barking cough and stridor
- Neither radiographs nor laboratory tests are necessary to make the diagnosis.
- Radiographs may be helpful in excluding other causes.
Croup: Anteroposterior radiograph with "steeple sign"

The anteroposterior (AP) view demonstrates tapering of the upper trachea, known as the "steeple sign" of croup. Note that the finding can be simulated by differing phases of respiration even in normal children.

*Courtesy of the Department of Diagnostic Imaging, Texas Children's Hospital*
Treatment

**Mild symptoms**
- Managed at home
- Single dose of oral dexamethasone (0.6 mg/kg)

**Moderate to severe symptoms**
- Supportive care: humidified air or oxygen, intravenous fluids.
- Racemic epinephrine as nebulizer over 15 min
  - 0.05 mL/kg per dose (maximum of 0.5 mL) of a 2.25 % in 3 mL of NS
- Nebulized epinephrine
  - 0.5 mL/kg per dose (maximum of 5 mL) of a 1:1000 dilution.
    - Nebulized epinephrine can be repeated every 15 to 20 min.
- Dexamethasone (0.6 mg/kg)
- Observed for three to four hours after intervention.
- Monitoring for worsening respiratory distress