STRIDOR, COUGH AND ASPIRATION

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Anatomy

Pediatric versus adult mouth and pharynx
Anatomy

Pediatric versus adult airway
Cough

One of 4 mechanisms to protect the respiratory tract:

• Cough
• Gag reflex
• Mucociliary escalator
• Phagocytic and lymphatic systems
Cough

2 functions:
• expel foreign material
• remove excess secretions

4 stimuli:
• chemical (tobacco smoke)
• mechanical (vascular ring)
• thermal (cold, dry air)
• inflammatory
Cough

Afferent pathway: airway receptors

• slow-adapting (tactile)
• rapidly-adapting (tactile)
• C-fiber (chemical and mechanical)
• pulmonary stretch (mechanical)
• V, IX, X, phrenic
Cough

Efferent pathway:

- X
- C2-S2
- phrenic nerve
- cerebral cortex
Cough

4 phases:
- inspiratory
- contractive
- compressive
- expulsive
Glottic Closure Reflex

- Larynx serves as a sphincter to protect the lower airway during deglutition
- Superior laryngeal nerve
- TVC, FVC, aryepiglottic folds
- Laryngospasm
Normal Age-Related Feeding Behavior

Well-coordinated swallow

• Pediatric versus adult
• Closure of the airway
• Opening of the upper esophageal sphincter
• Reflex inhibition of breathing
Aspiration

- Indirect versus direct
- Normal barriers
- Pathophysiology
- Predisposing factors
- CNS disease
GERD

• Pathophysiology
• Symptoms and complications
• Pulmonary manifestations
• Predisposing factors
Aspiration: Diagnosis

- History
- Physical exam
- Modified barium swallow
- Upper GI series
- GE scintigraphy
- Esophageal manometry
Modified Barium Swallow

- Best procedure to evaluate swallowing mechanism
- Anatomical evaluation
- Dynamic evaluation
- Identification of modifications to improve swallowing
Aspiration: Diagnosis

24-hour esophageal pH probe
Aspiration: Diagnosis

Lipid-laden alveolar macrophage index
Aspiration: Diagnosis

- Direct laryngoscopy, bronchoscopy, esophagoscopy
  - Type I laryngotracheal cleft
- Pulmonary function tests
- Modified Bernstein test
GERD: Management

1. Physiologic reflux or reflux with mild symptoms:
   - Supportive therapy
     - Dietary adjustments
     - Lifestyle modifications
     - Reassurance
   - Improvement
   - No improvement
     - Continue supportive therapy
     - Trial of medical therapy
       - Improvement
       - No further work-up
       - Proceed with diagnostic work-up as above
         (persistent symptoms)

2. Persistence of symptoms or suspected complications
   - 24-hour PH monitor study ± EGD
     - Consider other diagnosis
     - Medical treatment

1. Based on the history, consider UGI contrast study (mechanical obstruction) and gastric emptying study (delayed gastric emptying)
2. Type and length of therapy may change according to the age of patient and the type of complication related to GER
Aspiration: Management

- Modification of food and positioning
- Pharmocotherapy
- Anti-reflux procedures
  - Nissen fundoplication (pyloroplasty?)
  - Thal fundoplication
  - cricopharyngeal myotomy
  - gastrostomy
Management of Intractable Aspiration

- Narrow field laryngectomy
- Endolaryngeal stent
- Epiglottic flap closure
- Glottic closure
- Trachesophageal diversion
- Laryngotracheal separation
TED and LTS
Chronic Cough: Evaluation

- History
- Physical exam
- Etiology and age

Fig. 2. Etiology of cough at age first seen. There are 85 diagnoses in 73 patients, 13 representing mixed diagnoses. Aberrant innominate artery = AIA; cough-variant asthma = CVA; sinusitis = S; tracheomalacia = TMAL; gastroesophageal reflux = GER; cystic fibrosis = CF; psychogenic cough = PSY; unknown = UNKN; subglottic stenosis = SGS; viral bronchitis = VIRAL; bronchogenic cyst = BCST.
Cough: Diagnosis by Age

Birth to 18 months:
- aberrant innominate artery
- cough-variant asthma
- GERD

18 months to 6 years:
- sinusitis
- cough-variant asthma
Cough: Diagnosis by Age

6 to 16 years:

• cough-variant asthma
• psychogenic
• sinusitis

Studies of choice by age:

• Birth to 18 months: endoscopy
• 18 months to 6 years: sinus films
• 6-16 years: PFTs with metacholine challenge
Cough: Evaluation

Duration:
- Chronic = 2-3 weeks or longer

Quality:
- Seal-like
- Canada-goose
- Paroxysmal
- Staccato
Cough: Evaluation

Timing:
- Postprandial, sleep
- with feeding
- during exercise, cold, laughing, sleep

Productivity:
- young children swallow phlegm
- non-productive, dry
- wet, productive
- hemoptysis
Cough: Physical Exam

- Vitals, height, weight, general appearance
- Chest
  - increased respiratory rate a sensitive indicator of pulmonary disease in children
  - auscultate neck
- Head and neck exam
  - “99” test
Chronic Cough: Evaluation

- Pulmonary function tests, with methacholine challenge
- Sinus films
- Barium swallow
- Endoscopy
- Sweat test
- Chest films for possible foreign body
Cough: Differential Diagnosis

- Congenital
- Inflammatory
- Infectious
- Neoplastic
- Miscellaneous
Congenital Anomalies

Fig. 2. Double aortic arch encircling and compressing trachea and esophagus.
Chronic Cough

Other etiologies:

- *Bordetella pertussis*
- Cystic fibrosis
- Psychogenic
Stridor: Evaluation

- Pathophysiology
- History
- Physical exam
- Airway evaluation
Case Study

- A 2 year old child was noted to choke and gag when chewing on some lettuce and now has intermittent cough.
- The family does not note any respiratory distress but takes him to the ER for evaluation.
Case Study

• Parents deny any cyanosis, audible wheezing or stridor en route to ER.
• No significant PMH. No recent URI.
• PE reveals an intermittent dry cough. Respiratory rate is 22 and non-labored. Breath sounds are equal bilaterally. No stridor is appreciated with auscultation of the neck.
Case Study

- AP and lateral CXR are normal
- Child is released home and asked to follow up in the clinic in 2 days.
- 2 days later, the child still has a cough, which sounds more productive, and now has a low-grade fever. PE is unchanged.
- AP and lateral CXR are obtained.
Case Study
Case Study

• AP CXR shows mild hyperinflation of the left lung.
• You explain to the parents that the child may have aspirated the lettuce and that direct endoscopy is necessary to confirm the diagnosis.
• The parents are reluctant to proceed to the OR and would prefer to wait.
Case Study

• The parents return to your office the next day and report that the child continues to cough, but otherwise is doing o.k.

• PE reveals decreased breath sounds on the left. Faint biphasic stridor is audible. The child is pink and in no distress.

• Repeat AP and lateral CXR are obtained.
Case Study

- AP chest X-ray shows collapse of the left lung, with mediastinal shift to the left.
- The child is taken to the OR. During transportation to the OR, all equipment necessary to establish an airway is available, and care is taken not to agitate the child.
- A peanut is found in the left mainstem bronchus.
Case Study

- The key to successful management of airway foreign bodies is a high index of suspicion. Physical signs are present in less than 50% of cases.
- Mortality rate 2%; 3,000 deaths/year
- The highest mortality rate is for laryngeal foreign bodies, approaching 45%