Wheeze, Stridor, Cough, and Other Respiratory Noises

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Wheeze

Continuous musical sounds, typically expiratory in nature
But What Do Parents Mean by “Wheeze”

- Less than 50% agreement between parents and clinicians (Cane et al. Arch Dis Child 2000;82:327)
- Wheeze most commonly used term for respiratory sounds until imitated or shown video (Elphick et al. Arch Dis Child 2001;84:35)
- 30% of parents used other words for wheeze and 30% labeled other sounds as “wheeze” (Cane et al. Arch Dis Child 2001;84)
Causes of Wheezing

- Bronchiolitis
- Asthma
- Cystic fibrosis
- Foreign body (*monophonic*)
- Bronchomalacia
Causes of Wheezing

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- Bronchomalacia
Patient GH

- 5 m.o. with wheezing and retractions
- Onset 6 weeks of age
- No response to albuterol
Patient GH

- BAL from RUL
  - 52% neutrophils
  - 400,000 cfu/ml Moraxella catarrhalis
  - 400,000 cfu/ml Haemophilus influenzae
- Coughing and wheezing resolved with Augmentin ES600, 90 mg/kg/day divided BID
- Stridor and retractions when excited persisted from the mild laryngomalacia
Bronchomalacia
	right upper lobe
Bronchomalacia

(right mainstem)

(forced exhalation)
Noises and Clinical Consequences Associated with Bronchomalacia


- Protracted bacterial bronchitis – most with bronchomalacia
- BAL for persistent presence of cough, wheeze, or noisy breathing
  - Inflammation (*neutrophilia*)
  - High colony counts bacteria
    - S. pneumo
    - H. influenza
    - M. catarrhalis
- Improved with Augmentin, but recurrences common
Airway Malacia

- Bronchomalacia: 41%
- Tracheomalacia: 26%
- Both: 13%
- None seen: 20%
Stridor

Continuous inspiratory musical sound of variable pitch
Laryngomalacia

- Common to varying degrees – about 60% of stridor in infants
- Represents a delay in maturation of supporting laryngeal structures.
- Generally resolves by 2 years of age
- Rare cases result in pulmonary hypertension
- Laser laryngoplasty for very occasional severe cases affecting feeding or growth
What is “croup”?  

- Transient inflammation of the laryngeal area causing upper airway obstruction characterized by *inspiratory stridor* - generally from viruses

- Commonly associated with inflammation of the trachea and bronchi, hence the term “laryngotracheobronchitis”

- Typically accompanied by harsh barking cough from the tracheobronchitis – but a “croupy” cough alone is not croup

- Responds to epinephrine aerosol with transient relief and dexamethasone for sustained benefit
Etiologic Agents Recovered from Children with Croup

N = 360

- Paraflu 1: 47%
- RSV: 10%
- Paraflu 3: 18%
- Paraflu 2: 9%
- Influenza A: 4%
- Influenza B: 3%
- M Pneumoniae: 4%
- Misc. vir.: 5%

Denny et al, Pediatr 71:871, 1983
Epiglottitis

- Bacterial infection
  - H. influenza group B
  - S. pyogenes (*beta hemolytic streptococcus, group A*)
- Life threatening
- Medical emergency
- Treatment
  - Establish an airway
  - Antibiotics
Jennifer J -
15 Y.O. Girl With 3 Weeks of recurrent stridor and dyspnea

- First episode while detasseling - Rx with epinephrine in ER successful
- 2nd episode next day while detasseling - same treatment with same result
- Then daily episodes without detasseling and without response to epinephrine
- Respiratory sound called wheezing
- Rx with inhaled bronchodilators, prednisone, and hospitalization without response
Treadmill exercise induced “wheezing” (actually a high pitched stridor)
Normal pre-exercise; decreased flow only on inspiration post-exercise
Diagnostic of extrathoracic airway obstruction
Sarah J - 15 Y.O. Girl With 1.5 Year History
Recurrent Severe “Wheezing” and Dyspnea

- Multiple paramedic calls for ER Rx because of severe respiratory distress
- Rx with bronchodilators, inhaled and oral corticosteroids
- Several hospitalizations
- No consistent response to any treatment
Sarah J – spirometry before and after preparing to perform bronchoprovocation

- “Wheezing” (actually a high pitched inspiratory stridor and a monophonic expiratory wheeze) and dyspnea began while preparing to perform bronchoprovocation
- Initially normal; then severe airflow obstruction apparent on both inspiration and expiration
Vocal Cord Dysfunction Syndrome

- Commonly mis-diagnosed as asthma
- May be present along with asthma
- Two clinical patterns (Doshi D. Weinberger M. Long-term outcome of vocal cord dysfunction. Ann Allergy Asthma Immunol 2006;96;794-799)
  - Exercise induced (can be blocked with anti-cholinergic aerosol)
  - Spontaneous
- Treatment of spontaneous VCD – vocal cord training by a speech therapist familiar with the disorder
17 m.o. girl with 8 months of harsh nocturnal stridor and coughing

Rx with albuterol and corticosteroids

No response to treatment

Flexible bronchoscopy showed intermittent paradoxical vocal cord movement
MRI of D.D.

Chiari 1 malformation with herniation of cerebellar tonsil below foramen magnum
Causes of Stridor

- Croup
- Epiglottitis
- Laryngomalacia
- Chiari malformation
- Vocal cord paralysis
- Laryngeal foreign body
- Vocal cord dysfunction syndrome
Cough

Forceful exhalation after quickly raising thoracoabdominal pressure, often to $> 100$ cm H$_2$O
Pertussis
Whooping Cough

- Most dangerous in unimmunized infants
- Occurs in immunized adolescents and adults
  - 26% of 130 college students with persistent cough \( \geq 6 \text{ days} \) (Mink et al, Clin Infect Dis 1992;14:464-71)
  - 21% of 75 adults with cough \( \geq 2 \text{ weeks} \) (Wright et al, JAMA 1994;273:1044-6)
  - 12% of 153 adults with cough \( \geq 2 \text{ weeks} \) (Nennig et al, JAMA 1996;275:1672-4)
Nasal Swab for Pertussis PCR
Habit Cough Syndrome

Clinical Characteristics

- Loud, repetitive, dry, barking cough
- Duration of weeks or months
- Irritating and disturbing to others - prevents school attendance
- Commonly misdiagnosed as asthma
- No response to medication
- *Absent once asleep*
Habit Cough
Rx With Suggestion Therapy - Outcome

Lockshin, Lindgren, Weinberger, Koviach. Ann Allergy 1991;67:405 (from U of IA Ped All/Pulm Clinic)

- 8/9 patients treated successfully with 15 minute session, 1/9 required 30 minutes
- Minor relapses controlled with autosuggestion technique
- 1 required a 2nd session 9 days later
- All remained asymptomatic for median of 2.2 years
Habit Cough Syndrome
Natural History


- Follow-up of 62 pts (34 m & 26 f) for mean length of 7.9 years
- Ages 4.6-15.6 (mean 10.5)
- Mean duration till Dx - 7.6 months
- Mean duration till resolution 6.1 months
- 16 pts still coughing for mean of 5.9 years from time of Dx
Habit Cough Syndrome
Rx With Suggestion Therapy - Method

- Physician must have confidence in success
- Focus patient’s attention on suppressing cough
- Explain cough
- Reinforce even brief successes
- Emphasize that patient, not physician, is controlling cough
- Success usual in about 15 minutes
- Emphasize autosuggestion for minor relapses
Donna E -
9 Y.O. Girl With Cough for 2 Years

- Treated as asthma
- Oral corticosteroids
  - Growth retarded
  - Cushingoid
  - Hirsute
- Several hospitalizations with IV antibiotics and corticosteroids
- No response to any of the therapy
Patient MW

- 14 m.o. coughing day and night
- 4-5 spasms of coughing a day lasting 4-5 minutes
- Interferes with activity
- Coughing disturbs sleep, especially when lying on her back
Patient MW
Patient MW

- No inflammation on BAL
- Referred to pediatric surgery
- Aortopexy performed
Tracheomalacia - treatment


- Aortopexy – stenting the trachea using a stitch between the sternum and the aorta to place tension on the connective tissue between the aorta and anterior wall of the trachea
Aortopexy
Patient MW

- Cough now not troublesome
- She now sleeps well at night on her back
History of A.K.

- 4 y.o. with harsh barking cough
- Present since infancy
- Dx as asthma
- Allergy skin testing negative
- Rx with cromolyn, Singulair, prn albuterol, and multiple courses of steroids
- Equivocal response to all treatment
Upper Airway of A.K. Through Flexible Bronchoscope

3.y.o. girl with chronic cough

- No response to bronchodilators
- No response to prednisolone
- No response to antibiotic
- No airway inflammation on BAL
- No bacteria on BAL

Other Causes of Cough

- Acute viral bronchitis (or tracheobronchitis)
- **Asthma** *(1215 tomorrow)*
- Protracted bacterial bronchitis
- M. Or C. Pneumoniae
- Aspiration
- Cystic fibrosis
- Primary ciliary dyskinesia
- **Habit cough syndrome** *(Saturday at 1300)*
What about GERD and Cough???


Controlled clinical trials have not shown PPIs to improve cough associated with GERD symptoms in infants, children, or adults.
What About Post-Nasal Drip?

A diagnostic label that is unhelpful

No accepted definition

Mucus dripping down the back of the throat not consistently associated with cough

Presence of post-nasal drainage with cough likely indicates inflammation of lower airway in addition to the upper airway

Morice AH. Post-nasal drip syndrome – a symptom to be sniffed at? Pulmonary Pharmacology & Therapeutics 2004;17:343-5.

Other Respiratory Noises

- Crackles – interrupted sounds
  - Fine crackles – inspiratory opening of alveoli that closed on previous exhalation(s)
  - Coarse crackles (*preferred terminology over rhonchi*) – movements of fluids in bronchi or bronchioles
- Pleural rubs
- Increased transmission of voice sounds
  - Bronchophony and egophony
  - Whispering pectoriloquy
Describing Respiratory Sounds

- Inspiratory or expiratory
- Continuous or interrupted
- Pitch
- Volume
- Location
- Duration and frequency