All that wheezes isn’t asthma

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Outline

1. What is asthma?
2. Other causes of wheezing
3. Cases

What is asthma?
Airway hyper-responsiveness to exogenous stimuli

Testing:
1. Response to bronchodilator
2. Spirometry
Methacholine challenge is considered the “gold standard”

**Caveats:**
- May vary with 1. allergen exposure 2. viral infections

**Spirometry criteria for diagnosis of asthma**
- FEV1 < 80% *
- FEV1/FVC < 70% *
- Post-bronchodilator improvement of 12% in FEV1
- Post-bronchodilator improvement in FEF 25-75%

*small airways disease*

**Other examples of flow volume loops**
Example Spirometry

If Spirometry Is Not Available

- If the patient’s history suggests asthma (wheezing with allergen/irritant exposure: grass pollen, cats/horses, forest fire smoke, exercise)
  - Symptomatic response to inhaled corticosteroid +/- long- or short-acting beta-agonist
  - Improvement in peak flows following treatment with controller medication or following rescue albuterol
Diagnosing asthma in children

- Intermittent episodes associated with a common trigger
  - URIs, exercise, animal exposure
- Seasonal variation with pollen exposure
- Family/maternal history of asthma and atopy
- Cough during the day or night or with exercise

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1. What is asthma?
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Common causes of wheezing in infants and children

**Acute**

1. Foreign body aspiration
   - 85% < 3 years old
2. Viral Bronchiolitis
   - RSV if < 2 yrs old
   - Rhinovirus if > 2 yrs
   - also influenza, adenovirus
Wheezing due to inflammation of small airways

Common causes of wheezing in infants and children

Acute
1. Foreign body aspiration
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   also influenza, adenovirus
3. Epiglottitis
   - Haemophilis influenza type B
4. Mycoplasma pneumonia

Chronic
1. Asthma
   - cough as presenting symptom
2. Bronchopulmonary dysplasia
3. Epiglottitis
   - Haemophilis influenza type B
4. Mycoplasma pneumonia
### Bronchopulmonary Dysplasia

Risk factors:
- Very low birth weight infants (<1500 gms)
- Prolonged mechanical ventilation

Diagnosis made by gestational age at birth (+/- 32 wks) and whether or not O2 was needed for more than 28 days

Improvements in outcome by treatment with surfactants, maternal glucocorticoid treatment and less aggressive mechanical ventilation

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#### Chronic or recurrent

1. Asthma
2. Bronchopulmonary dysplasia
3. Other structural abnormalities
   - tracheal stenosis/web
   - tumors/lymphadenopathy
   - cardiomegaly
4. Acid reflux +/- aspiration
5. Cystic fibrosis
6. Pulmonary edema
Other causes of wheezing in adults

Upper airway obstruction
- Severe nasal congestion
- Hypertrophied tonsils
- Tumors/masses
- Laryngeal edema
- Obesidad

Below the vocal cords
- Tracheobronchomalacia
- Tumors/masses
- Intrathoracic goiter
- COPD
- Pulmonary edema
- Pulmonary embolism
- Congestive heart failure
- Bronchiectasis
- Carcinoid

Vocal Cord Dysfunction

Vocal Cord Function

Dysfunction can occur while breathing in or out
Causes of Vocal Cord Dysfunction (VCD)

- Acid reflux
- Strong odors or perfumes
- Tobacco smoke
- Strong emotions or stress
- Exercise
- URI/post nasal drip
- Dry powder inhalers

Symptoms of VCD

- Difficulty getting air in or out of the lungs
- Tightness in the throat or chest
- Feeling of choking or suffocation
- Frequent cough/clearing of throat
- Wheezing from throat
- Hoarse voice

Diagnosis of VCD

- Gold standard – laryngoscopy
- Exam: where is the wheeze the loudest?
  - neck vs. lungs
- Spirometry – truncation of inspiratory flow loop

nature.com/nrgastro/journal
ATS Web site on VCD
www.thoracic.com
www.utmb.edu
Treatment of VCD

• Treat triggers
  – GERD, post nasal drip, cough, smoking cessation

• Breathing exercises to control vocal cords
  – Referral to speech therapist experienced in VCD

• Switch from dry powder inhaler (DPI) to HFA with spacer

Other causes of wheezing in adults

Upper airway obstruction
- Severe nasal congestion
- Hypertrophied tonsils
- Tumors/masses
- Laryngeal edema
- Obesity
- Vocal cord dysfunction

Below the vocal cords

Tracheobronchomalacia
Tumors/masses
- Intrathoracic goiter
- COPD
- Pulmonary edema
- Pulmonary embolism
- Congestive heart failure
- Bronchiectasis
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Tracheobronchomalacia
Narrowing of the trachea and one of both main stem bronchus during expiration

Risk Factors:
Congenital - mucopolychondritis
Acquired
- intubation (cuff pressure/steroids)
- chest trauma
- pressure from mass such as benign mediastinal goiter
Other causes of wheezing in adults

Upper airway obstruction
- Severe nasal congestion
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Below the vocal cords
- Tracheobronchomalacia
- Tumors/masses
- Intrathoracic goiter

COPOD
- Pulmonary edema
- Pulmonary embolism
- Congestive heart failure
- Bronchiectasis
- Carcinoid

Lower airway causes of wheezing (#1)

- COPD
  - Smoking history
  - FH of emphysema (alpha-1 anti-trypsin deficiency)
- Pulmonary edema (non-cardiogenic)
  - Viral infections
  - Pulmonary embolism
  - Salicylate toxicity
  - Neurogenic (acute central nervous system event)
- Pulmonary embolism
  - History and high index for suspicion

Lower airway causes of wheezing (#2)

- Congestive heart failure
  - Past medical history and HPI
- Bronchiectasis (high resolution CT chest)
  - Autoimmune disease
  - Immunodeficiency
  - Occupational exposures (hypersensitivity pneumonitis)
- Carcinoid
  - Tumors can secrete histamine
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Case #1

A 32-year old man who works in an auto parts manufacturing plant has a 2 month history of dyspnea, cough and episodic wheezing. Two months earlier, he reported acute onset of epistaxis, cough and wheezing within minutes of accidentally inhaling a toxic level of chemical fumes (sulfur dioxide).

Physical exam was normal (no acute wheezing)

Spirometry: FEV1 90%, FVC 94%, FEV1/FVC 82%, FEF 25-75% 57%

Case #1

Which testing would you do?
A. Peak flow monitoring
B. Repeat challenge to sulfur dioxide
C. Methacholine challenge
Case #2

A 3 year old boy has a history of nocturnal cough and wheezing associated with viral URIs. He has had 3-4 episodes a year. Nebulized albuterol has improved his symptoms. He was admitted twice to the hospital twice for bronchiolitis and once for pneumonia.

Both of his parents have hayfever, his mother also has asthma and eczema. She smoked during her pregnancy and has been unable to quit.

What is his diagnosis?
A. Severe combined immune deficiency
B. Acid reflux
C. Asthma

Case #3

A 16 year old girl has a history of acute difficulty breathing when she plays soccer or basketball. Her symptoms include rapid breathing, loud inspiratory wheezing, throat tightness, voice changes and mild substernal pain. Pre-treatment with albuterol provides minimal relief.

Her symptoms begin and resolve abruptly.
Case #3
What treatment is recommended?
A. Stop participating in sports  
B. Breathing exercises to relax vocal cords  
C. Pre-treatment with albuterol

Case #4
A 36 year old female is 4 weeks out from the projected delivery date of her first child. She started to experience mild dyspnea with wheezing midway through her first trimester, which resulted in cessation of her exercise program. Her dyspnea very recently progressed to the point that it is difficult for her to climb a set of stairs; her ankles have noticeable swelling.

Her PMH is significant for childhood asthma which resolved in middle school.

Case #4
What is in the differential for her dyspnea at the various stages of her pregnancy?
A. First Trimester (Asthma or Dilated Cardiomyopathy)  
B. Near Term (Asthma or Dilated Cardiomyopathy)

Asthma during the first trimester, Rule of thirds. 1/3 of women with asthma improve, 1/3 stay the same, and 1/3 have exacerbation of symptoms. O2 sat can drop with a 6 minute walk; inhalers may help, but if the asthma is severe, they may need to wear oxygen or limit their heart rate.

In the last month of pregnancy, dilated cardiomyopathy is a rare cause of severe dyspnea. Impairment of left ventricular systolic function can be demonstrated by ECHO.
Case #5

A 42 year old male with a history of recurrent sinopulmonary infections presents with gradually increasing wheezing and dyspnea. As a child, he was hospitalized twice with pneumonia. The second time he had pneumonia, cultures were positive for Streptococcus pneumonia. As an adult, he has been treated with antibiotics 3-4 time a year, primarily for sinus infections, but pneumonia has been confirmed by chest x-ray twice.

During a recent health screening at work, a comprehensive metabolic panel drawn. Labs he brought in with him show a protein level of 6 and an albumin of 4.2.

FH is significant for uncle that died in his early childhood of an unknown cause. His father also has recurrent sinus infections; his mother and sisters have always been healthy.

What is the likely diagnosis?
A. X-linked hypogammaglobulinemia
B. Asthma
C. COPD with alpha-1 antitrypsin deficiency

X-linked hypogammaglobulinemia with bronchiectasis.

Questions?