Severe Intractable Asthma

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Lecture Objectives
1. Define asthma and severe asthma in children.
2. Identify alternate diagnoses and co-morbid conditions that complicate asthma
3. Review unusual presentations of asthma in children

Case #1
• GM comes in with 2 months of trouble breathing with exercise
• No PMH, born Full term. Runs track and plays lacrosse competitively.
• 2 months ago had one episode of hemoptysis and then noticed cough and chest pain with any activity. Albuterol did not help.
• Physical Exam revealed RUL crackles and PFTs showed consistent notching in the expiratory loop. NO albuterol response

What is asthma in children?

Diagnosing Asthma
• RECURRENT cough, wheeze, chest tightness that
• REVERSIBLE (at least partially) to a bronchodilator (inhaled medicine like albuterol)
• REACTIVE Symptoms often have specific triggers like exercise ****
• Rule out other causes
Asthma is the most common chronic disease of childhood.

Classic pediatric asthma phenotype:
- Allergic (80-90%)
- Eosinophilic inflammation
- Albuterol response and improvement with inhaled or oral glucocorticoids

Asthma is a complicated inflammatory disease (NAEPP 2007).

Asthma is the most common chronic disease leading to hospitalization in kids.

Bronchoconstriction:
Before
10 Minutes After Allergen Challenge
Asthma Treatment: Stepwise Approach

Case #1 diagnosis?

Remember all that wheezes is not Asthma

Upper/Central Airways
- Allergic rhinitis and/or sinusitis
- Foreign body
- Vascular ring or sling
- Laryngo/tracheo/bronchomalacia
- Vocal Cord Dysfunction
- Airway mass

Lower Airways
- Bronchiolitis
- Cystic fibrosis
- Bronchopulmonary dysplasia
- Heart disease
- Aspiration/GER*
- Asthma

The physical is important if it is positive
- It could be asthma if
  - The child wheezes
  - The child has a clear lung exam
- Think of other things with
  - Crackles
  - Clubbing
  - FTT
  - Oxygen Requirement

Bronchial Carcinoid Tumor

What is severe asthma in children?
Case #2

- YD is a 9 yo African American girl with severe persistent asthma who also has seasonal allergies.
- She is on high dose combination therapy (budesonide-formoterol 160/5).
- She limits her activity daily and has nighttime cough every night. She has had prednisone every other month for the last 2 years.
- Her cough is barking and albuterol does not always help.
- Physical Exam: normal except for allergic stigmata.
- PFTs: reversible airway obstruction.

WHO definition

“Severe asthma is defined by...frequent severe exacerbations and/or adverse reactions to medications and/or chronic morbidity.”


WHO definition

- Untreated severe asthma
- Difficult to treat asthma
- Treatment resistant severe asthma (Intractable)
  Either controlled on high dose medication or not controlled on high dose medication.

Airway inflammation in severe asthma

- Variable
- Eosinophillic is the most common
- They do not have evidence of Th-2 cytokines such as IL-4, IL-5, IL-13 in their airway lavage fluid.
- Mostly affects small airways.

Asthma Patient

Evaluation

History

Pulmonary Function

Guideline Directed Treatment for 3 months

Control achieved

Not controlled

Evaluate for... alternate diagnosis, co-morbidities, poor adherence

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Severe Intractable Asthma
Asthma comorbidities

Common Features of Severe Asthma in Children

- Allergen sensitization
- Viral respiratory infection triggers
- Irritants: air pollution, smoking, etc.
- Poor response to corticosteroids
- Treatment side effects
- >50% Poor medication adherence or technique

Case #2

- YD was evaluated for airway obstruction given her barking cough and severe exacerbations

Treatment

- Referral to an asthma specialist
- Treat co-morbidities, poor adherence
- For severe asthma:
  - Consider adjunct therapies:
    - Long Acting Beta Agonists
    - Ipratropium
    - Immunomodulators
  - With impending respiratory failure
    - IV magnesium
    - Heliox
    - Noninvasive Ventilation
    - Terbutaline?

Case #2

- Airway clearance
- Tiotropium bromide to stabilize her airways and decrease albuterol use
- Consider a biologic agent

Unexpected Presentation and anesthesia and asthma
Case #3
• 16 mo x 28 weeker with a history of chronic lung disease of prematurity and asthma presents with a femur fracture and a cold
• Admitted overnight for spica cast placement in the morning
• Overnight, she developed increased work of breathing and oxygen requirement up to 1 liter
• At induction, she had hypoxemia, wheeze, and retractions

Anesthesia Risk and respiratory disease
• Children with chronic inflammatory disease of the lungs such as asthma are at risk for
  • Bronchospasm and other perioperative respiratory adverse events
  • Desaturation or poor gas exchange
  • VQ mismatch
  • Hyperinflation
• Increased risk for postoperative bronchospasm

Anesthesia Risk and respiratory disease with illness
• Children with respiratory symptoms are at further INCREASED risk for perioperative respiratory adverse events
  • Respiratory symptoms within 2 weeks of surgery double the risk of PRAE
  • History of asthma or wheeze was also associated with increased risk (RR 8.46 CI 6.18-11.59)

Preventing respiratory complications in asthma
• Children with well controlled respiratory symptoms are at DECREASED risk for perioperative respiratory adverse events
• Improving control:
  • Emphasize adherence to inhaled steroids for the 4 weeks before anesthesia
  • Consider oral steroids (prednisone 2/mg/kg/day up to 80mg/day)

Intraoperative considerations
• Consider hydrocortisone intraoperatively for children on oral steroids within 2 weeks - 6 months of general anesthesia or who are on high dose inhaled steroids
• 2007 NHLBI guidelines: “100 mg hydrocortisone every 8 hours intravenously during the surgical period and reduce the dose rapidly within 24 hours after surgery. Stress doses of corticosteroids may be considered for select patients treated with prior high-dose ICS therapy as well, because clinically important adrenal suppression has been reported in such patients, particularly children (Todd et al. 2002a, b)”
Summary

- Asthma is a chronic inflammatory disease with recurrent symptoms
- Severe Intractable asthma is diagnosed in patients who have poor control despite maximal therapy
- The diagnosis of asthma must include a review of alternate diagnoses including airway anomalies
- Children with asthma are at increased risk for complications of anesthesia

Thank You

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