CLINICAL ASPECTS OF PEDIATRIC ASTHMA

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ASTHMA DEMOGRAPHICS

Affects > 26 million Americans

Affects 6 million children < 18 years old</p>

1 in 13 people have asthma

1 in 12 children have asthma

♦ 3,615 people died from asthma in the U.S.

10 Americans die from asthma every day

AAFA.org (2018) and CDC.Gov (2018)

ASTHMA DEMOGRAPHICS

Adults die 4x more frequently than children Women > men and boys > girls African-Americans: Higher risk of death ♦ 2008 to 2013: \$81.9 billion dollars/year Leading chronic disease in children Top reason for missed school days

◆ AAFA.org (2018) and CDC.Gov (2018)

MAIN QUESTION

Doctor: "I want to know if my child has asthma"

WHAT IS ASTHMA?

Asthma is an heterogeneous disease characterized by chronic airway inflammation

Symptoms: wheeze, shortness of breath, chest tightness and cough that vary in time and intensity

Variable expiratory airflow limitation

Global Initiative for Asthma (2015)

IMMUNOLOGICAL ASPECTS OF ASTHMA



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CLINICAL ASPECTS OF ASTHMA



Atlas of Pediatric Physical Diagnosis, 1987

VARIABLE AIRFLOW LIMITATION



https://commons.wikimedia.org/w/index.php?title= User:Evgenios Metaxas MD MSc, Pulmonologist MD_MS

RADIOLOGICAL ASPECTS OF ASTHMA



Atlas of Pediatric Physical Diagnosis, 1987

HOW DO YOU DIAGNOSE ASTHMA?

- Pediatric asthma can be hard to diagnose and challenging to treat
- The diagnosis of asthma is clinical
- There is no specific test for asthma



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HISTORY OF PRESENT ILLNESS

- Cough, wheezing, chest tightness and difficulty in breathing.
- Most common: cough and wheezing

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HISTORY OF PRESENT ILLNESS - COUGH

- Asthma: More common cause of chronic cough in children > 3 years old
- Asthma can present just with cough
- Investigate the patterns of cough: nocturnal, seasonal, etc.
- Asthma is frequently misdiagnosed or not suspected

HISTORY OF PRESENT ILLNESS - COUGH

- 80% of asthma children: symptomatic before age 5
- Asthma is frequently misdiagnosed



Ryanboren: Chase coughing. Flicker.com

HISTORY OF PRESENT ILLNESS - WHEEZING

Hallmark of asthma

Inspiratory and expiratory: polyphonic

Central Obstruction: expiratory, monophonic: tracheomalasia

 Vocal cord dysfunction: inspiratory and monophonic (Stridor)

Early onset: intermittent. Viruses

Late onset: more persistant. Atopy

HX OF PRESENT ILLNESS ASTHMA PATTERNS

Intermittent exacerbations

Seasonal patterns

 Aggravating factors: smoke, construction, irritants, URIs, GERD, rhinits, medicines



Asthmatrigger.PNGwikimedia 7mike5000

HX OF PRESENT ILLNESS VIRAL INFECTIONS

- URIs: Most important aggravating factors
- Rhinovirus, Influenza, and RSV.
- Also: Mycoplasma, Chlamydia.
- Chronic sinusitis





HX OF PRESENT ILLNESS VIRAL INFECTIONS



Pediatr Infect Dis J 2005; 24(11): S217-22.

HX OF PRESENT ILLNESS EXERCISE

Occurs in up to 90% of children with asthma



HX OF PRESENT ILLNESS WEATHER

Cold Air
Hot, humid days
Thunderstorms
Winds



HX OF PRESENT ILLNESS CIGARETTE SMOKE

Most common environmental risk factor for the development and progression of asthma in children

Smoking outdoors is better than indoors exposure



HX OF PRESENT ILLNESS ALLERGENS

- House dust mites Common asthma triggers
- Cockroaches
- Rodents
- Pets
- Pollens









Pet dander



HX OF PRESENT ILLNESS IRRITANTS

Nitrogen dioxide

Perfumes

Propellants from sprays

Paint

Room deodorizers
Cleaning products
Diesel particles



HX OF PRESENT ILLNESS STRESS





ADDITIONAL ASPECTS OF THE CLINICAL HISTORY

- Atopic diseases: atopic eczema, rhinitis
- Food allergy
- Nasal polyposis
- Neonatal course
- Obesity
- Medications

- Tobacco smoke
- Wood burning
- Ventilation systems
- Animals
- Bedroom
- Water leaks

ATOPIC ECZEMA

80% of children with atopic dermatitis develop asthma and or allergic rhinitis later on in life.



Atopic dermatitis child.JPGwikimediacommons

ATOPIC ECZEMA



David Weldom, M.D. Texas A & M University, BSC

ALLERGIC RHINITIS

50% of people with AR have asthma
Most patient with asthma, have rhinitis
Risk factor for asthma



Atlas of Pediatric Physical Diagnosis, 1987

OBESITY

- Prevalence of obesity and asthma is increasing in the world
- Early Onset: Atopic
- ♦ Late Onset: Non-atopic
- Asthma is severe
- Less responsive to inhaled steroids
- Depression & sleep/apnea



MEDICATIONS

- Aadherence: < 60% in some studies</p>
- Drug efficacy
- Drug delivery systems
- Response to treatment



PAST MEDICAL HISTORY

Prematurity

Developmental delay

Failure to thrive

Recurrent infections

♦ GERD

Hospitalizations

Emergency room visits

DISEASES THAT MIMICK ASTHMA

♦ Sinusitis

- Bronchiolitis
- Foreing Body
- Vocal cord dysfunction
- Vascular ring
- Laryngotracheomalacia

- Cytic fibrosis
- ♦ BPD
- Heart disease
- Bronchiectasis
- ◆ T-E Fistula
- Habitual cough
- ♦ GERD/aspiration

FAMILY HISTORY

- Over 100 genes associated with asthma
- 1 Parent: risk is 25%
- 2 Parents: risk is 50%



Thomsen SF. Eur Clin Respir J. 2015; 2: 10.3402/ecrj.v2.24643

ENVIRONMENT

- Wood burning
- Stoves
- Ventilation systems
- Animals, leaks & mold
- Patient's bedroom
- Smoke exposure



PHYSICAL ACTIVITIES

Most children with asthma can have symptoms brought on haveby intensive activity



PHYSICAL EXAM

 Betweend episodes, exam is usually normal

Barrel chest

- Wheezing, rales, ronchi
- Decrease inspiratory phase

Use of accesory muscles



Dr. Meyer B.Marks: Atlas of Pediatric Physical Diagnosis, 1987

PHYSICAL EXAM

Signs of rhinitis ♦ Nasal Crease ♦ Eczema Clubbing Cyanosis Signs of developmental delay

Malnutrition

Cough

Fever

Lethargy

♦ Fatigue

Angioedema

Conjunctivitis

DIAGNOSIS OF ASTHMA

- History of intermittent chronic symptoms of asthma: cough and wheezing
- >10% increase of predicted FEV1 after inhalation of SABA
- Presence of other atopic diseases or family history of atopy
- Absence of other diseases

USEFUL TESTS FOR ASTHMA - SPIROMETRY

Demonstration of reversible airflow obstruction establishes the diagnosis of asthma

FEV1 <80%; FEV1/FVC <85%; FEF25-75% <65%</p>



USEFUL TESTS FOR ASTHMA - PEAKFLOW

- Measurements are variable
- Effort dependent
- Variability in reference values
- Variability in values from brand to brand



USEFUL TESTS FOR ASTHMA – ALLERGY TESTS

Demonstrates the presence of atopy

Must be supported by clinical history

Food allergy test is not helpful unless there is GI symptoms, eczema or urticaria



USEFUL TESTS FOR ASTHMA – IMAGING

 Useful in children who do not respond to initial therapy

Can help with other causes of wheezing: aortic arch, pneumonia, atelectasis, cystic fibrosis, etc.



Kendig's Disorders of the Respiratory Tract in Children. Chernick 1990

USEFUL TESTS FOR ASTHMA SWEAT CHLORIDE TEST

- When cystic fibrosis is suspected:
- Foul smelling stools
- Recurrent pneumonia
- Evidence of malabsorption
- ♦ Failure to thrive



Bruce Blaus. Blausen.com staff (2014)

ADDITIONAL TESTS FOR ASTHMA

Sputum analysis Barium Swallow CBC with differential Total Immunoglobulins ABPA panel Methacholine Test. Nitric Oxide

DIAGNOSIS OF ASTHMA IN CHILDREN

Asthma



Martinez. J Allergy Clin Immunol 1999;104:S169-S174.

DIAGNOSIS OF ASTHMA IN CHILDREN

Asthma Predictive Index

History of greater than 4 wheezing episodes in one year (one - physician documented) PLUS

OR

- One major criteria:
 - Parent with asthma
 - Atopic dermatitis
 - Aeroallergen sensitivity
 - > 1 aeroallergen

- Two minor criteria:
 - Food sensitivity (milk, egg or peanuts)
 - Peripheral eosinophilia > 4%
 - Wheezing not related to viral URIs

If +, then 65% likelihood of developing asthma

If -, then 95% likelihood of NOT developing asthma

Guilbert TW et al J Allergy Clin Immunol 2004; 114: 1282-7

David Weldom, M.D. Texas A & M University, BSC

CASE # 1, Maria, a 3.5 y.o. girl

History

- Maria had onset recurrent cough and labored respirations at about 7 months of age
- ♦ Typical course: rhinorrhea →cough →respiratory distress & wheezing primarily September to March
- 5 acute care visits past year for respiratory symptoms; 1 hospitalization
- Dx pneumonia 3 times
- Rx: IM & oral antibiotics repeatedly, budesonide aerosol 2 times daily, montelukast given daily, 3 four day courses of prednisolone
- Asymptomatic between episodes

CASE # 1, Maria, PB, 3.5 y.o.girl

Evaluation

- You are seeing Maria for the first time during the summer when she's been well with no symptoms for the past month
- Normal PE and oximetry
- Review of outside chest x-rays from 3 episodes including hospitalization – peribronchial thickening, no parenchymal infiltrates
- Allergy skin testing: no specific IgE to common inhalant allergens.

Audience Evaluation

What's the diagnosis?

What treatment should be considered?

Take Home Points about Maria

- Symptoms are consistent with an asthma phenotype characterized by recurrent VRI induced lower airway inflammation (cough, wheezing, dyspnea) without chronicity
- Treatment with maintenance inhaled corticosteroids of little or no benefit (McKean M, Ducharme F. Inhaled steroids for episodic viral wheeze of childhood. Cochrane Database Syst. Rev. 2000;(2):CD001107)
- Oral corticosteroids effective for acute episodes; if given early, emergency care and hospitalizations potentially avoided

CASE # 2, Lucy, 4.3 y.o. girl History

- Lucy had atopic eczema beginning at 3 months of age
- Onset recurrent cough and labored respirations at 1.9 years of age in May
- 6 acute care visits the past year, about every 2 months
- Chronic rhinorrhea, worse seasonally with sneezing and conjunctivitis
- Episodic coughing at night
- Daily labored breathing with exertion
- Lucy wants to play sports but activity is limited by cough & dyspnea
- Improves with albuterol & prednisolone

CASE # 2, Lucy, 4.3 y.o. girl Evaluation

Lucy's PE Normal except for:

- Nasal stuffiness
- Eczematous lesions in flexural creases and crusted areas on malar surfaces

Oximetry 93%

- Outside x-ray reports reviewed: 10/17/06 "interstitial infiltrates"; 7/2/07 "interstitial prominence"
- Allergy skin testing: Allergen specific IgE for molds, including Alternaria, and multiple pollens

Audience Evaluation

What's the diagnosis?
 What treatment should be considered?

Take Home Points about Lucy

- Classic atopic triad (atopic eczema, allergic rhinitis, allergic asthma)
- Allergic asthma causing persistent symptoms
- Inhaled corticosteroid for maintenance
- Inhaled albuterol/salbutamol for acute symptom relief
- Oral corticosteroid for acute exacerbation
- Allergen identification and environmental amelioration if possible

MERRY CHRISTMAS

