

Childhood asthma

learning objectives

1-when to diagnose asthma and what are their trigger factors

2-Identifying common presentations of asthmatic child

3-Relevant findings of Pulmonary function tests and other diagnostic tools

4-Emergency management of acute asthma exacerbation and long term asthma control

5 -family counseling about asthma preventive measures ,controller medications and devices

Asthma is a chronic inflammatory disorder of the lung airways resulting in episodic airflow obstruction presented as recurrent wheeze ,cough, chest tightness and dyspnea .

Epidemiology

Asthma Patterns in Childhood

Transient nonatopy wheezing

Common in early preschool years

Recurrent cough/wheeze, primarily triggered by common respiratory viral infections

Usually resolves during the preschool and lower school years without increased risk for asthma in later life

Persistent atopy associated asthma

Begins in early preschool years , associated with atopy in early preschool years

- Clinical (e.g., atopic dermatitis in infancy, allergic rhinitis, food Allergy))

- Biologic (e.g., early inhalant allergen sensitization, increased serum immunoglobulin E, increased blood eosinophils(

- Highest risk for persistence into later childhood and adulthood

Lung function abnormalities:

- Those with onset before 3 yr of age acquire reduced airflow by school age

- Those with later onset of symptoms, or with later onset of allergen sensitization, are less likely to experience airflow limitation in childhood

Asthma with declining lung function

Children with asthma with progressive increase in airflow limitation

Associated with hyperinflation in childhood, male gender

Etiology

A-genetic -asthma has been linked with gene loci containing proallergic, proinflammatory genes e.g IL4 gene cluster on chromosome 5

B-Environmental:

-as viral infections of the respiratory tract such as respiratory syncytial virus(RSV)

-allergic exposures in sensitized

Early childhood risk factors for persistent asthma

Parental asthma

Allergy:

- Atopic dermatitis (eczema)
- Allergic rhinitis
- Food allergy
- Inhalant allergen sensitization
- Food allergen sensitization

Severe lower respiratory tract infection:

- Pneumonia
- Bronchiolitis requiring hospitalization

Wheezing apart from colds

Male gender

Low birthweight

Environmental tobacco smoke exposure

Reduced lung function at birth

Pathogenesis

1-airways obstruction is the result of bronchoconstriction

2-increase mucus production and edema formation

3-airways inflammation

4-Basement membrane thickening

clinical manifestations

-chronic symptoms are key aspect of asthma

-intermittent dry coughing and/or expiratory wheezing are the most common chronic symptoms of asthma, chest tightness and breathlessness reported by older children

-Respiratory symptoms are characteristically worse at night, asthma symptoms are typically provoked by numerous events or exposure as

1-common viral infections of respiratory tract

2-aerallergens in sensitized asthmatics

 animal dander, indoor allergens (dust mites, cockroaches, molds)

3-seasonal aeroallergens : pollens (trees, grasses, weeds) , seasonal molds

4-environmental tobacco smoke

- 5- air pollutants(ozone,sulfer dioxide) dust endotoxin, mycotoxins ,wood or coal-burning smoke
- 6-strong or noxious odors or fumes (perfume,hair sprays, fumes)
- 7-occupational exposures (farm and barn exposure ,formaldehydes,paint fumes, cedar)
- 8-cold air, dry air 9-exercise 10-crying ,laughing, hyperventilation
- 11-co-morbid conditions (rhinitis,sinusitis,gastroesophageal reflux
- 12-Drugs (Aspirin, nonsteroidal antiinflammatory drugs- β -Blocking agents

Examination

- 1-Chest exam may be normal
 - 2-Expiratory high pitched polyphonic wheezing
 - 3-Identifying co-morbid conditions (e.g allergic rhinoconjunctivitis, rhinosinusitis,atopic dermatitis)
 - 4-During exacerbations there is prolong expiratory phase and wheeze also decrease breath sound and segmental crackles or rales due to atelectasis
- In severe exacerbations there is signs of respiratory distress as nasal flaring,suprasternal and intercostal retractions and usage of accessory respiratory muscles also inspiratory and expiratory wheeze.

Differential diagnosis

- 1-Viral bronchiolitis 2-GOR 3-foreign body aspiration
- 4-congestive heart failure 5-cystic fibrosis

Diagnosis

1-history and physical examination

2-pulmonary function test

this study is typically feasible in children older than 6 yr age.

4-Bronhprovocation challenges as exercise challenge e.g running for 6-8 min can also identify the child with exercise induced bronchospasm, FEV1 typically decrease during and after exercise by more than 15%

5-peak expiratory flow (PEF)monitoring

PEF morning to evening variation greater than 20% consistent with asthma

Lung Function Abnormalities in Asthma

Spirometry (in clinic)
Airflow limitation
Low FEV1 (relative to percentage of predicted norms)
FEV1/FVC ratio <0.80
Bronchodilator response (to inhaled β -agonist)
Improvement in FEV1 $\geq 12\%$ or ≥ 200 mL ^[*]
Exercise challenge

Worsening in FEV1 $\geq 15\%$ ^[*]
Daily peak flow or FEV 1 monitoring: day to day and/or AM-to-PM variation $\geq 20\%$ ^[*]

FEV₁, forced expiratory volume in 1 sec; FVC, forced vital capacity

Radiology

a-may be normal b-hyperinflated chest c-detection of complications as atelectasis, pneumothorax or emphysema d-for other diagnosis

treatment Goals of childhood asthma treatment

A-regular assessment and

B-control of factors contributing to asthma severity

1-eliminate or reduce environmental exposures as dust mites or tobacco smoke

2-treatment of co-morbid conditions (rhinitis, sinusitis, gastroesophageal reflux)

C-patient education

D-asthma pharmacotherapy

Classification of asthma severity

Assessing Asthma Severity

COMPONENTS OF SEVERITY	Intermittent	Mild PERSISTENT	Moderate PERSISTENT	Severe PERSISTENT
Daytime symptoms	< 2 days/wk	>2 days/wk but not daily	daily	Daily Throughout the day
Nighttime awakenings	<2/ mo ^x	3-4/ mo	>1 wk but not nightly	Often 7 ^x /wk
Short-acting β_2 -agonist use	2 days/wk .	>2 days/wk but not daily	Daily	Several times per day
Interference with normal activity	None	Minor limitation	Some limitation	Extreme limitation
:Lung function FEV1 % predicted,	Normal FEV1 between exacerbations ≥ 80	≥ 80 . predicted	60-80% predicted	<60% predicted
FEV1:FVC ratio	>85%	>80%	75-80%	<75%

Quick relief medications

1-Inhaled short acting B-agonist e.g albuterol and terbutaline

2-Inhaled anticholinergic agent e.g ipratropium bromide

3-prednisolone orally or methylprednisolone injection

these drugs are indicated in acute exacerbation to hasten recovery and prevent recurrent symptoms

Long term control medications

Use for treatment of persistent asthma as

1-nonsteroidal anti-inflammatory agents (cromolyn and nedocromil)

2-inhaled glucocorticoids as beclomethasone, budesonide, triamcinolone, largely use in treatment of asthma. side effects of glucocorticoids

1-oral candidiasis (thrush) 2-dysphonia (hoarse voice) 3-growth suppression

3-sustained release theophylline

4-long acting inhaled B-agonist example salmeterol and formoterol have more duration of effect at least 12 hrs

5-leukotriene modifying agents as

leukotriene synthesis inhibitors as zileuton (not use below 12 yr age)

leukotriene receptors antagonists e.g zafirlukast and montelukast

long term treatment

in all types of asthma severity in acute attack use quick relief medication as short acting B-agonist as needed, for long term medications control as below

A-mild intermittent asthma: no daily medication is needed

B-mild persistent once daily anti-inflammatory agents as low dose inhaled glucocorticoid, cromolyn or leukotriene modifier or slow release theophylline as alternative

C-moderate persistent asthma : once daily medium dose inhaled steroid or low dose inhaled steroid with slow release theophylline, or low dose inhaled steroid with long acting B-agonist

D-severe persistent asthma: daily medications high dose inhaled steroid plus long acting B-agonist plus leukotriene modifier

acute exacerbation management

asthma exacerbation are acute or subacute episodes of progressively worsening symptoms associated with expiratory airflow obstruction, it is classified into 1-home management of exacerbation 2-emergency and hospital management

1-home management

immediate treatment with medications start inhaled short acting B-agonist up to three times /hr a good response is resolution of symptoms within an hr

if the child have an incomplet response to initial treatment (persist symptoms or PEF of 60-80% of predicted ,give short course of oral glucocorticoid e.g prednisone 1 mg/kg/24 hr for 4 days in addition to inhaled B-agonist , further deterioration or presence of risk factors for asthma morbidity and mortality so give

emergency department and hospital treatment

1-close monitoring of clinical status

2-supplemental oxygen

3-inhaled short-acting B-agonist every 20 min for one hr

4- systemic glucocorticoid orally or I.V

5-inhaled ipratropium may be added to the B-agonist

6 -mechanical ventilation if impending respiratory failure occure

If the patient improve ,discharge on inhaled B-agonist and oral steroid .

Other adjvent therapies

1-I.V theophylline effective in severe life-threatening asthma

2-Heliox-inhaled heliox (70:30-helium:oxygen mixture)

3-I.V magnesium sulfate –smooth muscle relaxant ,

PROGNOSIS

Recurrent coughing and wheezing occurs in 35% of preschool-age children. Of these, approximately one-third continue to have persistent asthma into later childhood, and approximately two-thirds improve on their own through their teen years. Asthma severity by the ages of 7-10 yr is predictive of asthma persistence in adulthood. Children with moderate to severe asthma and with lower lung function measures are likely to have persistent asthma as adults. Children with milder asthma and normal lung function are likely to improve over time

Family Education

They should be taught how to use various spacer devices appropriately. It is important that they recognize the symptoms of asthma and know how and when to seek help. Many children are given dairy card to help them recognize symptoms and also have asthma card which gives them an individual treatment plan .for acute attacks

Education of the patients and parents involve following steps:

- Take medications correctly
- Correct technique to use nebulizers and spacers
- Understand the difference between quick relief and long term

medication

- Avoid triggers
- Monitor status by PEF induction
- Recognize signs that asthma is worsening and take action
- Seek medical help as appropriate.

Awareness of Psychological Factors as parental separation, child abuse

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