

Exercise Induced Asthma

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Introduction

- Common
- Troublesome
- Disorder of pulmonary system
- Frequently impairs athletic performance
- First described in second century A.D.

Epidemiology

- 12 - 15% general population experience EIA
- 40% of children at some stage of development
- 40% have h/o allergic rhinitis

Epidemiology (cont)

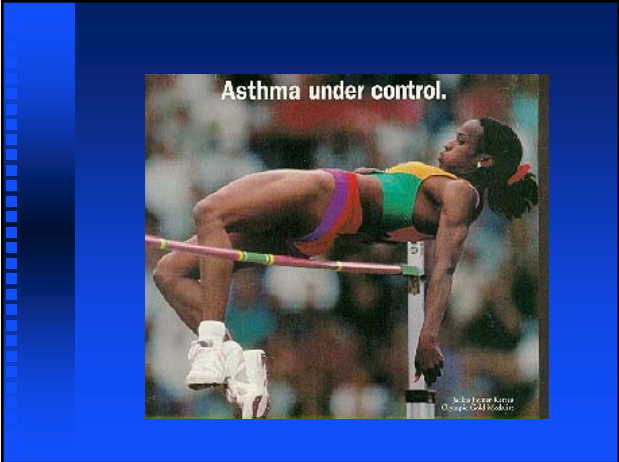
- 70 - 90% of asthmatics have EIA
- Occurs at any age
- Adults: Males = Females
- Children: M:F = 2:1
- Common enough that USOC routinely tests all athletes now

Performance Issues

- 1984 US Olympic Team:
 - ◆ 67/597 athletes had EIA
 - ◆ 32/67 were dx' d after qualifying
 - ◆ 41/67 won medals (15 gold, 21 silver, 5 bronze)

Performance Issues

- 1992 US Olympic Team:
 - ◆ Bob Kempainen (marathon)
 - ◆ Jan Klecker (marathon)
 - ◆ Jackie Joyner-Kersey (1988, 1992 Olympic gold medalist - heptathlon)



Clinical Features

- Occurs after strenuous exercise, and
- Follows near maximum (80%) exercise load \geq 5 minutes, and
- Athlete has difficulty breathing.
- Coughing, chest tightness, and/or wheezing

Pulmonary Function Criteria

- \geq 20% fall of FEV₁ from baseline after exercise
- \geq 35% fall of forced expiratory flow, FEF₂₅₋₇₅
- \geq 10% fall of peak expiratory flow rate (PEFR)
- Functional reserve capacity increased
- Normal subjects: $<$ 10% fall in FEV₁

Grades of Severity

- Mild: 15 - 20 % decrease in FEV₁
- Moderate: 20 - 40% decrease in FEV₁
- Severe: > 40% decrease in FEV₁

Factors

- Exercise
- Environment
- Fatigue
- Stresses
- Overtraining

Types of Exercise

- Induce EIA
 - ◆ Running
 - ◆ Cycling
 - ◆ Playing offense in team sports
 - ◆ Cross-country skiing

Types of Exercise (cont)

- Reduce EIA
 - ◆ Kayaking, swimming
 - ◆ Aerobics, dancing
 - ◆ Volleyball, baseball
 - ◆ Downhill skiing
 - ◆ Playing goalie in soccer
 - ◆ Playing defense in team sport

Duration of Exercise

- Maximum fall of PFTs occurs after 5-8 minutes
- However over extended activity, further increase is not noted
- Degree of Stress from Exercise
 - ◆ Very strenuous: more likely to induce EIA
 - ◆ Less strenuous: less likely to induce EIA

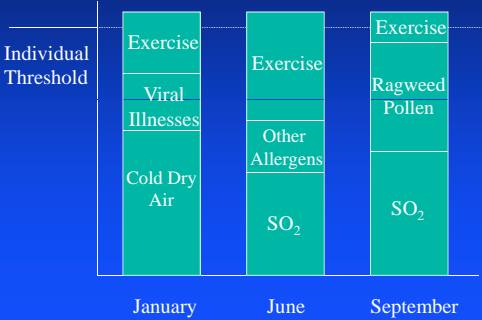
Environmental Factors

- Increase EIA:
 - ◆ Cold air
 - ◆ Dry air
 - ◆ Air pollution (sulfur dioxide, smoke)
 - ◆ Allergens
 - ◆ Viral infections

Environmental Factors (cont)

- Decrease EIA:
 - ◆ Warm air
 - ◆ Moist air
 - ◆ Humid air

Factors in Overcoming Thresholds



Other Factors

- Fatigue
- Emotional stress
- Athletic overtraining

Mechanism of EIA

- Current Theory
 - ◆ Mediators - released
 - ◆ Heat Exchange - with resultant heat loss
 - ◆ Osmolality - increased
 - ◆ Sympathetic response - Vagus nerve
 - ◆ Bronchospasm final result

Diagnosis

- Similar to acute asthma attack but shorter duration
- Vague dyspnea, chest tightness, chest pain
- "Out of Shape", wheezing, and fatigue
- Seen shortly after exercise

Diagnosis (cont)

- History of:
 - ◆ Bronchitis
 - ◆ Emphysema
 - ◆ Bronchopulmonary dysplasia
- Concurrent "allergies" or sinus disorders
- Exam: majority have no findings

Testing

- For general purposes peak flow meter adequate and least expensive
- Must sustain vigorous exercise
 - ◆ Treadmill, jogging, cycling, sprinting, stairs
 - ◆ For at least 5 minutes (usually 6 - 8)
 - ◆ Heart rate: 140bpm or 80% maximum

Testing (cont)

- PFTs (FEV₁, FEF₂₅₋₇₅, and PEFR) measured
- Baseline (before) and
- After exercise at 5, 10, 15 minute intervals

Equipment

- Simple (Breon) spirometer
- Cycloergometer: least asthmogenic
- Treadmill: more asthmogenic
- Free running: most asthmogenic

Meds to Avoid Before Studies

- Aerosols: beta agonists, anti-cholinergics for 6 hours
- Oral meds: theophylline, SR beta agonists for 24 hours
- Cromolyn sodium for 24 hours
- Antihistamine and decongestant avoidance preferred

Precautions

- Wait at least 3 hours between tests
- Test no more than twice in a day
- Bronchospasm may become difficult to reverse
- Be aware of patients with heart disease, seizures
- Use albuterol or terbutaline inhaler after testing to reverse (2-4 puffs)

Management Plan

- Follow general asthma management plan to control asthma.
- Determine the pre-exercise medication to prevent EIA.
- Set guidelines (based on peak flow readings) for participation.
- Have medication available to reverse EIA should it develop.

Management Plan

- Achieve and maintain satisfactory aerobic fitness.
- Understand techniques to minimize EIA.
- Should asthmatic reach national or international standards know banned drugs.

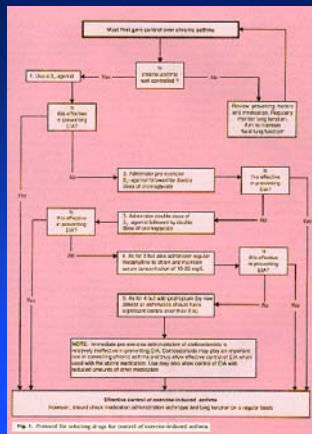


Fig. 3. Protocol for selecting drugs for control of exercise-induced asthma.

Pharmacologic Therapy

- Sympathomimetic amines (beta₂ agonists)
 - ◆ aerosols
 - 15 - 20 minutes before activity
 - ◆ oral meds (banned by IOC)
- Khellin derivatives (Intal)
- Methylxanthines (theophylline)
- Belladonna alkaloids (Atrovent)
- Glucocorticosteroids (banned by NCAA)

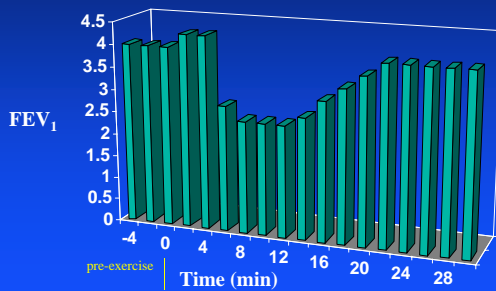
Non-pharmacologic Therapy

- Conditioning
- Short bursts of vigorous exercise
- Warming up
- Warming down
- Avoid hyperventilation
- Nasal breathing
- Wearing mask/scarf over nose and mouth

Refractory Period

- 30 - 120 min after episode of EIA
- Main reason to “work through” asthma by:
 - ◆ Slow, gradual warm-up
 - ◆ Stay below threshold
 - ◆ Stay in refractory period

Refractory Period (cont)



Late Phase Response

- Half of children and 40% of adults develop second episode
- Occurs 4 to 8 hours after exercise
- Related to inflammatory mediators
 - ◆ eosinophil chemotactic factor of anaphylaxis
 - ◆ platelet-activating factor
 - ◆ leukotrienes
- Avoid steroid preparations if evaluating for late phase

Late Phase Response

