Management of Asthma in the Athlete

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Management of Asthma in the Athletic Patient

- Definitions
- Epidemiology
- Pathogenesis
- Clinical features
- Diagnosis
- Prevention
Asthma Triggers

- Allergen exposure
- Respiratory infections
- Exercise
- Cold air
- Strong expressions of emotion (laughing, crying)
- Air pollution
- Cigarette smoke
- Household products
- Drugs / medications
- Pets
- Dust / dust mites

Asthma Triggers Important to the Adolescent and Active Patient

- Tobacco
- Allergens
- Exercise/sports
- Scuba diving
- Cave dwelling
- High altitude
- Travel
Definitions

- Asthma
- Exercise-induced asthma (EIA)
- Exercise-induced bronchospasm (EIB)
EIA Aggravants

- Continued exercise from 6–8 minutes at 80%–90% maximum heart rate
- Cold and/or dry weather
- Atopy
- Air pollution (e.g., ozone, nitrogen, sulfur dioxides)
- Poorly controlled asthma
Airflow During and After Exercise

- Athletic performance may significantly decline.
- Late-phase bronchospasm may occur 3–6 hours post-exercise.
Epidemiology of EIA / EIB

- Can occur at any age
- Most frequently seen in children and young adults
- 80%–90% of asthmatics have EIA
- 7%–10% of the general population have EIB
<table>
<thead>
<tr>
<th>Group</th>
<th>Prevalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asthmatics</td>
<td>90%</td>
</tr>
<tr>
<td>Allergic rhinitis</td>
<td>40%</td>
</tr>
<tr>
<td>General population</td>
<td>3%–13%</td>
</tr>
<tr>
<td>Competitive athletes</td>
<td>10%–20%</td>
</tr>
<tr>
<td>Cold weather athletes</td>
<td>Up to 50%</td>
</tr>
<tr>
<td>Army recruits</td>
<td>7%</td>
</tr>
</tbody>
</table>
EIB Screening in High School Athletes

- 238 varsity football players screened
  - 10% history of asthma
- 214 athletes
  - 13% African Americans (17/126)
  - 2% European Americans (2/82)
- Albuterol reversed bronchospasm
- Risk factors
  - Remote history of wheezing
  - Poverty area residence
  - High humidity

EIB Screening in High School Athletes

- 801 students screened
  - 46 known EIA / EIB
- 755 students
  - 45 identified EIA / EIB
- Overall incidence: 12%
  - 9% males
  - 16% females

EIB Screening in Professional Athletes

- 320 elite athletes screened
  - 74 identified to have EIB / EIA
  - 23% incidence
Factors Modifying Risk and Severity of EIB

- Ambient temperature/humidity
- Intensity/duration of exercise
- Air pollutants
- Underlying bronchial hyperreactivity
- Type of exercise
- Interval since last episode of EIB
Pathophysiology of EIB
Pathophysiology of EIB?

- Airway warming and cooling
- Increased pulmonary tissue osmolarity
- Rewarming of blood in airways
- Discharge of bronchospastic mediators secondary to airway irritation
- Vagal nerve stimulation
Typical Symptoms of EIB

- Wheezing
- Coughing
- Shortness of breath
- Chest tightness
Subtle Symptoms of EIB

- Uncomfortable breathing
- Feeling out of shape
- Palpitations
- Headache
- Stomach ache
- Inconsistent athletic performance

- Frequent colds
- Chest congestion
- Muscle cramps
- Lack of energy
- Exercise fatigue
- Short exercise periods well tolerated, long exercise periods poorly tolerated
High Asthmogenic Activities

- High minute ventilation activities
  - Long distance running
  - Cycling
  - Soccer
  - Basketball
  - Rugby

- Activities associated with cool, dry climates
  - Ice hockey
  - Ice skating
  - Speed skating
  - Cross-country skiing
Low Asthmogenic Activities

- Tennis
- Handball
- Racquetball
- Gymnastics
- Golf
- Karate
- Wrestling
- Boxing

- Sprinting
- Swimming
- Diving
- Football
- Baseball
- Downhill skiing
- Isometrics
- Water polo
Differential Diagnosis of EIB

- Poor conditioning
- Upper airway obstruction
- Tracheal syndromes
- Pulmonary embolism
- Anxiety
- Hyperventilation
- Anaphylaxis
- Spontaneous pneumothorax
- Restrictive lung disease
- Cardiac disease
- Disorders of muscle metabolism
Diagnosis of EIB

- History and physical examination
  - Do you have wheezing, coughing, or chest tightness with or following exercise?
  - Have you ever missed school or work because of these symptoms?
  - Do you have itchy eyes, hayfever, or allergic rhinitis?
  - Have you ever been told you have EIA?
Diagnosis of EIB (cont’d)

- Confirmed by ≥ 10% decline in PEFR or FEV₁ after an exercise challenge or hyperpnea challenge
- Test patients in their usual environments performing activities that produce symptoms
- EIB does not occur with every exercise session; definitive testing can be difficult
Surrogates for Exercise Testing

- Eucapneic voluntary hyperpnea
- Hyperosmolar aerosols (4.5 % saline)
- Dry powder mannitol

- Severity is based on FEV1 fall from baseline-
  - Mild – 10% to 25%
  - Moderate – 26% to 49%
  - Severe – 50% and greater
Factors Leading to a False Negative Diagnosis

- Insufficient provocation
  - Inadequate workload
  - Temperature of inspirate too high
- Medications that attenuate EIB
  - Antihistamines
  - Long-acting methylxanthines
  - $\beta_2$-agonists
  - Decongestants
Prevention of EIB / EIA

- Non-pharmacologic
- Pharmacologic
Prophylaxis of EIA

- Premedication
  - Inhaled beta agonists and/or cromolyn or nedocromil
- Warm up 10–15 minutes
- Interval or combination warmup exercise
  - Calisthenics with stretching exercise
  - Workout with objective of 50%–60% maximum heart rate for 5–10 minutes
  - Use beta-agonist if asthma develops and restart when clear
Prophylaxis of EIA (cont’d)

- Select sport knowing asthmogenic potential in terms of climatic conditions needed
- Breathe through the nose and provide adequate pharmacotherapy for underlying nasal conditions (i.e., allergy and environmental avoidance precautions); mask in cold weather
- Warm down by jogging and stretching for 10–15 minutes and avoid rapid warm to cold transition
- Low salt diet, fish oil, ascorbic acid
- Appropriate control of chronic asthma with anti-inflammatory medication
## Premedications

<table>
<thead>
<tr>
<th>Medications</th>
<th>Dose (puffs)</th>
<th>Pre-Exercise (minutes)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Beta&lt;sub&gt;2&lt;/sub&gt;-agonists</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SABA</td>
<td>2–4</td>
<td>15–30</td>
</tr>
<tr>
<td>Salmeterol MDI</td>
<td>2</td>
<td>30–60</td>
</tr>
<tr>
<td>Salmeterol DPI</td>
<td>1</td>
<td>30–60</td>
</tr>
<tr>
<td>FormoteroI DPI</td>
<td>1</td>
<td>15–30</td>
</tr>
<tr>
<td><strong>Mast cell stabilizers</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cromolyn</td>
<td>2–10</td>
<td>10–20</td>
</tr>
<tr>
<td>Nedocromil MDI</td>
<td>2–4</td>
<td>10–20</td>
</tr>
</tbody>
</table>
Daily Medications

- Patients with EIA who have chronic asthma
  - First choice – ICS and LABA
  - Alternate choices
    - ICS and LTM
    - LTM and LABA
- Sometimes the addition of a mast-cell stabilizer (cromolyn or nedocromil)
- Treat allergic rhinitis and GERD
Regular Albuterol Use Leads to Increased EIB

Availability of Beta-Agonist Inhaler During Sports

- 579 children surveyed
- 80 reported asthma
  - Prevalence 14%
- 22% had rescue inhaler available

Asthma Deaths During Athletics

- 30 deaths confirmed histologically
- Primary activity running/gym
- Mean age 13.8 ± 5.5 years
- Absence of inhaled corticosteroid therapy
- No available rescue inhaler

US Olympic Committee (USOC) and International Olympic Committee (IOC) Drug Control

- **Allowed**
  - Theophylline
  - Cromolyn and nedocromil
  - Montelukast
  - Ipratropium

- **Notification necessary**
  - Albuterol, terbutaline
  - Salmeterol
  - Formoterol
  - Inhaled corticosteroids
  - Fluticasone + salmeterol

**NOTE:** Antihistamines and topical nasal corticosteroids and decongestants allowed.

www.usantidoping.org
USOC / IOC Drug Control: Banned Substances

- Bitolterol
- Metaproterenol
- Pirbuterol
- Oral beta agonists
- Injectable beta agonists
- Systemic corticosteroids
- Systemic decongestants

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Conclusions

- EIA vs. EIB
- EIB is fairly common, especially among athletes
- Pathophysiology is unknown
- Most common symptoms were wheezing, coughing, or chest tightness during or after exercise
- Diagnosis is confirmed by >15% decline in PEFR or FEV$_1$ after exercise challenge
- EIA – control chronic asthma and use prophylaxis
- EIB – prophylaxis only
Conclusions

- EIA commonly affects
  - 10%–20% of the general population
  - Up to 50% of cold air elite athletes
  - Up to 90% of unselected asthmatics

- Easily managed
  - Warm-up and warm-down
  - Nasal breathing and pre-medication
  - Appropriate control of underlying asthma and inhalant allergy
  - Environmental avoidance and anti-inflammatory medication

- Good control of EIA allows a healthy lifestyle avoiding the vicious cycle of sedentary life apprehensive of exercise