Exercise-Induced Asthma

JEFFREY R. KOVAN, DO, and THOMAS J. MACKOWIAK, ATC • Michigan State University

Well documented, poorly understood, yet commonly seen in athletics, exercise-induced asthma (EIA) affects 12–15% of the general population. Studies suggest that more than 90% of patients suffering with asthma and 40% of allergy sufferers experience symptoms of EIA. Typical symptoms include wheezing, cough, chest tightness, and difficulty in breathing shortly after beginning exercise. Diagnosis is typically made with a thorough history and physical examination, along with exercise testing to assess pulmonary function pre- and postexercise. First-line treatment focuses on the nonpharmacologic avoidance of environmental stimuli including cold or dry conditions and allergens. Medications remain the cornerstone of treatment for EIA. Use of a beta agonist 15–30 min before exercise will prevent most cases and should serve as a first-line treatment measure in acute flare-ups.

Key Points

Exercise-induced asthma (EIA) affects 12–15% of the general population. Studies suggest that more than 90% of patients suffering with asthma and 40% of allergy sufferers experience symptoms of EIA. Typical symptoms include wheezing, cough, chest tightness, and difficulty in breathing shortly after beginning exercise. Diagnosis is typically made with a thorough history and physical examination, along with exercise testing to assess pulmonary function pre- and postexercise. First-line treatment focuses on the nonpharmacologic avoidance of environmental stimuli including cold or dry conditions and allergens. Medications remain the cornerstone of treatment for EIA. Use of a beta agonist 15–30 min before exercise will prevent most cases and should serve as a first-line treatment measure in acute flare-ups.

Key Words: pulmonary system, illness, medical assessment

Pathophysiology

There are two theories of the possible etiology of EIA. Each has its basis in temperature and moisture changes in the airway. The water-loss theory describes water loss through the bronchial mucosa to warm and saturate inspired air after strenuous exercise. Hyperosmolarity of the airways occurs, causing a bronchoactive mediator release and bronchoconstriction. The heat-exchange theory is based on increased ventilation as a result of exercise, which cools the airways. Once cooling is completed, the bronchial vasculature dilates and engorges to rewarm the epithelium. A rebound hyperemia of the bronchial vascular bed occurs and causes airway narrowing (Storms, 1999). Other factors have also been described to affect EIA.
These include hyperventilation (mediator-release effect), pollutants (irritants), respiratory tract infections, stress, excessive heat or cold, and environmental exposures. Hyperreactivity caused by any of these can stimulate an exaggerated EIA response with even minimal exertion.

**Clinical Diagnosis**

Children, young adults, and, less often, adults might describe wheezing, chest tightness, or shortness of breath with physical exertion. These symptoms often occur within 5–10 min after exercise and might worsen for a short time. Episodes typically remit within 30–60 min. Awareness of these symptoms and the less common complaints of cough, fatigue, inability to keep up with peers, stomachache, and the inability to work out for a prolonged period of time should alert athletic trainers and therapists to an underlying respiratory ailment. Missing these clinical cues (Table 1) in children often results in their choosing activities requiring less aerobic endurance or avoiding sports altogether. Individuals with other respiratory conditions such as chronic asthma, bronchitis, pneumonia, allergies, and cystic fibrosis might have similar histories and should be evaluated further.

Physical examination rarely provides helpful clues in diagnosing EIA, except in acute events. Auscultation of the lungs often demonstrates clear fields with adequate inspiratory and expiratory efforts in cases of EIA. Wheezes heard at rest might be indicative of chronic asthma. Crackles or rhonchi might indicate acute bronchitis or pneumonia. Checking for heart murmurs or heart-rate irregularities is essential to assess for fatigue or exertional shortness of breath with exercise. Inspecting the face and eyes for “allergic shiners” and intranasally for nasal polyps or chronic inflammatory changes can be useful when looking for an allergic component to EIA.

**Diagnostic Testing**

Empiric testing is often used as a means of identifying and treating those with suspected EIA. Use of an inhaled beta-2 agonist or an anti-inflammatory agent just before exercise might alleviate exercise-related complaints and provide a therapeutic approach to diagnosing the condition.

**Table 1. Symptoms of Exercise-Induced Asthma**

<table>
<thead>
<tr>
<th>Typical Symptoms</th>
<th>Atypical Symptoms</th>
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<tbody>
<tr>
<td>Wheezing</td>
<td>Nausea</td>
</tr>
<tr>
<td>Difficulty in breathing</td>
<td>Stomachache</td>
</tr>
<tr>
<td>Cough</td>
<td>Fatigue, “out of shape”</td>
</tr>
<tr>
<td>Chest tightness</td>
<td>Unable to keep up with peers</td>
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</tbody>
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Pulmonary-function testing provides an accurate assessment of baseline pulmonary function. When performed at rest, pulmonary function tests establish norms for an individual both pre- and post-exercise. A spirometer (see Figure 1) measures forced expiratory volume in 1 s (FEV₁), which is generally normal in preexercise EIA athletes and less than 100% in chronic asthmatics at rest. In EIA, there is a marked decrease in FEV₁ from normal preexercise values after exertion.

Exercise challenge testing requires the use of a treadmill or cycle ergometer to achieve heart rates 80–90% of maximal levels for 5–8 min. Those with chronic asthma typically have a baseline FEV₁ less than 80% of predicted norms. Those with EIA should have normal baseline FEV₁ readings. FEV₁ and forced expiratory flow 25–75% of forced vital capacity are measured immediately postexercise and then every 3–5 min for approximately 20 min. Most often, FEV₁ will be used to assess pulmonary response to exercise after an exercise challenge. A 15–20% fall in FEV₁ from baseline suggests mild EIA, a 20–30% decrease suggests a moderate degree, and a decrease of more than 30% suggests a severe form of EIA (Lacroix, 1999). When spirometry is unavailable, using a peak-flow meter pre- and postexercise can also be helpful in assessing respiratory status and treatment options.

Occasionally, even when there is a high clinical level of suspicion, exercise-testing results are equivocal. Methacholine challenge testing can be performed to help facilitate a drop in FEV₁ with administration of nebulized methacholine (Wilkerson, 1998). Nebulized methacholine has been found to cause a reduction in pulmonary function in asthmatics but not in healthy subjects. In non-asthma sufferers, a high concentration of methacholine is required to produce a 20% drop in FEV₁ (Lacroix, 1999). In athletes with EIA, much lower