Asthma in Athletes: Scope, Risks, Mimics, Trends
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INTRODUCTION

Exercise-induced asthma (EIA), first described by Aretaeus of Cappodecia in 89 AD, is common and often unrecognized in athletes of all levels, recreational to elite. It can occur in known asthmatics or in otherwise healthy, asymptomatic athletes (1). I cover here new information on the scope and risks of EIA, pearls on its mimics, and trends in natural history, diagnosis, and screening.

SCOPE AND RISKS

The prevalence of EIA varies greatly from study to study, depending in part upon the sport studied and the screening test used. Several studies suggest that the prevalence of EIA is greater in elite athletes — especially in endurance sports, winter sports, and swimming — than in the general population, where it ranges from 8% to 15% (1,2). Indeed, studies using strong provocative tests find that the prevalence of EIA — or at least of airway hyperreactivity — among elite swimmers, for example, ranges up to nearly 80% (3). The vagaries of EIA in the literature raise the question — to be considered below — of whether and how to screen athletes for EIA.

The risk of EIA may be underrated. Most sports medicine articles on EIA focus on performance limitation and fail to mention a potentially grave risk. Surveys find that, although in recent years asthma deaths have decreased, asthma still kills annually more than 4000 people in the United States (4). Among athletes, EIA can be the final straw that kills. In August 2001, Rashidi Wheeler at Northwestern University, running sprints in a football practice, collapsed and soon died from an asthma attack (2). In November 2002, Leslie Dawley, a freshman midfielder at Bowling Green State University, collapsed 5 min into a soccer game and soon died, from a cardiac arrhythmia brought on by an asthma attack. In 2006, EIA likely was a key culprit in the deaths of two high school football players, one in Virginia, one in California. All four of these athletes had known asthma.

Epidemiologic studies also document the risk of death from asthma during sports. Among 136 well-studied, sudden, non-traumatic deaths of high school and college athletes over a decade, four (3%) were attributed to asthma (5). In a recent study of 263 potential asthma-related athletic deaths (over 7.5 yr), 61 met the criteria for an asthma death tied to a sporting event or physical activity. Ninety percent of subjects had a history of asthma, but only 5% were on long-term control medications. Most of the deaths were in white males 10–20 yr old. Many sports, organized and recreational, were implicated; the two most common were basketball and track. The vexing conclusion is that sudden fatal asthma exacerbations can occur in athletes in action (6).

PEARLS ON ASTHMA AND MIMICS

Pearl: What are the three most common causes of chronic cough with a normal chest x-ray? Answer: Postnasal drip, gastroesophageal reflux, and asthma (7). In fact, post-race cough is the most reported symptom of athletes with EIA. Researchers argue that self-reports on questionnaires, however, are unreliable in identifying EIA — too many false positives and false negatives (8,9).

A pitfall: Asthma mimics exist. I have seen anemia present as dyspnea on exertion (DOE) thought initially to be EIA. Other common mimics are detailed in a practical study of 142 young people (aged 6–21 yr) who had DOE (average duration 30 months) but no other symptoms of asthma and no response to albuterol. Upon exercise testing, only 8% had EIA. Most (52%) had no cardiopulmonary abnormalities, only normal physiological limitations causing DOE. Vocal cord dysfunction (VCD) was found in 9%. Restrictive physiology from chest cage abnormalities was seen in 11%. In 18%, DOE could not be reproduced, so the cause remained unclear. Finally, two with DOE had laryngomalacia, one had primary hyperventilation, and one had supraventricular tachycardia (10).
VCD is often misdiagnosed as asthma because of “wheezing” that is actually a high-pitched stridor from paradoxical adduction of the vocal cords during inspiration (11,12). In a study of 370 elite athletes, inspiratory stridor suggesting VCD was seen in 5%, all but one of them female (12). In some subjects, VCD occurs only during exercise—a pearl is that pretreatment with an anticholinergic inhaler may prevent exercise-induced VCD (13).

**DOES IT WAX AND THEN WANE?**

In athletes, EIA or asthma may develop during, and subside after, a sports career. For example, when seven elite triathletes, initially not asthmatic, were exercise-tested 3 yr in a row, bronchial reactivity increased yearly, and three developed EIA (14). This may stem from inflammation or remodeling in the airways due to the mechanical stress of high-level training and/or allergens, cold air, and pollutants (1). In contrast, when 42 elite swimmers were tested twice in 5 yr, 50% had EIA at baseline that tended to subside in those who retired from competition (15).

**TRENDS IN DIAGNOSIS AND SCREENING**

How best to diagnose EIA? Spirometry measurements seem more precise than gauging peak expiratory flow rate (PEFR) via a handheld flow meter, but I favor the latter in sport-specific field testing for EIA. Researchers also have used peak flow meters. For example, in a study of 114 college cross-country runners who ran 2000 meters, PEFR was used to diagnose EIA; if defined as a 15% fall in PEFR after the test run, 14% had EIA (16).

Debate continues, however, as to the best test for EIA. For example, in a recent study of 107 college athletes in 22 sports, the IOC-sanctioned test—eucapnic voluntary hyperpnea—was used. By this test, 42 (39%) athletes had EIA, even though few had a history of EIA and symptoms did not predict EIA (17).

Other researchers have used other tests, with mixed results. In a study of elite cold weather athletes, field testing (during competition) was far more likely to diagnose EIA than was exercise testing in a laboratory (8). Yet in a study of elite skiers, testing by inhaled methacholine challenge in the laboratory was far more likely to diagnose EIA than was testing in the field via a cross-country ski race (18).

Finally, debated is whether to screen widely for EIA in athletes. Given the many vagaries in defining EIA and testing for it, along with our incomplete knowledge of the natural history, performance, and health implications of EIA, the case for widespread screening is not yet cogent (19). Yet sports medicine physicians can help athletes—and maybe save lives—by being alert to asthma and EIA.

**References**
