

Sudden Death From Respiratory Disease in Sports

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Exercise and a physically active lifestyle bring well-documented benefits to those with chronic diseases^{1,2} in general or respiratory diseases³ and asthma⁴⁻⁶ in particular. When an apparently healthy athlete dies during the practice of a sport, the tragedy seems to call into question the very foundation of our scientific understanding, asking us to rethink the boundaries of disease. In such cases, specialists feel moved to improve the preventive diagnosis of conditions that might cause sudden death in sports.

When an individual achieves the status of high-performance athlete, whether professional or amateur, his or her expertise is recognized by fellow athletes. A competitor who is ranked among a select few is assumed to be in excellent physical condition. Such an individual is mistakenly believed to be free of any defects that might stand in the way of achieving technical excellence through supervised, focused training: in short, the athlete is a modern Spartan, perhaps physical perfection itself, able to hold steady in any storm that may come along. This is the problem. It is a mistake to believe the elite athlete is in perfect health. Sustained, planned exercise and the care that is theoretically lavished on an athlete certainly do support good health. Lesions are avoided or recovery is superior. The complications of certain conditions that can develop with technically demanding exercise can be avoided or the prognosis improved. However, participation in professional sports does not exclude congenital or hereditary conditions that are difficult to diagnose and prevent if there is no history that leads to suspicion. Nor does it exclude diseases which can become aggravated for a variety of reasons—whether related to the practice of a sport or not—even while performance remains high.

The term sudden death has been used in various ways by epidemiologists, clinicians, pathologists, and specialists in legal medicine.⁷ From a clinical standpoint it usually refers to death from natural causes (thereby excluding accidents, poisoning, suicide, etc) within an hour of the first symptoms. Various body systems may fail, but the heart is implicated in more than 90% of such deaths and

ischemic heart disease present in over 80%, particularly after the age of 35 to 40 years.⁸ In younger athletes who die suddenly, hypertrophic cardiomyopathy is fairly often present,⁹ and subclinical myocarditis is quite common.⁸ Other diseases found in this age group, though in few cases, are pre-excitation (Wolff-Parkinson-White) syndrome,¹⁰ arrhythmogenic right ventricular dysplasia,¹¹ mitral valve prolapse and other valve diseases, and congenital coronary artery anomalies.⁸ The actual incidence of sudden death varies from place to place in relation to the prevalence of ischemic heart disease, though it is much higher in northern Europe and the United States than in Mediterranean countries. According to the World Health Organization, the incidence of sudden death among males between 35 and 64 years old ranges from 20 to 160 cases per 100 000 per year in industrialized countries.¹² In relation to exercise, there is evidence to suggest that intense sports activity markedly increases the risk of sudden death. In fact, persons who train intensely have a higher incidence of sudden death than nonathletes (1.6 vs 0.75 cases per 100 000 population per year).¹³

For sudden death during sports, the relevant window of time is extended to 24 hours after activity¹³ so as to include all relevant processes that might trigger the event. The prevalence has been estimated to be 1 in 200 000 per year in a population under the age of 35 years and 1 in 18 000 in athletes aged over 35 years.¹⁴ Cardiovascular causes are usually to blame, just as they are when sudden death occurs in nonathletes. In most victims under the age of 35 years, unsuspected cardiac defects are present¹⁵ in addition to the causes mentioned above. It should also be noted that if the registry of sudden death is complicated, records of cases related to competition are even more so. Case finding is usually a matter of searching out reports in the press,¹⁶ and this leads to the possibility that while researchers may be finding all such cases on record, they are not seeing all the cases that exist.

The events grouped under the heading of sudden death seem even more dramatic when they occur in the context of competition. If cases were named only according to the cause of death, not only would the incidence be reduced considerably but we would also see the misleading dilution of a problem whose solution resides at least partly in the proper study and monitoring of athletes.

From a scientific standpoint, but especially from a popular one, the manner of presenting statistics has come to mean that sudden death during sports is always associated

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with the heart, and this is particularly reflected in preparticipation screening criteria.^{17,18} Is this possibly because deaths arising from other causes are not counted? Sudden death during exercise can indeed be brought about by other conditions, and this should not surprise us since the adaptation that exercise requires is not confined to the cardiocirculatory system. Metabolic, nervous, endocrine, and respiratory systems must adapt as well. Heat shock,¹⁹ cerebral hemorrhage,²⁰ life-threatening hemoptysis,²¹ or anaphylactic shock triggered by exercise²² may indeed be among the adverse events that can develop in an apparently healthy individual.

This editorial seeks to express the concern we feel that an athlete's death within 24 hours of competition as a direct or indirect consequence of a respiratory disease is not considered sudden death during sports in certain circumstances and that, as a result, no statistics are available to serve as a warning or enable us to identify common features of the type we could place conveniently on the examining table so as to bring them into the decision-making process.

When the specialist sees a patient who practices a sport or is about to start one, or who takes up a recreational activity that involves physical exercise and stress on systems that must adapt, the patient's particular circumstances must be investigated along with diseases present, interactions between the patient's circumstances and medications, the level or intensity of effort, and the setting where the activity will take place. This is especially true when exercise can put the patient's life in danger. Specialists in respiratory medicine and sports medicine should attend to the diseases which the amateur or professional athlete might have and which affect health and potentially lead to sudden death as well as to those that may affect performance.²³ A history of spontaneous pneumothorax, certain congenital defects of the lung, chronic airflow limitation, and specifically asthma, will be the most common problems.²⁴

Most respiratory diseases that cause exercise-related breathing difficulty will never put the patient's life in danger given that they will limit the intensity of exercise. There are diseases, however, that do carry risk that should be taken into consideration, particularly if the organism is subject to environmental stress in addition to exercise.²⁵ Generally, it is not necessary to generate great concern over rare, special cases.^{26,27} Such cases, however, might serve to show the athlete and patient that it is important to adhere to medical advice and take the prescribed medication.

In principle one type of respiratory disease patient who can manage to engage in high intensity exercise and even reach very high performance levels is the individual with asthma. However, thanks to ease of travel and new technologies, patients with other diseases can also practice certain other activities and reach locations that will undoubtedly challenge their cardiorespiratory systems. High mountain excursions, hiking and climbing,²⁸ freediving or scuba diving,^{29,30} and balloon travel³¹ are some of the choices recreational centers offer.

Focusing on asthma in Spain, mortality estimates put the number of deaths due to this disease at 800 to 1000

each year.³² Most are the result of underdiagnosis, inadequate treatment, and delayed medical attention during a fatal crisis.³³ We do not know how many of these crises arose while the victim was engaged in exercise. What is known is that there is no existing registry of deaths that occur during exercise or competition. It may seem that this is of little interest given the paucity of medical literature on the subject, but in reality it is extremely difficult to collect data on these deaths.^{34,35} They are not considered cases of sudden death, even though they occur fairly rapidly and unexpectedly. They are classified as deaths due to a fatal asthma crisis triggered by exercise alone, by exercise in combination with the intake of certain foods to which the patient is sensitive, or by exercise in a context of already exacerbated disease or other concurrent circumstance. In any case, the underlying disease is well known to the patient, his or her doctor, and sometimes to others in the vicinity. The common denominator in deaths due to asthma during sports is the presence of a certain degree of severity of the underlying disease (moderate persistent asthma), poor adherence to prescribed treatment, and in general an underestimation of the disease.³⁶ All those factors can be corrected through good patient education and follow-up.

As noted, sudden death is uncommon in childhood and adolescence,³⁷ and this should be borne in mind when considering those caused by asthma, half of which occur in victims aged between 10 and 20 years with no distinction between those occurring during the practice of competitive sports or recreational activities. This is important because although not all children compete, all of them do play.

At a time when we have become aware of the benefits of physical activity on chronic diseases, an editorial like this one might seem alarmist and out of place. It should not be thought so. It is true that deaths due to asthma during sports are so rare as to be nearly anecdotal if we consider all asthmatics who engage in exercise, and in any case, as we have said, nearly all of them share fairly common factors that can be addressed. What is important is to recognize that there is a complex relationship between asthma and exercise. In asthma, exercise need not be feared, but it should be paid due respect. The message for the patient should be clear. Although in principle the athlete should not be discouraged from active participation in sports, he or she should understand that asthma has potentially serious consequences. Yet it is a disease that can be controlled by proper use of prescribed medication.

Whether or not death due to respiratory disease during physical activity is or is not considered sudden death should matter to us to the extent that such deaths can be identified, counted and hence evaluated. Basing our actions on response to such knowledge, we can aim to reduce the number of deaths if not eliminate them altogether—just as we have confronted the problem of sudden death due to cardiovascular disease.^{38,39} Problems that can be measured can be ameliorated. I do not believe I am wrong in thinking that sudden deaths related to respiratory disease during sports exist, arise from diverse causes, and can be avoided if we understand them better and take consequent action.

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