The Role of Sports in Preventive Cardiology

Hans H. Bjørnstad, Tor H. Bjørnstad, and Yngvar Ommundsen

Sports Activity and Cardiovascular Disease

Sport and Physical Activity as Preventive Tools Against Cardiovascular Disease

There are a large number of studies demonstrating that physical activity reduces cardiovascular morbidity and mortality. Some studies are on physical activity during work, some on leisure-time activity and some on a combination of the two.

Regarding physical activity at work, the study of Morris from 1953 of bus drivers versus conductors in London was one of the first. The best-known studies on leisure-time physical activity are the studies of Pfaffenbarger in Harvard alumni and the so-called MRFIT study from Minneapolis by Leon; there have been similar findings in a recent study from Finland. According to Pfaffenbarger, there is an increasing protective effect with increasing intensity of training, but at very high intensities the effect of an increase is marginal. It also has been shown that the activity has to be sustained over time; thus seasonal activity is not protective. This message also should be considered for sports activity, which needs to be regular to be protective. That sports activity is protective was also shown by Pfaffenbarger et al., but not more than heavy exercise. The effect of physical activity on endothelial function also has been demonstrated by Hambrecht et al., who also showed an effect on endothelial progenitor cells. Increased endothelial function also has been demonstrated in top athletes. Measurement of the physical activity is important in such studies, and is also a source of bias. Therefore the effect of physical activity probably is stronger than that measured in most studies. Furthermore, a tendency to a stronger effect in the best studies has been shown by Froelicher.

The Impact of Fitness on Cardiovascular Diseases

Physical fitness can be measured easily and exactly, and has been shown to have a negative correlation to coronary heart disease. However, there is also a negative correlation between increasing fitness and risk factors like hypertension and hypercholesterolemia. Intervention by physical training has been shown to reduce these risk factors in studies at the Cooper Clinic in Dallas. If these confounders are corrected for, physical inactivity doubles the risk of coronary disease. In highly trained Norwegian skiers, a risk reduction of 4.8 was found compared to the least fit group in the study. In the same study, the quartile with the highest fitness had a relative risk of cardiovascular death of 0.4 compared to the quartile with poorest fitness. Large studies from the US also show a double risk in persons with low exercise capacity compared to those with a high exercise capacity. Still it may be questioned whether the training or the high fitness per se is protective. This is addressed in a study by Hein et al., where indirect O₂ consumption was measured and physical activity monitored. The conclusion was that physical activity is protective irrespective of the fitness level.
Cardiovascular Risk of Exercise

The data are varying, but according to a study by Thompson et al. there is one death per 400,000 jogging hours. Most deaths occur in those aged above 40 years, as in a study on squash players, and in many cases there are many coronary risk factors. On the other side, physical activity protects against sudden death during exercise, and this benefit by far outweighs the risk. Thus the risk of sudden death during exercise is six times higher in persons never exercising compared to regular exercisers, and the total risk of sudden death four times higher in persons never exercising.

Role of Sports in Prevention of Cardiovascular Disease

There are many studies showing reduced mortality in training when following rehabilitation programs. However, there are no specific studies on sports participation in secondary prevention. Still, sport is a useful tool in the maintenance of physical activity. Play and sports in school children now outweigh walking to school as a source of physical activity. In fact one study showed no effect of walking to school on total physical activity in primary school children, demonstrating the dominant effect of play and sports in this regard. In Nordic athletes an active lifestyle is maintained after the active career both in an old and in our own study done recently. The effect of sports on the level of exercise in the community and thereby as a preventive tool on cardiovascular disease will be dealt with separately.

Preventive Cardiology in Athletes

Sudden Death in Athletes

In athletes below 35 years, hypertrophic cardiomyopathy is the most important cause of sudden death according to Maron et al. (Figure 21-1). However, according to Italian data, right ventricular dysplasia is the most important cause. Myocarditis accounts for only about 10% of deaths, but an increase of ventricular dilatation and of antibodies in autoimmune myocarditis has been shown. Therefore, training and competition during febrile infectious disease should be discouraged. According to the European recommendations for screening of athletes, a clinical examination and a standard ECG should be taken in competitive athletes.

In athletes above 35 years, ischemic heart disease is the most important cause of sudden death. According to the European recommendations, exercise ECG should be done in high-risk individuals (males above 35 and females above 40).

Long-Term Effect of Athletic Activity on the Heart

The athlete’s heart was first described more than 100 years ago by Henschen, and was then looked upon as pathological. Later there was wide agreement that it is a normal phenomenon, and a harmonious increase in heart size is seen in top athletes. However, this has been questioned in editorials in the *European Heart Journal*, and the need for long-term follow-up studies has been stated.

ECG

The most typical findings in athletes are sinus bradycardia, increased voltage, and precordial ST elevations. In a 15-year follow-up of elite endurance athletes who had all ended their active careers, we found regression of ST elevations and Sokolow index, while heart rate was not significantly reduced except during night hours (Figure 21-2).

Rhythm Disorders

In some follow-up studies there were a few cases of atrial fibrillation, though not reaching significance; but a significantly increased prevalence of atrial fibrillation in veteran athletes and in a middle-aged sports population has been demonstrated. However, these results are not necessarily applicable to previous top athletes. In our study of Norwegian top endurance athletes, no cases of atrial fibrillation were found at 15-year follow-up. In a 3-year follow-up on continuously active endurance athletes. We found...