Cardiac impact of long-term endurance training: Negligible or negative?

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‘No sports’ – the famous quote by W. Churchill is not a recommendation we as cardiologists tell our patients nowadays. There is no doubt: sports are healthy. Sports increase physical and psychological well-being by increased self-confidence, offer diversion, increase serotonin turnover and β-endorphin release, besides they decrease the incidence of cardiovascular diseases, diabetes, obesity, fractures, osteoporosis, breast cancer and colon cancer and increase the neurogenesis in the brain. What more do you want?

However, there remains an open question: when are sports harmful? Is there a level of physical activity which harms the heart? There is the entity ‘athlete’s heart’ which was first mentioned in 1899 by Henschen [1], occurring in cross-country skiers. ‘Athletic heart syndrome’ was defined in 1985 as the physiologic response to repetitive exercise [2]; since then, the belief that exercise changes are reversible and benign has predominated.

The cardiac changes resulting in athlete’s heart depend on the type of physical exercise the athletes perform. In sports with high dynamic and low static demands, such as in world class cycling, there is typically a predominantly eccentric left ventricular hypertrophy. In strength athletes, such as in weight lifting and wrestling, concentric left ventricular hypertrophy predominates [3]. Typical of the athlete’s heart in contrast to hypertrophic cardiomyopathy are the following features: a small end-diastolic diameter of no more than 45 mm, normal diastolic function, decrease of left ventricular wall thickness with deconditioning, and the lack of a family history of heart disease [4]. Typical ECG changes include sinus bradycardia and sinus arrhythmia, junctional escape rhythm, ventricular premature contractions, first and second degree AV block (Wenckebach), and elevation of the ST segment and J point [5].

What about long-term outcome? So far, only few studies have been published on this. In 13 former athletes aged 66 years with a history of previous cross-country skiing and running, left atrial dimension was larger than in controls [6]. In 19 elderly marathon runners (mean age 67 years), 11% needed a pacemaker, 53% had left ventricular hypertrophy and frequent ventricular premature contractions [7].

In two studies, which we recently published, we showed that in 62 former professional cyclists (average age of 66 ± 7 years) compared to 62 matched controls, there was an increased incidence of sick sinus syndrome, ventricular tachycardia, atrial fibrillation, atrial and ventricular dilatation and diastolic dysfunction (as assessed by tissue Doppler imaging) [8, 9].

In the current study published in this journal by Bjørnstad et al. [10], there are the interesting findings of a 15-year follow-up of 30 previous top level competitive athletes (now at age 39 ± 3 years; 15 men) from a paper published earlier [11]. The authors have to be complimented on this unique study in which a rather long follow-up was available in the same athletes. These athletes, including cross-country skiers, performers of biathlon, long dis-
tance, track as well as field and orienteering running, were still physically active (average 4.2 ± 2.3 h weekly training on follow-up) despite having ended their competitive careers. The authors found no evidence of a deleterious effect on these hearts with preserved systolic and diastolic function. There was only mild left atrial dilatation and some residual ST elevation in the precordial leads, especially in men; no athlete had negative T waves. During this follow-up, no patient had developed atrial fibrillation (yet?), and there was a regression of sinoatrial and atrioventricular blocks. Four of 30 subjects (14%) had increased ventricular arrhythmias at follow-up. There was no change in left ventricular volume and mass corrected for body surface area. This is not a study designed to show the effects of deconditioning and no study on the outcome at old age; however, it shows that up to a certain amount of exercise, long-term endurance exercise can be performed for quite some time without any obvious harm. This study included a small population of endurance athletes performing various types of sports, so we still need more long-term follow-up studies in large populations of athletes to definitely determine the amount of exercise it takes to possibly harm the heart. It will be hard to analyze these studies without being certain that the athletes were not exposed to performance-enhancing agents, which might interfere with any cardiac finding.

For sports affecting our hearts, we do not think that Oscar Wilde is correct in saying: ‘Moderation is a fatal thing’, but rather quote Theognis: ‘Moderation is best in all things’. This has not been proven for sports, but there are still no large studies to suggest otherwise.

References