Functional features of the heart in cyclists

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Abstract

Objective of the study was to evaluate the effect of training loads on the functional parameters of the heart of cyclists.

Methods and structure of the study. The observation was made on 18 trained young cyclists with at least three years of sports training experience. The control group included 22 clinically healthy young men who did not go in for sports. Echocardiography was performed on the SSD-80 Aloka device (Japan).

Results and conclusions. Experienced cyclists have left ventricular myocardial hypertrophy. It was manifested by an increase in the thickness of its walls and its mass while maintaining the optimum of its overall size and the size of its cavity. Well-trained cyclists are characterized by a high rate of relaxation of the heart muscle. It is clear that regular cycling increases the physical capabilities of a person, trains his heart, while maintaining the optimum of general hemodynamics.

Keywords: *cycling, left ventricle, heart, muscle activity, sports loads.*

Introduction. Systematically repeated muscle loads provide a very pronounced training effect on the body and enhance the work of internal organs [1, 2]. Rational physical activity can lead to a clear improvement of the whole organism [3]. This is due to the fact that regular muscle activity can enhance the severity of a number of biochemical and physiological processes in muscle tissue and vital organs [4]. In the case of correct dosing of loads, they increase the resistance of the whole organism and increase its adaptive characteristics [5].

Dosed aerobic exercise has a beneficial effect on the morphological and functional parameters of the heart [6]. Strengthening of the myocardium is primarily associated with its thickening and increased contractile function of the left ventricle [7]. At the same time, the dynamics of the main cardiac parameters in various types of sports activities has not been fully studied and needs to be clarified [8]. Changes in the myocardium that occur in healthy young men as a result of regular aerobic exercise, including cycling, remain unclear. The need for further improvement and increase in the effectiveness of the entire training process in sports requires additional monitoring of upcoming changes in the myocardium in well-trained athletes [9].

Objective of the study was to evaluate the effect of training loads on the functional parameters of the heart of cyclists.

Methods and structure of the study. The observation was made on 18 young cyclists aged from 18 to 21 years. Depending on the weather conditions, all young men taken in the study experienced daily cycling loads either on the track or on an exercise bike. All surveyed had a sports experience of at least three years. The control group included 22 clinically healthy young men aged 18 to 21 years who experienced significant muscle loads only during academic physical education lessons at the university.

In those taken under observation, a heart examination was performed using an ultrasonic device SSD-80 manufactured by the Japanese company Aloka, recording a number of basic cardiac parameters.

Results of the study and their discussion. The work performed made it possible to obtain information about the state of the recorded indicators among cyclists and find their differences from the values in the control group (see table).

Cardiac parameters of the examined

Cardiac indicators	Cyclists, M±m, n=18	Control, M±m, n=22
Left atrial diameter, cm/m^2	1,93±0,06	1,80±0,09
Anteroposterior size of the left ventricle in diastole, cm	5,35±0,14	5,11±0,11
Reduction of the anteroposterior value of the left ventricle, %	35,05±0,85	32,91±0,72
Diastolic thickness of the left ventricle in the posterior wall, cm	1,18±0,06	1,01±0,08 p<0,05
End diastolic volume of the heart, cm^3/kg	1,82±0,14	1,96±0,09
Stroke volume, cm^3/kg	1,11±0,15	1,09±0,10
Myocardial mass, cm^3/kg	2,52±0,22	2,19±0,18 p<0,05
The highest rate of relaxation of the left ventricle in the posterior wall, cm/s	13,3±1,31	10,5±0,67 p<0,05
Ratio of end-diastolic volume to myocardial mass, cm^3/kg	0,72±0,09	0,89±0,16 p<0,01
Ejection fraction, %	61,74±1,16	60,33±0,74

Note: p - the obtained significance of differences between groups of subjects.

The diameter of the left atrium in cyclists tended to exceed the value in the control by 7.2%. Cyclists had a tendency to exceed the value of the anteroposterior diameter of the left ventricle during diastole (by 4.6%) and reduce this size (by 6.5%) compared with the control group.

The left ventricular posterior wall at the time of diastole had a greater thickness in cyclists by 16.8% ($p<0.05$). The end diastolic heart volume of cyclists tended to be lower than the control value (by 7.7%). However, the stroke volume in both observed groups was similar.

The value of myocardial mass in cyclists was higher (by 15.1%) than in the control group, indicating the formation of myocardial hypertrophy in them. However, this did not affect their ejection fraction, which was comparable in both groups of patients.

In the region of the posterior wall of the left ventricle, the highest rate of development of relaxation in cyclists (by 26.2%) exceeded that in physically inactive young men.

It can be assumed that cycling leads to left ventricular myocardial hypertrophy, as indicated by thickening of its posterior wall and an increase in its mass. At the same time, the athletes retained the optimum volume and size of the left ventricular cavity, which were similar to those in the control group. The ratio of the end diastolic volume to the mass of the heart muscle was inferior in cyclists (by 23.6%) to the control level, indicating a high sensitivity of this indicator to cycling.

No differences were found between the groups and in the parameters of central hemodynamics and myocardial contractility. The ratio of end-diastolic volume to myocardial mass under conditions of cycling decreased due to an increase in myocardial mass. A decrease in the ratio of end-diastolic volume to myocardial mass to 0.72 ± 0.09 in cyclists proves the predominance of left ventricular muscle hypertrophy phenomena over dilatation of the cardiac cavities [10].

A significant rate of myocardial relaxation is typical for well-trained people [11]. It can be considered that the rate of relaxation of the left ventricle in the region of the posterior wall is a marker that allows assessing the development of diastole [12]. In our observation, this indicator was higher among cyclists.

Conclusions. Regular cycling stimulates hemodynamics and improves myocardial contractility. Cycling develops the heart, increases the mass of its left ventricle and enhances the functional characteristics of the heart. In the case of systematic cycling loads, there is a tendency to accelerate the relaxation of the left ventricular muscle, which improves hemodynamics.

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