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COMPARATIVE MYOCARDIAL OXYGEN CONSUMPTION CHARACTERISTICS FOR THE INDIVIDUALS WITH DIFFERENT TYPES OF FUNCTIONAL ASYMMETRY

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Abstract. In the process of activities, changes are observed in the functional state of the body that are conditioned by the transition of physiological systems from a state of rest to that of stress and fatigue with subsequent recovery of those systems. The functional state of the cardiovascular system responding most promptly to muscle efforts and limiting the body's capacity to work can serve as a reliable indicator of the level of adaptive reactions to emerging internal and external effects under intense physical exertion.

The state of the reserves of the cardiovascular system is the most valuable criterion of energy potential. One of the most important indicators of this reserve is the Robinson index characterizing the systolic work of the heart: the higher the R-index at maximum physical exertion, the greater the functional capacity of the heart muscle. This index enables the indirect judgment on the consumption of oxygen by the myocardium.

Key words: cardiovascular system, Robinson index, endurance coefficient and functional asymmetry.

Topicality. The cardiovascular system with its multilevel regulation is the most subtle indicator of the functional state of the body. With short-term physical stress, adaptation to changing conditions of vital activities occurs through the participation of the vegetative regulation of heart activity [1, p. 1190].

In the complicated hierarchy of the structures implementing the adaptation process, the most important role belongs to the vegetative nervous system. It is well known that the role of the vegetative nervous system in the vital activity of the organism is extremely great: it maintains homeostasis and provides energetically different forms of physical and mental activities [2, p. 385]. The vegetative nervous system participates in the development of all diseases: in some cases, a disturbance of its function is a factor of pathogenesis, and in other cases, changes occur as a secondary factor, in particular as a response to the damage to the body's systems and tissues [1, p. 1195].

The state of the cardiovascular system depends on the functional reserves of the body that specify the level of physical performance [3, p. 842; 4, p. 125].

In contrast to static work, dynamic work depends on the efficiency of energy supply mechanisms and requires maintaining an appropriate level of metabolic processes and it necessitates significant activation of the respiratory system [5, p. 1057; 6, p. 335]. It is known that a three-fold increase in metabolism results in severe oxygen starvation [7, p. 132; 8, p. 799]. In the case of intense physical exertion, the rate of oxygen consumption is increased 3 times, and in this case, the minute blood volume can increase 6 times compared to that in the state of rest. As a result, the supply of tissues with oxygen is increased approximately 18 times [9, p. 120].The data provided by K. U. Rozumbetov and A. T. Esimbetov, (2021) allow us to state that an unfavorable environmental situation, in particular, the use of pesticides, negatively affects the work of the cardiovascular system, including the indicators of central hemodynamics, as well as the adaptation mechanisms of the body that can result in a disturbance of the vegetative balance, increased stress, instability of the myocardium, and as a matter of fact the disturbance of the heart rhythm [10, p. 377]. The studies of the specific features of the mechanisms of general

resistance to physical exertions depending on the state of the human functional system are of great importance because it makes the prevention of maladaptation disorders more effective and goal-oriented.

Purpose: identifying a possible relationship between the type of expressiveness of functional asymmetry and the specific features of metabolic and energy processes of the myocardium.

Task of the research: establishing the peculiarities of oxygen consumption by the myocardium at rest and during physical exertion, taking into account the peculiarities of functional asymmetry.

Materials and methods. One hundred and thirty six (136) second-year students of the therapeutic and dental faculties of KhNMU participated in the research. The reference group consisted of persons with right-sided type of functional asymmetry (RSTFA) - 48 persons; the comparison group consisted of persons with left-sided type of functional asymmetry (LSTFA) - 42 persons, including persons with a mixed type of functional asymmetry (MXTFA) - 26 persons and persons with a socially altered type of functional asymmetry (SATFA) - 20 people. The groups were formed based on the highest number of gained percentages when answering 10 questions. Analysis of the obtained data is indicative of the available relationship between the specific features of functional asymmetry and the studied indicators.

Physical endurance was assessed using a bicycle ergometer test with the load dosage of 400 W for men and 200 W for women at a constant speed of pedal rotation of 60 revolutions per minute, and the endurance coefficient (the Cvasu index) (CI) was calculated according to the Cvasu formula.

Vegetative support was assessed by determining systolic (BPs) and diastolic pressure (BPd) using the Korotkov method (in mmHg), the pulse blood pressure (BPp) was calculated by appropriate formula, and the heart rate (HR) was calculated by radial artery pulsations. The level of metabolic and energy processes in the myocardium was calculated according to the Robinson index (RI) that characterizes the systolic work of the heart. Materials were processed using standard Excel package resources.

Research results. The results of the bicycle ergometer test show that individuals with LSTFA have the highest physical endurance (142.1 seconds), individuals with MXTFA and SATFA have approximately equal scores (125.1 and 125.3, respectively), and the individuals with the RSTFA (111.5 sec.) are in last place. Since RI reflects the functional ability of the myocardium, and according to the available reference data, this ability emerges with an increase in the energy exchange and oxygen consumption we can state a direct correlation between CI and RI. This is reliably illustrated by the data obtained during physical exertion in persons with SATFA: at rest, RI was 89.4, and after physical exertion it was 185.9; CI at rest was19.1 conventional units and after physical exertion it was 22.5 conventional units.

It was established that in people with MXTFA, the RI is the lowest (86.6), CI is 18.2 conventional units at rest, and after physical exertion, the RI is increased 2 times; CI is 24.8 conventional units. People with SATFA and RSTFA had the highest RI at rest (89.4 and 89.6, respectively), after physical exertion, RI has increased 2 times. It should be noted that RI (89.6) and C (19.4) were the highest in people with RSTFA at rest.

Conclusions

1. At rest, myocardial oxygen consumption indicators are better in people with MXTFA, and it is indicative of a maximum aerobic capacity

2. People with LSTFA have maximum physical endurance.

3. At maximum physical exertion, the consumption of oxygen by the myocardium degrades in people with SATFA, and it is indicative of the limited adaptive capabilities of the myocardium.

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