Abstract: P248

A new method to correct the structural and functional myocardium changes, mediated by stress and over-training

Authors:
L A Balykova\(^1\), LM Makarov\(^2\), SA Ivyansky\(^3\), OM Soldatov\(^4\), AV Krasnopolskaya\(^1\), AA Shirokova\(^1\), KM Varlashina\(^1\), Medical Institute of the Mordovian State University - Saransk - Russian Federation, \(^2\)Center for Syncope & Cardiac Arrhythmias in Children & Adolescents of Federal Medical-Biol. Agency - Moscow - Russian Federation, \(^3\)National Research Ogarev Mordovia State University, Medical Institute - Saransk - Russian Federation, \(^4\)Children's Clinical hospital 2 of Mordovian Republic - Saransk - Russian Federation,

Topic(s):
Sports Cardiology

Citation:
Introduction. Highly intensive and prolonged physical training led to formation «athletes heart» in a half of sportsmen and in some of them cardiac remodeling became non-physiologic and associated with over-training syndrome. The approaches to pathogenetic correction of these changes have not yet been established.

Purpose. To study the prevalence and manifestation of over-training cardiac remodeling and to develop the new method of its pharmacological correction in young athletes.

Methods. Study consisted in 2 parts: experimental and clinical and was approved by local ethic committee. Animal study followed the "Principles of laboratory animal care" (1985) and national law if applicable. Morphological manifestation of over-training heart was studied in 30 mice underwent everyday 2 weeks course of swimming "till exertion". The myocardial ultrastructure was studied by electron microscopy by the end of experiment in 2 groups of mice: control group (n=14, without any pharmacological support) and study group (n=16) received 2-weeks course of creatine phosphate (CP). The state of the cardiovascular system was studied in 189 young footballers (12-16 years) sport-school attendants, who had non-common changes on standard ECG. All the athletes underwent complex examination. Athletes with over-trained myocardium signs were enrolled into a clinical trial and randomized into 2 groups in 1:1 ratio: control and CP. The dynamics of cardiac remodeling and physical working capacity was analyzed after 4 weeks.

Results. By the end of experiment stress-induced and overtraining myocardium hypertrophy (MH) and dystrophy developed in all the mice and 30% of mice died. Ultrastructural cardiac changes manifested as marked cell polymorphism and cell damage. CP enhanced physical capacity, reduced myocardial hypertrophy, limited the cardiomyocytes damaging, preserved the number and structure of mitochondria and prevented lethality in all the mice. Non-physiological myocardial remodeling was identified in 24-43 (12.7-23.8%) of young footballers. It manifested as cardiac rhythm and conduction disturbances, heart cavities dilatation (>98 percentile), MH (left ventricle myocardium mass index >51g/m2.7), systolic (ejection fraction <55%), diastolic (E/A >2) disfunction, elevation of myocardial enzymes and stress hormones level (>1.5 norms) and abnormal QT reaction on physical exertion and recovery. In 40 (20.2%) of young athletes over-trained heart was diagnosed. CP using contributed to a rise of physical working capacity in PWC170 test by 9% to the original level, significant reduced (by 32-87%) or eliminated the structural and functional signs of myocardium over-training and normalization of myocardium repolarization reaction on exercise stress.

Conclusion. Every 5 of the young athletes develops non-physiologic over-trained «athletes heart» signs, which effectively reduce by CP.