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THE ELECTROPHYSIOLOGICAL CHANGES IN THE MYOCARDIUM AND HEART RATE VARIABILITY DURING SPACE FLIGHT (PRELIMINARY DATA)

Abstract

INTRODACTION: We still lack understanding of the role of electrophysiological changes in the myocardium in genesis of orthostatic intolerance and other cardiovascular disorders documented in orbiting crews. The experiment COSMOCARD onboard of the ISS is intended to study the relationship of electrophysiological shifts in the myocardium with changes in autonomic regulation of cardiovascular system under the influence of long-term microgravity. METHODS: The experiment will involve only Russian members of the ISS crews. To collect statistically valid baseline data, each participating cosmonaut will be investigated twice before flight. In flight, 5 to 6 experimental sessions will be required. On return, investigations are planned on days 1-2 and 3-4 after landing. Experimental data analysis focused on the following parameters: daily average, 8- and 6-hour values of P, O, R, S, T amplitudes and PQ, QRS, QT time intervals, electrophysiological characteristics of the myocardium. Results of HRV analysis used to determine the next parameters of autonomic regulation of blood circulation: sympathetic and parasympathetic involvement in circulation regulation, arterial blood regulating system activity, synchronization of the autonomic mechanisms maintaining cardiorespiratory homeostasis, involvement of the higher autonomic centers in regulation of blood circulation. RESULTS: Preliminary data analysis of the electrophysiological processes in the myocardium and their relationship to autonomic regulation of blood circulation in the two astronauts in two space missions revealed the following. Prolonged exposure in microgravity characterized by the autonomic balance shifting in favor of the sympathetic activities, reductions in the regulation functional reserve, loss of orthostatic tolerance, and alterations of the myocardium ECG parameters. Correlation of diurnal dynamics of the autonomic regulation indices with electrophysiological characteristics of myocardium diurnal variations in myocardium ECG can serve as an indicator of adaptive reactions of organism. In different periods of long-duration space flight the relationship between the myocardium electrophysiological parameters and autonomic regulation of blood circulation is dependent equally on the pattern of adaptation and individual typological features of cosmonaut's organism. Incipient structural and electrophysiological remodeling in the course of prolonged microgravity may be no less important for the development of orthostatic intolerance than changes in vascular tone. CONCLUSION: It is hoped that COSMOCARD will become a model for further enhancement of the space crew medical monitoring system. On acquisition and consideration of the first results of the experiment, a decision could be made to transfer its technology from the research category to the onboard medical operations.