SPACE LIFE SCIENCES SYMPOSIUM (A1)
Human Physiology in Space (2)

Author: Dr. Elena Luchitskaya
Institute for Biomedical Problems, Russian Federation

Mrs. Irina Funtova
Institute for Biomedical Problems, Russian Federation
Prof. Roman Baevsky
SSC RF Institute for bio-medical problems RAS, Russian Federation
Prof. Jens Tank
Hannover Medical School, Germany

SPACE EXPERIMENT "CARDIOVECTOR" AS A NEW STEP IN THE DEVELOPMENT OF THE METHOD OF BALLISTOCARDIOGRAPHY

Abstract

Introduction. Microgravity is the ideal environment for studying body microoscillations associated with the displacement of blood masses from the heart to large vessels. The recoil effect of systole or the so-called ballistic effect, gave name to the method of ballistocardiography. Space ballistocardiography was registered first on December 26, 1977 in the first Salyut-6 mission (Baevsky R.M., Funtova I.I., 1982), while the first spatial ballistocardiogram - on April 10, 1990. In this report we present material on the preparation for the ISS aboard a new space experiment "Cardiovector" with registration ballistocardiogram in six axes (three linear axes and three axes of rotation). Methodology. The purpose of this experiment is to study spaceflight factors effect on spatial distribution of cardiac contraction energy and the input of right and left heart in blood circulation adaptation to microgravity. In addition to ballistocardiogram, will be registered electrocardiogram, impedance cardiogram, seismocardiogram and pneumotachogram. The goals of experiment "Cardiovector" are: a) to provide maximum all-round information about changes in energy profile of cardiac contractions in the conditions of microgravity, and its spatial distribution; b) to permit evaluation of the right and left heart inputs and assess the relation between the hemodynamic and energy properties of the heart in different periods of extended mission. Results. The device "Cardiovector" has been tested in conditions of short-term weightlessness during the parabolic flights and in ground-based experiments such as immersion and influences of lower body negative pressure. The obtained data showed the high quality of records and allowed to construct the phase trajectories of pulse displacements of the body in space and also to calculate scalar and vector characteristics of this displacements. We have obtained an array of normative data that is required to estimate future research results in conditions of long-term microgravity. Conclusions. New space experiment "Cadiovector" is a new step in the development of the method of ballistocardiography. For the first time it will allow to get a comprehensive understanding of micromovements related with activities of the heart. We will be able to estimate of myocardium energy and the role of right and left part of the heart in adaptation to the conditions of weightlessness. The results will be important for the physiology of circulation, to develop the fundamental understanding of the mechanisms of the heart action. These data will be also interesting for clinical cardiology.