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BONE DENSITOMETRY AFTER LONG-TIME MISSIONS ON ISS

Abstract

The normal functional performance of human bone system is stipulated by the evolution of the species in the conditions of the Earth's gravitational field, so weightlessness presents a potential danger in the form of osteoporosis development. The task of this work is to perform physiological assessment of changes in the bone system observed after prolonged space flights. Osteodensitometry is the main method of assessing the bone system state. A lot of pre- and post-flight examinations of Russian cosmonauts - participants of the missions to ISS have been carried out. The state of the bone system before and after flights lasting 6-7 months was studied with the use of the HOLOGIC "QDR-1000W" or "Delphy" osteodensitometers according to standard clinical programs including Lumbar Spines, Left Hip and Whole Body. The bone mineral density (BMD, g / cm2) and bone mineral content (BMC, g) were determined. Dynamic observation of the cosmonauts BMD state showed the individual specificity of both the baseline state of the bone system and its responses to the effects of space flight factors. The loss of bone mass (BM) in different segments of the skeleton increases in the direction of the gravity vector and is regular (r = 0.904) only in the trabecular structures of the bones of the lower half of the skeleton. They constitute 5.4High individual BMD values in cosmonauts, even after normal (average in the observation group) losses of the BMD after flight, allowed qualifying its state as the norm in most cases; and in cosmonauts with low BMD it was qualified as osteopenia. Measurement of BMD does not give an idea about the quality of the remaining bone tissue, which can react to changes in external conditions not only as a material, but also as a structure. Features of the formation of bone architectonics in weightlessness require further study. Successfully conducted long space missions inspire optimism and do not give ground for considering the risks for the bone system to be excessive in flights of this duration. However, an increase of duration of stay in space and of the number of astronauts will require answers to the questions raised above.