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Changing of anisotropic properties of bone tissue during unloading hanging

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Studies performed that anisotropic properties of the bone tissue changes significantly in case of changing the activity. All tests were conducted on nonlinear laboratory rats (180-200 g). As a model of gravitational unloading we used antiorthostatic support model. All experiments were performed according to bioethical standards and were approved by local ethical committee of the Kazan Federal University. The femoral bones and shoulder bones were dissected from all tested rats with following weight measurement and measurement of geometrical parameters. Bones was scanned on μCT in diaphysis, metaphysis and epiphysis regions. After scanning the bone porosity was calculated. The structure of porosity medium was analyzed in terms of fabric tensor. It was investigated different groups: Control and hypogravitational on different time of unloading hanging (7, 14, 21, 30 and 40 days). The result of anisotropic properties of diaphysis of the bone were as follows: Main stiffness directed in longitudinal direction, structure of bone tissue looks like adaptive to bending with compression. Anisotropic properties of a femur changes after some period of unloading: Main stiffness direction turns at an angle relative to longitudinal direction. The value of the angle increases in dependence of time of unloading. In transverse plane stiffness changes aspect ratio of stiffness in radial and tangent directions. These results emphasize that bone tissue in unloaded bones adapt to external forces and anisotropic properties of the tissue changes significantly.

Biography

Artur Fedianin has begun the scientific research in the field of Fundamental Medicine still being a student of the 2nd course of Department of Human and Animal Physiology, KFU. Since 2013, he is a part of the research group at Kazan Federal University which is engaged in development of methods of stimulation of neuroregeneration at such diseases as an injury of a spinal cord and an atrophy of skeletal muscles and bones. He did his graduation from KFU.

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