

The Influence of Hindlimb Unloading on Bone and Muscle Tissues in Rat Model

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Abstract

© 2016, Springer Science+Business Media New York. Numerous results indicate on interactions between muscles and bones. Thus, mechanical, genetic, endocrine, and age-related factors influence both tissues at the same time. Nevertheless, the details of physiological mechanisms of interaction between muscles and bones are still unclear. The purpose of this study was to evaluate the changes in low extremity muscles and bones during gravitational hindlimb unloading in rats. After hindlimb unloading during 7, 14, 21, and 30 days, muscles from the low extremities were collected and measured to estimate the muscle weight and perform cross-sectional analysis. Femoral bones were collected in order to evaluate weight, density, and geometrical parameters of the bone. Additionally, a test with a three-point bending was carried out to evaluate biomechanical bone properties. Results show that loss of muscle weight can be observed already at 1 week of hindlimb unloading with the maximum changes at 14 days. Changes in bone tissue showed the maximum loss of bone weight at 21 day. By 30 days of unloading, the density and rigidity of a bone were decreased; however, the most profound changes were observed in reduction of bone durability. These data support a hypothesis that the atrophy of skeletal muscles may promote the subsequent bone deterioration.

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Keywords

Bone density, Hindlimb unloading, Muscle atrophy, Rats

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