

Effect of Branched Chain Amino Acid (L-Leucine) on the Muscle Changes during Cast-Immobilization in Adult Male Albino Rats: A Morphological and Ultrastructural Study.

Maha Khalid Abd El Wahed¹ and Hanan Dawood Yassa²

**Anatomy and Embryology Departments, Faculties of Medicine,
Fayoum¹ and Bani-Suif² Universities**

Abstract:

Objective: Immobilization is known to result in substantial muscle atrophy, joint stiffness, and functional limitations. Branched chain amino acids (BCAAs), especially leucine, are the key amino acids to modulate muscle protein metabolism. It has been declared that dietary leucine supplementation may represent a useful nutritional tool for maintenance of muscle mass and prevention of muscle atrophy during cast immobilization. The present work aimed to evaluate the ability of branched chain amino acid L-leucine in prevention of immobility associated changes which occur in muscles during cast-immobilization.

Materials and methods: Thirty adult male albino rats weighing 180-220 g were used and classified into three equal groups: I) control group, II) cast-immobilized group and III) immobilized L-leucine-treated group. Right hindlimb cast immobilization was performed for 21 days in groups II&III, while L-leucine was given by oral gavage in a dose of 0.7g/kg/day concomitant with immobilization in group III. The initial and final body weights were determined. The right gastrocnemius muscle was prepared for light and transmission electron microscopic studies.

Results: Immobilization resulted in significant reduction of body weight and gastrocnemius weight as well as cross-sectional area of muscle fibers.

Microscopic studies revealed atrophic changes of the cast immobilized gastrocnemius muscle. Hx. &E.- stained sections showed extremely thin muscle fibers, marked widening of the interstitial spaces and hypercontraction areas of the muscle fibers. Ultrastructure examination of myofibrils demonstrated disturbed contractile structure, loss of sarcomere organization, shrunken myonuclei and swollen mitochondria. Leucine administration to rats of group III affords a good protection against immobilization-induced muscle atrophy, which could be attributed to its direct anabolic effect or its ability to reduce oxidative stress.

Conclusion: Leucine intake may represent a nutritional strategy for limiting muscle atrophy as a consequence of immobilization and as a trial to accelerate rehabilitation.

Key words: L-Leucine, Cast-immobilization, Muscle atrophy, Ultrastructure.

Corresponding Author :Maha Khaled Abd El Wahed Hussein, Anatomy and Embryology Department, Faculty of Medicine, Fayoum University, Egypt, e-mail: dr.mahakhald @ yahoo.com, Mobile: 01001803145.