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## **Age-Dependent Morphological Changes in Skeletal Muscle Tissue of White Outbred Rats After Mechanical Closed Injury**

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### **BACKGROUND**

Mechanical closed injuries of skeletal muscle are widely encountered in experimental and clinical traumatology and are associated with complex structural, biochemical, and functional alterations in muscle tissue. The regenerative potential of skeletal muscle largely depends on age-related physiological characteristics, including inflammatory response, satellite cell activation, and vascular supply. Although the general mechanisms of muscle injury and regeneration have been extensively studied, age-dependent morphological alterations following closed mechanical injury remain insufficiently investigated. Understanding these changes is essential for clarifying the dynamics of degeneration, inflammation, and regeneration at different stages of ontogenesis and for improving therapeutic strategies in musculoskeletal trauma.

### **Objective**

To investigate and comparatively evaluate age-dependent morphological changes in skeletal muscle tissue of white outbred rats following experimental mechanical closed injury of the hind limb.

### **Materials and Methods**

The study involved 100 male and female white outbred rats divided into four age groups: 3, 6, 9, and 12 months. A standardized mechanical closed injury of the hind limb was experimentally induced under controlled laboratory conditions. Skeletal muscle tissue samples were collected at different time intervals after injury. The following methods were used:

- Histological examination (hematoxylin-eosin staining)
- Histochemical analysis
- Cytomorphological evaluation

- Morphometric assessment of muscle fibers and inflammatory infiltration

Degenerative changes, necrosis, edema, inflammatory cell infiltration, vascular alterations, and regenerative processes were evaluated microscopically and statistically analyzed.

## **Results**

The study demonstrated significant age-dependent differences in skeletal muscle response to mechanical closed injury. In younger rats (3–6 months), rapid inflammatory response and early activation of regenerative processes were observed, characterized by moderate edema, limited necrosis, and active myofiber regeneration. In middle-aged rats (9 months), degenerative changes were more pronounced, with increased inflammatory infiltration and delayed regeneration. In older rats (12 months), marked structural damage, extensive necrotic areas, vascular disturbances, and slower regenerative activity were detected. Morphometric analysis confirmed a progressive decline in regenerative capacity with age.

## **Discussion**

The findings indicate that skeletal muscle regeneration after mechanical closed injury is strongly influenced by age. Younger animals exhibit more efficient inflammatory regulation and faster tissue repair, whereas aging is associated with impaired microcirculation, reduced satellite cell activity, and delayed regeneration. These morphological differences may explain slower functional recovery observed in older organisms after musculoskeletal trauma.

## **Scientific Novelty**

1. Age-dependent morphological patterns of skeletal muscle damage and regeneration after mechanical closed injury were identified.
2. Comparative morphometric analysis revealed progressive decline in regenerative potential with aging.
3. Structural and cellular markers of degeneration and regeneration were characterized across different age groups.

## **Practical Significance**

The results provide new insights into age-related morphological and regenerative characteristics of skeletal muscle following mechanical closed injury. These findings may contribute to improving age-specific therapeutic approaches, optimizing rehabilitation strategies, and developing more effective treatment protocols in musculoskeletal trauma.

## **Conclusion**

Mechanical closed injury induces significant age-dependent morphological changes in skeletal muscle tissue. Younger rats demonstrate faster and more effective regeneration, while older rats show pronounced degeneration and delayed repair. Understanding these differences is important for improving clinical management of skeletal muscle injuries and developing targeted therapeutic strategies.

## References

1. Charge S.B., Rudnicki M.A. Cellular and molecular regulation of muscle regeneration. *Physiological Reviews*. 2004.
2. Tidball J.G. Inflammatory processes in muscle injury and repair. *American Journal of Physiology*. 2005.
3. Hawke T.J., Garry D.J. Myogenic satellite cells: physiology and molecular biology. *Journal of Applied Physiology*. 2001.
4. Grounds M.D. Age-associated changes in skeletal muscle regeneration. *Annals of the New York Academy of Sciences*. 1998.
5. Carlson B.M., Faulkner J.A. Muscle transplantation and regeneration in aged rats. *Journal of Gerontology*. 1989.
6. Jarvinen T.A., Jarvinen T.L., Kaariainen M., Kalimo H., Jarvinen M. Muscle injuries: biology and treatment. *American Journal of Sports Medicine*. 2005.