MORPHOLOGICAL CHANGES IN MUSCLE FIBERS AFTER THERMAL BURNS IN LABORATORY RATS

Moyliev Gayrat

moyliyev_dr@yahoo.com

Head of Department in Tashkent emergency center of Tashkent city branch, Yashnabod district, Tashkent, Uzbekistan

Babakhanov Otabek

babakhanov_pharm@yahoo.com

PhD, Institute of Pharmaceutical Education and Research, Yunusabad/19, Yunus ota, Tashkent, Uzbekistan

Annotation. *Purpose of the study: Thermal burns cause various accelerated catabolic processes in the body, as the body tries to repair the damaged area. In this study, changes in the morphology of muscle fibers at the injured site were studied. Research methods: thirty laboratory rats were used. They were divided into control (C) and injured (I) groups. Rats in group J were thermally burned over 45% of body surface area standardized by body weight. Rats in both groups were euthanized four, seven, and 14 days after injury. Medial parts of the medial gastrocnemius muscles were cut and stained with hematoxylin and eosin. Then histological analysis was performed. Results and Discussion: The control rats showed normal muscle characteristics with evenly distributed and polygonal muscle fibers with peripheral nuclei. However, these characteristics were not observed in the rats in the injured group. It was found that many fibers in them are round in outline. In addition, the amount of connective tissue was significantly increased in the rats in the injured group. Conclusion: This experimental model was found to be effective in histological assessment of morphological changes in muscles after thermal burns of 45% of the body surface area.*

Keywords: *morphology, muscle fibers, skeleton, connective tissue, burn.*

Histological studies were conducted to observe morphological changes in muscle fibers of euthanized rats in groups N and J after thermal burns. Histological analysis of collagen fibers was performed on Picrosirius12-stained sections [1, 2, 3]

Picrosirius photomicrographs were taken under normal and polarized light to distinguish type I (red and yellow) and type III (green) collagen. For morphological analysis, photomicrographs taken at different magnifications were evaluated by light microscopy using attached cameras (Axioscope 40, Axiocam HRc, Zeiss, Germany) [4, 5, 6, 7].

Research results. Sections of group C showed evenly distributed peripheral nuclei with polygonal muscle fibers. However, in group I, many fiber sections showed rounded contours, variable staining intensity, weakly stained nuclei, and larger interfiber distances.

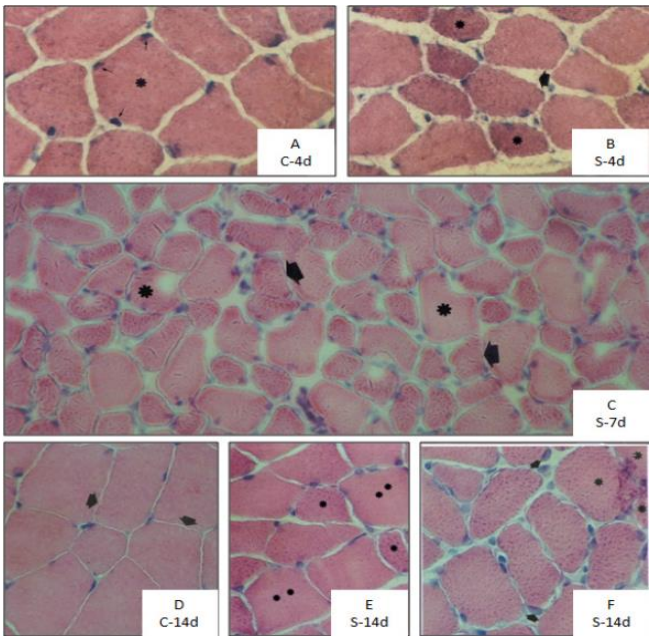

Figure. Sections of rat gastrocnemius muscle stained with hematoxylin and eosin; panels show control group sections taken at days 4 (A) and 14 (D) and burn group sections taken at days 4 (B), 7 (C) and 14 (E and F) after thermal injury. A. Simple fibers with polygonal sides (*), peripheral nuclei (arrows), and slightly irregular contours. B. Muscle fibers with irregular granules of acidophilic aspect (*) and increased interfiber space (arrow). C. Irregular muscle fibers of various shapes and sizes with irregular contours (*) and acidophilic

granules (arrows). D. Normal-looking muscle fibers, some irregular contours (arrows) are visible in certain areas of the muscles. E. Fibers containing acidophilic granules and dividing fibers (*) interspersed with fibers of normal appearance (**). F. Muscle fibers with acidophilic granules, markedly irregular contours, abundant round macrophage-like cells (arrows) in an enlarged intercellular space. Note that some cells degenerate (*). (Zoom: A-B and D-F, 715x; C, 275x.).

Taking into account the consequences of thermal damage to organs, the treatment of burn patients should not only eliminate the acute injury. In addition, due to changes in other tissues such as skeletal muscles, delayed rehabilitation of the patient should be considered. Protein catabolism continues for several months after thermal injury6 and can cause growth retardation for up to 2 years in injured children.

Summary. This study showed that the morphological changes in the muscles changed the shape of the fibers, but no central nuclei were observed, indicating regeneration. However, group I micrographs taken 14 days after injury showed fusion of muscle cells. This feature indicates the beginning of the muscle recovery process. A longer follow-up period allows better observation of the morphological changes accompanying the regeneration of damaged muscle fibers after thermal injury.

REFERENCES

1. Piccolo NS. The 2002 Everett Idris Evans Memorial Lecture. Burn care in Brazil: ideas from the past, trends of the present, and hopes for the future. J Burn Care Rehabil. 2002;23(6):385-400.

2. Padfield KE, Astrakas LG, Zhang Q, Gopalan S, Dai G, Mindrinos MN, Tompkins RG, Rahme LG, Tzika AA. Burn injury causes mitochondrial dysfunction in skeletal muscle. Proc Natl Acad Sci USA. 2005;102(15):5368-73.

3. Pereira CT, Murphy KD, Herndon DN. Altering metabolism. J Burn Care Rehabil. 2005;26(3):194-9.

4. Atyeh BS, Gunn, SWA, Dibo SA. Metabolic implications of severe burn injuries and their management: a systematic review of the literature. World J Surg. 2008;32(8):1857-69.

5. Fang CH, Li BG, Fischer DR, Wang JJ, Runnels HA, Monaco JJ, Hasselgren PO. Burn injury upregulates the activity and gene expression of the 20S proteasome in rat skeletal muscle. Clin Sci (Lond). 2000;99(3):181-7.

6. Hart DW, Wolf SE, Chinkes DL, Gore DC, Milcak RP, Beauford RB, Obeng MK, Lal S, Gold WF, Wolfe RR, Herndon DN. Determinants of skeletal muscle catabolism after severe burn. Ann Surg. 2000;232(4):455-65.

7. Al-Mousawi AM, Williams FN, Mlcak RP, Jeschke MG, Herndon DN, Suman OE. Effects of exercise training on resting energy expenditure and lean mass during pediatric burn rehabilitation. J Burn Care Res. 2010;31(3):400-8.