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Effect of Mesenchymal Stem Cells on Induced Skeletal Muscle Chemodenervation atrophy in Adult Male Albino Rats

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Abstract

The present research was conducted to evaluate the effect of bone marrow derived mesenchymal stem cells (BM-MSCs) as a potential therapeutic tool for improvement of skeletal muscle recovery after induced chemodenervation atrophy by repeated local injection of botulinum toxin-A in the right tibialis anterior muscle of adult male albino rats. Forty five adult Wistar male albino rats were classified into control and experimental groups. Experimental group was further subdivided into 3 equal subgroups; induced atrophy, BM-MSCs treated and recovery groups. Biochemical analysis of serum LDH, CK and Real-time PCR for Bcl-2, caspase 3 and caspase 9 was measured. Skeletal muscle sections were stained with H and E, Mallory trichrome, and Immunohistochemical reaction for Bax and CD34. Improvement in the skeletal muscle histological structure was noticed in BM-MSCs treated group, however, in the recovery group, some sections showed apparent transverse striations and others still affected. Immunohistochemical reaction of Bax protein showed strong positive immunoreaction in the cytoplasm of muscle fibers in the induced atrophy group. BM-MSCs treated group showed weak positive reaction while the recovery group showed moderate reaction in the cytoplasm of muscle fibers. Immunohistochemical reaction for CD34 revealed occasional positive CD34 stained cells in the induced atrophy group. In BM-MSCs treated group, multiple positive CD34 stained cells were detected. However, recovery group showed some positive CD34 stained cells at the periphery of the muscle fibers. Marked improvement in the regenerative capacity of skeletal muscles after BM-MSCs therapy. Hence, stem cell therapy provides a new hope for patients suffering from myopathies and severe injuries.

Keywords: Botulinum toxin-A; Muscle atrophy; Mesenchymal Stem Cells; CD34

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