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Electrical stimulation and umbilical cord stem cell transplantation in murine injured sciatic nerve

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Several approaches have been proposed for peripheral nerve regeneration. We aimed to assess effect of electrical stimulation and Mesenchymal Stem Cells (MSCs) on recovery of rat sciatic nerve. Fifty adult male albino rats weighing 180-250 g were divided into 5 groups: Group-1; sham operated intact nerve. Group-2; crushed nerve control group. Group-3; crushed nerve followed by transplantation of MSCs (3×10⁵ cells/rat) once intra-lesion immediately after injury. Group-4; crushed nerve followed by applying electrodes 5 mm proximal to the injured site using a biphasic current pulse (100 μs pulse width, 20 Hz pulse rate, 2 μA amplitude) for 30 minutes. Group-5; crushed nerve followed by combining procedures of previous two groups. Wound closure and post-surgical care followed. MSCs were isolated from human umbilical cord blood by Ficoll-Hypaque density gradient centrifugation, culture of mononuclear cells and selection by CD 105+ve CD34-ve CD45-ve magnetic separation method using MACs separator. Behavioral testing before injury and at fourth and eighth weeks, serum malondialdehyde and total antioxidant capacity at 48 hours then electrophysiological studies measured at 8 weeks. After 2 weeks, gene expression of brain derived neurotrophic factor (BDNF) mRNA in injured tissue was measured by real-time-PCR. Treatment with either ES or MSCs transplantation accelerated regeneration in all parameters over 8 weeks of the study. Combined treatment group did not show superiority compared to the other two sole treated groups except in the BDNF expression value. Using MSCs and electrical stimulation give better outcome for peripheral nerve regeneration. Further investigation of combined electrical stimulation and stem cells is recommended.

Biography

Amani Abdelfattah Mohamed Ali Elbaz has completed her PhD from Suez Canal University, after having a one year Research Fellowship in the Neuropsychiatric Institute in the University of Illinois at Chicago, USA in 2001. Presently she is working as a Professor in the Physiology Department, Faculty of Medicine at Suez Canal University, Egypt. She has published more than 20 papers in local and international journals and she has been serving as Member of Scientific Advisory Board in many reputed journals.

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