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The therapeutic role of the bone marrow mesenchymal stem cells and the schwann cells and their co-transplantation in regeneration of the injured sciatic nerve in rats

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Introduction: Cell transplantation using The Bone Marrow Mesenchymal Stem Cells (BMSCs) and The Schwann Cells (SCs) to alleviate neurological deficits has become the focus of research in regenerative medicine. In attempt to identify the possible mechanisms underlying the regenerative potential of cell transplantation (BMSCs and SCs), this study investigate the most effective therapy of the sole cell transplantation (BMSCs and SCs) by induction of injury in rat's sciatic nerve when compared to their co-transplantation.

Materials & Methods: In this comparative experimental study, adult male albino rats (n=60, 250-300 gm) divided into 5 groups: Group-1: The control intact sciatic nerve, Group-2: The left injured sciatic nerve injected intralesionally with physiological saline, Group-3: The left sciatic nerve injected intralesionally with BMSCs, Group-4: The left sciatic nerve injected intralesionally with SCs and Group-5: The left sciatic nerve injected intralesionally with BMSCs and SCs. BMSCs and SCs were labeled with Bromodeoxyuridine (BrdU). After 12 weeks, nerve conduction velocity, electromyographic, functional assessments, oxidative and anti-oxidative effects of cell transplantation and measurement of BDNF were performed and analyzed by one-way analysis of variance (ANOVA).

Results: This treatment led to improved walking tract as measured by sciatic nerve index in all the treated groups, increase in nerve conduction velocity and EMG magnitude by using biopack MP150 significantly ($p < 0.01$) in SCs and co-treated groups, increase in the antioxidant effect and reduction in the oxidative effect of cell transplantation in nerve tissue significantly ($p < 0.01$) in BMSCs and co-treated groups and increase expression of brain derived neurotrophic factor (BDNF) in nerve tissue using real time PCR significantly ($p < 0.01$) in SCs and co-treated groups.

Discussion: The results showed the superiority of the co-transplantation group followed by SCs group in the most of the assessments to BMSCs group which exceptionally succeeded in the increase of the antioxidant and the decrease in the oxidant levels.

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