

Repair of Spinal Cord Injury (SCI) Using Bone Marrow Stromal Cell Transfected with Adenoviral Vector Expressing Glial derived Neurotropic Factor (GDNF) in a Rat SCI Model

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Back ground

Subsequent to spinal cord injury many pathological changes may occur that could lead to inappropriate environment for repair. The Most important of such changes is the death of neurons. Exogenous administration of growth factors that modulate neuronal survival, synaptic plasticity, and neurotransmission has been proposed as a potential therapeutic treatment for SCI. Among these growth factors, GDNF is a peptide with pleiotropic survival and growth-promoting effects on neurons. In addition, GDNF induces the growth of motor and sensory axons and inhibits neuronal apoptosis. Adult stem cells may provide new strategies to treat SCI. Among various types of candidate stem cells, bone marrow stromal cells (BMSC) are promising because they have shown potential to neuronal differentiation and repair in damaged spinal cord. In this study, we aimed to improve results of treatment using combination of BMSC and GDNF features.

Methods:

Rats were divided randomly into four groups of six. Spinal cord injury was then performed under general anesthesia using the weight dropping method. The BMSCs were injected on 3th day of post-spinal cord injury. Group one included rats receiving normal saline, group two received BMSC, group three received BMSC infected with adenoviruses encoding the beta-galactosidase gene, and group four received BMSC infected with adenoviruses encoding the GDNF gene. A Basso, Beattie and Bresnahan (BBB) score test was performed for a period of four weeks. Two weeks before the end of BBB, biotin dextran amine was injected intracerebrally followed by tissue staining at the end of the fourth week.

Results:

There was a significant difference in BBB scores between groups one and four ($p < 0.05$). BBB scale improved to 12.8 points group one, while it was 8.6 in the control. There were no significant differences between other groups. There were significant differences in axon counting between group one and other groups ($p < 0.0001$). Also, there were significant differences in axon counting between group four with groups two and three ($p < 0.0001$).

Conclusion:

Combined use of these methods (GDNF expressing BMSCs) showed better results in comparison with BMSC alone. In this study the two methods were used simultaneously. The time of injection of BMSCs is very important and so we suggest that other injection times be tested.

Key words: BMSC, GDNF, Gene Therapy, Spinal cord injury.

Poster Presentation

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