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Poster Presentation

Therapeutic Potential of Neural Stem Cells for Spinal Cord Injury

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Abstract

Spinal cord injury (SCI) is a destructive condition that the cord can't send signals below the level of the injury. Despite advances in the medical and surgical care of SCI patients, no effective treatment exists for the neurological deficits of SCI. Cell therapy is a new approach for SCI, and preclinical models demonstrate that cell transplantation can improve some secondary events through neuroprotection and also restore lost tissue through regeneration. Neural Stem Cells (NSCs) are multipotent cells committed to the neural lineage that can self-renew. NSCs are found in both fetal and adult central nervous system (CNS). NSCs locate within specific niches in the adult CNS, including the subventricular zone in the lateral ventricles of the forebrain, the dentate gyrus of the hippocampus, olfactory bulb and the region of the central canal of the spinal cord. Transplantation of NSCs into injured tissue, promoted functional recovery with neuroprotective and neuroregenerative effects. Most studies with transplanted NSCs have shown modest recovery of the injured spinal cord. Adult mouse brain–derived NSCs transplanted into the injured rat spinal cord with concomitant infusion of growth factors promoted oligodendrocyte differentiation of the grafted NSCs, remyelination, and improved locomotor function. NSCs derived from fetal rat spinal cord differentiated into neurons that integrated into the injured cord and improved recovery, and transplanted NSCs combined with valproic acid administration promoted neuronal differentiation, resulting in restoration of disrupted neuronal circuitry and enhanced recovery. NSCs have also demonstrated some immunomodulatory and pathotropic ability by homing toward damaged tissue as well as secreting various neurotrophic factors and cytokines. Neuralstem cells also express nerve growth factors that are essential to the healthy function of the CNS. These could protect the patient's own neurons from further degeneration due to injury. By solving some limitations in future, cell therapy can open a new window for treatment of SCI.

Keywords: Neural Stem Cells, Spinal cord injury, Cell therapy.

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