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Adult stem cell therapy for acute and subacute spinal cord injury: Early clinical results and combined therapy strategy

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Spinal cord injury (SCI) invariably results in the loss of neurons and axonal degeneration at the lesion site, leading to severe functional impairment, paraplegia, or tetraplegia. Currently, there is no effective treatment for SCI. An emerging strategy for regenerating damaged tissue is the implantation of stem cells. The use of adult stem cell in cell therapies may have some advantages over the use of other sources of cells: they are relatively easy to isolate, they grow well in tissue cultures, and they may be used in autologous or allogenic transplantation protocols. Preclinical studies have been performed on rats with a spinal cord injury and have shown that transplanted cells in the injured spinal cord survive, migrate into the host tissue and lead to axonal regeneration and motor function recovery.

But the nave adult stem cell transplantation has some limitations including their inability to differentiate into functional neuronal cells. Adult stem cells produce a variety of neurotrophic factors as well as chemokines and cytokines in vitro and in vivo. However, the mechanisms that mediate functional recovery and secreted factors effects remain speculative. The ability of neurotrophins and growth factors to promote growth of damaged axons suggests that they may be used therapeutically to repair the injured spinal cord, most likely as an element in a combination therapy.Several examples of the combined strategies performed in our lab will be presented including genetic modification of stem cell, application of neurotrophic factor secreting nanospheres.

There are many controversial issues regarding to cell therapy clinical trial in spinal cord injury patients including safety and effectiveness issues. Since May. 2007, after permission from IRB and KFDA, we started clinical trial of cell therapy in acute and subacute complete spinal cord injury patients using bone marrow derived stem cells(6patients) and fetal neural stem cells(20 patients). We will present preliminary results and early observations of this study.

Key word: Adult stem cells, Spinal cord injury, Transplantation, Combined therapy, Clinical trial