

Stem Cell Therapy: A Possible Treatment for Paralysis

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Key Points

- Definition of neurodegenerative diseases
- What is stem cell therapy
- Efficacy and safety of stem cell therapy
- Side effect of stem cell therapy

Neurodegenerative diseases due to the gradual loss of structure and function of neurons, or certain spinal and brain injuries cause different degrees of paralysis and contribute to loss of sensation and cognition. Due to the lack of successful treatment options for neurodegenerative diseases and nervous injuries a considerable burden on the society is created and it also has an economic impact. Stem cell therapy, has given an amazing opportunity to find new innovative ways for treating neurodegenerative diseases and injuries. This is because stem cells have the capability to repair damaged nerve tissues by replacing the injured or dead cells with differentiated cells and saving the existing healthy glial cells and neurons from further damage.¹

From multiple studies we have got to know that when tissues are delivered, the mesenchymal stem cells get the inflammation reduced, the growth of local progenitor cells is driven and blood vessel formation is promoted through exosome secretions and paracrine proteins, along with the transfer of mitochondria, when delivered into the damaged or dead tissue.²

One of the most suitable and appropriate cells for paralysis treatment are adult adipose tissue stem cells. First of all, adipose tissues can be easily separated from various parts of the body. Secondly, during a single sampling, a large amount of stem cells can be isolated from adipose tissues as the number of stem

cells produced per unit area is very high. Thirdly, the adipose tissue stem cell transfusion isn't an expensive procedure. And most importantly, the Adipose-derived stem cells (ASCs) are very safe to use. Because of these advantages and benefits ASCs are an appropriate candidate for the treatment of paralysis.³

The efficacy and safety of intrathecal autologous adipose tissue derived mesenchymal stem cells in patients with sharp and traumatic spinal cord injuries is being investigated by The CELLTOP study, which is an ongoing multiple disciplinary clinical trial being conducted at Mayo Clinic. In this report the outcome of the first treated patient is described. The patient was a 53-year-old surfing accident survivor who sustained an American Spinal Injury

Association Impairment Scale grade 'A' high cervical spinal cord injury. Although he improved to an American Spinal Injury Association grade 'C' impairment classification, the patient was still wheelchair bound. A biopsy of adipose tissue was performed and mesenchymal stem cells were isolated, grown, and cryopreserved. According to the protocol, the patient was given an intrathecal injection of 100 million autologous ADMSCs after being given a standard lumbar puncture at the L3-4 level, around 11 months after he got injured. The procedure went well and the patient didn't experience any serious adverse effects. To determine the efficacy, clinical signs were observed at the third, sixth, twelfth and eighteenth months after the injection in both sensory and motor

scores, based on International Standards for Neurological Classification of Spinal Cord Injury. Thus, intrathecal administration of AD-MSCs was completely safe and suitable in this patient and suggested meaningful signs of improved neurologic status.⁴

Therapeutic application of mesenchymal stem cells shows some promising approach in the treatment of neurodegenerative diseases and spinal cord injury. Nevertheless, stem-cell therapy in its early stages is facing many challenges too. We need to have a better understanding of the mechanism of action and how the stem cells behave when they reach the pathological environment after transplantation so that we can get to know about the best time frame, and the most appropriate and suitable routes of delivering the cells to the affected areas. Several randomized, controlled, double blind and multi-center clinical trials need to be conducted to prove the therapeutic efficacy of stem cell therapy, and to get this procedure recognized as a treatment option for paralysis.⁵

References:

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