Bone Marrow Stromal Cell

Bone marrow stromal cells (BMSCs) have been reported to exert potential neuroprotection properties in models of neurotrauma, although precise mechanisms underlying their benefits are poorly understood. Despite this lack of knowledge, several clinical trials have been initiated using these cells.

A combined treatment comprising Platelet-rich plasma (PRP) and brain derived neurotrophic factor (BDNF)-overexpressing BMSCs produced beneficial effects in rats with regard to functional recovery after spinal cord injury SCI through enhancing migration of astrocytes into the transplants and axonal remyelination [1].

The intranasal delivery of bone marrow stromal cells (BMSCs) or mesenchymal stem cells to the injured brains of rodents has been reported.

They reached the injured spinal cord through the intranasal route and contribute to the recovery of hind limb motor function and lesion cavity reduction. However, the effects were not as significant as those seen in the intrathecal BMSC-treated group [2].

To determine whether local mechanisms mediate BMSC neuroprotective actions, Brock et al grafted allogeneic BMSCs to sites of severe, compressive spinal cord injury (SCI) in Sprague-Dawley rats. Cells were administered 48 h after the original injury. Additional animals received allogeneic MSCs that were genetically modified to secrete brain derived neurotrophic factor (BDNF) to further determine whether a locally administered neurotrophic factor provides or extends neuroprotection. When assessed 2 months post-injury in a clinically relevant model of severe SCI, BMSC grafts with or without BDNF secretion failed to improve motor outcomes. Thus, allogeneic grafts of BMSCs do not appear to act through local mechanisms, and future clinical trials that acutely deliver BMSCs to actual sites of injury within days are unlikely to be beneficial. Additional studies should address whether systemic administration of BMSCs alter outcomes from neurotrauma [3].

1)
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2)
Ninomiya K, Iwatsuki K, Ohnishi Y, Ohkawa T, Yoshimine T. Intranasal delivery of bone marrow stromal cells to spinal cord lesions. J Neurosurg Spine. 2015 Jul;23(1):111-9. doi: 10.3171/2014.10.SPINE14690. Epub 2015 Apr 3. PubMed PMID: 25840039.
3)
Brock JH, Graham L, Staufenberg E, Collyer E, Koffler J, Tuszynski MH. Bone Marrow Stromal Cell Intraspinal Transplants Fail to Improve Motor Outcomes in a Severe Model of Spinal Cord Injury. J Neurotrauma. 2015 Nov 13. [Epub ahead of print] PubMed PMID: 26414795.