



Title: Spinal cord injury: How can stem cells help

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Abstract:

Tremendous efforts have been made to ameliorate and improve locomotor function after spinal cord injury (SCI) by the transplantation of various types of stem cells. However, the mechanism of action still has to be elucidated. In our study we compared stem cells from different sources – mesenchymal stem cells (MSCs), an immortalized stem cell line (SPCs) derived from human fetal spinal cord tissue or human induced pluripotent stem cell-derived neural precursors (iPS-NPs) – for the treatment of a SCI. Both types of NPs survived and differentiated in the lesion. We further investigate the effect of cell grafting on activity of pro-inflammatory NF- κ B pathway. Cell transplantation resulted in significant downregulation of TNF- α production and in strong inhibition of p65 NF- κ B activity. To assess the effectivity of the MSC treatment, different dosages and repeated applications were compared. Histochemical analyses revealed a gradually increasing effect of grafted cells, resulting in a significant increase in axonal sprouting, spared gray matter and reduced astrogliosis. MSC-secretome had similar effect as cell application.

Our results demonstrate that the transplantation of stem cells into the lesioned rat spinal cord improves functional outcome due to their strong immunomodulatory properties based on inhibition of a major signalling pathway. Reduced inflammation may have led to observed tissue sparing and glial scar reduction. The effect of MSCs on spinal cord regeneration is dose-dependent, potentiated by repeated application and comparable with their secretome. Neurogenic stem cells have the ability to interact with the host tissue and differentiate into a more mature phenotype.

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