Advanced approaches to regenerate spinal cord injury: The development of cell and tissue engineering therapy and combinational treatments

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Abstract

Spinal cord injury (SCI) is a central nervous system (CNS) devastate event that is commonly caused by traumatic or non-traumatic events. The reinnervation of spinal cord axons is hampered through a myriad of devices counting on the damaged myelin, inflammation, glial scar, and defective inhibitory molecules. Unfortunately, an effective treatment to completely repair SCI and improve functional recovery has not been found. In this regard, strategies such as using cells, biomaterials, biomolecules, and drugs have been reported to be effective for SCI recovery. Furthermore, recent advances in combinatorial treatments, which address various aspects of SCI pathophysiology, provide optimistic outcomes for spinal cord regeneration. According to the global importance of SCI, the goal of this article review is to provide an overview of the pathophysiology of SCI, with an emphasis on the latest modes of intervention and current advanced approaches for the treatment of SCI, in conjunction with an assessment of combinatorial approaches in preclinical and clinical trials. So, this article can give scientists and clinicians' clues to help them better understand how to construct preclinical and clinical studies that could lead to a breakthrough in spinal cord regeneration.

Keywords: Spinal cord injury, Regenerative medicine, Tissue engineering, Biomaterials, Stem cells, Combinatorial treatments