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Perspective

Therapeutic Effect of Messenchymal Stem Cells for Neuronal Disorder

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DESCRIPTION

Spinal Cord Injury (SCI) is crippling and complicated. A secondary injury cascade that includes oxidative stress, excitotoxicity, metabolic alterations, inflammatory processes, necrosis or apoptosis occurs after the initial damage brought on by external factors; the resulting gliosis and fibrosis provide an unfavourable environment for axonal regrowth. Because of the adult spinal cord's existence of growth inhibitors and the weak intrinsic regeneration capacity of neurons, axons typically fail to regenerate, preventing neurologic recovery. In order to improve the hostile injury environment, SCI therapy employs a number of techniques, such as providing trophic factors for cell protection, chondroitinase ABC for proteoglycan degradation to lower the concentration of inhibitory molecules, and Decoy/minocycline to reduce inflammation. The other options include employing cell therapy to replace the injured or dead cells, such as Neural Stem Cells (NSCs) or mesenchymal stem cells, and gene-mediated improvement of intrinsic neuronal regrowth machinery after injury, such as regulation of the PTEN/mTOR pathways (MSCs).

MSCs are mesoderm-derived progenitor cells that may be cultured from bone marrow, adipose tissue, and the placenta. Numerous neurotrophic factors are secreted by MSCs, who also exhibit low immunogenicity. In the right experimental settings, MSCs transdifferentiate into neural lineage cells and regulate immunoreactivity to lessen inflammation. In animals with SCI, MSC transplantation has been found to improve neurological and motor functioning. MSC transplantation has been employed in clinical trials in recent years to treat SCI, and it has been demonstrated to enhance the overall AIS grade without causing any significant side effects. Through the prevention of inflammatory cell activation, restoration of local blood supply systems, and cell protection caused by the MSC paracrine impact, MSC transplantation has special effects in spinal cord repair. The evidence for naive MSC differentiation into functional neural lineage cells *in vivo* is poor, yet some pre-induced MSCs develop into neural lineage cells after transplantation. MSC-Conditioned Media (MSC-CM) is seen as a desirable possibility for stem cell-based therapeutic applications as a result. According to studies, MSC-CM promotes hindlimb functional recovery in SCI rats and increases neuronal survival under glutamate excitotoxicity and Oxygen-Glucose Deprivation (OGD) settings. MSCs' released substances may help in immunoregulation and tissue regeneration. MSCs function as extracorporeal bioreactors and release bioactive substances into the CM that may be used in clinical settings as a unique treatment approach for CNS injury.

Future clinical uses of MSC-CM depend critically on its production and effectiveness. Growth factor supplements like bFGF and EGF used in MSC cultures may have noticeable effects on the proliferation of MSCs. There hasn't been any more elucidation of the therapeutic effects of MSC-CM formulations, as the majority of studies have concentrated on changes in the expansion and features of MSCs in various culture medium formulations.

CONCLUSION

In the current work, human MSCs were grown in Neural Regeneration Laboratory Medium (NRLM), which contains Foetal Bovine Serum (FBS)/patient's plasma, enabling quick *ex vivo* MSC multiplication using commercially available/clinical bone marrow samples. Additionally, we looked into the therapeutic effects of NRLM-CM, also known as the conditional medium from MSCs grown in NRLM, on SCI both *in vitro* and *in vivo*. *In vitro*, NRLM-CM had superior anti-inflammatory and neurite regeneration activities, and it improved functional recovery in SCI rats. Additionally, MSCs obtained from clinical patient bone marrow samples were successfully cultured using NRLM.

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