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Opinion Article

Cell Therapy: A Remedy to Repair Tissue after Stroke

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DESCRIPTION

The prevalence of age-related diseases will increase as the population ages. Although thrombolysis with recombinant tissue plasminogen activator for ischemic stroke is an approved therapeutic method for ischemic stroke, the ageing process is linked to a higher risk factor for stroke in both men and women. Many neurodegenerative illnesses in humans are linked to a reduction in neurogenesis and a decrease in stem/progenitor cell proliferation as they age. Stem cell-based therapy is a promising technique for encouraging neuro regeneration following brain injury, and it can be enhanced by supporting pharmaceutical therapy, particularly when the ageing process is present.

Stem cell therapy focuses on improving function rather than tissue restoration in the early stages of a stroke. Stem cells can also be used for gene therapy in regenerative medicine because of their plasticity and affinity towards damaged tissue. In a "glio-neurovascular niche," cell damage after a stroke affects not only neurons but also other brain cells and the extracellular matrix. As a result, treatments that target brain cells, such as growth factors or stem cell therapy, are attractive options for stroke regeneration strategies. Neuroprotection, axonal sprouting and regeneration, angiogenesis, and control of neuro-inflammation are some of the mechanisms involved in neuro regeneration of cell therapy after stroke. The method of action is specific to a certain transplanted cell type, and the best delivery route, dosages, and time window following lesion are still being debated.

Blastocyst cells (Embryonic Stem Cells (ESCs)), adult stem cells (Bone Marrow Derived Stem Cells (BMSCs) generated from peripheral blood or other organs such adipose tissue), umbilical cord blood cells, and Induced Pluripotent Stem Cells are all sources of stem cells, according to the source (iPSCs). The most promising cells for recovery after cerebral ischemia include Bone Marrow Mononuclear Cells (BM-MNCs), Bone Marrow Derived Mesenchymal Stem Stromal Cells (BM-MSCs), Umbilical Cord Stem Cells (UCSCs), and Neural Stem Cells (NSCs). However, before stem cells can be used in clinical settings, they must be thoroughly tested for safety and therapeutic potential in animal models of neurological illnesses.

Gene therapy has been characterised as an effective treatment for nerve injuries. Pereira and colleagues discovered that Endothelial Progenitor Cells (EPCs) supplied with the VEGF Gene and Granulocyte Colony-Stimulating Factor (G-CSF) accelerate regeneration and improve functional outcomes.

After ultrasonic microbubble transfection, VEGF administration using Endothelial Progenitor Cells (EPCs) was observed to promote migration and proliferation of human endothelial cells. EPCs can be a good way to get VEGF into the ischemic region following a stroke. Also described were Hyaluronic Acid (HyA-) based hydrogels that protect Sca-1(+)/CD45(+) Cardiac Progenitor Cells (CPCs) and improve cell survival and engraftment with host tissues following transplantation. Gene-modified SC that overexpresses neurotrophic factors such as Brain-Derived Neurotrophic Factor (BDNF), Akt, and NGF can help in neuro recovery after a stroke.

CONCLUSION

The efficacy of stem cell therapies has been disappointingly low thus far, owing to a lack of understanding of the time course of interactions between the hosts neuro-inflammatory response, which is the main barrier to exogenously mediated neuronal precursor cells, and exogenously administered stem cells. Although MSC transplantation into the brain has been shown to be beneficial in preclinical investigations of neurodegenerative and neuroinflammatory illnesses, only a few research have shown that stem cells may survive in a highly inflammatory environment, such as an ischemic area in a stroke.

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