Neuroregenerative role of transplanted olfactory ensheathing cells in a model of sciatic nerve crush injury in rats histological study

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Background: Olfactory ensheathing cells (OECs) are highly specialized glial cells that guide olfactory receptor axons from nasal mucosa to olfactory bulb. Olfactory ensheathing cells (OECs) are attractive candidates for transplantation-mediated repair of injured nervous system owing to their neuroregenerative properties.

Aim of the work: to evaluate the neuroregenerative role of OECs in a model of sciatic nerve crush injury in rats.

Materials and methods: Olfactory ensheathing cells (OECs) were isolated from the olfactory mucosa of 15 male albino rats (100 gm). Thirty adult female albino rats (200-250 gm) were used and divided into three groups of 10 rats each. Group I (control group) underwent sham operation. Group II underwent crush and divided into three groups of 10 rats each. Group III (treatment group) underwent sciatic nerve crush injury followed by transplantation of OECs. The lesion site was fixed with buffered formalin, processed, and examined histologically.

Results: Histological examination of sciatic nerves of group II rats showed discontinuity of nerve fibers with vaculated axoplasm and Schwann cells proliferation. Olfactory ensheathing cells (OECs) transplantation in group III revealed restoration of the normal histological architecture of sciatic nerves. A significant decrease in the diameter of myelinated nerve fiber sand myelin sheath thickness was recorded in group II compared to the control group. However, group III revealed a significant increase in the previous parameters compared to group II.

Conclusion: Olfactory ensheathing cells (OECs) have neuroregenerative properties which might represent a new vision in human cell based therapy.

Different fabrication methods of tissue engineering

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Tissue engineering is one of the most essential research field for regenerative medicine. This is because bioengineered tissue transplantation minimizes cell loss in contrast to cell injection. Moreover, it has the potential to repair critical tissue defects. The rational is building a scaffold-based tissue engineering utilizing a biodegradable polymer scaffold for seeding cells. A new technique of tissue engineering is cell sheet-based tissue engineering which has been developed. Stacked or monolayer cell sheets can be transplanted directly onto the damaged tissues. Cell sheet transplantation has already been applied. Clinically, Cardiac cell sheet stacking can produce pulsatile heart tissue. However, there are certain limitations as lack of vasculature which limits the viable tissue thickness to only 3 layers. Vascularization is one of the greatest challenges in tissue engineering. In engineered tissue constructs, cells must be sufficiently close to oxygen and nutrient. Recently, developing vascular networks within cell populated tissue could facilitate transport of nutrients thus preserving the cellular viability over a long period of time. The construction of vascularized engineered tissue constructs relies either on fabrication of a network of microchannels or cell based strategies. Tissue engineering is one of the most essential research field for regenerative medicine. This is because bioengineered tissue transplantation minimizes cell loss in contrast to cell injection. Moreover, it has the potential to repair critical tissue defects. The rational is building a scaffold-based tissue engineering utilizing a biodegradable polymer scaffold for seeding cells. A new technique of tissue engineering is cell sheet-based tissue engineering which has been developed. Stacked or monolayer cell sheets can be transplanted directly onto the damaged tissues. Cell sheet transplantation has already been applied. Clinically, Cardiac cell sheet stacking can produce pulsatile heart tissue. However, there are certain limitations as lack of vasculature which limits the viable tissue thickness to only 3 layers. Vascularization is one of the greatest challenges in tissue engineering. In engineered tissue constructs, cells must be sufficiently close to oxygen and nutrient. Recently, developing vascular networks within cell populated tissue could facilitate transport of nutrients thus preserving the cellular viability over a long period of time. The construction of vascularized engineered tissue constructs relies either on fabrication of a network of microchannels or cell based strategies.

3D bioprinting

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Due to a growing need for organ transplantation and a short supply of donor organs, tissue engineering has progressed rapidly towards the development of new technologies for organ fabrication. Due to the ability to pattern biomaterials with micrometer precision in three dimensions (3D), bioprinting represents an appealing alternative to address these growing requirements in biomedical engineering. Three-dimensional (3D) bioprinting is a novel approach for the design and engineering of human tissues and organs. It is a flexible automated on-demand for the fabrication of complex living architectures. Bioprinting can be used to precisely position cells and cell laden materials to generate controlled tissue architecture. Several techniques are used including inkjet bioprinting and laser-induced forward-transfer (LIFT) technique. Several successful trials have been done including skin and ear tissue engineering. However, there are still certain limitations to widely use this technique.

Histological and immunohistochemical study on the role of mesenchymal stem cells in the repair of experimentally induced skin burn in adult male albino rat

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Introduction: Patients having full thickness skin burns are difficult to treat and usually need special care and long