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Opinion Article

Implications of Stem Cell Therapy for Retinal Regeneration

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DESCRIPTION

Stem cell therapy makes it feasible to regenerate tissue. The effectiveness of the treatment, however, may differ based on the type and number of cells impacted by the underlying retinal disorder. Direct tissue replacement or rescue therapy employing stem cells developed into the specific cell of interest may be an option for treating retinal disorders where a single cell type, such as a photoreceptor or RPE, has fundamental malfunction.

However, the idea of using a single type of retinal cell for direct cell replacement to restore vision may be unduly idealistic and simplistic, particularly in eyes with considerable and long-term vision loss. First, more than one retinal cell type may be dysfunctional in a retinal condition. Second, the persistent retinal dysfunction involving numerous retinal neurons may irreversibly affect the neural circuitry within the retina as well as the retinal structure itself.

It has been demonstrated that photoreceptor degradation causes substantial retinal remodelling, including retinal neural migration and rewiring. The unsatisfactory visual results of eyes with retinal degeneration treated with subretinal transplantation of intact sheets of foetal retina are partially explained by these variables. Similar to this, the progressive loss of endothelial cells and pericytes in diabetic retinopathy-affected eyes results in the development of naked basement membrane tubes. The irreversible retinal ischemia causes these naked foundation tubes to develop into acellular capillaries.

Therefore, there may only be a brief window of time for stem cell therapy to prevent or lessen structural damage to the retina. Direct cell replacement, which reconstructs the vascular endothelium using just one kind of cell, may have a limited therapeutic benefit in such a situation. Harvested BMSCs with heterogeneous stem cell mixtures, some of which are capable of direct engraftment and paracrine trophic effects, may enable the stem cells to influence a variety of retinal cells that may be impacted in eyes with retinal dysfunction, including diabetic retinopathy and retinal degeneration.

The eye is a small, confined region, and local distribution of cells to the retina may be accomplished with only a small number of stem cells, two advantages of the retinal anatomy that make stem cell therapy promising for treating retinal disorders.

Additionally, the optically transparent eye tissue would make it possible to study the effects of the cell therapy noninvasively and at the cellular level using *in vivo* retinal imaging methods. Furthermore, objective and subjective functional tests can be used to assess the outcomes of cell therapy. Finally, compared to other organs, the eye is relatively immunologically privileged, making allogeneic cell transplantation more likely to succeed.

CONCLUSION

The definition of a stem cell is a cell that has the capacity for self-renewal and may simultaneously give rise to a variety of cell types. A cell that can be easily expanded and instructed to develop into the numerous retinal cells of interest that may be impacted by the pathologic condition would be the ideal stem cell for cell replacement in eyes with retinal malfunction. The ideal transplanted cell should integrate and last in the retina and restore the neuronal activity within the retina in order to have a long-term impact. To reduce the chance of aberrant cellular proliferation and teratoma formation in the eye, the cell should be stable and exhibit restricted proliferative potential following integration in the retina.

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