

The Potential of Human Stem Cells for the Study and Treatment of Glaucoma

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PURPOSE: Currently, the only available and approved treatments for glaucoma are various pharmacologic, laser-based, and surgical procedures that lower IOP. Although these treatments can be effective, they are not always sufficient, and they cannot restore vision that has already been lost. The goal of this review is to briefly assess current developments in the application of stem cell biology to the study and treatment of glaucoma and other forms of optic neuropathy.

METHODS: A combined literature review and summary of the glaucoma-related discussion at the 2015 "Sight Restoration Through Stem Cell Therapy" meeting that was sponsored by the Ocular Research Symposia Foundation (ORSF) .

RESULTS: Ongoing advancements in basic and eye-related developmental biology have enabled researchers to direct murine and human stem cells along specific developmental paths and to differentiate them into a variety of ocular cell types of interest. The most advanced of these efforts involve the differentiation of stem cells into retinal pigment epithelial cells, work that has led to the initiation of several human trials. More related to the glaucoma field, there have been recent advances in developing protocols for differentiation of stem cells into trabecular meshwork and retinal ganglion cells. Additionally, efforts are being made to generate stem cell-derived cells that can be used to secrete neuroprotective factors.

CONCLUSIONS: Advancing stem cell technology provides opportunities to improve our understanding of glaucoma-related biology and develop models for drug development, and offers the possibility of cell-based therapies to restore sight to patients who have already lost vision.

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