Curing Glaucoma Within Our Sights

By Zack Butovich

In previous issues of Sight + Sound, we mentioned the enormous strides in utilizing stem cells from the trabecular meshwork (TM) of the eye to alleviate the effects of, and potentially cure, glaucoma. Initially supported through a large grant from an anonymous donor, most of this work was spearheaded by Dr. Yiqin Du, who soon became the first ever researcher to publish on techniques related to isolating and growing TM stem cells — an enormous accomplishment. Later, Dr. Du followed up on this success by creating an animal model where TM stem cells actually restored lost function of the TM — in other words, she cured glaucoma in mice.

Also previously mentioned was the arrival of Dr. Nils Loewen to our research and clinical faculty. Dr. Loewen is a highly trained glaucoma surgeon and Chief of the Department’s Glaucoma and Cataract Service. He is one of only a small number of surgeons in the world who can perform a special kind of glaucoma procedure that removes part of the trabecular meshwork in order to relieve pressure. Dr. Loewen’s research follows suit, by investigating novel ways to completely remove and then rebuild a healthy TM, using gene therapeutic vectors and techniques from bioengineering and tissue regeneration.

Together, these two world-class researchers, in conjunction with the Chairman of the Department of Ophthalmology, Dr. Joel S. Schuman, a leader in glaucoma research and treatment, will partner with the Eye & Ear Foundation as we begin a campaign to develop the Initiative to Cure Glaucoma.

The Initiative will be built around three bold strategies to address the problem of glaucoma:

• The first goal will involve Dr. Loewen teaming up with Dr. Joseph Glorioso, a professor of Microbiology and Molecular Genetics at the University of Pittsburgh, to develop a gene therapy vector that would specifically remove the diseased tissue from the TM that is responsible for increased eye pressure and can thus address the cause of glaucoma. Already, this team has produced unique models that have demonstrated success in small experiments that are now ready to be scaled up to larger, more complex scenarios.

• This will lead to the second strategy, using Dr. Du’s TM stem cells to rebuild the damaged or removed TM tissue, by relying on the inherent self-regenerative ability of stem cell treatments and therapies. This effort would reduce the pressure caused by glaucoma and a malfunctioning outflow tract, thereby preventing damage to the optic nerve, or otherwise halting vision loss as a result of the disease.

• Finally, Dr. Loewen will then partner with Dr. Schuman, and Dr. Lawrence Kagemann, Assistant Professor of Ophthalmology and Bioengineering, to determine what is responsible for continued outflow resistance following surgical removal of TM segments. Determining the cause of this peculiar residual resistance, despite the absence of the TM that is responsible for outflow resistance, will allow to quickly develop entirely new drug categories and therapies.

“Retinal Regeneration,” states Dr. Loewen, “we believe this strategic plan really brings us within striking distance of something no one has yet accomplished — a cure for the high pressure seen in most forms of glaucoma.”

The Initiative to Cure Glaucoma is a very bold and dynamic effort in the fight against glaucoma and vision loss. We look forward with great anticipation to the benefit it can bring our patients.

To receive updates on the research advances being made at the Initiative to Cure Glaucoma, please contact the Eye & Ear Foundation of Pittsburgh at 412-864-1300 or info@eyeandear.org. Donations to the Initiative to Cure Glaucoma can be through our website, eyeandear.org, or by returning the attached envelope.