Glaucoma's unique protein expression could enhance diagnosis and treatment

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Dr. Kathryn Bollinger, Medical College of Georgia clinician-scientist specializing in glaucoma, has identified a unique group of proteins expressed in glaucoma that could improve diagnosis and treatment. Credit: Phil Jones, MCG campus photographer

An eye under pressure appears to express a unique set of proteins that physicians hope will one day help them better diagnose and treat glaucoma.

Glaucoma, the second leading cause of blindness worldwide, tends to progress silently until decreased vision indicates trouble, said Dr. Kathryn Bollinger, Medical College of Georgia clinician-scientist specializing in glaucoma.

But inside fluid-filled eyeballs, a changing protein profile - 30 with significant increases and 17 with significant decreases identified among hundreds of proteins present - appears to also give a heads-up, Bollinger reported during the Association for Research in Vision and Ophthalmology Annual Meeting April 30-May 6. The MCG ophthalmologist received the 2010 ARVO/Alcon Early Career Clinician-Scientist Research Award for the study.

With glaucoma, elevated pressures inside the eyeball stress the optic nerve and nerve arms - called axons - that reach out to communicate with the brain. Over time, increased pressure can kill nerve cells and axons and decrease vision. "At this point, we don't have a regenerative strategy," Bollinger said.

The pressure results from an imbalance in fluid production and loss. In a healthy eye, the fluid, called the aqueous humor, moves continually from the back to the front of the eye where it exits - mostly via a natural tract between the iris and cornea - first into spongy tissue near the cornea's base called the trabecular meshwork then into the venous system and back into the body.

In open-angle glaucoma, the most common type in this country, the tract remains open but fluid still backs up and scientists suspect changes in the permeability of the trabecular meshwork may be to blame. Topical glaucoma treatments work by reducing fluid production or increasing outflow through a secondary drainage system, also near the front of the eye. Ophthalmologists such as Bollinger can also create a new pathway surgically if needed.

To get a better picture of what happens to the trabecular meshwork, Bollinger examined tissues from the outflow tracts and trabecular meshwork of patients with and without glaucoma. She added TGF-β, a protein and inflammatory element known as a cytokine that is

consistently found at high levels in patients with open-angle glaucoma. After comparing treated and untreated tissue, she found that TGF-β resulted in a similarly unique protein pattern. Current therapies don't target TGF-β or its effects in the trabecular meshwork.

Next steps include identifying additional proteins expressed in glaucoma, determining the impact of the unique protein profile on the trabecular meshwork and clarifyingTGF-β's normal role inside the eye, Bollinger said.

Risk factors for glaucoma include age, a family history and black and Asian ethnicity.

Provided by Medical College of Georgia