Researcher taking the pressure off glaucoma diagnosis

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Mansur Mulk, a PhD candidate in Biomechanical Engineering, is working to improve the standard, yet fallible, techniques used to diagnose glaucoma, the second leading cause of irreversible blindness in the world's aging population.If successful, Mansur Mulk might not only help glaucoma sufferers retain their sight, but save health-care providers big bucks as well. Credit: Adela Talbot

(Medical Xpress)—Glaucoma represents the second-leading cause of irreversible blindness in the world's aging population, with 400,000 Canadians and 67 million people worldwide suffering from the

condition.

The standard glaucoma diagnosis is based on an individual having increasingly high eye pressure, also known as intraocular pressure (IOP). There are no early indications for the condition; it is usually caught while advancing and, once spotted, the only way to treat it – and prevent a potential loss of vision – is to lower the patient's IOP.

Therefore, Mulk said, measuring the patient's IOP is key to diagnosing glaucoma. But, as it stands, IOP tests are inadequate when it comes to giving accurate pressure readings and, as such, cannot provide consistently accurate diagnoses.

"Sometimes people have low pressure, but still they have glaucoma. Some people measure to have high pressure and they are assumed to (have it), but they do not," explained Mulk, a Western PhD candidate in Biomechanical Engineering.

While an elevated IOP is considered a major indicator of glaucoma, many clinical studies have shown evidence of the condition at normal intraocular pressures.

Leaning on the current 'gold standard' in testing eye pressure, optometrists use Goldmann tonometer and derivative forms of applanation tonometry tests – those tests where a puff of air is blown into your eye or you are asked to stare at a screen and respond when you see a visual cue. However, these tests fall short as evidence shows the presence of glaucoma in individuals with normal IOP. Therefore, it is likely a number of patients get an incorrect diagnosis.

This is the problem Mulk looks to address.

"Some patients, who (have glaucoma) but are diagnosed as not having it,

are delaying treatment and they are losing their vision," Mulk said.

"Other patients, who don't (have glaucoma), but were diagnosed as having it, are spending money and getting the wrong treatment. They are at risk for second-degree glaucoma. By taking the drugs, they are (developing) glaucoma symptoms and losing sight," he continued.

"This increases significant amounts of your medical costs – testing all these people, going to eye specialists, who make false diagnoses."

In the United States and Canada alone, direct medical costs associated with glaucoma are roughly $3 billion each year.

Mulk is looking at corroborating eye pressures with other correlated symptoms and early indicators of glaucoma to provide more consistently accurate diagnoses to patients, ultimately helping them get proper treatment, saving their sight and saving the system money.

One of these indicators is the bending stiffness of one's cornea – the transparent front part of the eye that covers the iris, pupil and anterior chamber. In order to determine correct IOP, one must accurately quantify the cornea's bending stiffness, Mulk explained.

But, there are still no satisfactory techniques for determining that stiffness. Using ultrasound technology, he hopes to improve current testing methods of stiffness, and, ultimately, a patient's eye pressure.

Mulk will be experimenting on the cornea's biomechanical and elastic wave propagation behavior, in response to changes in intraocular pressure, corneal hydration and collagen cross-linking.

"Our cornea has a special thickness – 520 micrometers. It's very thin and when people get high eye pressure the cornea is stressed and starts

becoming flattened," he explained.

Mulk's experiments will be conducted with equipment designed to create ultrasound waves in combination with tonometric measurements. This will provide assessments of corneal bending stiffness and its correlations with intraocular pressure measurements.

"The research I'm working on would (help) develop equipment that will not detect any false reading or give you any false eye pressure," Mulk said, noting his research would corroborate corneal thickness, eye pressure, alongside other related indicators, to help provide an accurate diagnosis of glaucoma every time.

"We are trying to improve the gold standard for measuring eye pressure, which will reduce medical costs. It will give you true, real eye pressure."

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