



Glaucoma Research
Society of Canada

We Support New Ideas

2017 RESEARCH GRANT PROJECTS

THANKS TO OUR DONORS RESEARCHERS RECEIVE \$293,355 IN GRANTS

Dr. Graham Trope, founder of the GRSC and chair of its Scientific Advisory Committee, recently announced the Society's 2017 research grants for the following fifteen projects:

Determining if delisting routine eye exams reduced the detection of glaucoma

Studies report that 55% to 81% of patients with glaucoma are diagnosed during routine eye exams. After the Ontario government delisted routine eye exams in 2004, people aged 20-64 significantly reduced their use of ophthalmologists and optometrists, likely due to cost barriers.

We will analyze data from 2000 to 2014 to determine if delisting routine eye exams reduced the glaucoma detection rate among Ontarians aged 20-64 vs 65+.
- Dr. Yaping Jin, University of Toronto, Toronto, ON

Developing a 3D bio-artificial tissue model for researchers

Despite decades of experience with trabeculectomy, surgical failure due to over or under healing of the surgical site occurs in about 40% of cases. Wound healing needs to be modulated post-operatively to increase success rates of both traditional surgery as well as the newer micro-invasive techniques. Current adjunctive therapeutics are limited by sub-optimal efficacy and come with the risk of additional vision-threatening complications.

Revolutionary advances in the field of tissue engineering have provided the opportunity to study bio-artificial human tissue, *in vitro*.

Our study will develop a novel 3D bio-artificial tissue model to provide researchers with a more precise tool within which to evaluate novel wound modulating therapeutic agents.
- Dr. Cindy Hutnik, Dr. James J. Armstrong, Charles B. Trelford (Honors Thesis Candidate), Ivey Eye Institute, St. Joseph's Health Centre, London, ON

Glaucoma and depression: referral of patients to the CNIB for support services

It is well understood that patients with advanced glaucoma have a higher incidence of depression.

Many of the studies assessing this relationship use depression scales or visual function scales as tools in identifying patients with decreased quality of life scores. These scores are then correlated to their visual function by comparing them directly to their visual acuity or their visual field.

While this identification is useful in clinical practice, there is little evidence as to how to manage these patients. Often it is suggested that the ophthalmologist involve the patients' primary care providers for further treatment.

Primary care providers can help support and treat depressive symptoms; however they are ill equipped to provide visual support services. Many of the depressive symptoms may be emanating from the patient's poor visual function.

To this end a referral to the Canadian National Institute for the Blind (CNIB) may be much more beneficial. The CNIB can offer visual rehabilitation services in addition to counseling and support services that can directly address visual function loss. These support services could improve patients' mood and depressive symptoms as well as improve their visual functioning.

This data could provide evidence in support of the value of CNIB services for visually impaired patients.

- Dr. Victor Penner, Dr. Jennifer Rahman, University of Manitoba, Winnipeg, MB

Evaluating the effect of pre-operative treatment on IOP in patients undergoing RALP

Intraocular pressure increases significantly during robot assisted radical laparoscopic prostatectomy (RALP) in steep Trendelenburg position (sTBURG) with proven consequences of post-operative vision loss. The most susceptible eyes are those with glaucoma or pre-existing optic nerve damage.

This masked randomized study will evaluate the effect of pre-operative brimonidine tartrate eye drops versus a placebo on the IOP of patients undergoing RALP in sTBURG.

We expect that the results of this study will lessen the IOP elevation commonly noted during the procedure and reduce the risk of adverse visual outcomes.

- Dr. Yvonne Buys, Dr. Rana Green, University Health Network, Toronto Western Hospital, Toronto, ON

Studying MNK1 as a novel neuroprotective target in retinal ganglion cell injury

The molecular mechanisms underlying retinal degeneration in glaucoma are still unclear, and no treatments directly address the neuronal loss that causes vision loss.

We have recently identified a potential new neuroprotective target in the retina called MNK1. MNK1 is a protein that regulates the production of other proteins in response to external signals, such as stress and inflammation. We hypothesize that MNK1 activation leads to alterations in protein synthesis that impair neuron survival in response to injury.

The objective of this study is to examine the role and mechanism of MNK1 signaling in models of glaucomatous retinal injury. Understanding this mechanism could offer novel treatment strategies for glaucoma and other neurodegenerative diseases.

- Dr. Jeremy Sivak, Alessandra Tuccitto (Student), University Health Network, Krembil Research Institute, Toronto, ON

Are protein deposits discovered in the eyes of dementia patients different from deposits in pseudoexfoliation glaucoma?

We have recently identified protein deposits in the eyes of dementia patients without glaucoma, and this is a novel finding. Deposits are a common finding in pseudoexfoliation glaucoma.

Our study will investigate the nature of deposits in glaucoma and dementia eyes to shed light on possible underlying shared and different disease pathways. Exploring these eye protein deposits in detail may point to the eye as a window to dementia disease, and to new understandings to prevent blindness from glaucoma.

- Dr. Neeru Gupta, Dr. Yeni Yücel, St. Michael's Hospital, Toronto, ON

Opening a window on the pathophysiology of glaucoma?

Our objective is to study ocular rigidity and choroidal pulse volume in patients with fully functional glaucoma filtration blebs and compare them to open-angle glaucoma patients controlled with medical therapy and matched for stage of glaucoma or to their own measurements prior to glaucoma surgery.

Our hypothesis, based on our recent observations in a group of bleb patients, is that their ocular rigidity will be lower and their choroidal pulse volume will be greater than the control group. Our measurements will be made using a novel OCT-based imaging technique that we have developed, validated and published in the last few years.

Patients with well functioning filtration blebs are usually stable for many years, but not necessarily only because of low IOPs. If the present study confirms our initial observations, there might be an important clue regarding what causes and what stabilizes glaucoma, as well as new avenues toward novel therapeutic approaches.

- Dr. Mark R. Lesk, University of Montreal, Maisonneuve Rosemont Hospital Research Centre, Montreal, QC

Determining the role of the transcription factor FoxF2 in eye development and glaucoma

Our objective in this project is to determine if loss of FoxF2 leads to glaucoma in zebrafish, and in so doing develop an experimental animal model where the molecular mechanisms that underlie the etiology of a genetic cause of glaucoma can be explored.

Our hypothesis is that FoxF2 is expressed in both the central retina and vascular mural cells and influences the expression of key genes that are required for the patterning and maintenance of the retinal ganglion cells, a key cell type impacted in glaucoma.

Our research plan is to determine an early eye phenotype in zebrafish FoxF2 mutants, examine the role of FoxF2 in the aging eye with respect to the development of glaucoma, and perform initial analysis of the molecular mechanism by which FoxF2 regulates eye development and homeostasis.

- Dr. Sarah Childs, Dr. Sarah McFarlane, University of Calgary, Calgary, AB

Combination therapies for the treatment of glaucoma

Therapies that will prove effective in treating glaucoma must be able to target multiple cell death triggers in order to protect the cells and their projections.

We hypothesize that a therapeutic strategy that targets both cell death and oxidative stress will provide optimal benefit in glaucoma.

In our current studies, we will combine X-linked inhibitor of apoptosis (XIAP) protein gene therapy with a novel small molecule compound (WN1316) that has previously been shown to potently suppress oxidative-stress induced cell death and inflammation in mouse models of amyotrophic lateral sclerosis (ALS). We will test this combination therapy in a mouse model of glaucoma and assess the mechanisms that lead to the degeneration of the optic nerve.

- Dr. Catherine Tsilfidis, Ottawa Hospital Research Institute, Ottawa, ON

Comparison of laser diode parameters

Transscleral cyclophotocoagulation (TSCPC) is effective in reducing intraocular pressure (IOP) but its use is limited by concern over complications from thermal damage and inflammation.

Our research project aims to compare the efficacy of two different treatment approaches of laser diode for elevated IOP uncontrolled with maximal tolerated medical therapy.

We will evaluate the efficacy and need for re-treatment of these techniques, as well the incidence and severity of complications over the study period.

Clinical data on standardized use of this technique will be able to better guide physicians to improve patient care in those patients undergoing laser TSCPC.

Clinicians could better titrate laser settings to minimize complications, increase efficacy, and provide more timely follow-up care post laser treatment.

- Dr. Andrew Toren, CHU de Québec-Université Laval Research Center, Québec City, QC

Studying dendritic retraction and associated physiological responses in glaucomatous neuropathy

Our research endeavors to relate the dendritic retraction of retinal ganglion cells, an early structural manifestation of cellular death, to changes in their physiological responses, to better delineate the functional loss in early manifestation of glaucomatous retinopathy.

Relating structure and function should lead to a better understanding of the retinal function in the early phases of the glaucomatous dysfunction.

- Dr. Francois Tremblay, Dr. Balwantray Chauhan, Dalhousie University, Halifax, NS

Assessing automatic self-transcending meditation in patients with glaucoma

Health-related quality of life (HRQoL) may significantly improve after automatic self-transcending meditation (ASTM). This class of meditation helps quiet the mind and induces physiological and mental relaxation. It uses a specific sound value (mantra) to draw attention inward and permit the mind to experience a restful but alert state of consciousness.

Our study will assess ASTM plus usual care versus usual care alone in patients with mild to severe glaucoma. Ophthalmic literature lacks HRQoL data. We will measure HRQoL of patients with glaucoma with clinical variables using a mathematical framework for ASTM plus usual care as well as usual care alone.
- Dr. Monali Malvankar, Dr. Cindy Hutnik, Ivey Eye Institute (Lawson Research Institute) St. Joseph's Hospital, London, ON

A prospective study of ptosis after glaucoma surgery

Ptosis, or drooping of the eyelid, is a recognized and unavoidable complication of some glaucoma procedures such as trabeculectomy. Some degree of ptosis may be present post-operatively after varying glaucoma procedures.

Our observational cohort study will evaluate functional and cosmetic eyelid outcomes of patients undergoing different types of both bleb forming and non-bleb forming glaucoma surgery, relative to controls. The primary outcome measure will be the incidence of ptosis at three months. Risk factor variables for the development of ptosis and incidence of ptosis relative to speculum time will be secondary measures.

The results of this study will give a better picture of the effect of glaucoma surgery on eyelid function in general, thereby enabling a more informative pre-operative discussion with glaucoma surgery patients in the future.
- Dr. Iqbal Ike K. Ahmed, Dr. Anmol Lamba, Trillium Health Partners, Mississauga, ON

A national multi-centre study of first perspectives and outcomes with an ab-interno gelatin stent

While trabeculectomy is considered the gold standard in treating glaucoma resistant to medical or laser intervention, its complications include cataract formation, hypotony, infection, and early failure.

Some of these complications may be mitigated with a micro-invasive, ab-interno approach.

The XEN 45 implant is a gelatin microfistula that can be implanted ab-interno to form a bleb without dissecting the conjunctiva.

Our study will provide first perspectives from glaucoma surgeons across several surgical centres in Canada on the safety and efficacy of the XEN 45 implant, in addition to determining the learning curve of the device.

A retrospective chart review will be conducted at multiple sites across Canada comparing the outcomes and complications of gelatin stent implantation with follow-up of at least one year.
- Dr. Iqbal Ike K. Ahmed, Dr. Matthew Schlenker, Dr. Andrei-Alexandru Szigiato, Trillium Health Partners, Mississauga, ON

Determining if cilia dysfunction is a common cause of glaucoma

Our project will evaluate three genes that when mutated cause congenital, juvenile and late-onset glaucoma to determine if they control cilia structure and function.

The experiments will be integrated with analysis of signaling pathways essential to the formation of the front portion of the eye.

These approaches will reveal if multiple glaucoma-causing genes affect cilia and if a common biological mechanism is shared across clinical and genetic subtypes of glaucoma.
- Dr. Ordan J. Lehmann, University of Alberta, Edmonton, AB