The Glaucoma Research Society of Canada in 2020 Awarded $180,000 in Grants for These Nine Research Projects

Testing Perceptual Grouping during Binocular Rivalry

We can detect some of glaucoma's impact on the primary visual system behaviourally before any functional deficits on standard measures occur.

Binocular rivalry occurs when distinct images are presented to the two eyes and the brain is unable to fuse the two images into one, leading to confusing the two images. Grouping is when parts of an image are perceived as separate objects. Strong grouping effects can lead to problems in reading, driving, or discriminating objects in a crowded environment.

Our study will test grouping during binocular rivalry in patients with mild glaucoma and in age-matched controls to gain insight into the connection of grouping and binocular rivalry in glaucoma. We expect to see a stronger grouping effect in people with glaucoma.
- Dr. Luminita Tarita-Nistor, Dr. Yvonne M Buys, University Health Network, Toronto, ON

Testing Compounds to Improve Post-Surgical Healing

Surgical failure due to unpredictable wound healing and fibrosis continues to be a major problem. Aberrant activity of the human Tenon's Capsule fibroblasts (HTCFs) has been implicated as a major cause of surgical failure.

We will use a 3D model of the human Tenon's Capsule to investigate the effects of scarring and fluid flow, while exploring the potential of various compounds to modulate these tissue responses. Modulating HTCFs'activity could improve glaucoma surgical success rates.
- Dr. Cindy Hutnik, Dr. James Armstrong, Matthew Fung, University of Western Ontario, London, ON

Comparing Treatments in Pseudoexfoliation Glaucoma (PXG)

PXG is an aggressive form of glaucoma caused by the intraocular pressure (IOP) created when an accumulation of materials block cellular pathways.

Selective laser trabeculoplasty (SLT) or medications reduce IOP in patients with PXG, but don't prevent the release of the materials that block cellular pathways causing PXG.

We will determine if treatment with phaco-emulsification (PHACO) could both reduce IOP and the release of materials causing PXG. The results will show if PHACO has the potential to change the course of PXG, leading to less need of medications, better quality of life, and smaller risk of blindness for many patients with PXG.
- Dr. Jayme Vianna, Dr. Marcelo Nicolela, Dalhousie University, Halifax, NS

Do Rho Kinase Drugs Affect Lymphatic Drainage from the Eye?

The lymphatic system is essential for clearing fluid and protein from the body, yet studies into how ocular lymphatics can be controlled by drugs are limited.

Rho kinase inhibitors are the first new class of agents to be introduced to glaucoma care in 20 years. They are implicated in the lymphatic pumps throughout the body and can affect other lymphatic systems. Findings suggest they play a role in lymphatic drainage from the eye.

Our study will clarify if Rho kinase inhibitors affect lymphatic drainage from the eye.
- Dr. Neeru Gupta, Dr. Yeni Yücel, University of Toronto, Toronto, ON

Determining the Risk of Glaucoma with Contraceptive Medications

Contraceptives including intrauterine devices, hormonal injections and different types of oral formulations are the most prevalent class of drugs used by women of child-bearing age.

Recent studies suggest that women of this demographic are up to five times more likely to develop glaucoma.

Our study will:
1) quantify the risk of glaucoma and ocular hypertension in women using contraceptives compared to non-users;
2) examine whether this potential risk differs among different hormonal preparations;
3) examine whether this risk is dose and duration related.

The large demographic used in this study means results may have a significant impact on public health in Canada and worldwide.
- Dr. Mahyar Etminan, Dr. Kate Hogdon, Dr. Frederick Mikelberg, Department of Ophthalmology, University of British Columbia, Vancouver, BC

Does Exposure to Neuroprotective Drugs Affect Glaucoma Diagnosis and Treatment?

Neuroprotective drugs, most often used to treat stroke or other nervous system complications, may also affect the development and progression of glaucoma.

Our study will determine if exposure to neuroprotective drugs is associated with a decreased incidence of glaucoma diagnosis and treatments.

We will use Ontario healthcare databases to compare patients with glaucoma who are using neuroprotective drugs with those who are not.

We will also determine if using these drugs in patients without glaucoma reduces the likelihood of their developing glaucoma.
- Dr. Cindy Hutnik, Dr. Vinay Kansal, Dr. James Armstrong, University of Western Ontario, London, ON

Studying Vascular Dysregulation in Normal Tension Glaucoma

Past studies indicate that over time vascular dysregulation may play a role in damaging optic nerve cells. Our study will use non-invasive optical coherence tomography angiography to compare the circulation system of the retinas of patients with glaucoma with people of the same age without glaucoma.

We expect this research will lead to a technique for measuring variability in retinal circulation as a marker for vascular dysregulation.
- Dr. Zaid Mammo, Dr. Kulbir Gill, Dr. Steven Schendel, Dr. Marinko Sarunic, University of British Columbia, Vancouver, BC

Studying Piezo Channels in a Mouse Model of Glaucoma

Our preliminary data and early studies suggest a role for Piezo1 in sensing intraocular pressure (IOP) leading to the loss of retinal ganglion cells (RGCs) in glaucoma.

Our study will analyze the Piezo1 receptor for RGC degeneration in mice with elevated IOP to determine a correlation. We believe this research will lead to studies into the molecular mechanisms triggering RGC death upon elevated IOP in glaucoma and to new therapies.
- Dr. Michael Reber, Dr. Jeremy Sivak, University Health Network, Toronto, ON

Mapping Optic Nerve Head Tissue Strain in Glaucoma

We have recently developed a non-invasive imaging method to map tissue strain in the optic nerve head (ONH). In our study, we will obtain ONH images of 150 patients with varying degrees of glaucoma to assess ONH strain and the degree of damage caused by glaucoma.

We will look for correlations in the degrees of strain and damage in each eye to determine if OHN strain correlates better than intraocular pressure with the degree of damage. Strain imaging could allow for more precise diagnosis and treatments for each eye.
- Dr. Mark Lesk, Dr. Santiago Costantino, Dr. Marisse Massis-Solano, Université de Montréal, Montreal, QC