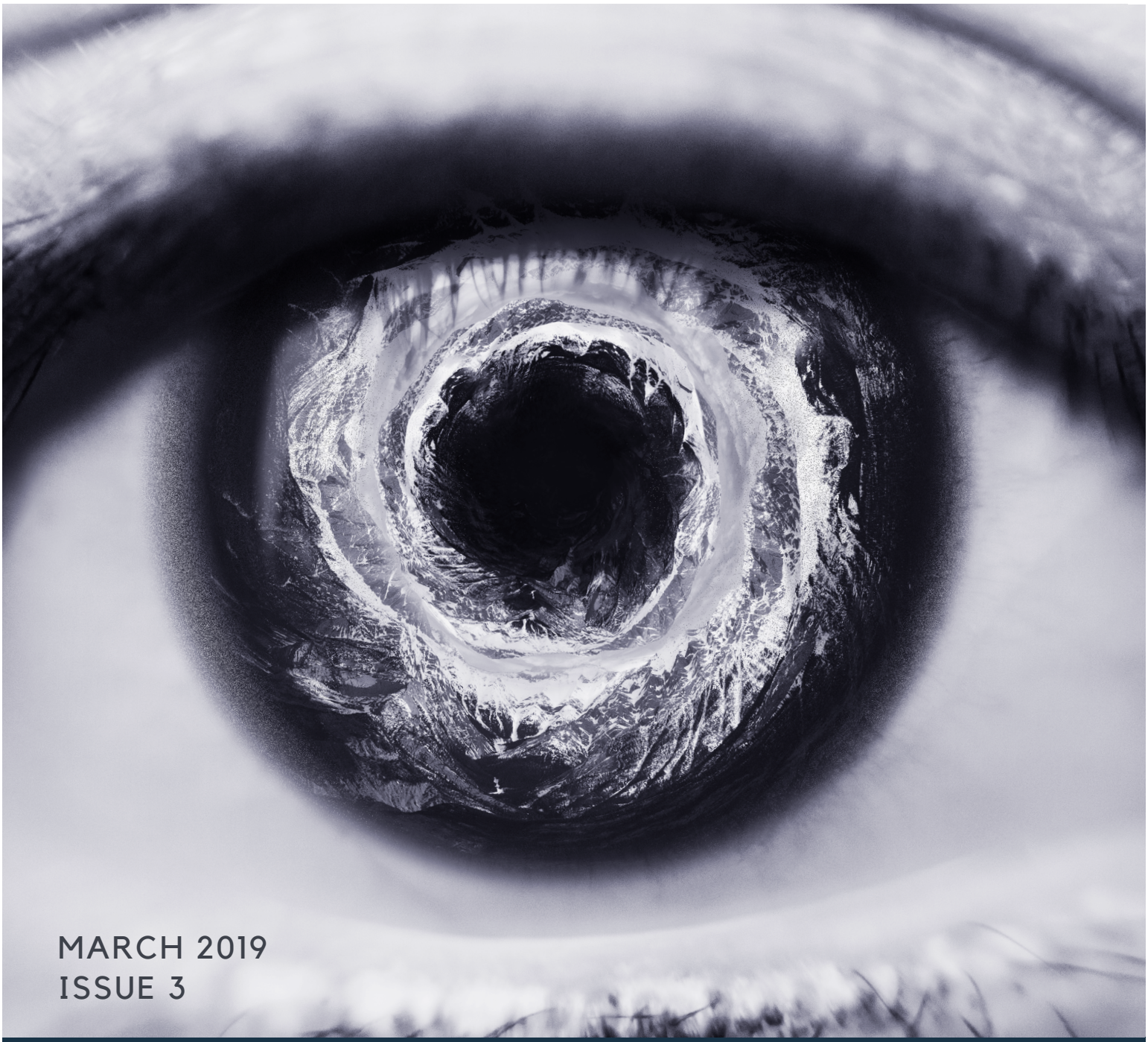
APERTURE MAGAZINE



MARCH 2019
ISSUE 3

CANADIAN ASSOCIATION OF OPTOMETRY STUDENTS
ASSOCIATION CANADIENNE DES ÉTUDIANTS EN OPTOMÉTRIE

CONTENTS

EDITOR'S NOTE

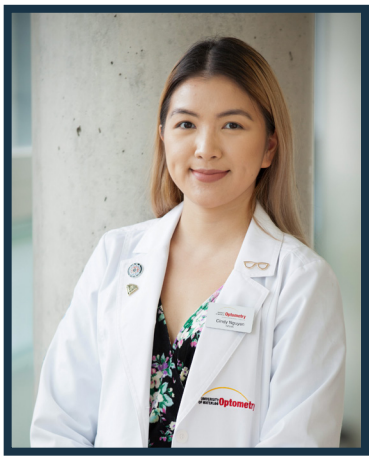
We are delighted that your continued interest, support, and contribution has led to our third issue of Aperture. Thank you to our dedicated CAOS members, executive team, generous sponsors (Eye Recommend, I-Med, Heine), contributing authors, and readers for making the long hours of planning, compiling, and designing worthwhile. It's been an honour to be involved in the inception of Aperture and witnessing its growth and ability to bring together students, optometrists, and optometry leaders across our nation.

This 2019 issue of Aperture features special messages from esteemed leaders of the optometric world, including the CAO president, Dr. Michael Dennis; the OAO president, Dr. Joshua Smith; and our very own Director of the School of Optometry & Vision Science, Dr. Stanley Woo. In addition, we have included exceptional articles written by Canadian optometry students that highlight their experiences, clinical tips, and their perspective on the future of optometry. All the articles present a unique perspective on various topics related to optometry, and we sincerely hope that you gain new insight and appreciation for the vast world of eye care. This year, we also introduced a photo contest in which students were challenged to relate their photos to two themes, "Eyes are the window to your soul" or "Beyond 20/20"; these photgraphic interpretations are interspersed within this publication. Last but not least, we have included two fascinating Grand Rounds Clinical Case Reports written by 4th year optometry students, selected by our Clinical Professor: Dr. Zay Khan.

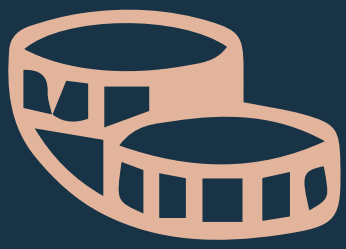
Needless to say, we sincerely hope that you enjoy this issue of Aperture and all its amazing content. Aperture aspires to be vibrant and engaging, and at the same time inclusive and enriching. Please feel free to share your thoughts, comments, and feedback with us at info@caostudents.ca. Finally, just remember that, *"people will forget what you said, people will forget what you did, but people will not forget how you made them feel"*.

Cheers to another year full of compassion and kindness!

Jennifer Tran
Communications Marketing Director



Cindy Nguyen
Communications Marketing Director Elect



CHECK OUT OUR SECOND ANNUAL VIDEO, "CAN I SLEEP IN MY CONTACTS?"

ON OUR **YOUTUBE CHANNEL "CAOS"**

DON'T FORGET TO SHARE AND SUBSCRIBE!

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EXEC-ELECTS

PRESIDENT'S MESSAGE

Dear CAOS Members,

Welcome to the third edition of our annual magazine, Aperture! For students, by students, this magazine celebrates the knowledge and skills they've gained throughout Optometry school. Their creativity and unique talents are showcased in these pages.

The 2018-2019 school year has been a remarkable time of growth for CAOS. Our mission is to offer programs that help students explore the vast landscape of optometry and empowers them to become the best doctors they can be. Our goal this year was to make future opportunities across Canada more transparent for students. We started in April 2018, hosting our annual Interview Day where students can meet with employers across Canada in one day, in one location. This year, we broke records with over 100 job opportunities!

We started the school year strong with a lecture from optometry's pharmacology gurus, Drs Melton and Thomas. With the new support of industry sponsors via the University of Waterloo, we were able to elevate our lecture series to a new level. Our team worked with our sponsors to host 12 clinical and professional lectures from renowned speakers. Through our Mentorship Program, our members visited 15 successful practices across Canada and were inspired by the personal journeys of each doctor they met. To take the connection further, we have shared over 50 Summer Internship opportunities for students.

We expanded the scope of our support beyond Waterloo by continuing to help our chapters in Montreal and the United States build their CAOS programs. Our goal is to help our fellow Canadian students studying in America be better connected to Canadian Optometry in order to ease their transition when they return. This year, we helped NECO build a strong enough network to provide CAOS backpacks, sponsored by EyeRecommend. To further expand our perks program, we worked with RW&Co and Lululemon to offer discounted clinic and lifestyle wear to our members. We also worked with HOYA to offer complimentary lenses. Finally, with the support of FYidoctors, we were able to provide MasterCraft cases to our members for the first time.

Outreach to educate the public on the importance of eye health is one of our top priorities. We've expanded our iCare EyeCare program to spread awareness at more locations in the city. We're thrilled to have launched our YouTube channel (CAOS) to spread the message even further. To support accessible eyecare worldwide, we hosted several fundraisers including our Dining in the Dark Dinner/Silent Auction for Optometry Giving Sight.

To share the student voice with leaders of Optometry, we conducted the annual CAOS SEES (Students Experience and Expectations Survey). This year, we focused on expectations vs. ideals of students with respect to salary, location and ownership ambitions. For the first time, we also conducted a workforce survey looking at graduates 1-5 years out of school. We were able to offer transparency on their work week based on salaries, hours, and locations. Our goal was to help students make an informed decision about their futures by providing them with a thorough overview of a new graduate's experience. Our presidents presented the findings to the Canadian Provincial Associations and FORAC at this year's Optometry Leaders' Forum to help bridge the gap between doctors and students. Both reports can be found on our website www.caostudents.ca under the Publications tab.

I would like to thank each member of the CAOS executive team for their passion and dedication in building the CAOS student experience. Thank you to Jennifer Tran and Cindy Nguyen of the CAOS Communications team for the time and energy they've put into creating this magazine. Finally, I would like to thank all our sponsors, doctors, professors, industry leaders and student members for supporting us. You allow us to thrive and continue to offer more to our members each year.

I encourage each of you to continue supporting your Associations beyond school, so that we can work together in providing the best eyecare to people everywhere. If you would like to engage further, please don't hesitate to contact me at president@caostudents.ca.

Sincerely,

Wynn Nguyen
CAOS President

University of Waterloo Chapter

A MESSAGE FROM CAO

DR. MICHAEL DENNIS
PRESIDENT OF CAO

As you read this, you are more than halfway through your school year. Whether you are in first or fourth year, what I hope – based on my own experience – is that you feel engaged in what you are doing. Nearly 40 years later, I can honestly say that I am still fully engaged in my profession, one that extends beyond my office clinical practice to work with both my provincial and national associations. This engagement has afforded me a professional life full of challenge and opportunity.

CAO's mission – to serve as the national voice of optometry – has been the same since its incorporation in 1948. Since then, CAO has depended on engagement with members to ensure that it can successfully position optometrists as primary eye care specialists to the public, to other health care providers and system stakeholders and to government.

As students, you are all CAO members, with access to all of the resources CAO has to offer at no cost. We encourage student membership because engaged now, means engaged later, ensuring the optometric community remains committed to advancing the highest standard of primary eye care for all Canadians.

CAO recognizes that engagement goes beyond mere membership benefits and programs. Indeed, it requires an exchange of thoughts and ideas, especially in decision-making. Following our inaugural call for nominees last March, our Board Development Committee was gratified by the high caliber of students interested in serving a term on our Council. Ms. Uyen Nguyen-Le serves as your voice this year, and she attended her first meeting in October. I would encourage you to reach out to her with your questions and/or ideas about CAO's efforts on your behalf.

I would also like to take this moment to thank those of you who took the time to participate in our annual Optometric Leadership Forum survey. Assessments of professional and practice issues and opportunities are critical to guiding the Association's efforts for their members and I look forward to sharing the results of these discussions with you.

There are times when CAO calls on members to be more actively involved in initiatives - from making a petition requesting a national vision strategy available to patients to sign, to sending a form letter to a Member of Parliament (MP) or Cabinet Minister on an issue of relevance to optometrists. CAO has "how to" resources available for members interested in more hands on engagement, like meeting with decision-makers about an issue. The opportunity to empower our members to engage is a definite win for optometry.

So empowering our students to engage? Priceless! CAO did just that, hosting two Advocacy and Leadership Training seminars at the University of Waterloo School of Optometry and Vision Science in March and November of 2018. As much as CAO believes in connecting with its members, it also believes in nurturing leadership and these two sessions provided a wonderful opportunity to do both.

CAO remains ever mindful of the important role of patient engagement in the delivery of eye health and vision care. No longer are those wearing the white coats the unquestioned experts. Our patients increasingly come to us with questions and concerns about their conditions and/or treatment, and a real desire to be a partner, rather than a passive recipient, of care. Nothing about us, without us, as the saying goes. Personally, I welcome this positive development in the patient-provider dynamic, because I believe that the foundation of the care we provide is that relationship. We must make a human connection with our patients, which will go a long way to ensuring that we remain both relevant and an essential part of our patient's health care routine.

This year, Congress will be held July 10-14 in Victoria, British Columbia. Registration will open at the end of January and student rates remain the same as they were for Congress in 2017. We are partnering with Pacific University's College of Optometry, which provides a unique opportunity to learn and network across both provincial and national borders. It is an opportunity for an up close examination of life beyond clinical practice and I look forward to welcoming you there!

CANADIAN ASSOCIATION OF OPTOMETRISTS
ASSOCIATION CANADIENNE DES OPTOMÉTRISTES

FROM THE OAO PRESIDENT

"LET OPTOMETRY TAKE YOU ANYWHERE!"

There are many career paths and occupations that can take you to new places, but o ptometry is one of the few that can actually take you anywhere.

When I was looking for career options during my last year of optometry school at the University of Waterloo, like most students I started by focusing on the places I called home. I had most recently lived in Calgary for four years, so I was naturally inclined to look west to where many of my closest friendships were still located. I kept an open mind, however, and eventually signed a contract in the Ottawa area, even though I had only visited Ottawa once in my life and had visited my new clinic once for an interview. It was certainly a leap of faith, but it was a choice that has brought me incredible freedom in practice, work-life balance, financial security, and job satisfaction.

Rural Canada is severely underserved by health care practitioners of all types, and optometry is no exception to that trend. While large urban centres become ever more saturated, rural areas continue to struggle to find ODs. When I joined the practice in North Glengarry, I had as many patients as I was able to keep up with. Even as my efficiency has increased over the years, I continue to be fully booked weeks ahead.

Rural Canadians are, by and large, faithful and committed to their health care practitioners, and they expect quality, modern, and attentive care in return, just like everyone else. My patients have become like family, and their support of local business has allowed our clinic to match the sophistication and quality of care of urban practice. I will note however that rural Canadians certainly do like to get to know their doctors and, although my official interviews took place before I graduated, it was only after two or three years in practice that the real interviews—those with the patients—seemed to slow down!

The freedom and support I enjoy from practicing optometry in rural Canada have also allowed me to continue my work in health care volunteerism, something I decided would be a significant element of my practice even before I started optometry school. This aspect of my practice

has brought me to Mexico (twice), Honduras, Jamaica, Nicaragua, and most recently to rural Ghana in November 2018 with Ghana Rural Integrated Development, a Canadian charity.

In Ghana, we treated cases of angle-closure glaucoma in patients as young as 27 years old, we treated diseases such as trachoma, which Canadians seldom have to face, and we served patients who travelled a thousand kilometers from Niger just to come to our clinic. The professional growth and knowledge I have received from these experiences in the developing world have been immeasurable. Although the sixty health care providers I travelled with deeply changed the lives of the people we examined and treated, what we learned from the local people of the Brong-Ahafo and Northern Regions of Ghana, both as health care practitioners and as human beings, cannot be explained in words.

Optometry can bring you places you have never been, never considered going to, and perhaps never knew existed. My best advice to optometry students is to determine your personal priorities for your future practice and working life, get the facts about different modalities and styles of practice, and talk to ODs you know and the OD mentors offered by our optometry associations. Optometrists are required in every village, town and city in Canada and our services are needed by every person in the world. If you keep an open mind, seize new opportunities, and always remember to serve both yourself and your patients, your professional and personal growth will never stop.

Dr. Joshua Smith practices primarily in Alexandria, Ontario and is the current President of the Ontario Association of Optometrists. You can learn more about OAO's Mentorship Program by reaching out to Shadae Wilson, OAO Member Services Manager, at swilson@optom.on.ca. For more about Ghana Rural Integrated Development and their work in northern Ghana, visit www.grid-nea.org.

CANADIAN OPTOMETRY GROUP | COG

The Canadian Optometry Group (COG), started in November 2012, is a free email-based and commercially-independent forum restricted to Canadian optometrists, optometric educators (ie. professors in a school of optometry) and 2-4th year students at UWSO and École d'optométrie, Université de Montréal.

This simple to use, yet powerful resource allows optometric colleagues across Canada to communicate anything relevant to optometric practice. This forum is commercial-free, and has no financial ties to industry. There are over 1000 COG members - coast to coast in all Canadian provinces.

Topics include but are not limited to clinical and practice management questions/discussions, eyecare news stories and clinical studies. It is an excellent method to stay current in the evolving profession of optometry. Information sent to and from COG is exchanged in real-time using email.

If you are interested in becoming a member, please contact your class president with your name and email address which you wish to use to receive and send emails to COG.

Peter Rozanec, OD

Toronto, ON

INTERNATIONAL OPTOMETRIC BRIDGING PROGRAM

DR. JANESSA VOS, PROGRAM MANAGER

The International Optometric Bridging Program (IOBP) is designed to provide eye care professionals educated outside Canada and the United States with a structured orientation to Canadian standards of optometric practice. The program runs at the University of Waterloo, School of Optometry & Vision Science (WOVS) and provides qualified applicants with opportunities to gain the critical language, academic and clinical skills necessary for registration in Canada.

Internationally educated eye care professionals apply to the Federation of Optometric Regulatory Authorities of Canada (FORAC) and go through a credential assessment process. Favorably assessed applicants then proceed to an evaluating exam conducted by Touchstone Institute. Applicants who meet the minimum eligibility requirements for bridging can then apply to the IOBP, however, demand surpasses program capacity and not all eligible applicants obtain an offer of admission. The bridging program currently accepts 18 students per year and typically runs from late January until mid-March of the following year. It is a very intensive academic program that is comprised of lectures, laboratory sessions, WOVS internship and clerkship rotations. Lectures and labs are taught by WOVS faculty members and community optometrists. Consistent with the Doctor of Optometry program, the IOBP has clerkship locations throughout Canada.

Looking ahead, the IOBP is collaborating with WOVS on a plan to integrate IOBP students within the Doctor of Optometry program. The IOBP hopes to present the first draft of the integration model to faculty later this year.

Students wishing to learn more about the pathway to registrations in Canada for international eye care professionals are encourage to visit the following websites:

https://uwaterloo.ca/international-optometric-bridging-program/

http://forac-faroc.ca/?page_id=192

Questions? Please contact iobp@uwaterloo.ca

IOBP
International Optometric Bridging Program

COMING FULL CIRCLE AT WATERLOO

In my family, the joke is that I've been doing optometry since birth.

My grandfather was in the optical business. My father, George Woo, was a professor of optometry here at the School and founded the Centre for Sight Enhancement. My uncle is an ophthalmologist in Hong Kong. So it seemed I was predestined to take an interest in Optometry.

But I decided early on that if I was going to do optometry, I wanted to do it my own way – far from Waterloo. Growing up around the School, all the professors and many students knew me as a kid. I imagined myself sitting in class, with every row I sat in feeling like the front row. And I'm not a front row kind of guy.

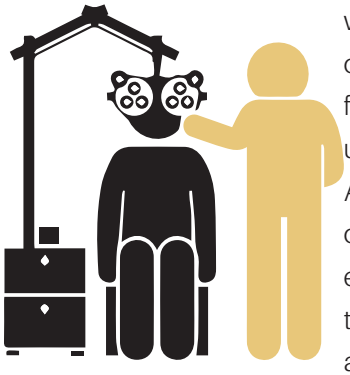
I chose to do my undergrad in Pharmacology at the University of Toronto and then headed to the University of California at Berkeley. I loved California, with its diverse population; I met many American-born Chinese who had similar experiences as I did. And I enjoyed Berkeley's rigorous OD program and the student experience there. The "Big Game" against Stanford was an annual highlight and kindled an interest in football (the American kind) that persists to this day.

After Berkeley, I travelled to the University of Houston College of Optometry (UHCO) to do my residency. Ironically, I followed my dad's footsteps into low vision rehabilitation. I suppose that the adage the apple does not fall far from the tree is correct in spite of my best efforts to find another orchard. Houston's program was a good choice for me because it allowed me to specialize in low vision, and also experience other facets of optometry including contact lenses, ocular disease and primary care. My first weekend on call I had the pleasure of removing carbon bits from the cornea of a patient who had decided to get a little too close to the fireworks over the 4th of July.

I wasn't sure what to expect in Texas; like many people I'd heard all the stereotypes. But Houston surprised me. It's a large metropolitan city with arts, sports, and great food and it became home base for the next 18 years. After completing my residency, I worked with

Vitreoretinal Consultants in the Texas Medical Center and joined UHCO's faculty. Teaching, patient care, and research were exciting in a very collegial atmosphere.

While doing my graduate work at UHCO, I met my wife, Lisa. When you know, you know, right? As luck would have it, she is a brilliant optometrist who worked locums for a few years before opening up her own practice, Eye to Eye. As a successful family practice optometrist she did it all, and established a strong presence in the community, including being an active Rotarian.



Along the way, I realized that I didn't want to follow the typical academic path; I'd completed my master's degree in vision science, but I didn't see a PhD and psychophysics in my future. Instead, I became more and more interested in patient care, health policy, and the business side of optometry.

That interest was stoked through my volunteer work with the Texas Optometric Association (TOA). The work was exciting, and the shared experience with dedicated and passionate optometrists from across Texas was both educational and inspiring. Lasting friendships and candor kept me grounded as I learned first-hand (and from Lisa) about practitioners' challenges, from coding and billing difficulties to provider discrimination by insurance companies.

While completing some business courses at Rice University, I met people from areas all across health care and began to imagine new pathways for integrating optometry into the wider system. This led me eventually to the Executive MBA program at Rice with a concentration in medical and healthcare management.

The opportunity to re-invent myself was invigorating, and it seemed like I was channelling my Mom's experience for inspiration. Mom raised the kids and went back to school to become an accountant after we got old enough to look after ourselves. Eventually, she rose through the ranks and became an executive in Manulife in Hong Kong and was part of a joint Canadian-China venture based in Shanghai.

The MBA program was once again a chance to interact with, and learn from, people with a wide variety of perspectives about business; my project team included the chief of emergency medicine at Texas Children's Hospital and executives from the oil and gas industry, among many other talented folks. I think if I hadn't done an MBA, I wouldn't have had the perspective or confidence to take the next step in my administrative career, becoming the first dean of the Southern California College of Optometry (SCCO).

SCCO was undergoing a dramatic transformation under the leadership of President Kevin Alexander and the Board of Trustees. In 2013, the College become a health sciences institution, Marshall B. Ketchum University. With the addition of a School of Physician Assistant (PA) Studies and a College of Pharmacy, the University (and SCCO) focused on interprofessional education and collaborative practice.

SCCO's faculty, staff, and students embraced the vision and persevered through the ups and downs of transformative change. The work was tough, but the people were wonderful. It was an incredible honor to be part of the team, and it didn't hurt that SoCal is a lovely place with beaches only 30 minutes from where we lived.

But after four years as dean, my journey came full circle when I returned to Waterloo. Waterloo's School of Optometry & Vision Science was heading in an exciting new direction, one that aligned well with my interests and experience. I never thought that I'd return, but the opportunity to come home, share my experience, and help lead an amazing Canadian team of faculty, staff, and students was too good to pass up.

People have asked me if it was weird to come back to a place where I have so much history. But it doesn't feel weird, just strangely familiar. There's the campus that

I used to bike across to get to my high school, WCI (go Vikings!), although now with many new buildings. At the School, there's the concrete spiral staircase and the hanging sculptures in the clinic that used to creep me out as a kid. And let's not forget the red carpet.

I started out my career wanting to make my own way, separate from my dad's achievements. Though it took a while to forge my own path, I eventually realized that it's not a competition. In fact, Dad and Mom have opened up many doors of opportunity. I've enjoyed being able to share with them including lecturing with Dad at the AAO together. We laugh now, but the year that I was President of the TOA, Dad was president of the World Council of Optometry (WCO). Seriously?!? How does that happen? I joked that the world was almost as big as Texas.

When I meet alumni, we feel a sense of kinship even though I never went to Waterloo, just because they knew me as a kid and recall Dad with fondness as a professor. I've had folks share that they heard my siblings and I play violin and cello, and that the experience encouraged them to do the same with their children. It's neat to see the many interconnections and threads in our lives.

At the same time, my experience studying and working in the States has helped me connect with other Canadian optometrists who've come home to practice. I believe that, no matter where we train, optometry is strongest – and our patients benefit most – when individuals, the schools, the colleges and associations all collaborate.

In the next few years, that collaboration will be more important than ever, as our profession faces challenges and opportunities from rapidly changing technology. I believe that we can overcome those challenges by focusing on what we do best – building communication with our patients and providing exceptional care.

Like me, my wife, and my parents, together we're stronger as an optometry family.

Stanley Woo, OD, MS, MBA, FAAO
Director and Clinical Professor
School of Optometry & Vision Science
University of Waterloo

IDENTIFYING THE MISSING ELEMENT IN HOSPITAL FALL PREVENTION

Photo credits: Grand River Hospital

"Did you get your eyes checked?" an elderly gentleman asks a fellow patient in a hospital lunch room. When the other patient nods, he smiles.

These are two of the nearly 100 patients who are participating in a collaborative research project conducted by the University of Waterloo's School of Optometry & Vision Science (WOVS) and Grand River Hospital (GRH), in Kitchener, Ontario. By agreeing to have their vision assessed, these patients are helping to shed light on a serious threat to seniors' health - falls.

Falls are already the leading cause of injury-related admissions for Canadian seniors. But those that occur in a hospital setting, where patients tend to be frailer and have other serious health conditions, can be deadly. In fact, one study showed that nearly half of elderly patients who break a hip while in hospital will die within a year of their fall.

That's why hospitals like GRH have developed protocols using evidence like prior falls, the use of walking aids, and balance issues to assess patients' risk of falling while in care.

But one key element is missing in those protocols – vision.

WOVS researcher Dr. Susan Leat wants to help change that. In partnership with Dr. Abhishek Narayan of GRH, she's conducting research to assess the visual needs of patients and how poor vision might contribute to hospital falls. She hopes to create new tools that will cut the risk of falls for older patients.

A tool to optimize care

One of Dr. Leat's research streams focuses on vision in aging and special needs populations. A previous study she conducted at another Ontario hospital showed both a high percentage of patients with poor vision as well as an association between poor vision and falls while in hospital.

This research attracted Dr. Narayan's attention. As Medical Director,

Complex Continuing Care at GRH, he notes that 'zero falls' is one of the hospital's key quality measures, "but there's always room to optimize care."

In the fast-paced hospital environment, where clinicians are often dealing with life-threatening conditions, there's little time for other concerns.

"We don't do a good job assessing vision. In fact eye drops are the most frequently missed medication on admission to hospital," he says.

But what if there was an easy-to-use tool that could allow vision assessment s to become a routine part of the "head-to-toe" admission screening process?

That's one of the goals of Dr. Leat's project.

The study is based at Grand River Hospital's Freeport Campus, which hosts GRH's rehabilitation program. Unlike acute care, which happens at GRH's KW Campus, patients may stay at Freeport for several weeks, rather than days, allowing the research team time to gather information and create interventions.

"We hope to create a brief set of questions to identify patients with poor vision so that providers in the unit can take precautions to prevent falls," Dr. Leat says.

On admission to hospital, patients will be assessed using this screening tool. Based on these results, hospital staff will be able to put safeguards in place if a patient's score indicates they might be at increased risk of falling. Staff will also be able to give feedback to patients about their visual needs and advise them to follow up with their eye care provider once they're released from hospital, ensuring continuity of care.

"Seeing the person in front of you"

This project is one of very few (if any) vision studies that have been conducted in a hospital setting. It's also unique in that patient information is being gathered by optometry and vision science students, giving them hands-on clinical and research experience.

Kaitlyn Sinclair, Victoria Cadman and Nicole McKenney are three of the students who volunteered to collect data under the supervision of WOVS faculty Dr. Andre Stanberry, Dr. Tammy Labreche, Dr. Lisa Christian, Dr. Shamrozé Khan or Dr. Leat herself. One of the key reasons the students participated was the chance to see patients that they wouldn't normally be exposed to in a primary care setting, including people recovering from stroke and other acute neurological conditions.

Working in pairs, the students interviewed patients, asking about their previous and current eye care and their general health, why they were in hospital, and if they had experienced any falls in the past. The students then conducted a series of vision function tests, including visual acuity, contrast sensitivity, stereopsis (depth perception) and visual field analysis.

In testing patients, the students sometimes witnessed the heart-breaking consequences of end-stage eye disease coupled with complicated, systemic illnesses. Patients like the woman Nicole saw who had age-related macular degeneration (AMD) that had scarred the back of her eyes.

"She demonstrated obvious eccentric viewing, turning her head to avoid looking past the scars in order to read the eye chart. Seeing this in person made me realize just how important it is to get routine exams to pick up on diseases like AMD and get them treated quickly," Nicole says.

And while the students had the opportunity to practice their technical skills, they also gained insights into the relationship-building side of vision care. Victoria noted how many patients looked forward to their 20 minute screening and the chance to chat with the students. For Kaitlyn, working with people with cognitive or communication challenges was eye-opening.

"My partner and I were assessing a patient who had experienced a stroke and was struggling to communicate," she says. "I could tell he was frustrated, but we listened to him, modified the tests to fit his needs and worked to make a personal

connection with him. It was a much more positive experience for all of us and helped me realize that it's important to see the person in front of you, not just the condition."

Inter-professional collaboration

The Freeport vision study is an example of inter-professional collaboration at its best, one in which all the health professionals involved - physicians, nurses, optometrists and students - gain a better understanding of patients and their needs.

For example, "many nurses were curious if some of their patients had visual field defects after strokes," Victoria says. "While we weren't able to confirm diagnosis, we could share a suspicion of restricted vision field post-stroke."

By identifying patients' vision problems, helping to protect them while in hospital, and connecting them to vision care providers once they're discharged, this study may not only help to prevent falls. It could promote the goal of all health care providers: to ensure their patients lead longer, healthier lives.

From left: Adeela Ahmed, Kathleen Li, Boris Wong, Dr. Susan Leat, Dr. Abhishek Narayan, patient Reginald Duguay, Nicole McKenney, Keren Delos Santos and a GRH staff member. Photo provided by Grand River Hospital.

1. Johal, K.S., Boulton, C., Moran, C.G. Hip fractures after falls in hospital: a retrospective observational cohort study. Injury, 40 (2009), pp. 201-204.

2. Leat, S.J., Zecevic, A, Keeling A., Hileeto D, Labreche, T., Brennan D, Brymer C, Are Falls among Hospital In-patients Linked to Vision Loss? Ophthal Physiol Opt 38 (2018): 106–114.

BEYOND 20/20 IN CAMANÁ

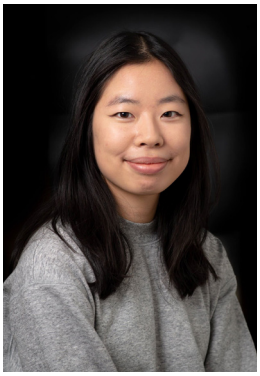
PC: SHERENE VAZHAPPILY

"BEYOND 20/20"

On a chilly day in Camaná, Peru, we set up our mission eye clinic in an abandoned gymnasium. Makeshift tents serve as examination rooms and benches as dispensary shelves. Hundreds of Peruvians line up for free eye examinations. Spanish and English words fly around as I leave my tent to take a break from a hectic morning examining patients. In a nearby tent, I encounter my colleague (Pictured: Meraj Iqbalzada) performing direct ophthalmoscopy with great focus. He leans back and she shakily reaches out to hold his hand. He sits down in front of her and smiles. "Ojos sanos", he says in broken Spanish. Healthy eyes. She breathes relief and tears stream down her face. "Reading glasses will help you read your Bible again". She beams and whispers in gratitude, "Gracias, doctor." Thank you, doctor. God bless you.

Being in the optometry profession is more than prescribing glasses to help patients see 20/20. It is being in a position to examine and educate patients about their eyes, alleviate their fears, help them achieve their goals, and in the best cases, assist them in regaining something that they once thought was lost. As optometrists, we understand the importance of maximizing visual function so our patients are able to perform their daily activities, interact with the people around them and maintain a sense of who they are in this world. Our duties go far beyond 20/20, as we not only examine eyes but take care of our patients' visual needs as well, to the best of our abilities and knowledge.

CONFESSIONS OF A "TEENAGE" OPTOMETRY STUDENT



BY CHRISTINE CHOW

1ST YEAR OPTOM STUDENT

A professor of mine once argued that adolescence lasts until somewhere between 26 and 28 years old. He told my class this through email, his reply both heavy-handed and laden with disappointment at a fellow student's plea to cut back on midterm content—as if to insinuate that we were teenagers who lacked the maturity for real-world problems. Our complaints had clearly unearthed a deep-seated frustration from him, and although he later apologized for the unintended harshness of his words, a single thought persisted.

He wasn't wrong.

I've been in school for as long as I can remember. It's hard not to feel like an overgrown teenager when your roommate asks if you're a university freshman, even after you've been in the running for five years too long. It's hard not to question yourself when you board the bus every morning with a student card that labels you an undergraduate, as if earning your Bachelor's degree was just something you once dreamed.

Being a student, really, is all I know. I can tell you the number of vertebrae in a person's spinal cord and how proteins are made by the cells in our body, but I don't have a clue as to how to fix a flat tire, or how to not get ripped off by a salesman taking advantage of my inexperience. I still live with my parents, despite being 22 years old, and because I was born in the summer of 1996, I'm considered a millennial—but only just. We're a generation that has become infamous for appearing lazy and disillusioned; ridiculed for our supposed entitlement and our tendency to splurge on, God save us all, avocado toast. We fight for marks worth less than a percent of our final grade, content to rest safe in our academic bubble while outside, just beyond our doorstep, the real world rages on.

But the real world is a scary place. The housing market is beyond our reach, the job market unstable, the expectation looming over our heads that as a workforce, we must support a growing elderly demographic for years to come. It's hard to face the music. Maybe that's why, in keeping with a verse from Hotel California, despite checking out a long time ago, I just can't bring myself to leave.

In the short time we've been here, professional school has proved to be a sobering experience. My peers fought hard to dispel the notion that as a class, we were struggling, but in many ways, we were. I know I certainly was. I teetered on the brink of academic burnout for most of the semester, struggling to re-calibrate

to a life of lectures and endless evaluations after two years of problem-based learning and independent research. Our class Vice-President later resigned from his post; our President followed suit shortly after. Attempts to embrace mental health awareness barely scratched the surface in an ocean of deeper issues. The Ford government made changes to OSAP funding, causing an uproar among my university friends and fellow students, and yet, it paled in comparison to the chilling indifference with which my parents' friends and friends' parents responded. What is it, they asked, that you think you're owed?

At the time, I didn't have an answer: some sympathy, however, might have been nice. I've been asked why I want to become an optometrist so often that I've perfected my answer down to an art. I tell people that I want to help others; that I seek financial stability and a good work-life balance. Neither of those answers is a lie, but as the term went on, they were ultimatums I found increasingly difficult to believe in. This brings me to my confession:

It was never my dream to become an optometrist.

I didn't have some divine epiphany at the tender age of ten, where I suddenly decided my life would never be complete without correcting someone's vision. My true dream remains half-realized—a snow globe on a shelf I'm too scared to pursue with full force, for fear that it will break if I want it too hard.

Of course, it was never a question of whether or not to go after my dreams, either.

There's a certain irony in losing sight of the big picture: how can I hope to help others see clearly, if I can't even do the same for myself?

Becoming an optometrist is the reality I chose.

Maybe learning to accept that without feeling like I've somehow betrayed myself is what it means to grow up.

THE JOURNEY TO BECOMING A SUCCESSFUL OPTOMETRIST

ANONYMOUS

"Focus on your journey, not the destination." - Greg Anderson

Dear students, friends, and future colleagues, I urge you not to think of optometry school as a means to an end, but rather, as a journey into something greater. We are each on our own pathway to something bigger, a voyage that could prove to be vastly different for each and every one of us.

Classmates, as I've gotten to know you throughout the past few years in optometry school, I've been impressed by your fervent motivation, your appetite for learning, and your firm commitment to becoming successful optometrists. We may all come from different backgrounds, but we have all met here at this metaphorical crossroads, in a common place, at a common time, and with common goals. We are all alike in that we share a desire to become good clinicians, to be understood, and to be recognised for our own unique capabilities.

I wish I could give you all a simple formula to help you on your way to becoming successful and compassionate clinicians, but unfortunately nothing in life is that simple. The truth is that success is not a final destination that can be found at the end of a wide multi-laned highway that exists for us all to follow mindlessly. Rather, I like to think of success as the journey itself, not the destination. For some of us, it will be a bumpier and more tortuous ride, but we will only be made better by it. So, although I can't tell you how to become a better optometrist, I will share with you a few things that may help you along the way.

"Success usually comes to those who are too busy to be looking for it." - Henry David Thoreau

Be busy. Don't focus too much on the end of the road, but on the road itself. I know that at times we all feel a bit overwhelmed by all of life's offerings. As optometry students, we are lucky enough to be working towards joining a profession that is continually working to expand its horizons. At times it may feel to us as though we are standing under a never-ending, impossible-to-keep-up-with waterfall of new advances in the forms of technology, pharmaceuticals, and peer-reviewed articles. Sometimes it seems like we never stop looking at PowerPoint presentations, completing assignments, practicing newly learned techniques, and reading up on that which we are so passionate about: the human eye. I know it can be hard, buy try your best not to recoil in the face of all this knowledge—embrace it and contribute to it.

"You don't have to do what everyone else is doing."- Oprah

Stop comparing yourself to others. We are all guilty of doing this. Don't worry about who's doing better in clinic or on midterms. Stop comparing yourself with everyone else, and start comparing your present self with who you were yesterday. Focus on your own work not because you're afraid of being at the bottom, but because you are excited to become a better version of yourself.

"Knowing yourself is the beginning of all wisdom." - Aristotle

Take care of yourselves to take better care of your patients. It doesn't matter if you're still in first year and are ways away from seeing your own patients; it is never too early to work on yourself. **Take the time to learn about yourself.** Take a break if you need to and do something you enjoy—read, write, exercise, spend time with friends and the people that you love. They are all part of your unique journey.

The eqssence of our profession is a deeply compassionate one. Because we have a duty to our patients, we also have a duty to ourselves. Be reflective. Our struggles, mistakes, and accomplishments are all meaningless experiences without the reflection that follows them. Think critically about everything you do. Analyze yourself, your colleagues, your supervisors, and create your own views and rules on how to best deal with the challenges that will inevitably come up throughout the rest of your career as an optometrist.

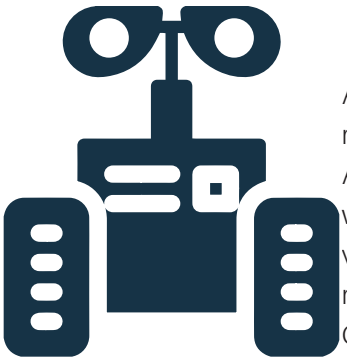
"Curiosity is the engine of achievement." - Ken Robinson

If I can tell you one last thing, it's to **never stop learning.** Never stop wanting to learn. Ride those waves of extreme curiosity as far as they will take you. There might be times when you are bored, and that's okay, too. On some days you may even question if you made the right choice in coming to optometry school, but have faith in yourselves and in the decisions you've made up until this point. Most importantly, remember to always have confidence in yourself and your abilities. Good luck everyone on your journeys to success!

AN EYE FOR AI: WILL IT MAKE THE WORLD GO BLIND?

BY QUINTON YAU

3RD YEAR OPTOM STUDENT



JARVIS from Marvel's *Iron Man*. Disney-Pixar's *WALL·E*. Skynet from *Terminator*. Although far from these representations of artificial consciousness, artificial intelligence (AI) is making progress today in various research fields around the world. Most people probably recall Alphabet's (formerly Google) subsidiary DeepMind's AlphaGo breakout performance in 2015, where it defeated the 3-time European Go champion.1 Just this past year, AI ventured into complex video games such as StarCraft II and Dota 2, with DeepMind's AlphaStar and OpenAI's OpenAI Five respectively, and achieved some notable results.2,3 The answer to why this move from an ancient Chinese game to e-sports is important is nicely mentioned in an OpenAI blog:

> "Relative to previous AI milestones like Chess or Go, complex video games start to capture the messiness and continuous nature of the real world. The hope is that systems which solve complex video games will be highly general, with applications outside of games."3

Applying AI to the everyday reality that we experience is difficult, but researchers are advancing, and one area of focus is optometry's raison d'être, the human eye.

But first, it's important to clarify some buzzwords used in popular media: AI, machine learning, deep learning, and neural networks. I asked Dr. Joseph Paul Cohen, a postdoctoral fellow at the Montreal Institute for Learning Algorithms, to help clarify these terms for us. In an email statement he writes:

> "Artificial intelligence [is] some algorithm (possibly machine learning) which interacts with the world
>
> Machine learning [is] an algorithm which writes a program given examples of an input and an output. Instead of writing a program we have an algorithm learn that program.
>
> Deep learning...is machine learning using deep neural networks (deep neural networks are neural networks with more than 1 hidden layer)
>
> Neural networks [are a] bunch of non-linear functions (aka an activation functions, ex: logistic regression) assembled together into a computation graph (aka an architecture)."

In short, AI entails algorithms applied to the world, machine learning (a subset of AI) uses examples to learn and change the algorithm, and deep learning is machine learning but taking advantage of multiple neural networks to influence its decisions.

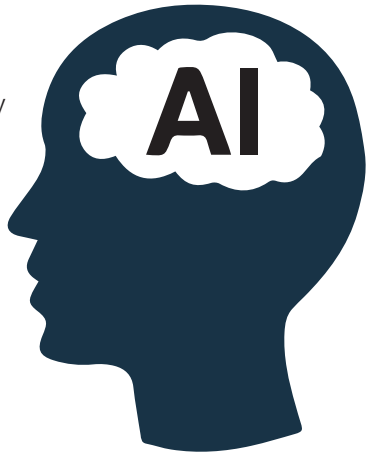
Looking back to the eye or should I say, looking at the back of the eye (bad pun intended), much of the buzz revolves around ocular health conditions. An internet search for AI in eye care yields hundreds of results. There are successful AI studies including detecting glaucoma in fundus photos,4 retinal lesions in OCT images,5 plus disease in

retinopathy of prematurity,6 diabetic retinopathy,7 age-related macular degeneration (AMD),8 grading nuclear sclerotic cataracts,9 and even cardiovascular risk factors from retinal photos.10 However, the advent of AI in eyecare doesn't stop at isolated academic studies.

In 2016, DeepMind partnered with Moorfields Eye Hospital in the UK to see how AI can be used in detecting diabetic retinopathy and AMD.11 In 2018, they announced the results in their blog and published an article in Nature Medicine where they revealed performance matching or exceeding their panel of 5 retinal ophthalmologists and 4 specialist optometrists in recommending treatment by referral type (e.g. urgent, semi-urgent, routine, observation). They also try to solve the "black box" problem, which is figuring out exactly why the AI made its recommendation, by providing two neural networks, one of which analyses the scan and the other presents the recommendation.12 The next phase is researching into how the AI can predict disease before symptoms set in, particularly in AMD.13 While it must undergo randomized clinical trials and regulations to be validated for real clinical use, the early results show that the technology is capable and aims to be an integral part of the eye care profession. But you would be mistaken if you thought there wasn't anything being used today.

IDx-DR, uses deep learning to screen for diabetic retinopathy via fundus images uploaded to a cloud, was approved by the FDA to market in April 2018,14 and has been available to European physicians since 2014 with quite high sensitivity and specificity.15 In China, an AI start-up called Airdoc, has its machines in optical stores and hospitals which also analyzes fundus images in a cloud and sends a list of diseases with their probability to your smartphone.16 These cloud-based platforms are marketing around the world, and with partnerships such as Verily (another Alphabet subsidiary) and Nikon (parent company of Optos),17 clinical units could be coming soon.

Apart from the glamour of OCT and retinal imagery, AI is being used in other aspects of vision care. BlindTool, SeeingAI, Minerva, EnvisionAI are all mobile applications incorporating machine learning to help visually impaired people interact with the world and are addressed in a survey in which Dr. Cohen was involved.18 AI in quality assurance could also be implemented in factories around the world, including those making ophthalmic lenses.



So, what is the future of optometry with AI? Are we going to be replaced as primary care eye doctors? **No.** Most, if not all, articles written by ODs and MDs on the applications of AI to healthcare reach this conclusion as well.

Firstly, AI is only as good as the data/images that is used to teach it. AI trained to detect diabetic retinopathy isn't going to do much for glaucoma, not to mention if you feed it bad-quality images.

Dr. Cohen expands saying, "[that] because the systems are based on data, the populations which make their data available to the public are the ones that will benefit from the tools. These tools are sensitive to their training data and they won't work on other populations if the images are different. Not just if the human phenotype is different but also systematic differences in how the data is acquired like the machine configurations".

Secondly, as much as we would like, patients don't come in labelled with a single condition on their forehead. Conditions can exist simultaneously and while Deepmind's AI attempts takes this into account, others may not.12 That's why the word comprehensive is tacked on with full eye examinations.

Thirdly, AI loves OCT and fundus images, but what about the peripheral retina? Binocular indirect ophthalmoscopy still is

our gold standard and it seems that AI hasn't moved into that field (yet?). There's also binocular vision disorders and low vision assessments that haven't had the machine learning treatment.

Last but not least, is that we have a live patient in front of us. We don't treat faceless diseases, we treat patients with conditions. Patient communication, the human factor in healthcare, the importance of patient values in evidence-based medicine...all of this is what separates doctors from mindless diagnosis machines.

To wrap up, this article isn't meant to critically appraise studies or discredit AI but to help promote it! AI is no longer a question of if it's coming to practice, but when it's coming. My hopes are that knowing what AI can potentially do and can't do, we, as eye care professionals, can be excited for the future tools we can use to better care for our patients. While some may rightly say AI isn't up to standards (yet!), fighting eye for an eye against AI will make the world go blind. Not because of bad technology, but because of fears of being replaced by a machine.

So, don't be the machine. Be the doctor.

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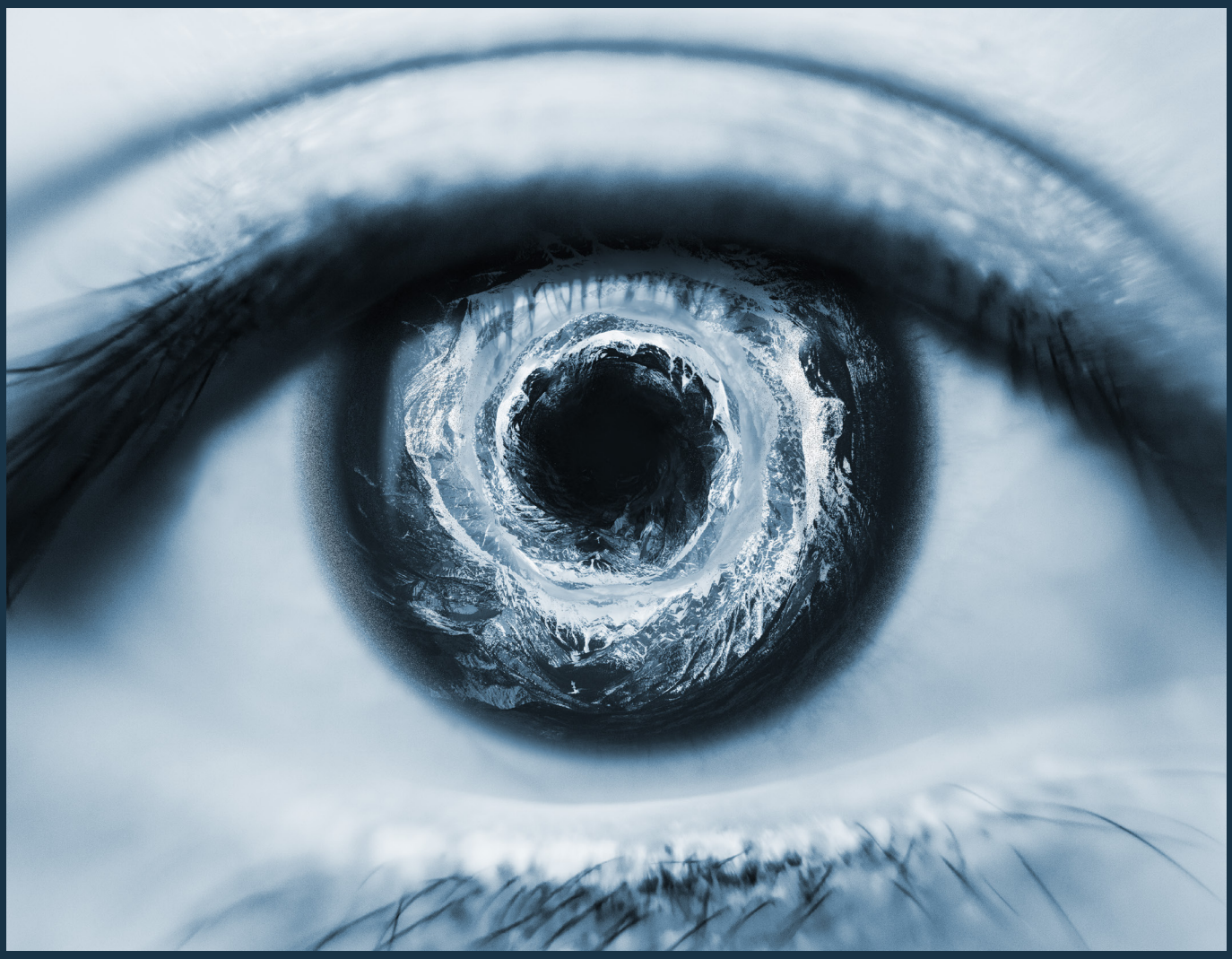
MOUNTAINS AND CRYPTS

PC: BORIS WONG

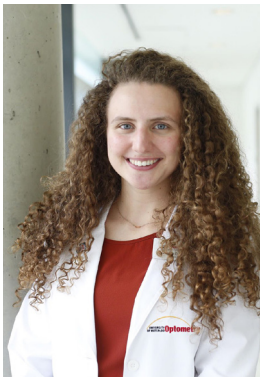


"EYES ARE THE WINDOW TO THE SOUL"

Here we see a close-up of a beautiful eye, with the Canadian Rockies as the iris, all cast in an icy blue hue. She is from the west coast but far away from home as she is studying here in Waterloo. When the bone chilling -36 degrees wind hit this winter, her mind went straight to the mountains. The picture is both cold from the overall hue and warm from the bokeh -- she is lost in thought. We feel another's emotions through their posture; we hear another's emotions through their voice. But nothing is more instantaneous than seeing another's emotions through their eyes.

MORE THAN 20/20

BY SOPHIA CAPO
2ND YEAR OPTOM STUDENT



When I first thought about Optometry
It meant seeing near or far
Would I need to wear some glasses?
20/20 was the bar

But now I'm a second year student
And I have learned so much more
About eyes and treatment and disease
And other things that I adore

So many classes per semester
Another year passing with a blink
I ask, "What is an optometrist?"
It's more difficult than I used to think

It's analyzing the patient history
And asking the right question
To help solve every problem
By using our best discretion

It is more than basic refraction
Or asking a patient one or two
It's moving the circle of least confusion
So you know which rx to do

It's deciding what drug to give
In many different but similar cases
And taking into account reactions
In the body's other places

It's knowing what technique to use
Or whether or not to dilate
Angle closure is always possible,
It can't be left to fate

It's looking beyond the retina
And finding problems with the brain
Nerve palsies and aneurysms,
Our BV tests are not in vain

Whether treating amblyopia
Or increasing PFV
Optometrists want all their patients
To see the best that they can see

There are many forms of the same disease
Conjunctivitis has three
I learned how to treat them all
Bacterial, viral or allergy

It is joining clubs like CAOS
And signing up for talks and events
So I can supplement my learning,
It really makes a lot of sense

My stress levels have gone up
And much time is spent in the library
But thanks to new technology
BIO doesn't even scare me

I learned about the posterior eye
And indirect ophthalmoscopy
I was able to see more retina
AND, wow, it was in 3D!

But, now that I'm in second year
I surely can report
That there are many parts of the eye
That you can accidentally distort

Pressing the tono probe too hard
Will definitely do the trick
Messing up the epithelium
–With fluorescein, you'll see the knick

If the gonio lens doesn't come off
It will surely give you a scare
But better than not on enough,
Or just seeing eyelash hair

It's hard enough to invert an image
That needs to be illustrated,
But it's even harder to see anything
While your pupils are dilated

"Who wants to practice with me?"
I definitely bother my friends,
By touching their lids and lashes,
And shining bright light through a lens

But we work hard because we know,
One day we'll have optometry powers.
All our work will soon pay off,
Eye exams won't take two hours!

In the next two years I'm sure we'll grow
To respect optometrists even more
Their passion, drive, and energy
Full of heart right to their core!

So we need to thank all optometrists,
And if you don't, you're kind of funny
Because eye exams are so much more
Than vision at 20/20

MENTAL HEALTH'S ROLE IN OPTOMETRY

BY CINDY SHAN

2ND YEAR OPTOM STUDENT

Being health practitioners, we are eager to provide advice and guidance to our patients regarding their physical health. However, the human body is intricate and our patients' well-being does not only refer to the physical, anatomical aspects. Our role extends to the non-physical aspects too, as they can affect or be affected by ocular diseases. Similar to how systemic diseases can affect the health of the eye, mental health issues can also influence the lifestyle of our patients.

Mental Health Affecting the Eyes

Dry Eye and Depression

In the science community, there is now a plethora of papers linking depression and dry eye disease (DED). The prevalence of depression among dry eye disease patients is as high as 29% (Zheng et al., 2017), followed by glaucoma (25%) and age-related macular degeneration (24%). It is unclear the exact relationship between the two conditions but there are a variety of different proposals relating the two. One interesting hypothesis for this link could be due to the lower threshold that those with depression have for perceiving physical discomfort or pain (Kim et al., 2011). For this reason, these patients may be more likely to have symptoms relating to dry eye disease. This carries over to other cases as well, as pain perception is important in many of the conditions we treat. Other studies have also identified that depression leads to higher levels of cytokine production, which worsens DED (Mrugacz M et al., 2017).

Effects of Meditation

As society takes notice of the importance of mental health, more focus has been put on the concept of meditation and the benefits of such practices. What once was an ancient and "hippie" practice, unheard of or ignored by many skeptics is now a common topic of conversation in the healthcare community.

In particular, the effects of meditation on glaucoma have been studied in both Germany and India (Dada et al., 2018). The experimental group completed a three-week program of meditation and breathing exercises with a trained yoga instructor for 60 minutes every morning while continuing their eye drops. The control group only continued the eye drops and did not meditate. After three weeks, 75% of the patients who practiced meditation demonstrated a significant 25% drop in eye pressure, which was not observed in the control group. The meditation also showed decreased levels of the stress hormone cortisol, decreased oxidative stress, positively modified gene expression and pro-inflammatory markers.

Ocular Diseases Affecting Mental Health

Many of us have heard about reports of suicide cases due to corneal neuralgia experienced by patients receiving laser eye surgery. Although there are other factors that could have led to these unfortunate occurrences, it is inevitable

that mental health plays an important and large role in the well-being of our patients. Ocular conditions, such as dry eye or corneal neuralgia, and complications from ocular procedures could play significant roles in our patients' lives. Constant pain and discomfort can have a drastic impact on someone's quality of life and affect their mood and perception of the world they live in. Practitioners could consider implementing the use of a a short anxiety disorder questionnaire to assess the risk of patients (link below).

Recent studies have also shown that assessment of eye movement can help in the diagnosis of certain mental conditions such as schizophrenia, autism and depression. A recent study completed in Shanghai found that patients with depressive disorders showed significantly abnormal eye movements indices compared to healthy control patients (Li et al., 2016). With the ability to earlier diagnose psychological disorders, patients would be able to better understand the way their minds work and address any unanswered questions. As optometrists, we have the ability to assist in the care of our patients not just through the eyes.

The Chicken or the Egg?

It is hard to pinpoint what came first. Is it the mental health condition causing certain eye diseases or is it the eye disease that's leading patients to develop these conditions? Research mainly focuses on correlation at this point, but the association is clear. In today's society, it is important for health practitioners to keep in the mind the importance of mental health and how it can affect the well-being of our patients. We can be the support that individuals need to feel heard and cared about. A further step would be to connect them to the right resources.

Resources to learn more

Generalised Anxiety Disorder Assessment (GAD-7): A self-administered patient questionnaire used as a screening tool and severity measure for generalised anxiety disorder (GAD).

https://patient.info/doctor/generalised-anxiety-disorder-assessment-gad-7

Psychological First Aid: First aid course provided by the Red Cross. Provides knowledge and techniques to recognize and assist people in crisis after experiencing loss, grief, trauma, and stress, with an emphasis on self-care and personal protection.

https://www.redcross.ca/training-and-certification/course-descriptions/psychological-first-aid/psychological-first-aid

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A PAINLESS PRESENTATION OF ANGLE CLOSURE: A CASE REPORT

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KEYWORDS

Angle closure
Gonioscopy
Anterior segment OCT
Synechiae,
Secondary glaucoma
ICE syndrome

ABSTRACT

Acute angle closure classically presents as a unilateral red eye with intense headache or browache, severe pain, nausea or vomiting, elevated intraocular pressure, and a fixed mid-dilated pupil. The following case report outlines the diagnosis, treatment, prognosis and long-term management plan for a patient who presented without the classic signs and symptoms of angle closure.

INTRODUCTION

As clinicians, we become experts at narrowing down a differential diagnosis list based on the presenting signs and symptoms. But sometimes, a patient's presentation differs from the pre-formed illness scripts we have stored in our mind. For instance, a subconjunctival hemorrhage has prototypical features of a painless red eye, usually noted by someone else or while looking in the mirror, and often occurs after lifting, straining or valsalva movements.[1] In contrast, acute angle closure typically presents with symptoms of decreased vision, halos around lights, headache or browache, and severe eye pain which can be intense enough to produce nausea or vomiting.[1,2] Classic signs associated with angle closure include an elevated intraocular pressure (often >45mmHg), conjunctival injection with circumlimbal flush, a hazy or edematous cornea, and a mid-dilated pupil (usually 4-6mm) that reacts poorly to light.[1, 2] The following case report outlines a patient who presented without many of the classic signs and symptoms of angle closure.

CASE REPORT

A 38-year-old Chinese man presented late one afternoon with a chief complaint of a very red left eye. The patient reported that he did not realize his eye was red until his wife directed his attention to it that morning. He was experiencing no pain, no headache, no foreign body sensation, and no photophobia. Upon further questioning, the patient revealed he had been lifting boxes in his garage the previous evening. The patient had a routine eye exam six months previously and the results from that exam were unremarkable. The patient did not wear spectacles, had no systemic health conditions, no ocular health conditions, and was taking no medications.

At this walk-in appointment, unaided visual acuities were 20/20 OD, and 20/60- OS, improving to 20/30 with pinhole. Intraocular pressure (IOP) by non-contract tonometry measured 10mmHg OD and 9mmHg OS at 3:34pm. Pupils were equal (2mm OU in light, 4mm OU in dim), round, reactive to light (PERRL), and relative afferent pupillary defect negative (RAPD–). Extra-ocular motilities were smooth, accurate, and unrestricted; the patient experienced no pain on eye movement.

Anterior segment exam of the right eye was unremarkable with the exception of narrow angles graded 1:1/4 by Van Herrick. The left eye had mild-to-moderate superior lid chemosis and diffuse grade 3+ injection of the entire bulbar conjunctiva, worse temporally, as measured by the Efron grading scale. The left temporal bulbar conjunctiva also had significant chemosis. The left cornea was hazy and edematous with half a dozen corneal folds and one corneal stria slightly inferior to the central visual axis. The angles in the left eye were closed nasally and

temporally by Van Herrick and the presence of peripheral anterior synechiae (PAS) was noted. Starting clockwise from the temporal limbus (~3 o'clock) PAS extended 1.0 mm towards centre, from the inferior limbus (~6 o'clock) trace synechiae were observed, from the nasal limbus (~9 o'clock) PAS extended 0.5 mm towards centre, and the superior limbus (~12 o'clock) appeared clear. The left anterior chamber was difficult to assess through the edematous cornea, but no cells were overtly visible. Subtle details of the iris were also difficult to assess through the edematous cornea but no obvious abnormalities or transillumination defects were present. The left lens was clear and unremarkable.

Intra-ocular pressures were re-checked by Goldmann applanation tonometry and found to be 12mmHg OD and 10mmHg OS. Gonioscopy was attempted in both eyes but the patient was too apprehensive to successfully tolerate the procedure and repeated attempts were abandoned.

Posterior segment exam of both eyes by fundus biomicroscopy was unremarkable. The patient had equal and symmetric 0.2 cup-to-disc ratios in each eye, healthy neuro-retinal rims, even macular pigment, normal course/calibre/crossings of vasculature, and no holes/tears/retinal defects detectable by Optos digital retinal imaging in either eye. The patient was not dilated.

As an alternative to gonioscopy, anterior segment optical coherence tomography (AS-OCT) images were taken to better assess the patient's angles. By AS-OCT imaging, the temporal limbus of the left eye – where the PAS was most evident during slit-lamp-exam – showed complete apposition of the anterior iris to the posterior cornea (Figure 2). The nasal limbus of the left eye showed a region of peripheral synechia without direct irido-corneal apposition (Figure 3). Imaging of the superior and inferior angles was attempted but not possible. AS-OCT imaging of the fellow eye (right) was also undertaken. This revealed open angles nasally and temporally, albeit anatomically narrow (Figure 4). Additionally, by comparing the thickness of the cornea OD to the thickness of the cornea OS, the extent of the corneal edema was appreciable (Figure 5).

After reviewing the AS-OCT images, further discussion with the patient was undertaken to assess for possible longstanding nature. The patient reported that he had never noticed a red eye or experienced pain in that eye previously. He did report, however, that he had been experiencing difficulties with his night vision over the past couple of months due to halos and starbursts around car headlights. Additionally, he noted a recent "film-like" quality to his vision upon rising in the morning, but because it cleared quickly he had not thought much of it.

The ophthalmologist on-call was paged. While waiting, in-office use of pharmacologic agents for acute intraocular pressure lowering were deemed unnecessary since current IOPs were already low. Additional testing including posterior segment OCT and visual fields were briefly considered but deemed likely to be unreliable due to the hazy and edematous left cornea.

The patient's atypical presentation was explained to the on-call ophthalmologist over the telephone. The ophthalmologist asked three sets of questions pertinent to: a) the patient (age, race), b) the state of the affected eye (intraocular pressure, clarity of the cornea, state of the angles) and c) the state of the fellow eye (including angles and refractive error). The patient was quickly accepted and sent for further assessment/treatment. A communication back from ophthalmology confirmed sub-acute angle closure secondary to suspected iridocorneal endothelial syndrome (ICE). The patient was referred to a glaucoma specialist for long-term management.

DISCUSSION

Pathophysiology and Etiology

Angle closure can be classified in three different ways – by etiology, research-based classification, or symptom-based classification.[2, 3] The most widely used classification describes angle closures based on etiology: either primary or secondary.[2, 3] Primary angle closures include primary pupillary block, phacomorphic, or plateau iris.[2] Secondary angle closures involve a "pulling" or "pushing" mechanism.[2] Examples of a "pulling" mechanism include neovascularization of the angle, iridocorneal endothelial syndrome (ICE), or posterior polymorphous dystrophy.[2] Examples of a "pushing" mechanism include choroidal effusion, aqueous misdirection syndrome, or a space-occupying lesion in the posterior segment such as an iris or choroidal tumor.[2] The research-based classification subdivides Primary Angle Closure Disease (PACD) according to standards set by the International Society Geographical & Epidemiological Ophthalmology (ISGEO).[3, 4] The ISGEO system subdivides patients into Primary Angle Closure Suspect (PACS), Primary Angle Closure (PAC), and Primary Angle Closure Glaucoma.[4] While the ISGEO classification is extremely

useful in research and surveys, it is not often used in clinical practice.[3] A third way of classifying angle closure is based on presenting symptomology.[2, 3, 5] Angle closure is termed "acute" if characterized by an abrupt onset of symptomatic elevated IOP (>21 mmHg) resulting from total closure which is not self-limiting.[2, 5] Angle closure is termed "sub-acute" or "intermittent" if characterized by an abrupt onset of symptomatic elevation of IOP resulting from closure of the angle which is self-limiting and recurrent.[2, 5] Finally, angle closure can be classified as "chronic" if characterized as elevated IOP or peripheral anterior synechiae (PAS) resulting if only a portion of the angle is blocked at any given time; symptoms do not occur since the IOP remains normal or only slightly elevated.[2, 5, 6] Thus, the diagnosis of our patient would accurately be described as chronic sub-acute angle closure secondary to iridocorneal endothelial syndrome.

While the patient described above did not present with an elevated IOP, he did have conjunctival injection, an edematous cornea, and reduced visual acuity noticed upon waking, suggesting he had experienced an IOP spike overnight. Furthermore, his report of a self-limiting "film-like" quality to his vision in the mornings and halos around car headlights at night over the last couple of months (which were never considered problematic by the patient) further corroborated the diagnosis of intermittent angle closure.6 The presence of PAS in at least two quadrants suggested a chronic nature of disease which eventually progressed to produce a sub-acute symptomatic attack.

Treatment and Management

The standard of care in acute angle closure is an emergency laser peripheral iridotomy (LPI) of the affected eye to relieve any component of pupillary block.[2] If the patient has narrow angles in the fellow eye – as was observed with the patient described above – a prophylactic LPI of the fellow eye should also be considered as approximately 50% of fellow eyes experience an angle closure attack within five years.[2, 7, 8] In this patient, an LPI alone would be unlikely sufficient therapy since a portion of the angle OS has been scarred shut by PAS. The appropriate surgical intervention would likely be goniosynechialysis, involving mechanical debridement of any PAS to allow for aqueous humor to have renewed access to the trabecular meshwork.[2] The success rate of goniosynechialysis is better if the PAS have been present for less than a year.[9] Trabeculectomy or shunt would be considered if the above interventions were not successful.[2, 5, 7] As adjunct therapy, the patient may be treated with IOP lowering medications, especially the prostaglandins, which have well established overnight efficacy to control any future nocturnal pressure elevations.[2, 5, 7, 11, 12]

Long-term management of a secondary glaucoma usually involves treating the underlying cause, if at all possible.[2, 12] Consequently, the prognosis for secondary angle-closure glaucoma varies considerably depending on the cause. In this patient's case, the closure was suspected secondary to iridocorneal endothelial (ICE) syndrome.[10, 11] ICE syndrome is a group of conditions characterized by structural abnormalities of the corneal endothelium, progressive obliteration of the iridocorneal angle via PAS, and iris anomalies such as atrophy and polycoria.[10] ICE syndrome has three clinical presentations: Progressive Iris Atrophy, Cogan-Reese syndrome, and Chandler Syndrome.[10, 11] These diseases are rare, such that the prevalence is unknown.[10, 11] ICE syndrome is seen predominantly in people of Caucasian origin and has not been well documented in Asian populations until recent decades.[10, 13] Usually ICE syndrome first presents in early to mid-adulthood (age of onset 20 to 50 years of age) and is typically unilateral.[10, 11] The condition is idiopathic and the pathophysiology is not well understood such that no treatment exists for the disease itself.[11] At present, therapies are aimed at maintaining corneal clarity, masking iris abnormalities, and treating glaucoma should it develop. 11 In a study of Asian patients with ICE, 76.7% developed glaucoma; 23.3% could be controlled medically while 53.3% required filtering surgery.[10]

Prognosis

In general, the prognosis for glaucoma depends on the cause as well as how early the disease is detected and treated. Prognosis is worse for patients with chronic angle closure compared to acute angle closure because the former undergo a long period where glaucomatous damage occurs yet the patient remains asymptomatic; diagnosis usually does not occur until functional changes are present.[2, 6] Secondary glaucomas – especially of the chronic variety – can be obstinate and challenging for even the most experienced specialist to manage.[2, 6, 10, 11, 12] Prognostic risk factors for poor response to treatment include a higher presenting IOP, a larger cup-to disc ratio, and a greater extent of PAS.[2] Unfortunately, this patient did indeed have significant synechiae with PAS present in at least 180 degrees and extending up to 1mm towards the central cornea. Furthermore, while the patient did not present with a high IOP, we suspect that he had had significant IOP spikes overnight - there exists no way of

accurately estimating how high his maximum pressure may have been.

This patient did have small cup-to-disc ratios and no overt neuroretinal rim defects, though admittedly, an extensive nerve fibre layer evaluation was not conducted. The hope is that the patient was diagnosed early enough such that intensive surgical and pharmacological intervention may negate further glaucomatous damage. This will be determined at future follow up appointments, but the patient will certainly require life-long management via surgical intervention and adjunctive pharmacologic therapy.

CONCLUSION

This case illustrates that the illness scripts we hold in our minds do not always accurately represent what will be encountered in practice. Case history should never be rushed; the diagnosis of intermittent angle closure could have been made more rapidly if questions about the presence of any long-term symptoms had been asked initially, rather than just focusing on the acute symptoms at hand. The case also serves as a reminder that one may need to use available equipment in creative ways. The diagnosis described here required the use of AS-OCT as an alternative to gonsioscopy when that gold standard could not be tolerated by the patient. Finally, the case is a good reminder that during emergency visits, it is imperative to check the fellow eye however unremarkable it may appear – one may gain information that could be useful in diagnosis, treatment or future prognosis.

APPENDIX

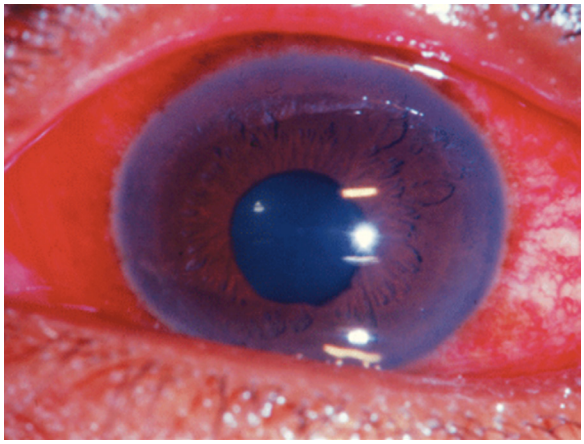

Figure 1 - Anterior segement photograph similar to this patient's presentation. This image demonstrates the severity of 3+ diffuse bulbar injection, with even more intense 4+ injection of the temporal conjunctiva. Image credits: Pitfalls in the diagnosis of angle closure glaucoma. Recent Advances in Ophthalmology 12, Chapter 7. Jaypee, New Delhi, India. [14]

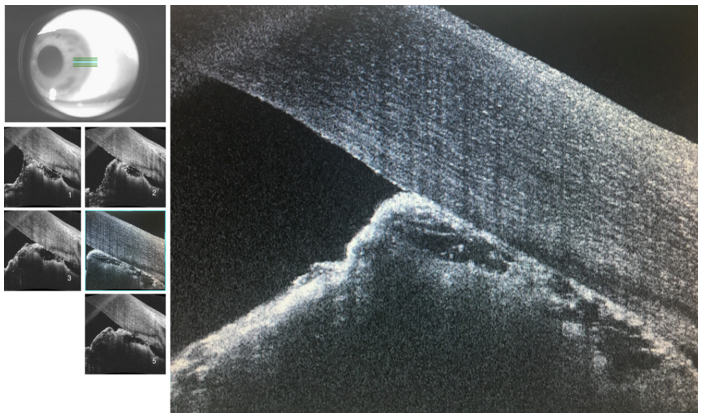

Figure 2 - Anterior Segment Optical Coherence Tomography (AS-OCT) image of the temporal limbus of the left eye. The iris is completely apposed to the posterior aspect of the cornea.

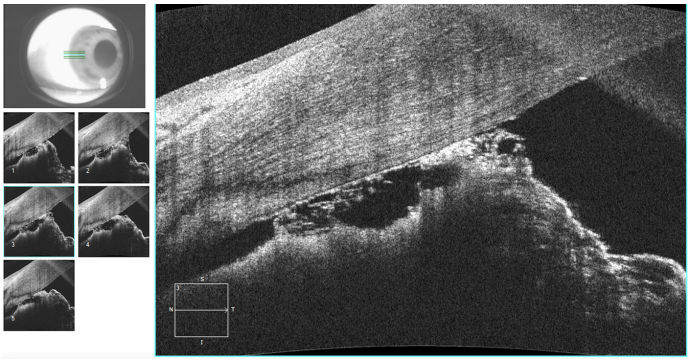

Figure 3 - Anterior Segment Optical Coherence Tomography (AS-OCT) image of the nasal limbus of the left eye. Imaging revealed an area of PAS scarring without direct apposition or irido-corneal touch (ITC).

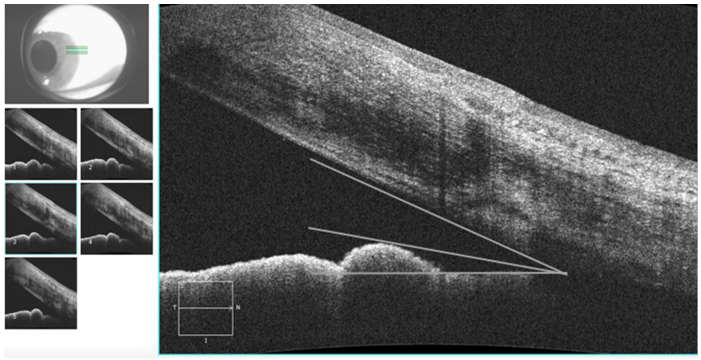

Figure 4 - AS-OCT of the nasal limbus of the unaffected right eye. The angle is open, but anatomically narrow. The angle was measured to be 24o when measured from the horizontal, or 16o when measured at the narrowest potion of the angle - along the line where the first irido-corneal touch (ITC) would be expected to occur.

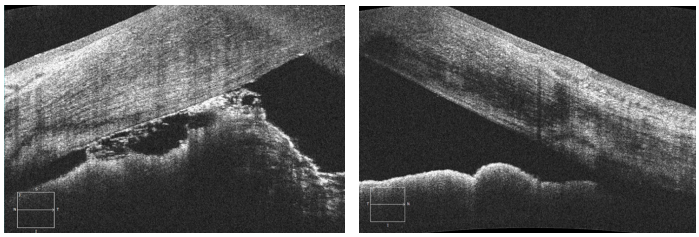

Figure 5 - Comparing the AS-OCT of the affected left eye (a) to that of the white and quiet right eye (b), the difference in corneal thickness due to corneal edema OS is appreciable.

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LOW VISION REHABILITATION CONSIDERATIONS FOR SEVERE VISUAL FIELD LOSS FOLLOWING STROKE

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KEYWORDS

Meningioma

Stroke

Low vision rehabilitation

Neglect

Right-sided visual field loss

ABSTRACT

Visual field loss due to optic atrophy can occur as a result of a compressive lesion in the region of the tuberculum sellae, or ischemia or hemorrhage in a cerebrovascular accident. Although often a devastating functional loss, there are ways in which these patients can undergo visual rehabilitation in order to carry out their activities of daily living (ADLs). The purpose of this article is to report management of visual rehabilitation for a person with severe visual field loss due to bilateral optic atrophy that occurred after a stroke which followed surgical decompression of a tuberculum sellae meningioma.

INTRODUCTION

Tuberculum sellae meningioma is a tumour of the meninges encasing the central nervous system and is often located below the optic chiasm and above the sella turcica.[1,2] Classically and most commonly, these neoplasms are slow to develop and can be surgically removed, but can lead to visual field loss secondary to compression of the optic chiasm.[1,2] The most common form of field loss is bitemporal hemianopsia, but it can vary and present as unilateral temporal defects or quadrantanopsia.[1] Losses in visual acuity and visual field are the most common symptoms during clinical presentation, followed by headaches.1 Optic atrophy ensues in 75-90% of patients.[1] For these reasons, it is standard of care to perform Humphrey visual fields to monitor visual function pre- and post surgery.[1] Tuberculum sellae meningioma is twice as likely to occur in women compared to men, is more likely to occur in persons of middle age, and constitutes 3-10% of all types of intracranial meningiomas[1,2] Treatment of this condition most commonly involves surgical decompression of the tumour via craniotomy, after which the risk of developing meningitis may range from 0.3%-10%.[1,3] Possible complications of acute bacterial meningitis include ischemic or hemorrhagic cerebrovascular events, which have been noted in 14-37% of patients with meningitis.[4] Stroke may then result in optic neuropathy and/or atrophy and resultant visual field loss. [1]

Visual field loss is often functionally devastating. Specifically, visual field loss affecting the right hemifield can make reading from left to right notably more difficult due to the visual system's need to see letters to the right of fixation in order to plan accurate saccadic eye movements.[5,6] Other functional difficulties associated with right-sided field loss include driving, balance, and mobility.[5]

Neglect, or loss of interest towards one hemifield, is also not uncommon for patients with brain injury resulting from stroke.[7,8] Left hemifield neglect corresponds with right brain damage and is observed more commonly than right hemifield neglect, likely because the right side of the brain is host to more areas responsible for spatial attention.[8]

Here I report a case of a patient who underwent surgical decompression of a tuberculum sellae meningioma and subsequently contracted acute bacterial meningitis, followed by a presumed stroke and bilateral severe optic neuropathy resulting in significant visual field loss. Management of the functional visual loss via a low vision rehabilitation plan is reported. Informed consent for use of personal health information was obtained from the patient.

CASE REPORT

GC, a 64-year old woman with a history of bilateral severe optic neuropathy, presented to the Low Vision Clinic seeking a Low Vision Assessment for assistance with reading and personal care (specifically, the goal of being able to see her own face in the mirror). GC was diagnosed with an asymptomatic tuberculum sellae meningioma in 2014, which was decompressed surgically three years later. The meningioma compressed the optic chiasm, encircling the right anterior cerebral artery at the junction between A1 and A2, and partially encasing the left anterior cerebral artery. Immediately after surgery, vision was 20/40 in the right eye and 20/50 in the left. Ten days after the surgery, GC contracted meningitis, was in a coma, and was believed to have had a stroke. Approximately one year after the presumed stroke, vision was markedly reduced to 20/80 in the right eye, Counting Fingers in the left, and 20/400 at near. Visual field testing at that time revealed that GC had some remaining vision in the nasal hemifield of the right eye beginning 16 degrees away from central fixation, and a very limited field in the left eye.

GC's disclosed medical history was significant for hypertension, hypercholesterolemia and GERD, for which she was taking lansoprazole, atorvastatin, and coenzyme Q10. It was noted that her medication list also included polyethylene glycol, ondansetron, domperidone, salbutamol, diclofenac and clotrimazole. GC also used a feeding tube at the time of her presentation. She used a wheelchair for distances and was enrolled in daily physical rehabilitation services in the Acquired Brain Injury unit of the hospital in which she resided, 75 kilometres away from our clinic. Prior to the surgery, she enjoyed reading books and the newspaper, watching television, playing cards and scrabble, writing, cooking and using the computer. However, since the surgery and subsequent complications leading to severe visual and physical disability, she was unable to do these activities.

GC's habitual spectacles measured: OD) -1.25 -0.75 X 71 and OS) -1.00 DS, ADD OU +250. Aided distance VA measured OD: 3/15, OS: 1.5/120 and OU: 3/19, and aided near VA measured 0.48/3.2M OU. Subjective refraction yielded OD) -2.00 - 0.25 X 85 with BCVA of 3/9.5, but there was no improvement from static autorefraction OS) of -1.75 DS. GC was able to read 1.6M print OU at 29 cm with an add of +3.50D, following add trial. Bilateral contrast sensitivity was 0.90. Various magnification devices were trialed, including optical and electronic magnification (pocket CCTV (video magnifier)), the latter of which was preferred by GC. To assess and address the visual field loss, Amsler Grid testing was carried out which revealed complete temporal hemifield loss OD, along with field loss extending from central vision to 10 degrees nasally (Figure 1). GC was unable to see the grid at all using her left eye. Clock face hemineglect testing revealed initial right-sided neglect, but when prompted, GC reported to have seen the entire clock face (Figure 2). For the line bisection hemineglect task, GC indicated the midpoint to be to the extreme left, again suggesting severe right-sided neglect. It should be noted that for the line bisection task, GC pointed to the apparent midpoint of the line, rather than using a pen to draw the bisection. It was not clear whether this test needed to be modified in this way because of visual or dexterity limitations, however, the latter were not explicitly reported by the patient or her husband, nor discussed at the time.

A new prescription for progressives was recommended for GC, as she noted significant improvement in vision compared to her current glasses.

Following the assessment, GC attended an Activities of Daily Living Consultation to learn how to apply low vision rehabilitation interventions. It was discovered through discussion and trial that to see her face in the mirror, all that was needed was relative distance magnification, as standing closer to the mirror allowed her to complete the task. GC was advised to purchase a mountable mirror at a local home décor store that could be moved closer. For reading, she was able to read aloud Quillman exercise sheets using the video magnifier during the assessment, by sliding the magnifier across the page. It was recommended to start with basic reading tasks and progress gradually with the exercises, as stroke often has a great effect on processing capacity, and complex tasks such as reading must be re-learned progressively.9 There was also a discussion about using a line marker on the margin of her left field when reading, to facilitate finding the beginning of the line. Tint trial was repeated, resulting in GC preferring an E15 tint (blue) for increased comfort.

Following both appointments, GC was given the pocket video magnifier for extended loan and was provided with 2M and 3M Quillman exercises to practice handling the device. A lap desk and adequate lighting to assist with reduced light adaptation capability, a common functional deficit in patients who have had a stroke, were also advised.10,11 Progress with the exercises was to be assessed at a follow-up visit with view to book a desktop

CCTV consultation. A desktop CCTV could allow GC to position her reading material within her seeing field, which can be helpful for patients with predominantly right-sided field loss.[11]

DISCUSSION

What caused the visual field loss?

Possibilities of the cause of GC's visual field loss included optic neuropathy from compression of the optic nerves at the location of the tuberculum sellae1 or atrophy of the optic nerves/damage to the occipital lobe as a result of ischemia from the suspected stroke. Vision immediately after decompression surgery and prior to the stroke was reported to be OD: 20/40 and OS: 20/50 which rapidly decreased to 20/80 after the stroke. This indicates that the stroke was the cause of the vision loss. There was no report of vision prior to the surgery, which would be helpful in determining if the additional contributing vision loss was due to compression of the tumour, as this is also possible.[1] If the meningioma caused the compression and atrophy of the optic nerves, it would be expected that there would be complete field loss in the right eye with temporal field loss in the left eye, as the tumour was more displaced to the right side. However, in this case the field loss was complete in the left eye with temporal loss in the right. Considering all known factors, it is more likely that the stroke was the cause of the vision loss - along with other losses of bodily function - rather than the compression from the meningioma. This is an important point because in such cases, one must evaluate the patient for other visual sequelae of stroke including neglect, or physical or neurological impairment, which could interfere with the success of the rehabilitation (described later in this text).

Other neurological functional losses

Because GC demonstrated loss of voluntary motor function and balance difficulties, the cerebellum was likely also affected by the stroke.[12] Additionally, her use of a feeding tube may be due to dysphagia, a possible result of damage to the brainstem or glossopharyngeal nerve.[12] Dysmetric eye movements noted could result from damage at any location to the pathway responsible for voluntary eye movements, which includes cortical and frontal cortex eye fields that project to areas of the thalamus and superior colliculus.[12] It is likely that the stroke was major, affecting many areas of the brain resulting in massive functional loss as described above. This is an important consideration when formulating a rehabilitation plan and managing both patient and practitioner expectations. The process will very likely take longer, require additional attention to physical abilities, and be more effort for the patient.

True visual field loss versus neglect

Assessing for neglect in patients who have had a stroke is a highly pertinent clinical skill and must be done in a careful manner to serve its clinical value. GC was prompted to look for more clock hours after she reported seeing only those on the left, following which she reported a full clock image. This was a shortfall in the performance of the test, as it is essential that the clinician does not lead the patient in their response in order to gain a true reflection of the patient's perception. It is uncertain whether or not GC would have eventually noted the full clock independently, which would have indicated less severe neglect, presenting as an initial inattention to one side, but with gradual awareness of the full potential of the visual field.[7,13] An additional indication of neglect that could have been assessed would have been to observe GC's path and gait when walking, noting if she was paying more attention to objects on her left.[7] This would, however, have involved an attempt to walk without the use of her wheelchair which would have presented safety concerns. When asked, neither GC nor her husband noted that she paid more attention to one side over the other, e.g of a dinner plate when eating, which can be another sign of neglect.[7] Perhaps, instead of neglect, GC had just simply not yet learned to compensate for the substantial visual field loss on the right side by turning her head or scanning to look into that area of missing field. This should have been addressed at the visit.

Rehabilitation options available

Successful compensatory reading strategies for low vision rehabilitation for individuals who have predominantly right-sided visual field loss include saccadic training and strategic use of the OKN reflex.[5,10,11] The latter of these two, with use of the Read-Right web app, involves training where a visual target is moved from right to left, inducing an involuntary eye movement into the right non-seeing field. In a controlled trial, this training was compared to a sham training and showed a significant improvement (18% vs 5%) in reading speed of static text.[14] This effect was also observed in another study, with the greatest improvement being 46% after 20 hours of training.[15] Other strategies to consider include magnification, contrast enhancement and use of adequate lighting.[10,11] In GC's case, magnification and increased contrast through the use

of a handheld video magnifier and use of proper lighting while reading were initial suggestions, with the intent of conducting a training session for a desktop CCTV in the future. This would help GC manipulate reading material within her seeing field.[11] In retrospect, the suggestion to use a line guide may not have been as beneficial because the difficulty with predominantly right sided field loss lies more in the inability to plan saccades into the next word, rather than to find the beginning of the line in the left seeing field.[5,6] With this in mind, magnification may also hinder this ability to plan saccades, as less words will be visible in the already constricted visual field. Another simple and inexpensive strategy that could have been implemented is the use of a typoscope because after a stroke, processing can be hindered by the crowding of words when reading.[11] For GC, training of the OKN reflex may be a consideration once her ability to read simple words with the help of low vision devices is enhanced, as this must be achieved before fluency can be pursued. The Read-Right app may therefore be useful, depending on her future progress.

GC's other impaired functions due to the stroke were not discussed in detail during the interaction. When asked if her visual goals were thought to be more hindered by vision rather than physical impairment, GC thought that her difficulty with these tasks was more attributable to reduced vision. More questions should have been asked about her physical limitations since the stroke, and this could have been explored during the device trial. It is important to not only investigate ways to adapt tasks to a patient's specific ability, but to also set realistic expectations for the rehabilitation (for example, that it may take time and will not be restorative to pre-disease levels).

Strategies for effective communication

In patients who have had a stroke, it is extremely important to use effective communication strategies to allow the individual to participate fully in their own healthcare, which has been shown to yield greater patient fulfillment.[16,17] It is helpful to involve the caregiver in the communication, but to ensure that the patient has been given adequate choice in their care.[16] It is important to keep in mind when speaking with a patient who has had a stroke that processing speed subjectively and objectively is often reduced, and to vary the pace of speech accordingly while maintaining a genuine tone.[9,16] These strategies were employed for the majority of GC's assessment, however at times complex questions were asked, which when simplified, GC was able to easily answer.

CONCLUSION

In conclusion, specific approaches to low vision rehabilitation for unique types of losses of visual function, in conjunction with consideration of any physical limitations, are needed especially after an event such as stroke has occurred. Noting how a patient is functioning during an assessment, as well as discussing any physical impairments, is key to the formulation of an effective rehabilitation plan that is realistically attainable. Recent developments in rehabilitation should be considered and presented if proven to be effective. Building the plan on accurate clinical results such as a careful refraction is helpful to ensure the patient is performing at their full function. To arrive at the rehabilitation plan, effective communication, which aids in obtaining an accurate history, clinical results, and patient engagement, is paramount.

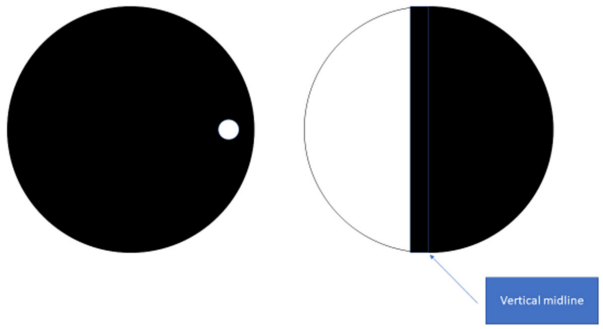

Figure 1: Schematic representation of patient GC's suspected visual field loss

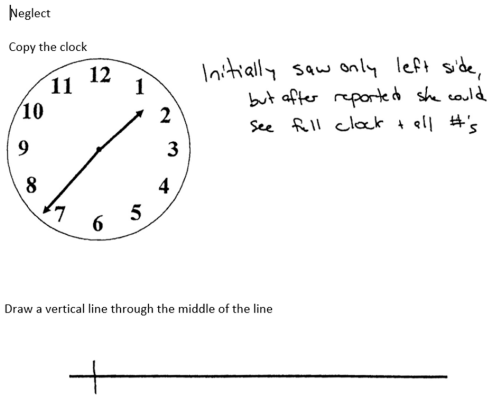

Figure 2: Results of patient GC's neglect testing (the top image represents the clock face hemineglect test, while the bottom, the line bisection task).

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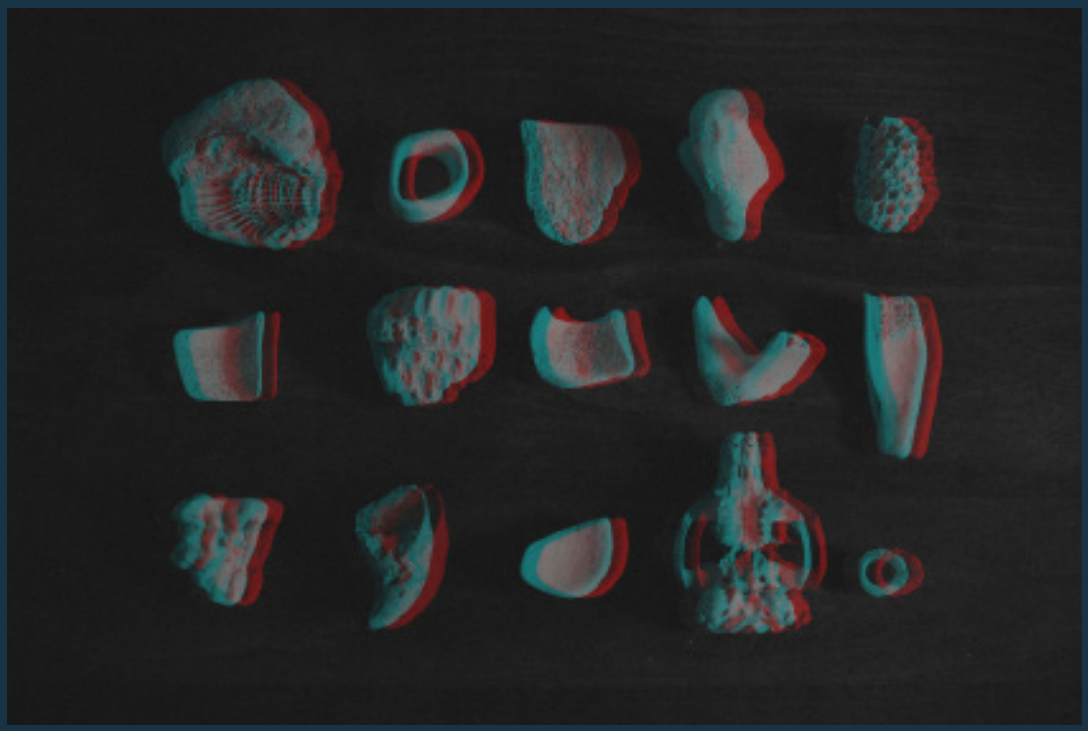

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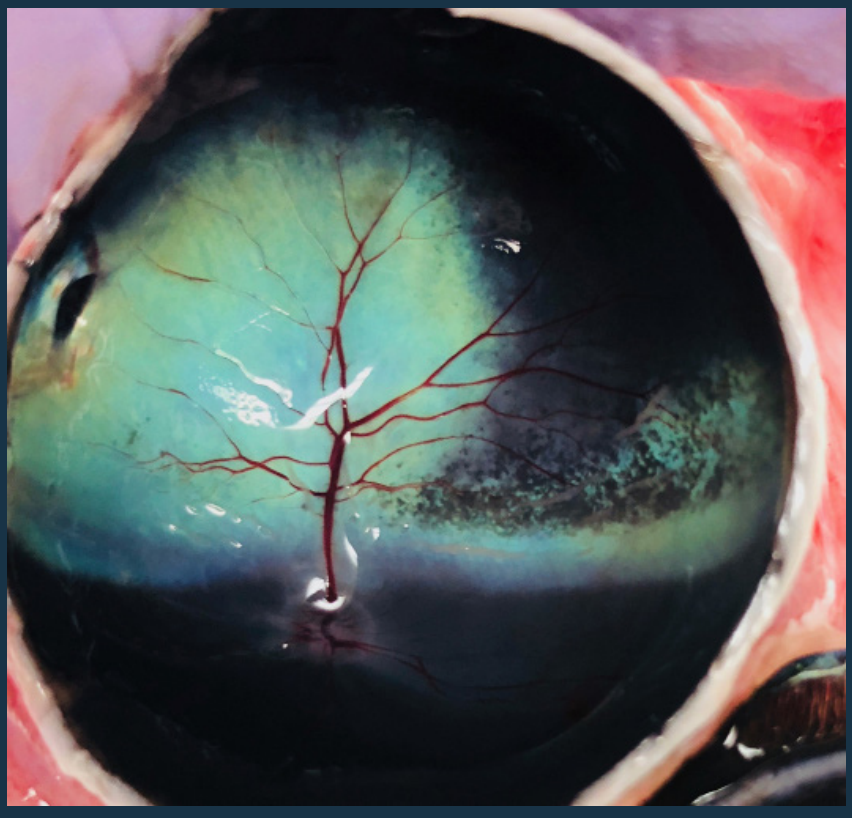

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