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An Uncertain Future

What does the recent LCD turnaround signal for the future of MIGS?

As you may be aware, five of the US Medicare administrative contractors (MACs) are withdrawing their local coverage determinations (LCDs) for a number of microinvasive glaucoma surgery (MIGS) procedures. Though this announcement has been welcomed by companies that would have been negatively impacted by the potential changes to Medicare coverage, the need for the U-turn does not diminish a sense of uncertainty.

Sudden turnarounds are not new. Only a couple of years ago – driven by mounting pressure from the American Academy of Ophthalmology (AAO) and the American Society of Cataract and Refractive Surgery (ASCRS) – Aetna rescinded its policy of requiring preauthorization for cataract surgeries (in every state except Georgia and Florida) after only one year.

It would be remiss, of course, to suggest that all ophthalmologists were against the proposed MIGS coverage changes taking place. Admittedly casting his view from the other side of the Atlantic, Power List alumnus Gus Gazzard, Consultant Ophthalmic Surgeon at Moorfields Eye Hospital, and UCL Professor of Ophthalmology at the Institute of Ophthalmology UCL and the NIHR Biomedical Research Centre, UK, told The Ophthalmologist earlier this year: "While many see this LCD ruling as terrible, I personally see it as a step towards common sense distribution of resources and the limiting of patients to risk of harm only when we know the device works. The designation of treatments as 'investigational' until there is randomized controlled trial (RCT) evidence is, in my view, long overdue, and moreover is precisely how we manage things at Moorfields."

However, Gazzard did append his statement with a reservation about what the ruling could have meant for ophthalmic development: "I do worry that this will limit innovation – slow it down, but not stifle it – but that may be the price we have to pay for keeping patients safe and using funds wisely." Whether or not you agree with this view, it's one that could be reiterated in the months and years to come – both in the US and abroad.

Whatever the future, the unfolding drama of MIGS coverage has cast a shadow on the glaucoma care landscape. Will it influence developers and investors interested in dipping their toes in the MIGS market? Will ophthalmologists-in-training reconsider their career options? Well, with glaucoma cases increasing to an estimated 112 million people by 2040 (1), ophthalmologists who specialize in glaucoma are likely to be in demand like never before – whatever the treatment options available to them.

Alun Evans
Associate Editor

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1. *Y Lin et al., "The Global Burden of Glaucoma: Findings from the Global Burden of Disease 2019 Study and Predictions by Bayesian Age–Period–Cohort Analysis," Journal of Clinical Medicine, 12, 1828 (2023). PMID: 36902615.*

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Feel free to contact any one of us:
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Change of address info@theophthalmologist.com
Hayley Atiz, The Ophthalmologist, Texere Publishing Inc., 115 Broadway, FL 5, New York 10006, USA.

General enquiries
www.texerepublishing.com | info@theophthalmologist.com
+44 (0) 1565 745 200 | sales@texerepublishing.com

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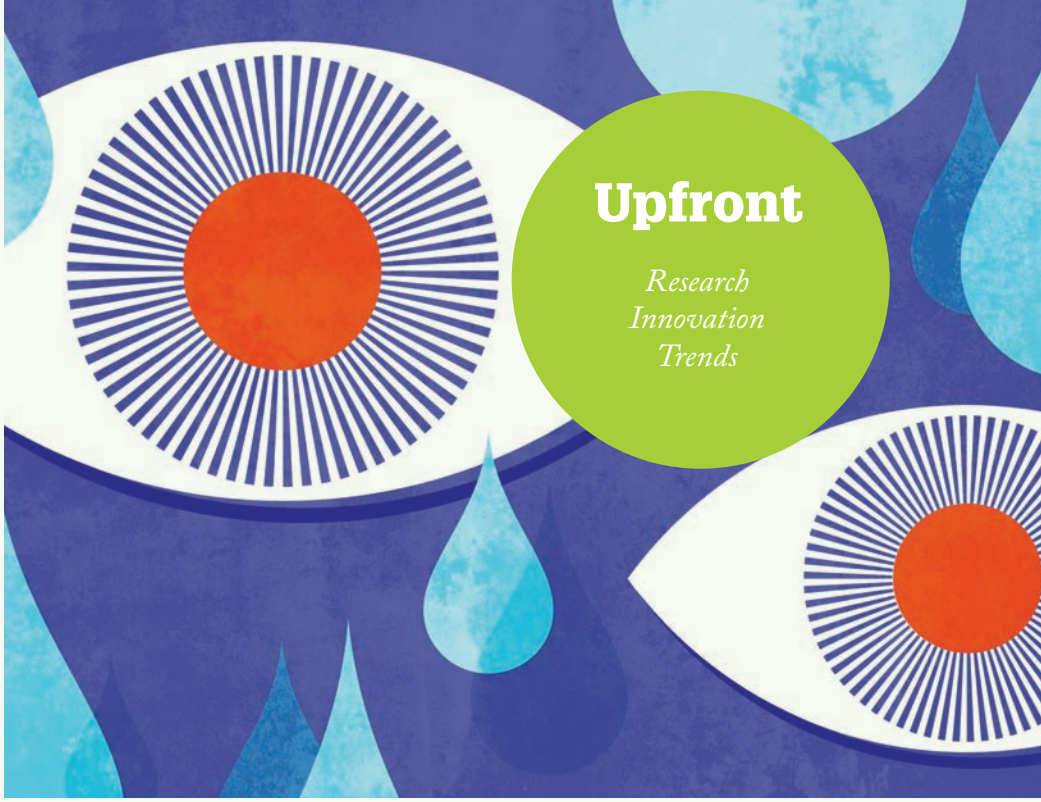

CHAMPioning Myopia Management

A randomized clinical trial suggests that low-dose atropine (0.01 percent) could be a promising therapeutic agent for children with myopia

Researchers from The Ohio State University College of Optometry, along with colleagues from the study sponsor Vylum, (and collaborators across the United States and Europe) have published data from the Childhood Atropine for Myopia Progression (CHAMP) study (1) – the first placebo-controlled, randomized, three-year phase III clinical trial in a US/Europe-based sample of children.

"I've been engaged in myopia research for 35 years. This is exciting work for the myopia research community and eye care practitioners alike. We've talked about treatment and control for decades. It's exciting to think there could be options in the future for millions of children we know are going to be myopic," said lead study author Karla Zadnik, Professor and Dean of the College of Optometry at The Ohio State University, in a press release (2).

The team sought to establish the safety and efficacy of two low-dose solutions (0.01 percent and 0.02 percent) versus placebo – both manufactured by trial sponsor Vyluma (New Jersey, USA). Each of the 489 children (aged 6–10 years) received a nightly application of one drop per eye. The dosing strategy and the low concentration help to minimize the potential visual disturbances caused by atropine-induced mydriasis and cycloplegia.

The researchers discovered that the 0.01 percent atropine formulation delivered the most significant improvements at all time points compared with placebo. Though the 0.02 percent atropine formulation did slow eye growth more than the placebo, the results were less consistent.

The researchers also noted in the press release that off-label, low-dose atropine are currently obtained from compounding pharmacies; however, there are limitations to those formulations. Vyluma's formulation is preservative free and packaged in single ampules intended for daily application.

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2. *Ohio State News, "Eye drops slow nearsightedness progression in kids, study finds" (2023). Available at: https://bit.ly/47Kuihk*

INFOGRAPHIC

Women and Eye Care

Recognizing gender inequality in ophthalmology and eye health

Globally, women account for

55 percent

of people who are blind or living with a visual impairment

90 percent

of those women with vision loss live in low- and middle-income countries

SPOTLIGHT ON ARVO

We help you keep up to date with the latest vision research from ARVO's journals

Solo Screening
To determine the efficacy of solely using optical coherence tomography (OCT) to detect established glaucoma, a recent TVST study examined the eyes of 70 patients with established glaucoma. The study found that a systematic OCT-based approach to glaucoma detection had high sensitivity and high specificity, and could be used alone in a real-world setting. PMID: 38190190.

All Aboard!
New TVST research has evaluated the efficacy of All_Aboard, a new mobile app designed to aid blind and visually impaired (BVI) travelers in finding bus stops. Conducting a field study of 24 participants, the researchers found that the new app had a significantly higher success rate (91 percent) than Google Maps (52 percent) and could be used as an accurate and reliable navigation aid for BVI users. PMID: 38224330.

Latinx Outlier
With Latinx populations experiencing higher rates of sight loss and visual impairment than any other demographic in the US, a TVST study sought to determine the factors influencing Latinx patients' adherence to diabetic eye screening. In their qualitative study, the authors identified a number of influential factors that affect adherence. PMID: 38060234.

Gender Disparity in Glaucoma Patients' Depression and Support
Researchers looking to understand differences in measures of depression, stress, and social support by gender among those diagnosed with glaucoma found that women with glaucoma were more likely to experience depression and stress and were less likely to have social support on some measures than men. PMID: 38149963.

Understanding Retinoblastoma
A new IOVS study has investigated how aqueous humor (AH) sampling might help to diagnose, prognose, and treat retinoblastoma (RB), while also improving our understanding of the pathophysiology of the tumor. The study's findings suggest that advances in liquid biopsy of AH for RB tumors could help clinicians make more individualized treatment plans for children with this rare form of cancer. PMID: 38180770.

Weight, Height, and Myopia

Study suggests possible sex-specific myopia associations in young adults

A recently published Eye study (1) assessed weight, height, and body mass index (BMI) of young adults (taken from Israeli Defence Forces data) to determine whether there were any possible sex-specific risk factors of myopia within this cohort. The researchers examined a total of 101,438 participants (22,326 myopes and 79,112 emmetropes), 57.9 percent male and 42.1 percent female, all who were 17 years old. The cross-sectional study found that myopia was more prevalent in young males who were either underweight or obese, as well as an unexplained increased risk in the lower height decile. For young females, however, while the same links were supported in the weight categories, no prevalence was noted in the height categories.

Reference

1. *Y Machluf et al., "Dissecting the complex sex-based associations of myopia with height and weight," Eye, [Online ahead of print] (2024). PMID: 38242948*

The gap between patient attendance or surgery rates has widened between men and women since

COVID-19

Though women make up almost 70 percent of the global healthcare workforce, they account for

< 25 percent

of the most influential leadership positions

Women represent **25 to 30 percent** of ophthalmologists and

25 to 45 percent

of trainees globally yet remain underrepresented in key positions

See sources online at: theophthalmologist.com

Sonic Translation

New study reveals that facial recognition may not be based solely on visual experience

The belief that blind people have enhanced senses as a direct result of their sight loss has long existed. This concept is reiterated frequently in fiction dealing with blind characters, and in real life there have been a number of scientific studies evidencing the claim. For example, a Journal of Neuroscience study from 2012 (1) indicated that people born deaf typically experience a neural remapping – their brains devoting neural processing power to touch or vision instead of sound. And a 2017 PLOS ONE study (2) went so far as to employ MRI scans of "early blind" patients to highlight the structural and functional changes of the brain in profound early blindness.

This surprising ability of our brains to effectively reorganize their neural networks in response to external environmental changes is known as neuroplasticity, and this concept has now been applied in another PLOS ONE study (3). The November 2023 study's main focus – conducted by a team at the Department of Neuroscience at Georgetown University Medical Center – examined how auditory patterns are processed by the fusiform face area (FFA – the location in the inferior temporal cortex dedicated to facial recognition). Interestingly, the authors claim that they were attempting to demonstrate that facial recognition isn't solely based on a person's visual experience.

To test the hypothesis, the team employed a sensory substitution device (SSD) that converted basic two-dimensional images into sound. During the study itself, participants – both blind and sighted – were required to wear the SSD, with each session involving having them recognize simple patterns and geometric shapes, with the stimuli becoming gradually more complex. Using functional MRI scans, the team was able to observe areas of the brain that were activated during participants' experiences of the image-translated sounds. The researchers found that for blind participants, sound-activated brain activity occurred in the left fusiform face area, while activation in sighted participants occurred in the right fusiform area.

Though the PLOS ONE paper was a small-scale study of only 16 participants, the results are somewhat surprising, as they suggest that blind people can indeed recognize and differentiate basic facial shapes when they are translated into distinct sound patterns. The goal for the researchers involved in the project is to eventually be able to use real-life pictures in the study, as opposed to emojis and other heavily simplified symbols; however, to take this next step, the researchers first need to greatly increase the resolution of the SSD equipment.

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2. *C Bauer et al., "Multimodal MR-imaging reveals large-scale structural and functional connectivity changes in profound early blindness," PLOS ONE, 12, 3 (2017). PMID: 28328939.*
3. *P Plaza et al., "Sound-encoded faces activate the left fusiform face area in the early blind," PLOS ONE, 18, 11 (2023). PMID: 37992062.*

IMAGE OF THE MONTH

The Art of Upcycling

Recycling plastics and print to bring attention to industry waste.

Credit: Malini Gutpa

Artist and endocrinologist Malini Gupta uses everything from disposable contact lens cases to plastic needle sheaths in her work to highlight the amount of waste produced in the medical industry. This image is from her new exhibition, "Mottenai."

Would you like your photo featured in Image of the Month? Send it to edit@theophthalmologist.com

QUOTE OF THE MONTH

"It's really important that we leave our differences aside and work towards encouraging collaborative care. If we depend on the government or a third party to come in and fix it, it is going to take longer. I think if each of us does our part, and puts more effort into referring our patients, into managing our patients, providing the best care, and collaborating with our colleagues, we can make a huge change and have a significant impact in the field."

Glenda Aleman-Moheeputh, President and CEO of OK Love Myopia Control Experts, Florida, US.

Step Count

Wilmer Eye Institute research reiterates the importance of continued physical activity in older adults suffering from visual impairments

While aging is an unavoidable fact of life, the choice to exercise – be that walking, running, or going to the gym – is still widely available to senior citizens of the Western world. But age-associated vision loss can restrict this choice. A new study from the Wilmer Eye Institute (1) has sought to delve deeper into how visual impairment (VI) in the elderly impacts their physical activity. Given that vision impairment has wider-reaching health implications beyond ophthalmology, "detecting and intervening early in cases of vision impairment is crucial," says Louay Almidani, post-doctoral researcher at the Wilmer Eye Institute. "Comprehensive access to eye care, along with public education and policy initiatives, can collectively address the burden of vision impairment and its impact on physical function."

Reference

1. *L Almidani et al., "The Quantitative Impact of Visual Function on Accelerometer-Measured Physical Activity in Older US Adults: A Nationwide Cross-Sectional Analysis," Ophthalmology Science [Online ahead of print] (2023). DOI: https://doi.org/10.1016/j.xops.2023.100464.*

In My View

Experts from across the world share a single strongly held opinion or key idea.

Proper Dropper

Many practitioners overlook the power of coaching and educating their patients when it comes to the actual mechanics of drop instillation

By Jason Bacharach

Drop therapy is a mainstay of treatment for a number of ophthalmic conditions – from glaucoma to ocular surface disease to cataract/refractive surgery. Busy clinicians might spend time educating patients about their condition and why they are taking a certain topical medication, but are they talking to patients about how to correctly instill drops in the eye? If patients are unable to adequately use their medication, our treatment efforts have already failed.

When I see a patient who is taking drops for the first time or a patient who has been on a particular medication but without the expected efficacy, I make sure they are applying the drops correctly. I begin by saying, "This does not have to be challenging – instilling drops should be simple."

"Drop therapy is a mainstay of treatment for many ophthalmic conditions – from glaucoma to cataract and refractive surgery."

First, I instruct patients to use a brace. This might be the opposite hand from the one holding the bottle or, if that is not possible, their cheek or forehead. Next, I tell patients to put a drop in the lower cul-de-sac. This is important to ensure they avoid hitting the bottle tip or the applicator on their cornea and causing an abrasion. Lastly, I tell them they do not need to flood the eye. One drop is all they need. Often people mistakenly think more is better, and we know that is certainly not the case with ocular medications.

Nasolacrimal occlusion and passive eyelid closure

If I am using nasolacrimal occlusion to reduce systemic absorption of the drop medication – for example, in the case of a beta-blocker – I instruct patients to use passive eyelid closure after the drop is dosed for one minute while using their index finger to occlude the puncta at the same time. I use a handout to illustrate the technique. Otherwise, I have them do passive eyelid closure for 60 seconds to ensure there is effective absorption to the target tissue. I tell patients to gently close their eyes, sit back, and let it absorb, reminding them not to rub their eye or move it all around. That is all there is to it; sometimes, we just need to demystify the process for them.

For patients who I believe might have a challenge – such as patients with Alzheimer's disease, Parkinson's disease, or arthritis – I ask them to instill a drop of artificial tears in their eye while they are in my office so I can see if they are successful. Watching the patient, helping with the correct

hand motion, and giving them tips for proper administration can be very beneficial. My technicians do much of the coaching and education, and they will spend extra time with a patient who is new to drops, particularly if the patient has questions.

"If the physician does not recognize that patients are struggling to properly instill their drops, it might be easy to assume the medication is not efficacious and therefore abandon the drop prematurely."

Drops are too big

A very common question from patients: "If some of the drop drips on my cheek, do I need to instill a second drop?" Well, the cul-de-sac, reservoir, and absorptive capacities of the eye is six to eight microliters, much smaller than the 35 to 50 microliter size of an average drop (1–3). It is well established that excess medication is linked to ocular and systemic toxicity (4, 5). With prostaglandin analogues, for example, these effects include hyperemia, contact dermatitis, pigmentary changes, and periorbitopathy (6). As mentioned above, beta-blockers have cardiovascular activity; therefore, overflow leakage through the nasolacrimal duct with subsequent systemic absorption has the potential to cause bradycardia, respiratory depression, fatigue, and even impotence (4, 5). Although patients will experience some overflow onto their cheek, it does not mean they need to instill another drop. I explain to patients that they do not want to flood their eyes with more medicine than they need.

Secondary adapters are available that fit onto bottles to help regulate the dose, make it smaller, and the drops easier to instill. Adapters can also make it easier for patients to hold a bottle over the bridge of their nose. Some examples of these include GentleDrop (BeDo Solutions), Nanodropper, and Eyenovia's OpteJet dispenser.

If the physician does not recognize that patients are struggling to properly instill their drops, it might be easy to assume the medication is not efficacious and therefore abandon the drop prematurely. There is a possibility that, due to poor technique, the doctor may under-appreciate the opportunity of a class of medicine. When I prescribe preservative-free products, I emphasize this feature to the patient and they often appreciate the option of drops coming in individual droppers, if available. Remember, however, that individual ampules cannot be used with an adapter.

Patients have many concerns around drops; questions range from their shelf life to proper storage, to what to do if the tip touches the eye. Safety of course is top of mind with recent cases of blindness and even death linked to illegal drops. I remind patients that branded products from trusted manufacturers undergo a rigorous development process and regulatory process for approval that includes studying safety and proper storage. In other words, it is exceedingly rare for issues to arise with FDA-approved products.

In short, I believe that it is incumbent upon physicians to answer all of patients' questions – including those around instilling drops – and fully address their concerns. Any unresolved concerns could lead to compliance issues, so we should not shrug off these legitimate questions. Instead, it is our responsibility to ensure that patients feel comfortable with their drops from an overall perspective and trust they are safe for the long haul. Taking the time to instruct patients fully on proper drop use will likely improve their adherence and, in turn, result in better efficacy and outcomes.

Jason Bacharach, MD, is Founding Partner and Medical Director, North Bay Eye Associates, California

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The Ikigai of Glaucoma Practice

Embracing the Japanese concept for a happy, meaningful existence could shape your professional life

By Puspha Raman

Upon completing my fellowship in glaucoma, I was posted in a public hospital in my hometown of Seremban in the state of Negeri Sembilan to start a glaucoma service from scratch. My ambitions soared. The possibilities were limitless, and a myriad of questions filled my mind. I wanted to attend to every glaucoma patient in my hospital, provide early surgical interventions, and explore the realm of minimally invasive glaucoma surgery (MIGS) in cost-restricted public healthcare. I wanted to reach out to remote villages and offer glaucoma screenings.

When I shared my vision with my mentor, Aziz Husni, Head of the Glaucoma Service at the Malaysian Ministry of Health, he responded with a smiley emoticon and introduced me to the concept of ikigai. He advised me to "start small."

My task was to understand the ikigai of glaucoma practice. The principle of ikigai is very simple: do what makes you happy. Get a hold on the motivation that gets you out of the bed every day. I delved into the principle and pondered how best to shape my practice for the benefit of both my patients and me. After 18 months as a glaucoma consultant, I now reflect on how these principles have refined my practice.

Starting small

The first pillar of ikigai – the concept of taking small steps – resonated deeply with me (1). I implemented this idea in two significant ways. I realized I needed to start from where I am rooted, rather than "going wide." First, I focused on a specific niche within my eye department – advanced glaucoma patients on maximum medication and those suffering from ocular surface disorders because of chronic medication use. I offered filtering surgeries to improve their intraocular pressure control while minimizing the need for eye drops.

Second, I embarked on the MIGS path, starting with the smallest interventions in moderate glaucoma cases, such as excisional goniotomy, trabecular microbypass shunts, and hydrus microstents for eligible patients.

Releasing yourself

The second pillar of ikigai centers on self-acceptance – a profound yet challenging task in life. To me, this principle signifies letting go of one's ego, pride, insecurities, fears, and sense of injustice. Instead, it involves focusing on others, listening, understanding, and empathizing. Each patient has a unique story to tell, and our fixation on intraocular pressure (IOP) might not always align with their concerns. One particular patient – with a high IOP despite being on maximum medication and lasers – comes to mind. He lost an eye from postoperative endophthalmitis several years ago. Surgery seemed like a viable option to me – I wanted to say, "We will do all we can do to avoid infection and make this surgery work for you." But it would be very arrogant of me not to respect his fear of losing his precious remaining eye from another unfortunate event. He told me, "I'm just hoping to retain my vision until my daughter's wedding." I listened to him; I decided to optimize his eye drops and monitor his progress closely.

"The principle of ikigai is very simple: do what makes you happy. I delved into the principle and pondered how best to shape my practice for the benefit of both my patients and me."

Harmony and sustainability

Amid the distractions of a competitive world, we sometimes lose sight of pillar three – the importance of collaboration

and harmony. Initially, as I started my public practice, I felt overwhelmed, thinking I had to handle everything myself. However, I gradually recognized the benefits of working together with other subspecialty consultants, fostering collaborations by joining national and international organizations, and building communities. The Malaysian Glaucoma Society provided a supportive glaucoma community where collaboration triumphed over competition.

The joy of the little things

The fourth pillar is my favorite. Glaucoma patients suffer from chronicity of the disease. They're often told they might lose their vision in later life if their condition is not properly managed. But at this point, their central vision may be good, they may be functioning well, and the only problem they really have is redness of the eyes from their prescribed anti-glaucoma drops. Sometimes they must have incisional surgery to prevent vision loss in the future. But they might feel worse after the surgery, and possibly have worse vision.

As a surgeon, it is quite demotivating when a patient cannot immediately feel the benefit of your work, even though we know that surgery was the right decision. The only way I could motivate myself was to find joy in the little things. For example, to see the white of an eye without the congestion from brimonidine. To see a well-functioning bleb. To see a patient smile when I say their IOP is within target range. Like the song from The Sound of Music, when something does not turn out the way I want, "I simply remember my favorite things and then I don't feel so bad."

Living in the here and now

The fifth pillar emphasizes immersing oneself in the present moment. It underscores the importance of calming one's thoughts, directing complete attention to the immediate circumstances. Dealing with chronic glaucoma patients can be emotionally taxing, as we tend to shoulder their burdens and share their fears. Our hearts sink a little every time when we face a failing bleb, worsening visual field, or persistent hypotony. The key is to exert control over our thoughts and emotions, conserving energy by not needlessly holding onto past grievances or worrying excessively about an uncertain future. We all have a "mental graveyard" that we occasionally visit to reflect on our mistakes, but it is vital to understand and accept that we cannot control the past; we can only govern our thoughts and our capacity for self-reflection. According to Ken Mogi – a neuroscientist and author of The Little Book of Iigai – children value the present because they lack a concrete concept of the past or future (2). Tapping into our inner child can help us appreciate the present moment and celebrate small achievements during follow-up visits, such as reaching the target IOP at the three-month or six-month mark or patients experiencing a slight increase in quality-of-life scores and getting recognized for our effort.

"The principles of ikigai have not only refined my approach to glaucoma practice, but have also enriched my understanding of patient care, self-acceptance, collaboration, and the joy of the present moment. These principles serve as a guiding light in my journey as a glaucoma specialist."

A guiding light

The principles of ikigai have not only refined my approach to glaucoma practice, but have also enriched my understanding of patient care, self-acceptance, collaboration, and the joy of the present moment. These principles serve as a guiding light in my journey as a glaucoma specialist, reminding me to start small, release myself, seek harmony, find joy in the little things, and live in the here and now.

Puspha Raman, MB Bch BAO, MS Ophthal, Consultant Ophthalmologist and Glaucoma Specialist, Hospital Tuanku Jaafar Seremban, Malaysia.

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A SHARED VISION

Five eye care experts present their views on the growing need for effective collaboration between ophthalmologists and optometrists – and practitioners from other disciplines

The relationship between optometrists and ophthalmologists – and the line separating the two – has often been fuzzy or even contentious. Back in the 1940s, for example, it was illegal for optometrists to use both diagnostic and therapeutic drugs in the US. It wasn't until 1971 – when Rhode Island passed the bill H 1517A, making it the first state to allow optometrists to use drugs for diagnostic purposes – that this attitude gradually began to change and the line between optometry and ophthalmology began to blur.

Since then, there has been plenty of well-publicized opposition to expanding the scope of optometric privilege – and collaborative care between the two professions appears to be in a state of flux. This is especially true in the US, where the situation is complicated further by varying state legislature.

To explore the latest thinking in this space and to learn how "shared care" models benefit optometrists, ophthalmologists, and their patients, The Ophthalmologist reached out to five advocates of effective collaboration.

ABOUT THE INTERVIEWEES:

Mariya Moosajee (left) – is Professor of Molecular Ophthalmology at UCL Institute of Ophthalmology, Group Leader of Ocular Genomics and Therapeutics at the Francis Crick Institute, and Consultant Ophthalmologist specializing in Genetic Eye Disease and Head of the Genetics Service at Moorfields Eye Hospital NHS Foundation Trust, London, UK.

Jasleen Jolly (top) – is Associate Professor at The Vision and Eye Research Institute, Anglia Ruskin University, and Honorary Research Fellow at Wellcome Centre for Integrative Neuroimaging, University of Oxford, Oxford, UK. She is also Director of Jolly Vision Science, *www.jollyvisionscience.com*. She has spent the last 10 years as a clinical academic in Oxford, working between the University, NHS, and BRC in the field of retinal genetics and gene therapy, working on first-in-man trials of novel therapies for inherited retinal degenerations. She is passionate about promoting clinical academia, including through the use of supervising student projects in medicine and optometry, stressing the importance of multidisciplinary research, as well as raising awareness about equality, diversity, and inclusion.

Glenda Aleman-Moheeputh (top center) – is President and CEO of OK Love Myopia Control Experts, Florida, US. She is an acting optometrist and business owner, managing her own private practice, iSmart Vision Care. She performs comprehensive eye exams, specializes in treating corneal disease and myopia control, and has a specialty contact lens clinic. In her mission to stop the myopia epidemic, Dr. Aleman-Moheeputh has recently launched her new venture, OK Love, designed to educate and consult fellow optometrist colleagues about myopia control treatments.

Kevin Waltz (bottom ceter) – is President of Ophthalmic Research Consultants, and Chair at the Board of Directors for Central American Eye Clinics. He has a long-standing interest in international charity care in the developing world, especially in Central America. He has recently become the Chair, Board of Directors for Central American Eye Cliníca.

Himal Kandel (right)– is Kornhauser Research Fellow (Postdoctoral Research Fellow) at the Save Sight Institute, Sydney Medical School, Faculty of Medicine and Health, the University of Sydney, Sydney, Australia. His research has focused on measuring and improving clinical and patient-reported outcomes in refractive error, keratoconus, and other eye conditions. His interests include epidemiological and interdisciplinary research.

WHAT DOES MULTIDISCIPLINARY TEAM WORKING LOOK LIKE IN YOUR COUNTRY?

Mariya Moosajee (UK): Ever since I entered medicine, the UK has always been incredibly strong in terms of multidisciplinary team (MDT) working – both in the clinical and research setting. At my own pediatric genetic eye disease clinic at Moorfields Eye Hospital, we begin each clinic with a MDT meeting where we discuss all patients attending and plan their management through our clinic and beyond. The core team consists of a consultant pediatrician specializing in neurodisability, a genetic counselor, an extended role orthoptist, a low vision optometrist, a family support officer, an imaging technician, a nurse, and myself. Together we can facilitate an excellent care pathway that covers most – if not all – of their needs in one visit, removing the need for several appointments. '

Similarly, if I look at the research team I have built at UCL Institute of Ophthalmology and The Francis Crick Institute, it is composed of scientists (some specializing in stem cell biology, genetics, biostatistics, or animal models), ophthalmologists, psychologists, optometrists, and orthoptists. Each specialist brings their own skills and expertise, but we work as a team, drawing on each other's strengths but also ensuring joint working so that new transferrable skills are learnt and a common "lab" language is spoken. This approach allows the whole team to contribute to discussions and provide different perspectives that push our research forwards in a diverse and open forum.

Kevin Waltz (US/Central America): In the US, optometry is typically a key part of ophthalmic research because there are many different layers to responsibilities and duties, and so optometric education fits very well with that. However, in the Spanish-speaking world, optometry is more what we would think of as a high-level technician in the English-speaking world. For instance, in Guatemala getting a degree in optometry takes six years. So it's quite an extensive degree in some parts of the world, but, nevertheless, although they practice independently they're not expected to have the same level of knowledge and responsibility as in the English-speaking world.

Glenda Aleman-Moheeputh (US): I think it is better now than it was years ago. We're definitely moving in the direction of elevating or encouraging more collaborative care for patients, but I still think there's a significant gap.

"THE CHALLENGE IS THAT OPTOMETRY HAS GROWN AND EVOLVED INTO MORE COMPETITION WITH OPHTHALMOLOGY." - KEVIN WALTZ

Jasleen Jolly (UK): I've moved in several workspaces, both research and clinical, and I've noticed quite a lot of variability. In some places, it's very integrated and it works like a dream; in others, there seems to be a lot of resistance to that integration. And it's not just from the older generation; that resistance can be propagated through the training that's needed to allow multidisciplinary clinics and services to happen. But we need it to happen. There's so much demand for these clinical services that, if we don't have the multidisciplinary way of working, the NHS is basically going to collapse.

Himal Kandel (Australia): Most Australian ophthalmologists have good working relationships with optometrists in their local area. They work together toward a common goal of improving patient outcomes. With the growing burden of vision and eye disease, ophthalmologists and optometrists are finding new ways of working together. For example, the integration of telemedicine technologies presents a promising avenue for expanding access to eye care in remote areas via collaboration between ophthalmologists and optometrists.

HOW HAS THE CLIMATE FOR OPTOMETRY–OPHTHALMOLOGY COLLABORATION CHANGED OVER THE COURSE OF YOUR CAREER?

Moosajee: I have always had the pleasure of working alongside optometrists in the hospital setting. I have seen them take more of an extended role consulting patients and providing care under the supervision of a consultant. I personally like to empower all of our allied healthcare professionals to gain more skills and confidence through training to expand their remit. This provides variation and allows them to remain stimulated. I work closely with optometrists who are active both clinically and in the research environment, and they strike a good balance. Our collaborations compliment my approach, which can be very focused on the disease, reminding me to consider how we can better support patients in their daily lives, for example through digital assistive technology and low vision aids.

Kandel: Throughout my career, I have worked in several optometry and ophthalmology settings and observed various levels of collaboration. Ophthalmologists and optometrists are both driven by the shared goal of ensuring every patient has access to the highest quality eye care.

The nature of this collaboration varies across settings, reflecting unique challenges and solutions. In places like Nepal and Kenya, for instance, where ophthalmology programs predated optometry programs, the latter became crucial in meeting the demand for eye care, especially given the low number of ophthalmologists. In Eritrea, where there was an acute shortage of ophthalmologists and a high burden of cataracts, the prolonged time required to train ophthalmologists prompted the training of ophthalmic nurses in cataract surgery, showcasing an innovative approach to address the pressing need for eye care.

In developed countries, such as the UK and Australia, new models of care are being considered for ophthalmologists and optometrists to work together to meet the growing demand for eye care. Globally, with the aging population, the need for eye care services is increasing and collaboration between ophthalmologists and optometrists is more crucial than ever before.

Jolly: Optometrists have access to extra qualifications now, which allow their advanced skills to be formally recognized. There is also funding for emergency eye care in the community, which has reduced the number of referrals into casualty departments in hospitals. So GPs now refer to these qualified optometrists in the community rather than going straight to the hospital. There's a lot of formal shared care schemes. There are also optometrists working in advanced roles within hospital clinics alongside the ophthalmologists.

I think where the ties could be stronger are in the clinical trials arena. And not just with ophthalmologists, but with any specialty where they're using vision outcomes (for example, psychiatry or neurology). In clinical trials, the only people who make the decisions are the ophthalmologists, but they may not have as deep an understanding of visual function measurement as optometrists. And that's a problem

because inappropriate outcome measures can lead to clinical trials failing to reach their pre-specified outcome measure.

Waltz: There has been a huge change. I graduated from optometry school in the US in 1981, and I graduated from my ophthalmology residency in 1991. In 1981, not all states allowed the use of medication for eye exams – so dilating drops and things like that were not legal for optometrists to use in some states. Nowadays, all states will allow drops for diagnostic purposes, and most states allow drops for therapeutic purposes – glaucoma, antibiotics, and so on.

A decade or so ago, a few states started allowing some surgical privileges. Now, there's a big difference between administering drops and surgery, and so there has been a much slower evolution; nevertheless, it is now there in the landscape.

So I'd say there's been a profound difference over the last 40 years.

The challenge is that optometry has grown and evolved into more competition with ophthalmology. And that's problematic. Optometry grows and competes against itself, but it also grows and competes against ophthalmology; ophthalmologists grow and compete against each other, but also against optometry…

Aleman-Moheeputh: It has changed significantly. I think at this point we are seeing more collaborative care between optometrists and ophthalmologists. One of the reasons for that higher collaborative care is, if we look at it from the optometrist's point of view, we have applied and extended the scope of practice, so that has allowed us to do a little bit more medical optometry, which gives a perfect environment to allow for more collaborative care. Optometrists have an expanded scope of practice in some states where they can do more medical procedures because the laws allow for it. There is definitely less collaborative care in states where the scope of practice for optometry is not as high or as wide as those other states. So it varies from state to state, but I would say that overall, nationally, it is moving more in the direction of collaborative care.

WHAT ARE THE MAIN ADVANTAGES OF CLOSER COLLABORATION?

Kandel: Collaboration between ophthalmologists and optometrists offers several significant advantages across clinical care and research domains. In terms of clinical care, the combined expertise and resources of these two groups – with appropriate task shifting and task sharing – result in increased outpatient capacity and improved timeliness of follow-up, leading to reduced waiting times for patients seeking eye care services. This collaborative approach enhances the overall efficiency of the healthcare system, ensuring that individuals receive timely and comprehensive treatment.

In the realm of research, mutual support from both professions is crucial. By capitalizing on the capacity of both ophthalmologists and optometrists, collaborative efforts can drive innovation, advance medical knowledge, and contribute to the development of more effective and tailored approaches to eye care. The synergy between these two professions not only benefits individual patients, but also strengthens the broader healthcare community by fostering a more integrated and interdisciplinary approach to addressing the complexities of eye health.

"THIS COLLABORATIVE APPROACH ENHANCES THE OVERALL EFFICIENCY OF THE HEALTHCARE SYSTEM, ENSURING THAT INDIVIDUALS RECEIVE TIMELY AND COMPREHENSIVE TREATMENT."
- HIMAL KANDEL

Jolly: Our skills are very complementary – we're not doing the same thing so there's no threat. We need each other to work effectively, and that will ultimately support the NHS in reducing waiting lists, enhancing patient care, training junior doctors and other health care workers so then we can have a bigger role in actually designing future treatments.

In the clinical trials space, if optometrists were more involved in the decision making process, if we were treated as equal partners, if we were employed as equal experts to the ophthalmologists by pharmaceutical companies, more trials would use better outcome measures. And if outcome measures were better funded as a proper research area, which is largely run by optometry and vision scientists, then we'd have greater success of translation from lab to bedside. Literally millions of dollars are currently going to waste because drugs – even gene therapies – are being deemed as not working when they do; they're just not being measured properly to prove that they work.

Waltz: My experience has been that each profession is best when they are practicing close to the edge of the margin of their privileges. If you have an ophthalmologist who's prescribing reading glasses, they're probably not paying much attention for the most part, because it's not going to hurt anybody and they don't consider that a challenge in their world. However, if you're talking about cataract surgery, their anxiety is up, their caution is up, and they're really towing the line and doing the best job they know how.

What's nice is to have as many team members as possible practicing close to the edge of their authority and their license, because then everybody's optimally practicing. It's kind of like on a speedboat – when you are moving along on a speedboat and you get going fast enough, it gets up on a plane above the water and it becomes much smoother and more efficient. I believe that professionals are very much the same – when they're practicing at the edge of their privileges, they go faster, they're smoother, they're better, and they're more responsible.

Aleman-Moheeputh: I think by far the biggest advantage is to the patient. Collaborative care can lead to significant improvements in the treatment of the patient. It also translates to a better life for that patient because it results in fewer visits between different offices and the number of doctors they need to see for their eye care needs.

COULD YOU PROVIDE AN EXAMPLE OF HOW CLOSER COLLABORATION BETWEEN OPHTHALMOLOGISTS AND OPTOMETRISTS HAS BENEFITED PATIENTS?

Moosajee: A great example is Gene Vision (www.gene.vision) – a fully accessible web resource focused on genetic eye conditions. It exists not only for healthcare professionals but also for all patients and public users. It was created as an educational tool for healthcare professionals as we entered into the era of genomic medicine, so that they could gain knowledge of rare inherited eye diseases and understand how to manage patients, including genetic testing with whole genome sequencing and access the latest information on clinical trials and related research. Gene Vision underwent usability testing with real-world end-users and professional digital accessibility consultants to ensure both deaf and visually impaired users could access the site fully.

A brilliant optometrist named Kishan Devraj approached me and suggested I could make Gene Vision even more accessible if we created a "chatbot" in conjunction with Amazon's Alexa. The chatbot is now linked to the website. Kishan is so passionate about digital health, he has now started a PhD in my research

group, building an app that can monitor patient's real-time behavior. He is using this passive data to correlate the digital signals with the patient's clinical phenotype. Ultimately, this will allow us to monitor disease progression, changes in vision, and associated parameters – like mental health – so that we can see patients in a timely manner, provide intervention, and apply a more holistic approach to care.

Kandel: The Save Sight Registries, such as the Save Sight Keratoconus Registry and Save Sight Dry Eye Registry, showcase the collaborative efforts by ophthalmologists and optometrists to improve outcomes in patients with eye diseases. These registries are international, web-based patient databases for tracking and improving the natural history of eye diseases and treatment outcomes. The keratoconus registry has two modules – one each for ophthalmologists and optometrists – and a linked referral web-based system allowing optometrists to share patient outcomes with ophthalmologists, and vice versa. All practitioners can track their patients with enhanced graphical displays of the patient's disease journey and benchmark outcomes with other practitioners in the system. The registry system has promoted seamless patient care for ophthalmological and optometric management of keratoconus. In Australia, ophthalmologists get CPD points from the Royal Australian and New Zealand College of Ophthalmologists (RANZCO) and optometrists from Optometry Australia (OA) for using the registry in their clinical practice.

In Nepal, during my undergraduate studies at B.P. Koirala Lions Centre for Ophthalmic Studies (BPKLCOS), Institute of Medicine, I experienced first-hand the advantages of a collaborative environment. In outpatient departments, optometry students, optometrists, ophthalmology resident doctors, and ophthalmologists worked together. The BPKLCOS is one of the most reputed ophthalmic training centers in Nepal. The collaborative setting provided an excellent teaching/learning environment. I am sure every ophthalmologist and optometrist trained at BPKLCOS appreciates the benefits of this collaborative model for learning and delivering quality eye care services.

Jolly: When I was working in Oxford at the diabetic eye service, optometrists were involved at every level. They were involved as graders for when the images came in; then I set up the clinic for the people whose images weren't readable. We also had ophthalmologists and optometrists working together in the diabetic clinic for patients who failed the grading and had to be seen in the ophthalmology clinics.

Waltz: I'll tell you my favorite co-management story with an optometrist from outside of my practice. I took care of a patient who wanted to have presbyopia correcting lenses. He was referred to me, and so I did his surgery, the surgery went great, but the patient was not happy. His job requires good vision, and although our measurements said that he had good vision, he said he didn't so was unhappy. Eventually he called me up on the phone and threatened bodily harm. I called up his co-managing optometrist and explained to him what happened, and he said, "Oh no, he's doing drugs again." The optometrist was friends with the sheriff in town, so he called him to say that the patient was threatening an ophthalmologist. The patient wasn't taken to jail, he just had an adult conversation with law enforcement telling him what he couldn't do. I got on famously with that optometrist for the rest of my career. That's a level of co-management that you rarely get to, but it shows what happens when you have different levels of involvement in the process!

"WHEN I WAS WORKING IN OXFORD AT THE DIABETIC EYE SERVICE, OPTOMETRISTS WERE INVOLVED AT EVERY LEVEL." - JASLEEN JOLLY

Aleman-Moheeputh: We are very lucky in my community because we have developed a very strong network of ophthalmologists and optometrists. To help to bridge that gap between them, and to encourage more collaborative care, we have founded a local group – which we hope to go national, and then international – called Women in Eye Care (WE). The whole purpose of WE is to encourage and facilitate more collaborative care among optometrists and ophthalmologists, and women in the industry as well.

We had an event recently for ophthalmologists and optometrists to socialize and get to know each other, so that if a patient requires, say, a retinal surgeon, we can recommend a retinal surgeon that we know. Personally, I feel more comfortable referring my patients to a specialist once I get to know them; if they seem like a good person, I'm going to be more likely to refer patients to them than somebody just off the directory.

IS THERE STILL A RIFT BETWEEN THE TWO PROFESSIONS?

Moosajee: In my particular field of genetic eye disease, there are no rifts that I am aware of. As with most healthcare professionals – including general ophthalmologists, GPs, and other allied groups – a lot more education is required in terms of genomics and how to manage patients with rare genetic eye diseases. I think we need to reach out and provide more teaching to optometrists on how to manage these patients who present to their practices, so they know how and when to refer them to specialist centers. In the future, there is scope for shared care with patients in the community and this will certainly bring the two professions closer together.

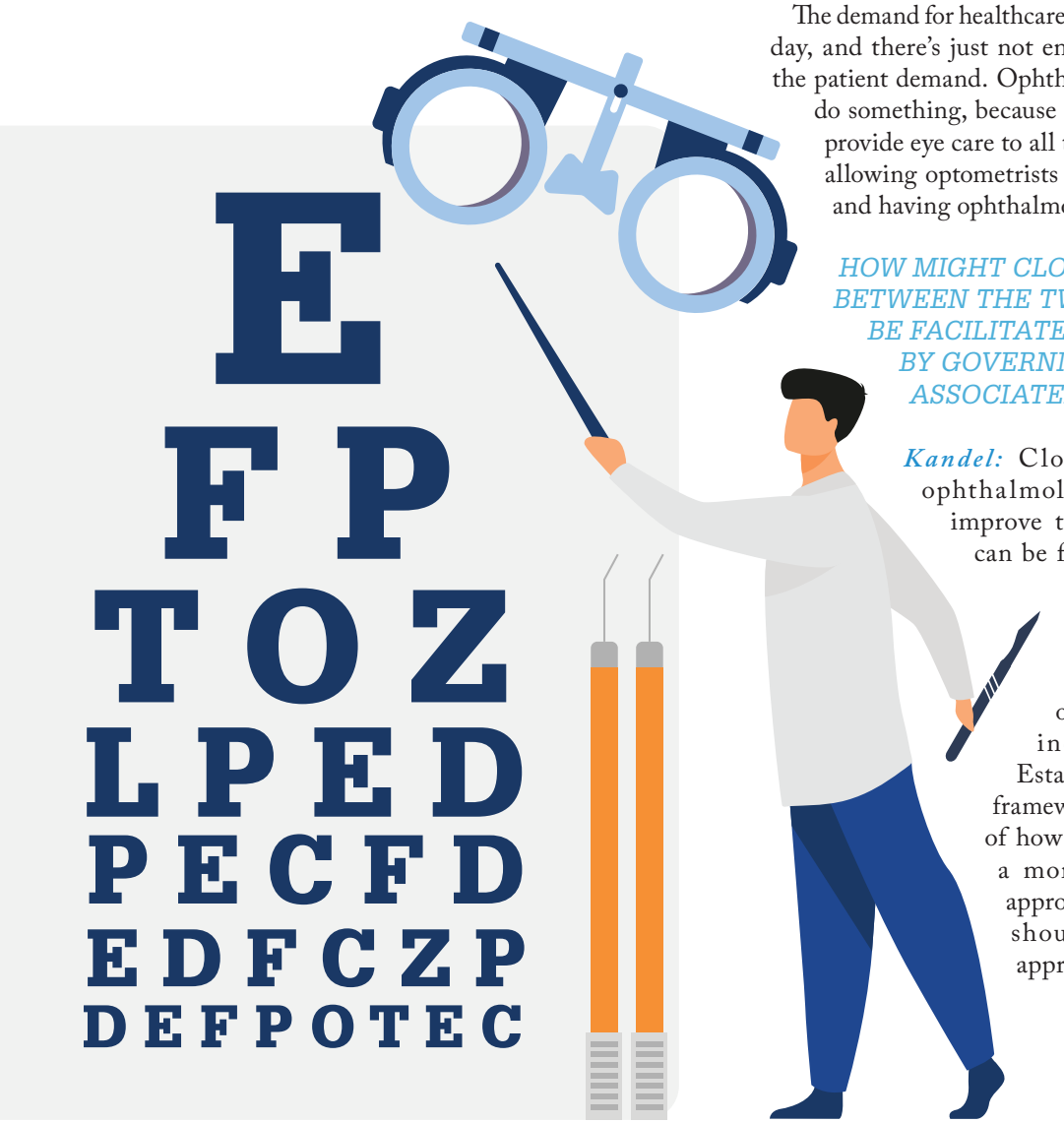
Jolly: In some spheres, yes. In some areas, there is still resistance to letting optometrists in – especially in the clinical trials space, as I mentioned earlier. Allowing medics to make all the decisions here can lead to unnecessary failure.

Waltz: Both professions raise money to be spent in the political arena to attack each other, so officially there's a rift! But on a day-to-day basis with the people you work with? There's not much of a rift. We are all trying to do our best to take care of patients and get along very well together.

Aleman-Moheeputh: There's still a significant gap. We are making progress, but our progress is not nearly as fast as it needs to be. Just last year, we fought a battle here in Florida, where there was resistance to calling optometrists "physicians." That was a rule promoted or sponsored by ophthalmology to try to keep optometrists from expanding our scope of practice.

Unfortunately, there is still this significant gap and initiatives like Women in Eyecare are necessary to bring awareness to this issue, because the only person that is suffering is the patient. At the end of the day, the patient is the one that suffers the consequences because they're the ones that are not getting proper care due to this lack of collaboration.

The demand for healthcare is getting higher and higher every day, and there's just not enough ophthalmologists to meet the patient demand. Ophthalmologists are going to have to do something, because the only way they will be able to provide eye care to all the patients that are in need is by allowing optometrists to deal more with primary care, and having ophthalmologists deal with the specialties.



HOW MIGHT CLOSER COLLABORATION BETWEEN THE TWO PROFESSIONS BE FACILITATED; FOR EXAMPLE, BY GOVERNMENT OR OTHER ASSOCIATED BODIES?

Kandel: Closer collaboration between ophthalmologists and optometrists to improve the outcomes of their patients can be facilitated through a structured framework with shared care arrangements. The frameworks should clearly distinguish between ophthalmology-led and optometry-led care and services, including referral protocols. Establishing structured collaborative frameworks helps streamline the process of how patients receive care, ensuring a more coordinated and efficient approach. Shared care arrangements should foster a patient-centric approach, allowing for a smoother

and more effective distribution of responsibilities based on the availability of resources.

Task shifting and task sharing, adaptable to different settings, can optimize the use of available skills and expertise. Recognizing the role of optometrists as the primary eye care service providers in most places allows ophthalmologists to concentrate on patients with serious eye conditions or else those in need of surgical interventions, promoting a more strategic and collaborative approach to eye care delivery.

Cultivating better professional relationships is key, and local meetings provide valuable platforms for optometrists and ophthalmologists to share experiences and expertise. Government and associated bodies can play a pivotal role in endorsing and implementing these collaborative strategies to enhance patient outcomes and optimize the use of available resources.

Jolly: I think regulators need to recognize that if vision function is being used then you need to have vision function experts – which means optometrists and/or vision scientists – on the team. Pharma and clinical trials teams that are led by medics also need to recognize that and bring those people on, not just as team members, but as decision-makers and experts.

A multifactorial change needs to happen, and I think maybe our professional bodies could do more to recognize this, but the regulators definitely need to do more to recognize this.

We need a mindshift across the board, because recently there have been a spate of high-impact clinical trials failures – particularly in the gene therapy and rare disease space. Because of these failures many companies seem to be pulling out of ophthalmology. So if we don't get this in order, a lot of patients are going to lose access to potential therapies and I think that's a massive shame.

I think this is really a crunch point for ophthalmology, and I think that's where we can make the biggest impact change right now.

Waltz: It's very likely – based on my 40 years' experience in the profession – that we're going to evolve to a place that's better than where we're at today. I believe we're going to develop a system that's going to make more sense than it does today. There's going to be some give and take along the way, and there'll be some winners and losers, but we will have a system that works for the optometrist and for the ophthalmologist, and for the patients.

Ophthalmologists, generally speaking, like to operate, and it's been shown that the more an ophthalmologist operates, the fewer complications they have. An ideal system would see relatively few people doing a lot of surgeries and a sophisticated support system around that. So, an optometrist doing a low number of surgeries is not beneficial for anybody.

> "IN MY PARTICULAR FIELD, A LOT MORE EDUCATION IS REQUIRED IN TERMS OF GENOMICS AND HOW TO MANAGE PATIENTS WITH RARE GENETIC EYE DISEASES."
> - MARIYA MOOSAJEE

What you want is an ophthalmologist working their butt off in surgery doing a great job. And then an optometrist who can support that, doing medical ophthalmology to help the ophthalmologists so they have more time to concentrate on surgery so that there's a better outcome for the patients, and there's better economics for the whole system.

IS THERE ANYTHING YOU WOULD LIKE TO ADD?

Kandel: By working together, optometrists and ophthalmologists can effectively address the diverse needs and wide spectrum of eye-related conditions, ultimately leading to improved patient care. These collaborative efforts contribute to enhanced quality, coordination, and efficiency in the delivery of eye care services. Embracing an integrated model, where both optometrists and ophthalmologists play complementary roles, emerges as the optimal approach.

Aleman-Moheeputh: It's really important that we leave our differences aside and work towards encouraging collaborative care. If we depend on the government or a third party to come in and fix it, it is going to take longer. I think if each of us does our part, and puts more effort into referring our patients, into managing our patients, providing the best care, and collaborating with our colleagues, we can make a huge change and have a significant impact in the field.

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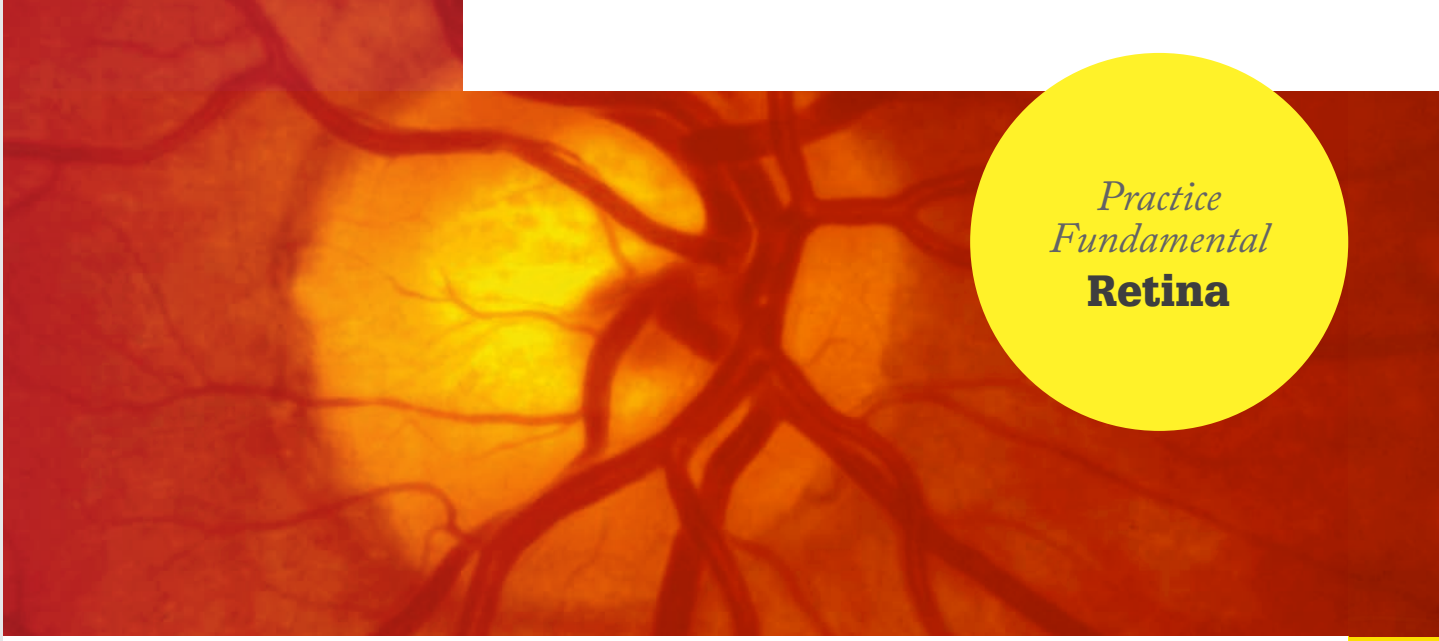

What are the odds? To assess the association between metformin use and the development of AMD in patients without diabetes, researchers conducted a case-control study using data from 2006 to 2017 in the Merative MarketScan Research Database. The results found that metformin use was associated with reduced odds of developing AMD, though the association does not appear to be dose dependent. PMID: 38019527.

Assessing atropine. To assess the long-term outcomes of atropine, researchers conducted a prospective, double-masked observational study – Atropine for the Treatment of Myopia (ATOM) 1 and ATOM2 randomized clinical trials. The researchers found that, in approximately one-quarter of the original participants, the use of short-term topical atropine eye drops was not associated with differences in final refractive errors 10 to 20 years after treatment. PMID: 38019503.

Eye engineering. A multidisciplinary team of researchers has changed the microenvironment in adult mouse retinas, allowing them to take stem cells from blood and transform them into retinal ganglion cells, which can then be migrated into the retina using chemokines – signaling molecules that stimulate cell migration. The researchers hope that the technique might one day be used to restore sight in glaucoma patients. PMID: 37931105.

Flow down. A recently published study in The Journal of Head and Face Pain has revealed that changes to retinal blood flow caused by migraines might explain why visual symptoms may be experienced during an episode. Using optical coherence tomography angiography (OCT-A), the UCLA team found that retinal blood flow decreases during a migraine attack, indicating that these retinal vascular signatures could be used as migraine biomarkers. PMID: 38031892.

Alzheimer's and AMD. A new observational study from JAMA indicates that acetylcholinesterase inhibitors (AChEIs), commonly used to treat Alzheimer's disease, appear to reduce the incidence of AMD in Alzheimer's patients, adding to previous evidence highlighting the correlation. The study authors note that randomized clinical trials are now required to accurately establish the cause-and-effect relationship of AChEIs and AMD. PMID: 38175625.

Type I monitoring. Study suggests that optical coherence tomography angiography (OCT-A) can be used to detect retinal abnormalities in early type 1 diabetes mellitus children, and notes that continuous subcutaneous insulin infusion (CSII) may offer therapeutic benefit over multiple daily insulin injections. PMID: 38127867.

IN OTHER NEWS

Artificial eye. *With diabetes incidence rising, diabetic retinopathy screening is increasingly under strain. To search for alternatives, a study has explored the use of artificial intelligence (AI) for evaluating mydriatic handheld retinal images, to decrease the burden placed on human graders. DOI: 10.1016/j.xops.2023.100457*

More than a headache? *Can aspirin be used to prevent diabetic retinopathy (DR)? A new Ophthalmology study, conducting a randomized and placebo-controlled trial on 15,480 with diabetes, found that aspirin had no clinically meaningful benefits for DR. PMID: 38237868.*

POAG driving DR risk. *A new large-scale retrospective study has found that primary open-angle glaucoma (POAG) can increase the risk of both Type I and Type II diabetes mellitus patients developing diabetic retinopathy (DR). The researchers suggest that clinicians need to rethink their approaches towards glaucoma patients with diabetes. PMID: 38215989.*

PRIMA Facie?

Lloyd Diamond, CEO of Pixium Vision, discusses his company's mission to bring its retinal implant, the PRIMA Bionic Vision System, to market

Bionics is developing at an astonishing rate – and it seems almost inevitable that the technology will be increasingly commercialized. One company attempting to bring bionics – in this case, retinal implants – into the ophthalmic sphere is the Parisian-based "bioelectronics and brain machine interface technology company," Pixium Vision. Leveraging its PRIMA Bionic Vision System, Pixium wants to partially restore central vision loss in patients affected by retinal diseases. The Ophthalmologist spoke with CEO Lloyd Diamond to learn more about the PRIMA System, clinical trial progress, and Pixium's plans for the future.

Please introduce us to the PRIMA Bionic Vision System – and explain what it could mean for patients…

The PRIMA system aims to restore central vision by replacing the photoreceptor cells that no longer function due to age-related macular degeneration (AMD) and other retinal diseases. It does so by preserving the residual peripheral vision that advanced dry AMD or geographic atrophy (GA) patients have, while restoring the central vision that they've lost, allowing them to combine both.

The neural implant itself is quite a marvel of modern technology. It was developed at Stanford University by Daniel Palanker, a well-known researcher in the area of tissue energy interaction. It's a small microchip, thinner than a human hair, with 378 independent electrodes. These electrodes, along with the photovoltaic (converting light into electricity) properties of the implant, take on the role of a photoreceptor cell – they convert incoming light into an electrical signal. The device is implanted by a retinal surgeon in the subretinal space in a minimally invasive procedure that takes one-and-a-half to two hours.

The aim of this system is to give patients back quality of life and increase the level of independence. Since these patients have no central vision, they cannot do tasks that require the use of detailed vision. For geographic atrophy patients, for example, reading and facial recognition are two big concerns. If they like reading novels, with PRIMA they can do that again. If they take medication, they don't need to have someone read them the prescription information. If they like to travel, PRIMA allows them to use public transportation again, without having to ask people for directions.

We are also developing improvements to our smart glasses, as well as co-development work with Stanford University on the next-generation implant. This next generation implant is up to 10,000 pixels – so an order of magnitude greater than what we currently offer. The goal with this technology is to give patients the ability to recognize faces at a distance and restore vision up to 20/20.

How does it differ from other retinal implant technology?

Pixium has demonstrated restoration of form vision, namely the ability to see objects based on light patterns projected onto the retina. This is very important because other technologies – including previous generations of retinal implants, be they cortical or epiretinal implants – only created phosphenes (the patient can see flashes of light). In fact, we are "restoring" some of the vision that patients have lost. We're talking about a new generation of technology and the restoration of form vision – patients actually being able to see shapes and read. We have the first technology to facilitate that ability – and we're very excited about that!

How far along are clinical trials with this technology?

We have three ongoing trials, and we're in our final pivotal study – the PRIMAvera trial – in Europe. PRIMAvera will create the data that we'll use for the CE mark. We also have a French feasibility study that is now more than four years post-implantation. And we have several publications in peer-reviewed journals on the safety and efficacy outcomes of that study, and we've shown at 48 months that patients had an average increase of 32 letters (1) – more than three lines on an ETDRS chart.

In the US, we also have an ongoing feasibility study where we've implanted patients; the 12-month data readout will be presented sometime early next year. In addition, the FDA granted us Breakthrough Device designation in March 2023, so we are currently negotiating our final investigational device exemption (IDE) study in the US with the FDA.

What are the challenges of developing this next-generation technology?

The challenge will lie in the ability to efficiently manufacture the implant. The current implant has 378 electrodes, and these electrodes are virtually flat on the implant. The next-generation implant will have up to 10,000 electrodes and the electrodes are three-dimensional. So, a challenge we face is working with our foundry partners to get our technology through the industrialization process, so that it can be reliably manufactured. We are reassured that we will be successful, as we have already demonstrated the ability to manufacture the current Prima neural implant at volume.

Lloyd Diamond

How do you see this technology developing in the future?

We understand what we need to do to maximize the effectiveness of the implant, so many of the future improvements will focus on wearables, namely the camera equipped glasses and the programmer that patients use to fine-tune their central vision, software which will likely one day make it to a smartphone. That means making the wearables more intuitive, incorporating the camera projection module into the glasses themselves, making them a lot easier for patients to use, and maybe more attractive to the outside world, more sleek. There's also the potential to improve the utility of the device via software improvements and different modules, such as beaming Google Maps directly onto the implant or incorporating a gaming module that optimizes the types of games this patient population likes to play. Because diseases like GA, dry AMD, Stargardt's, or retinitis pigmentosa can be isolating, creating a virtual community around these patients could be interesting.

Reference

1. *M Muqit et al., "Prosthetic Visual Acuity with the PRIMA System in Patients with Atrophic Age-related Macular Degeneration at 4 years follow-up," medRxiv [Online ahead of print] (2023). PMID: 38014146.*

Practice Fundamental
Anterior Segment

Deeper than surface level. Researchers set out to determine the functional role and mechanism of IL-11 – an immunomodulatory cytokine – in regulating inflammatory response at the ocular surface. The findings showed that corneal injury resulted in increased levels of IL-11 in the cornea, particularly the stroma, indicating IL-11 as a potential therapeutic to control inflammatory damage and accelerate wound repair. PMID: 37910094.

Dyslipidemia/DED Links. A systematic review and meta-analysis conducted in China has investigated the possible link between dyslipidemia – a common metabolic disorder characterized by an imbalance of lipids – and dry eye disease (DED). Results of the study suggested that both dyslipidemia, as well as use of lipid-lowering drugs, could be linked to an increased risk of DED. PMID: 37989379.

Low-level light therapy study. Randomized controlled trial shows that two sessions of low-level light therapy performed one week before and after cataract surgery were effective in ameliorating tear film stability and ocular discomfort symptoms. "Low-level light therapy is a groundbreaking technology able to cure different eye diseases by acting at the root of the cellular dysregulation," noted lead investigator Giuseppe Giannaccare of the University of Cagliari, Italy. PMID: 37890879.

Chronic VKC. Looking at ocular surface pseudoepitheliomatous hyperplasia (PEH) and its links to chronic vernal keratoconjunctivitis (VKC), a new retrospective study of 32 patients has revealed that ocular surface PEH can be a sign of chronic VKC. The India-based team proposes anterior segment optical coherence tomography (AS-OCT) be used to distinguish chronic VKC from ocular surface squamous neoplasia (OSSN), a disease which is closely mimicked by VKC. PMID: 38155329.

Simplifying diagnoses. A diagnostic study of 198 participants from South India attempted to answer whether microbial keratitis caused by Aspergillus species can be diagnosed using a rapid lateral-flow device (LFD) from corneal scrape samples. The study found that a commercially available LFD, along with a bespoke ratiometric analysis, resulted in high diagnostic accuracy, suggesting its potential use for patients with microbial keratitis. PMID: 37768674.

Modeling models. A Researchers have developed a Formalin-Quadrant-Model that closely replicates the clinical situation of phacoemulsification. The model can test the efficiency of various instruments on different cataract densities ahead of elaborate and costly clinical trials. PMID: 37816247.

IN OTHER NEWS

Tuft enough? *An organoid model of human conjunctiva has been developed by scientists at the Hubrecht Institute, allowing the team to discover a new cell type in the tissue, known as tuft cells, which increase under allergy-like conditions. PMID: 38215738.*

A world first. *A team of researchers at Moorfields Eye Hospital and University College London have developed the first effective drug candidate for the treatment of Acanthamoeba keratitis: a rare but serious infection of the eye that can result in permanent visual impairment or blindness. Press release.*

DYOP downside. *Study reveals the dynamic optotype (DYOP) visual acuity (VA) test – based on motion detection rather than element resolution – performed significantly worse than letter charts for the detection of uncorrected astigmatism; researchers say it is "difficult to recommend this test for the clinical determination of refractive error." PMID: 36400682.*

The European Approach to Dry Eye

A wish-list for the "non-linear" treatment of dry eye disease

Why did you establish a dry eye society in Europe?

There was already an Asia Dry Eye Society – founded by my friend, Kazuo Tsubota, in Japan – and based in the US there is TFOS (the Tear Film & Ocular Surface Society). But there was nothing in Europe. With respect to those organizations, the Asian approach and the American approach are slightly different. Some of the dry eye experts in Europe were already working together, writing papers on inflammation, on the vicious cycle of dry eye, the mechanism of dry eye, and so on, so it was logical that we create a society around the European approach. And it has been very successful – we now have more than 3,000 members and we're planning our fourth congress in Madrid in June 2024, after successful events in Paris and Munich.

I was also inspired to create EuDES by the European Glaucoma Society (EGS). I'm also a glaucoma specialist; I wanted EuDES to do for dry eye what EGS does for glaucoma. There's also EuCornea for corneal disease, which includes but is not dedicated to dry eye; and the European Society of Cataract and Refractive Surgeons (ESCRS), which of course is focused on refractive and cataract surgery.

In terms of the other dry societies, particularly TFOS, how do their definitions and classifications differ from those of EuDES?

TFOS has done a great job and produced some really useful work; I was a member of this society myself. Their definition of dry eye – and their way of understanding it – is absolutely correct. But they advocate a linear approach; in other words, mild, moderate, more severe, and very severe dry eye follows a line. So, the recommended treatment is also linear. But I would say that patients are not exactly like that. There are discrepancies between signs and symptoms; it's not linear. Twenty years ago, I devised a concept I called the dry eye vicious cycle. In my view, the vicious cycle is a way to understand the non-linear mechanism of dry eye, which means that, at some point, patients have a disease that is self-stimulated. Hyposecretory or evaporative dry eye – or whatever causes abnormalities of osmolality – stimulates the nerves, stimulates the inflammation, and results in additional loss of tears. It is a vicious cycle. There are also plenty of other causes of dry eye – the menopause, the environment, refractive surgery, contact lenses, glaucoma, preservative-containing eye drops, and cataract surgery. It's a mix of different causes. But if we understand that they are not independent causes but simply different entry points into the vicious cycle, we have to take a nonlinear approach.

TFOS has partly adopted the vicious cycle idea, but they have modified it and made it somewhat complex. My approach is more basic. You have points A, B, C, and D, and effectively, you have an idea of what is causing and self-stimulating dry eye.

"It was logical that we create a society around the European approach. And it has been very successful – we now have more than 3,000 members and we're planning our fourth congress in Madrid in June 2024."

Christophe Baudouin

What's on your dry eye wish list as an ophthalmologist?

I would say the use of preservative-free eye drops should be the first-line option. In reality, standard artificial tears are in most cases over-the-counter (OTC) products with preservatives, which actually may induce and aggravate dry eye disease. The patient will move progressively from mild to moderate. For moderate conditions, we use preservative-free eye drops, but they're more expensive. The patient's symptoms will improve, but they will start to find it a bit too expensive and go back to the OTC eye drops with preservatives. So, preservative-free artificial tears – or those with soft preservatives, for example, Purite or SofZia in the US – would be at the top of my wish list for first-line treatment.

Second, we still need a treatment that really tackles the mechanism of dry eye, such as cyclosporine. We have a new formulation of cyclosporine, which is good, but we don't have Lifitegrast in Europe. Lifitegrast hinders the T-cell activation and release of inflammatory mediators, and consequently inhibits the inflammatory pathways in dry eye. We need more treatments like this that really target the mechanism. Blocking inflammation seems to be the most efficient way to treat dry eye. We certainly need other anti-TNF (human tumor necrosis factor) anti-inflammatory or immunomodulatory medications. There is work being done on the role of TNF and interleukin-17 (IL-17) in various ocular surface inflammatory diseases, and that is an area that needs to be expanded.

"I would say the use of preservative-free eye drops should be the first-line option. In reality, standard artificial tears are in most cases over-the-counter products with preservatives, which actually may induce and aggravate dry eye disease."

There is also the issue of pain; some dry eye patients can move progressively to chronic pain. Drugs targeting the nerve receptors could be useful for those patients. There is a tendency now, which in my opinion is partly correct and partly incorrect, to say that when the cornea is not damaged, then this is neuropathic pain, and the treatment recommended antidepressants or strong analgesics. But when we use biomarkers in such patients we often, not always, find inflammatory mediators, inflammatory markers, or inflammatory cells. We didn't see the origin of the pain because there was no stain, reflected in the saying "no pain, no stain." So, better biomarkers for identifying those slight and non-visible mechanisms, those sub-clinical mechanisms, would also be on my wish list.

What is planned for the EuDES congress in Madrid?

The program is now almost complete! We will be including important topics such as how to recognize meibomian gland dysfunction (MGD) and treat patients with severe cases, and how to treat inflammatory reactions. We will talk about iatrogenic dry eye, which can be difficult to treat – do you go down the path of medication, surgery, laser surgery, or cosmetics? Also, last year we opened the floor to new companies – not to explicitly promote their products, but to show and explain what they are developing. We'll also be doing that again this year.

Christophe Baudouin is Professor of Ophthalmology at Versailles Saint-Quentin en Yvelines University, Versailles, France, and a chairman of Quinze-Vingts National Ophthalmology Hospital, Paris. He is also a founder and President of the European Dry Eye Society (EuDES).

DED 101

Tackling the pathophysiology of dry eye disease with targeted treatment

By Giulio Ferrari and Andrzej Grzybowski

Dry eye disease (DED) affects a significant portion of the population worldwide, with prevalence estimates varying greatly among different regions, demographics and occupational profiles, from less than 5 percent but up to 50 percent. It is almost twice as common in women than in men, and subjects older than 50 years old are at increased risk of developing DED.

The development and severity of DED are affected by external factors and systemic conditions, such as:

- environmental factors (including exposure to dry air, windy weather or air fluxes, tobacco smoke, chemical irritants)
- lifestyle habits (such as prolonged screen time)
- systemic diseases (Sjögren syndrome and many other autoimmune conditions, thyroid disease, Parkinson's disease, diabetes, graft-versus-host disease, dermatological disorders, vitamin A deficiency)
- oral medications (including antihypertensive and diuretic drugs, hormonal treatments, benzodiazepines and antidepressants, steroidal and non-steroidal anti-inflammatory medications, anticancer agents, and isotretinoin).

Local factors associated with DED include:

- use of contact lenses
- previous or current ocular diseases (such as blepharitis), allergies, previous conjunctival burns, or herpes keratitis

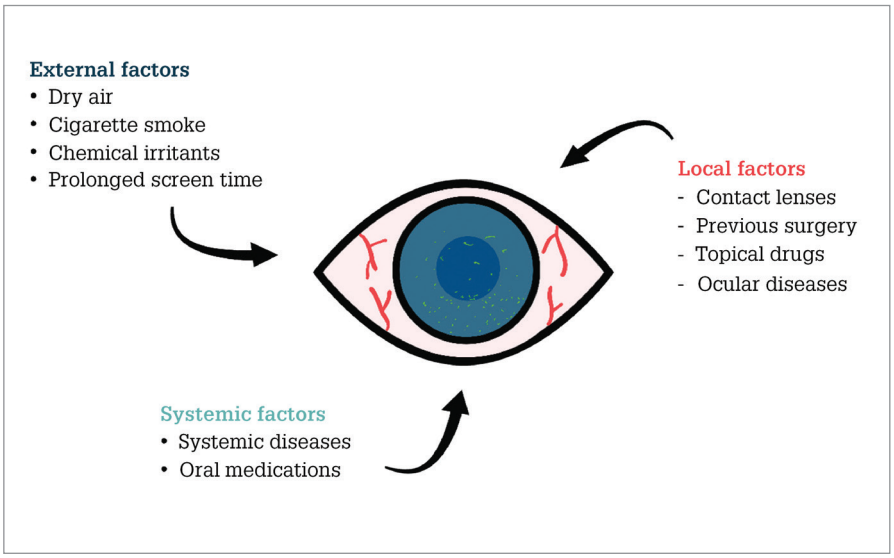

Figure 1. Risk factors for dry eye disease.

- topical drugs use (as seen often in glaucoma patients), either due to active ingredients or preservatives
- previous ocular surgery, especially involving the anterior segment or the annexa.

DED diagnosis

The pathophysiology of DED has been traditionally associated with reduced quantity and/or quality of the tear film and ocular surface inflammation. Tears play a vital role in maintaining eye health by lubricating the surface of the eye, washing away foreign particles, and providing a smooth optical surface for clear vision. When the tear film is disrupted, either due to reduced tear production, excessive tear evaporation, or an imbalance in its composition, individuals experience symptoms associated with DED.

Thorough examination of general and ocular history is necessary to identify systemic and local predisposing conditions. Questionnaires allow physicians to quantify the severity of symptoms and the impact of the disorder on quality of life, as well as to monitor disease progression and treatment response. Multiple questionnaires are routinely used in DED symptoms evaluation, including the Ocular Surface Disease Index (OSDI), the Dry Eye Questionnaire (DEQ-5), and the Standardized Patient Evaluation of Eye Dryness (SPEED).

"The two pillars of DED treatment: a targeted approach and a step-by-step progression."

Eyelid anatomy and function should be assessed during patient encounters. During slit lamp examination, signs of anterior blepharitis and meibomian gland dysfunction must be investigated. Ocular surface status is then evaluated through fluorescein and lissamine green staining.

Quantity, stability, and composition of the tear film are usually assessed through tear meniscus measurement and invasive or non-invasive tear film break-up time. Tear composition, osmolarity, and metalloproteinase-9 concentration can also be measured.

In those cases where a systemic disease is considered to complicate or be the cause of DED, further testing may be required.

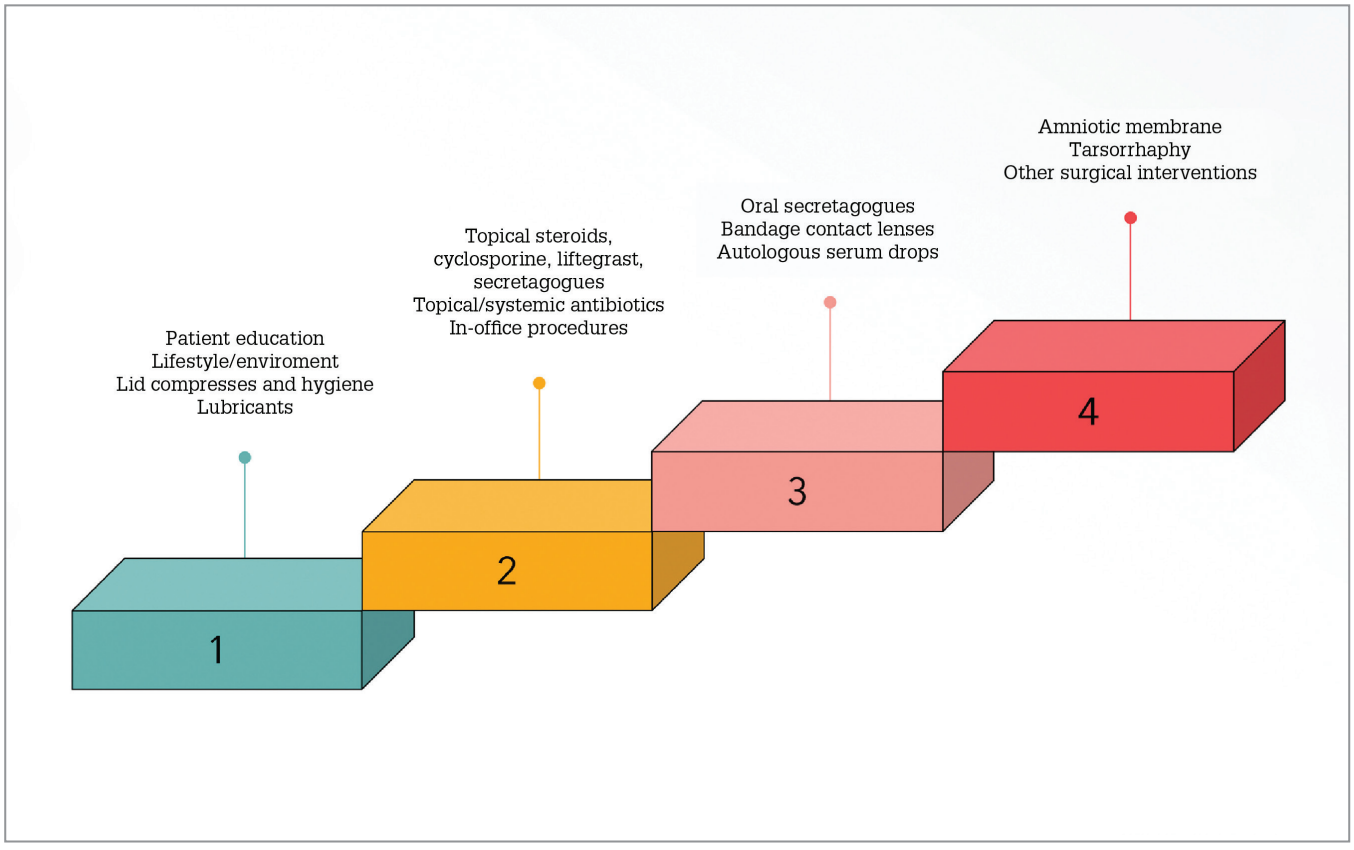

Figure 2. A step-wise approach to the treatment of dry eye disease

Tried and tested

Proper diagnosis and management strategies, ranging from lifestyle modifications to medical interventions, are essential in alleviating symptoms and preventing potential complications associated with DED. Recent years have seen new medications and devices reach the clinical arena.

The two pillars of DED treatment: a targeted approach and a step-by-step progression.

Specific factors (tear deficit, altered tear film composition, predisposing systemic conditions) should be addressed in a personalized treatment plan.

As suggested by the Tear Film and Ocular Surface Society International Dry Eye Workshop II (TFOS DEWS II), the first step usually requires patient education, lifestyle and environmental adjustments, warm compresses and lid hygiene, and the use of tear film substitutes (preferably preservative-free).

When these measures are not sufficient to control DED, topical steroids, Cyclosporine, Lifitegrast, secretagogues, topical or systemic antibiotics, or in-office treatments (for example, punctal plugs, intense pulse light) should be considered.

Severe cases may require the administration of systemic secretagogues, bandage contact lenses, or autologous serum drops. Finally, amniotic membrane, tarsorrhaphy, and other surgical interventions may be indicated in refractory patients.

Though the mechanism(s) of action of many of these treatments is often not completely understood, the final aim is clear: to improve lubrication and reduce inflammation of the ocular surface. Their efficacy varies depending on disease stage – and it is not uncommon for DED patients to try multiple treatments before the disease is controlled.

Despite extensive efforts from physicians and pharma companies, however, a substantial number of patient complaints of ocular surface discomfort and pain – even when lubrication and inflammation appear clinically well controlled.

A new target?

In our view, the pathophysiology of DED needs further elucidation. In this vein, the role of neurosensory alterations is increasingly acknowledged as a fundamental component of DED. These include morphological and functional abnormalities of sensory nerves reaching the cornea. Though the exact nature and impact of specific neuropathological alterations is still the object of study, ocular surface discomfort and pain are certainly a common finding in these patients. In the coming years, it seems likely that new therapeutic modalities will be developed to address this aspect, which substantially impairs the quality of life of DED patients.

Rising Star: Rahul Tonk

Rahul Tonk talks about his journey into ophthalmology and the mentors that helped him along the way

Rahul Tonk is a cornea, cataract and refractive surgeon at the Bascom Palmer Eye Institute in Miami, Florida, USA, where he also co-directs the cornea refractive surgery fellowship, serves as Associate Medical Director, and oversees operations at the Institute's satellite facility, the Lennar Foundation Medical Center.

Tonk was interested in medicine from early childhood, when his father gave him a very accessible book on anatomy, Charlie Brown's 'Cyclopedia of the Human Body. "I became fascinated with science and how the body worked, physiology and so forth, but I just didn't know where exactly to put that energy," he says. Going on to study Applied Economics and Management major at Cornell University, he believed he'd take a different career path. That was until he went on a mission trip to Nicaragua in 2005, and had an opportunity to work in providing ophthalmic care and ophthalmology in very remote rural areas.

"The nature of restoring somebody's sight, especially people who are needlessly blind through cataract surgery, left an incredible impression on me," Tonk explains. It convinced him that he did in fact want to pursue a medical route, but at the same time, he didn't want to give up his interest in health economics, administration, and entrepreneurship. So, he started medical school on a dual degree program at Rutgers Medical School and Rutgers Business School. "It gave me a medical education, but also the opportunity to take curricula in all of those other varied interests of mine, which has been fantastic and has led to the type of work that I do now."

From Rutgers, Tonk went on to residency training in Albany, New York, where among "many great mentors," he singles out John Simon, who was the chairman of the ophthalmology department at the time. "He was a pediatric ophthalmologist and really taught me the humanity of talking with the patient and understanding their concerns and their parents' concerns – no matter how busy your clinic was." He adds that Martha Farber, the first woman to chair the American Board of Ophthalmology, "drove me to become my best and to realize my potential." Also, Ted Wladis, who is now Chairman of Albany Medical Center's Department of Ophthalmology, "was always there when I needed him." And he credits Rob Schultz with inspiring his interest in cornea refractive surgery. He also points to his Bascom Palmer Institute mentors, Kendall Donaldson, Carol Karp and Anat Galor, who have "helped me understand how to create a program where research, education, and clinical care could all reinforce each other."

Following in the footsteps of some of the leaders and visionaries he's worked with, Tonk would like to make an impact in two different ways. "There's the impact of scope and there's the impact on individuals," he says. "There's nothing that fulfills me more than seeing the individuals I've mentored or trained go on to achieve extraordinary things. So, my purpose on the individual level is to continue working to inspire and mentor those very intelligent folks that are coming up in ophthalmology right now."

In terms of scope, clinical research is a key area of interest for Tonk – whether developing original ideas inspired by patients seen in clinic, or working with industry to bring new medications or technologies to market. At the same time, having scope means being involved as a leader with domestic and international societies where ophthalmology can come together as a field. "We learn from each other, we educate each other, we share things, and we raise the tides and that carries all the ships forward. If we can be strong as a community of ophthalmologists, there's nothing we can't achieve in eye care."

Rising Star: Li Lian Foo

Li Lian Foo of the Singapore National Eye Centre discusses her commitment to tackling childhood myopia

Li Lian Foo studied chemical engineering before she decided to embrace medical school and ophthalmology. In 2019, she enrolled at the MIT-Harvard Medical School Healthcare Innovation Bootcamp where, after a competitive round of interviews, she was selected as one of 70 participants from over 2000 applications.

Since completing her ophthalmology training, Foo has been heavily invested in researching and attempting to tackle childhood myopia management – a major issue in Singapore, where almost 80 percent of the current population is myopic. She is currently focusing on various childhood myopia control modalities, and how each of the different combinations of control modalities can help to slow down the rate of myopia progression in children. "Our main aim is to prevent high myopia amongst children in order to prevent potentially blinding-related complications later on in adulthood," Foo explains. "This is one of our utmost priorities at this point in time, considering the prevalence of high myopia is increasing and projected to affect 10 percent of the world's population."

Foo has published papers on a diverse range of subjects, from the use of deep learning systems in pediatric fundus imaging to predict high myopia risks to the application of artificial intelligence in cataract management. She has also co-authored two highly successful ophthalmology study guides: Practical Guide to VIVA and OSCE in Ophthalmology Examinations, and Fundamental OSCE Guide in Ophthalmology. She is the first Myopia fellow in the whole of Singapore, based at the Singapore National Eye Centre (SNEC), an institute providing specialist eye care to over half of the country's public sector. SNEC is one of the few global institutions that continue to record every single major operation it carries out to ensure the highest standard of surgical monitoring and patient outcomes.

Now, Foo's main goal is to find novel myopia solutions and treatments to curb myopia. As an aspiring clinician innovator, she hopes to use her skills – fueled by her combined engineering and medical background – and her passion to improve clinical care across Singapore with the aim of bridging the bench-to-bedside gap. Rapidly evolving technology is the key to achieving this, she says. "In my opinion, telemedicine and remote monitoring will likely become integrated in patient care, and this will ensure broader access to specialized treatment. I also feel that the breakthrough in AI, regenerative medicines, and even gene therapy can offer us unprecedented potential in terms of treating eye diseases."

Recommending Foo as a Rising Star, The Ophthalmologist's two-time Power Lister, Seang-Mei Saw, Distinguished Wallace Foulds Professor, told us, "I have had the privilege of mentoring Li Lian and have been consistently impressed with her dedication, intellect, and enthusiasm… I have no doubt she will continue to excel in her research endeavors in myopia and translate her findings to improve the outcomes of myopic children. I look forward to Li Lian's continued contributions in the prevention and management of myopia to combat the worldwide myopia epidemic."

"Telemedicine and remote monitoring will ensure broader access to specialized treatment."

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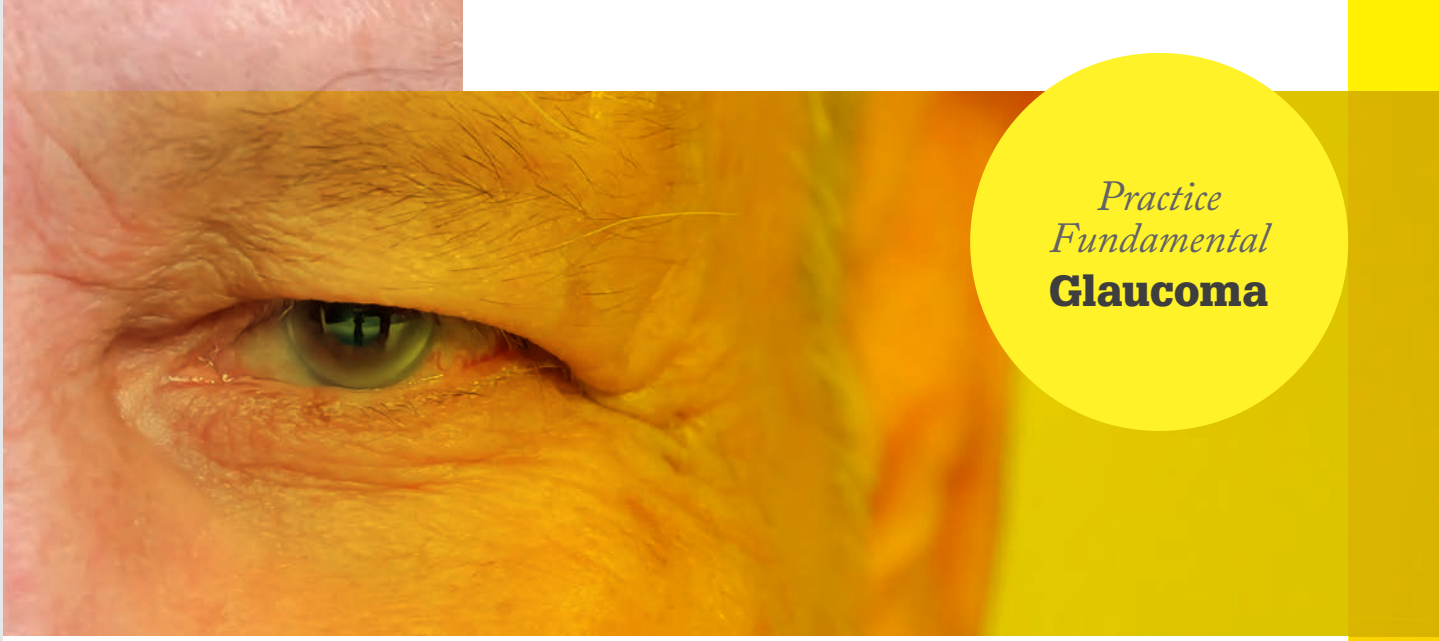

Risk assessment. To examine how binocularly asymmetric glaucomatous visual field damage affects binocular disparity processing across the visual field, researchers recruited 18 patients with open-angle glaucoma, 16 age-matched controls, and 13 young controls. After undergoing standard clinical assessments, researchers found that patients with glaucoma exhibited binocularly asymmetric visual field damage. PMID: 37129906.

One drop is all it takes. A recent study evaluated the efficacy of bunazosin hydrochloride (BH) – an alpha1-adrenergic blocker and commercialized glaucoma eye drop – in suppressing the progression of myopia in a lens-induced murine model. Researchers found that the administration of BH eye drops suppressed the myopic shift of refractive error and demonstrated the potential of BH eye drops for the treatment of myopia. PMID: 37955611.

Genetic disproportion. Though individuals with African heritage have been observed to be more frequently affected by glaucoma, the genetic underpinnings leading to this disparity have been less documented. A new Cell study has analyzed 11,275 people of African descent using genome-wide association studies, revealing two novel gene variants – rs1666698 and rs34957764 – in this population that can be linked to primary open-angle glaucoma (POAG). PMID: 38242088.

Diagnosis: glaucoma. To develop a deep learning algorithm that can automatically differentiate between macula and optic nerve head structures in OCT scans – as well as to determine which structure might best be used to diagnose glaucoma – researchers from Singapore performed a cross-sectional analysis of over 600 OCT scans. Their findings suggest that wide-field OCT could provide significantly improved outcomes for glaucoma diagnosis of both the macula and optic nerve head. PMID: 38197730.

Donut damage. Researchers have described a model of progression to predict the damage that glaucoma does to the ganglion cell layer (GLC) surrounding the fovea (i.e., the "GLC donut") using optical coherence tomography (OCT). Tested against data from their lab, the model was found to provide clinical aid and alert clinicians to potential non-glaucomatous causes of central macula damage when the GLC damage does not match predictions. PMID: 38060217.

Microenvironments. A multidisciplinary team has identified a promising new strategy for glaucoma replacement therapy. In the study, researchers present a methodology to guide stem cell-derived and regenerated neurons by engineering a microenvironment. PMID: 37931105.

IN OTHER NEWS

Progression in photonics. *Researchers Samantha Grist and Fernando Zvietcovich have proposed two separate light-based technologies to solve challenges in diagnostics, specifically in relation to the menopause and glaucoma. A $100,000 grant from the Optica Foundation will help to fund further research. Press release.*

Smoke gets in your eyes. *A Serbian study examining smoking and its association with different glaucoma subtypes looked at 283 patients. Though normal-tension glaucoma (NTG) was linked to poorer vision-related impairments, no links were found between smoking and the other glaucoma subtypes. PMID: 38085803.*

Trabeculotomy triumph. *The Treatment of Advanced Glaucoma Study (TAGS) has investigated whether IOP lowering drops or trabeculotomy should form the primary treatment for advanced glaucoma. Their findings indicate i) both treatments have similar safety profiles, and ii) trabeculotomy demonstrates superior efficiency for preventing disease progression and lowering IOP. PMID: 38199528.*

Contrast Sensitivity: Adding SPARCS to Your Testing

Why the Spaeth Richman Contrast Sensitivity test is set to raise the standard of CS assessments

By Parul Ichhpujani

Mr. X – a patient on a fixed-dose prostaglandin with timolol combination for advanced glaucomatous optic neuropathy – visited his doctor. He was finding it increasingly difficult to adjust after entering a room after his daytime stroll. His evening stroll had taken a toll as well because he wasn't able to see the curb at the roadside.

A junior fellow addressed his concerns: "You already have advanced visual field defects – a repeat test would be non-contributory. Also, because your intraocular pressures (IOPs) are in the early teens, it is unlikely that the disease is progressing." But then Dr. Y comes in, listens to Mr. X's concerns, and orders a test to assess contrast sensitivity (CS).

Mr. X had already performed this new web-based, online test – known as SPARCS (Spaeth Richman Contrast Sensitivity) test* – a few months back. The repeat SPARCS test showed that there was a decline in the central score as well as peripheral scores in two quadrants, suggesting progressive functional deterioration. Dr. Y stepped up the therapy and suggested some changes to help improve contrast in the home environment.

This case scenario highlights the need not only to listen to our patients' concerns regarding a very important visual function, but also to use appropriate tools to quantify it and then use the results for clinical decision making. Unlike standard visual acuity tests, which assess the ability to see black letters on a white background, CS testing evaluates visual function in more real-world scenarios. CS is important for tasks such as reading, driving, and recognizing objects in various lighting conditions. CS decline occurs in several ophthalmic disorders including cataract, glaucoma, diabetic retinopathy, and age related macular degeneration (1).

Choosing the best CS test or stimulus to be used in a clinical practice is a topic of debate. Letter-based CS charts measure recognition, while gratings refer to a detection task. The advantages of SPARCS over letter-based CS charts, such as the Pelli Robson chart, is that SPARCS is independent of the effects of literacy and language, chart fading, inadequate illumination, reflections, and limited optotypes. SPARCS can also be performed on most freely available web browsers, such as Chrome and Firefox – an added bonus given that most CS tests are not sufficiently accessible geographically, economically, or psychologically.

SPARCS also ascertains both central as well as peripheral CS, bridging a critical gap in current CS evaluation techniques. Studies using SPARCS have shown that CS correlates with quality of life and people's actual ability to perform activities of daily living better than visual field, visual acuity, stereopsis, and IOP (2).

Dr. Y also showed the patient that SPARCS can be administered by anyone with a minimum of training; indeed, it is designed to permit self-testing by anyone

who has access to a web browser. Vertical contrast bars of varying levels of contrast are randomly shown in five distinct areas of the field of vision – centrally, upper right, upper left, lower right, and lower left. The patient is instructed to click the area where the contrast images were displayed. When the limits of the individual's ability to see contrast are established, the score results are displayed for the patient, automatically stored in the patient's record, and are immediately available for review by the patient's doctor. The cumulative SPARCS score is the sum of all five areas, with 100 being the highest possible combined score. The data obtained by SPARCS is digital, quantitative, and immediately integrated into databases from which critical patterns, whether for individuals or populations, can be analyzed.

Given that classical glaucomatous visual field loss is usually detected first in the periphery (often as an arcuate scotoma occurring in the superior or inferior hemifield within 20 degrees of the fovea), researchers have attempted to correlate peripheral visual field loss with CS measurements. Glaucoma patients with even early optic nerve rim tissue loss, scored lower CS values than 95 percent of controls (3). And SPARCS scores were one of the best predictors when it came to identifying which glaucoma patients were at the highest risk of progressing rapidly (4). The potential of CS scores as markers to identify high-risk glaucoma patients needs to be explored. As in Mr. X's case, when the glaucoma is very advanced, the floor effects in structural imaging often impede the accurate detection of progression; in such cases, SPARCS can save the day.

Elderly patients with glaucoma often have coexisting cataracts; for these patients SPARCS is also more adept at identifying decline in CS with increasing cataract severity (5).

CS loss is diffuse throughout the field of vision, unlike the clusters of function loss (scotoma) seen on visual field testing. Therefore, more research is needed to ascertain how CS reduction is associated with the progressive loss of neural tissue in specific areas of the retina.

Testing at a fixed, low-spatial frequency is a relative drawback of SPARCS, but even this low spatial frequency complements the Snellen visual acuity assessment.

As we advance in the field of ophthalmology, innovative tools such as SPARCS are poised to play a pivotal role in enhancing diagnostic and therapeutic approaches, thereby raising the bar for standards of patient care.

Parul Ichhpujani is Professor at the Glaucoma Service, Department of Ophthalmology at the Government Medical College and Hospital, Chandigarh, India

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Advancing Glaucoma Care

Realizing the potential of precision therapy means understanding the foundational pillars of personalized medicine

By Rishikesh Gandhewari

William Osler paved the path of patient-centered care; we now leap towards personalized medicine. Patient-centered medicine is an integral philosophy of contemporary medical practices. Osler – a Canadian-born physician and one of the founders of Johns Hopkins Hospital – is credited with its early conception by emphasizing the importance of physicians caring more for the individual patient than for the disease (1). In the present day, this philosophy translates into active patient involvement in their treatment, with management options tailored accordingly. And yet, evolving medical technologies promise further optimization – most prominently through the burgeoning field of personalized medicine. Personalized (or precision) medicine allows us to integrate patient choices with robust genetic, molecular, and environmental data to generate a truly individualized treatment regimen. Though the realization of such a utopia is laudable, it is not only within reach but, in certain cases, increasingly necessary.

Glaucoma is a chronic debilitating condition and remains the leading cause of irreversible blindness worldwide (2). Despite recent advances, concerted efforts are needed to improve patient outcomes. A recent Lancet seminar (3) underscored the imperative for personalized treatment in glaucoma, owing to its diverse pathophysiology, heterogenous manifestation, and emergent myriad treatment options. Often termed the "silent thief of sight," glaucoma manifests asymptomatically and is increasingly being identified through routine screening by optometrists and opticians. Consequently, patients may receive a diagnosis at any point during the disease course, ranging from asymptomatic detection to late-stage irreversible sight loss. It's clear that accurate prediction of the disease state, progression, and associated risks is crucial to tailor management effectively.

Currently, intraocular pressure (IOP) remains the only widely accepted modifiable risk factor for disease progression, so it is the target to which all treatment options are directed (3, 4). However, many patients may progress despite normal pressures, prompting the need for further predictive markers through genetic profiling and therapy (3, 4). Presently, when considering management, an array of pharmacological, laser, and surgical options must be navigated, each with specific benefits and limitations. This potential decision paralysis has been made worse through the innovation of minimally invasive glaucoma surgeries (MIGS), which offer the potential of periods of drop-free care. It is clear that patient-specific modeling would greatly help both clinicians and their patients navigate this complex condition.

Personalized medicine operates on three foundational pillars: genetics, big data, and artificial intelligence (AI) (5), each playing a pivotal role in glaucoma. Some 542 genes have been associated with open-angle glaucoma, dubbed the "POAGome," exemplifying the varied disease pathophysiology (6).

"The dynamic interplay between big data and AI continues to transform the landscape of ophthalmology. Serial high-resolution imaging coupled with data-rich electronic health records provide an extensive repository for machine learning and deep learning technologies to develop predictions."

The majority of genes are implicated in inflammation and senescence and should be considered in the context of ethnic variations and environmental modification, through epigenetics (6). This genetic profiling is ever more relevant when addressing diverse populations and environments, underscoring initiatives such as

Australia's Genetics of Glaucoma Study (GOGS), one of the largest genetic studies of glaucoma worldwide (7). Such endeavors will be crucial in the pursuit of genetic risk profiling.

In addition to risk stratification, treatment is equally pertinent. A notable avenue of benefit lies in pharmacogenomics, a potent tool aimed at predicting individual responses to specific medications. For instance, varied responses to latanoprost have been associated with genetic polymorphisms associated with seven different genes (8). Looking ahead, the pursuit of neuroprotective gene therapies in an intraocular pressure (IOP)-independent manner stands as a promising goal in the quest for more effective and tailored interventions.

The dynamic interplay between big data and AI continues to transform the landscape of ophthalmology. Serial high-resolution imaging coupled with data-rich electronic health records provide an extensive repository for machine learning and deep learning technologies to develop predictions. Several assistive technologies, primarily rooted in OCT scans and visual field measurements, have emerged; however, the absence of rigorous diagnostic and progression definitions has resulted in heterogeneous data (9). Consequently, no autonomous AI models specific to glaucoma have secured FDA approval thus far (9).

Future advancements in predicting individual disease trajectory, patient outcomes, and treatment responses holds the promise of optimizing personalized treatment options. Pioneering efforts, exemplified by the work of Giovanni Montesano at Moorfields Eye Hospital, aim to map clinical trials and real-world outcomes to individuals. Such research is vital in data refinement and subsequent model enhancement, earning recognition through research awards from Glaucoma UK and The Royal College of Ophthalmologists (10).

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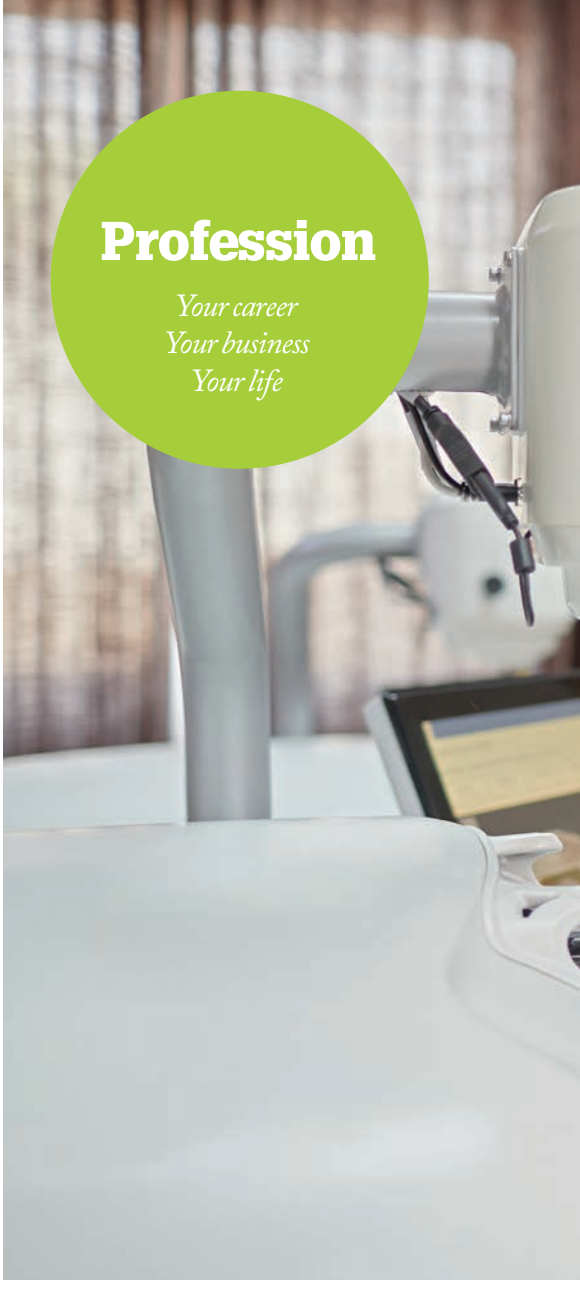
Despite the considerable promise that personalized medicine holds, certain challenges that extend beyond the aforementioned complexities must be acknowledged. Glaucoma management grapples with issues of therapeutic intolerance and suboptimal adherence. Treatments, such as MIGS, are novel but have a limited evidence base, with variation in surgeon experience, availability, and affordability. Moreover, with improving detection, patient desired outcomes are a balance of treatment burden and disease progression (11). Precision models built upon these limitations may prove inaccurate predictors, outdated predictors, or predict outcomes that are not a priority to the individual.

Overall, personalized glaucoma therapy presents an immense opportunity to tailor treatment with increased potential efficacy for the individual. However, precision models must be evidence based, diligently developed, and, most importantly, created with the patient as the focal point. It is essential we keep Osler's essence at the forefront – treating the patient, not just the disease.

Rishikesh Gandhewar is an Academic Foundation Year 2 Doctor at Imperial College NHS Trust, Imperial College London.

See references online at: top.txp.to/Advancing/Glaucoma/Care



Brightening the Eyes of a Nation

How HelpMeSee and Madagascar's Ministry of Public Health are working towards a 20-fold increase in the number of cataract specialists working in rural areas

By Oscelle Boye

How many ophthalmologists would you estimate are needed to serve a population of 29 million people? According to the American Academy of Ophthalmology (AAO) membership data (an estimated 92 percent of US-based practicing ophthalmologists are members), there were 2379 ophthalmologists serving California's more than 29 million citizens in 2018 (1). In stark contrast, the entire island of Madagascar (a similar population size to California in 2021) has only 25 ophthalmologists who are trained to perform cataract surgery.

Twenty of these ophthalmologists live and practice in the capital, Antananarivo, or in other large towns, collectively taking care of an urban population of 11.5 million people. The remaining five, who live and practice in rural areas, look after the other 17.5 million. The result of this poor ratio? Only 370 cataract procedures are completed for every million needed across the country.

Statistics from HelpMeSee, which is a global nonprofit using simulation-based training to fight cataract blindness, indicate that over 100 million people in less economically developed countries across the globe are blind or visually impaired as a result of untreated cataract or a lack of access to care. According to a Rapid Assessment of Avoidable Blindness (RAAB) study conducted by Madagascar's Ministry of Public Health, 200,000 people in the country are blind as a result of untreated bilateral cataract (2). With such a large and growing cataract burden, it is clear that more practitioners are needed – and fast. And that's why HelpMeSee partnered with Madagascar's Ministry of Public Health, and the Polyclinic d'llafy hospital in Antananarivo to launch the Mazava Project. With a name that means "bright" in Malagasy, the Mazava project is an initiative working to reduce the nation's prevalence of cataracts by training more than 100 general practitioners to become competent cataract specialists by mid-2024.

Here, we take a closer look at the Mazava Project – and the people behind it – to find out what it takes to restore sight to a nation.d girl knows that she has a future.

The initial spark

According to Bonnie An Henderson, HelpMeSee's President and CEO, to understand the origins of the Mazava Project, we should first understand the formation of HelpMeSee itself. Founded in 2010 by father and son, Al and Jim Ueltschi – Al also being a co-founder of the world's first Flying Eye Hospital, Orbis International – HelpMeSee aimed to eradicate global blindness by improving surgical training through simulation. "Building on Al Ueltschi's work in creating FlightSafety International, the first and most established flight simulation

With its ability to provide the feel of a human eye in training, HelpMeSee uses simulation-based training to help restore sight for people with cataract. *Credit: Ymagoo Cinetyka. Image provided by HelpMeSee*

company, we worked to develop the best-in-class, high-fidelity manual small incision cataract surgery and phacoemulsification simulators, which we use to deliver training throughout the world," says Bonnie An Henderson. "Since completion of the simulators, we have been able to train over 3,000 professionals across the globe."

The motivation behind the Mazava Project then – and, in fact, all HelpMeSee projects in less economically developed countries – is simple: to increase worldwide access to eye care and thus reduce the prevalence and impact of preventable blindness. "Access to care for cataract – the leading cause of blindness – in many parts of the developing world is limited by several factors, including access to a competent cataract surgeon. Madagascar is one of those locations where there is a dire need for ophthalmologists," says Bonnie An Henderson. "When a person is blind or severely visually impaired, this affects not only their life, but also that of their entire family. Often, a relative is required to stay home from school or work to care for the blind person. This has an economic effect on the family, community, and ultimately the country. Additionally, the person who remains home to be the caretaker is often the female child, which prevents girls from becoming educated, adding to the gender inequality in many countries."

From simulation to surgery

The Mazava Project certainly has the ambition and the technology to have an incredible impact on eye care infrastructure in Madagascar, but a

At the onset of this initiative, the entire island of Madagascar had only 25 ophthalmologists who were trained to do cataract surgery for 29 million people. Through a unique partnership, 100 new cataract surgeons are being trained who can restore the gift of sight. *Credit: Ymagoo Cinetyka. Image provided by HelpMeSee*

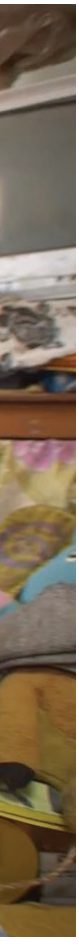
big question remains: how exactly do you go about converting 100 GPs into cataract surgeons? Jean-Marie Andre, HelpMeSee's Director of Business Development for Africa and Europe – and the Mazava Project's lead and chief instructor, tells us that, to be included in the project, GPs must meet key criteria:

- Under 45
- Already established in the periphery (away from the capital)
- Able to pass the dexterity and psychomotor skill test on the HelpMeSee simulator
- Able to pass the ophthalmological knowledge test at the University of Antananarivo, under the supervision of Professor and Ophthalmologist, Léa Raobela.

From there, successful GPs enter the training process. "The training is comparable to a concentrated ophthalmology residency program focusing solely on manual cataract surgery training," Bonnie An Henderson tells us. The program starts off with three weeks of simulated training. "Every cataract surgeon faces potential complications. But HelpMeSee's simulation-based training allows trainees to experience complications without risk to the human eye," explains Andre. "Training in these modules is mandatory before a trainee proceeds to surgery on a human, which is focused on increasing patient safety."

In addition to safety, the surgical simulation-based training offers other benefits, in particular, allowing trainees to focus on, repeat, and ultimately master each step of the multistep cataract surgery. The incorporation of surgical simulation into training regimens is something that Andre believes will become a mainstay of surgical education. "With its ability to provide the feel of a human eye in training, we believe that cataract surgery will be taught using the innovations of simulation-based training worldwide. What we are doing here in Madagascar is a result of the government recognizing the impact that this innovative technology can have on people waiting to have their sight restored."

After passing an exam on the simulator, the trainees proceed to live surgery, which is supervised by Raobela and her team. Once the student is deemed competent and autonomous in cataract surgery, they are then presented



with a Cataract Surgeon's Diploma. The freshly graduated cataract surgeons are then sent to operating rooms (ORs) across the country. Mazava operators from the first year will work within already established ORs that do not have cataract surgeons, whereas those from the second and third years will be positioned in new ORs that will be created by the Ministry of Public Health at strategic locations.

More Doctors, More Projects

The project has already made significant progress but, as Patrice Zafindrianomply, Director of Non-Transmissible Disease within the Ministry of Health, informs us, this is only the beginning. "At last measurement, the cataract surgical rate (CSR) – the number of cataract operations performed per million people over the course of one year – in Madagascar was 370, which is extremely low. Our focus for the Mazava project is achieving a CSR of 2,000 surgeries every year for the next ten years, as recommended by the World Health Organization (WHO)." Certainly, by increasing the number of cataract surgeons practicing in rural regions of Madagascar by 20 times what they were before it began, the Mazava project has the capability to seriously improve the majority of Malagasy people's access to cataract surgery and dramatically lower the nation's rates of preventable blindness.

Though bolstering an entire nation's eye care infrastructure is no mean feat, there are many other regions with the same dire need for ophthalmologists. And that's why HelpMeSee hopes the Mazava Project will serve as a successful blueprint that can be applied to other countries. "We believe this sustainable approach will help address the gaps in care that exist for 100 million people around the world who are blind or visually impaired as a result of cataract and are unable to access surgery," says Jean-Marie Andre. "Once the results of this project are complete via a scientific study we are conducting in parallel, our intention is to replicate this model in other developing countries."

It will take time before the data prove the exact impact of the project but, looking at what has been achieved in just a few months, the future of eye care access for the Malagasy people certainly seems bright – or, as they would put it, mazava.

What the doctor ordered

As of writing, 14 GPs have received their Cataract Surgeon's Diploma, six of whom are practicing routinely with excellent results. Rico Ludovic Mpanasoa, one of the trainees who has successfully attained his Cataract Surgeon's Diploma and now serves as a Cataract Operator at the Institut de la Vision, tells us of his personal experience of training through the Mazava Project.

Why did you choose to undergo this training?
I initially chose to enter into the Mazava Project because, as a GP, I was encountering a large number of patients from my local region who were coming to my practice presenting with blindness as a result of cataract. Having always been drawn to learning surgery, and wanting to do something to help my patient population, this was really an opportunity I could not miss.

How was the experience of undergoing the year-long cataract surgery training?
Learning to perform cataract surgery was a process that I found incredibly exciting; however, that's not to say that it didn't come without its challenges as I was still continuing to serve at my private practice over the course of my training.

How did the training you received translate to the experience of performing cataract surgery within your patient population?
For me, the training has translated well. Moving from the surgical simulator to working on actual patients' eyes was a smooth transition. I was well supported and mentored on-site by senior surgeons initially, and gradually gained my autonomy in performing the procedure. Everything happens naturally.

What impact is your Cataract Surgery Diploma having on your community?
At the moment, I perform around five of these procedures each week – and we are seeing good results. For my patients, they both understand and appreciate the fact that I am now a cataract surgeon and are really grateful to have the option to receive this treatment locally, which, for many, is the only way to access the treatment at all.

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Eye Health: No Woman Should Be Left Behind

Fighting gender inequality in ophthalmology and eye care

By Ciku Mathenge

As a young ophthalmologist in Kenya, I noticed that every one of my surgical lists started with male patients and ended with women. When I asked why, I was told that is how it has always been.

One day a man and his wife arrived for cataract surgery – both were blind. The man was first on the list and his wife was so far down that she didn't receive surgery that day. Instead, she continued to look after her husband, cleaning and feeding him whle waiting for her turn on the next list.

When we discharged the man from hospital, he said he could not leave his wife there for surgery because no-one would be at home to look after him. This triggered me – I realized the tables were not equal and women would always have more to do, even if they were blind.

From that moment, women appeared on the top of my surgical list. We made the environment more supportive for female patients. And before any male patient was booked in for surgery, they were asked to bring their wives with them so they could be tested.

Globally, women account for 55 percent of people who are blind or living with a visual impairment (1). The barriers that prevent women from accessing the eye health they need must be broken down – and this is why we need more senior female leaders in health. Yet, just like female patients, female leaders are met by many roadblocks and hindrances that prevent them from having a greater say in how programs and services are delivered.

"The barriers that prevent women from accessing the eye health they need must be broken down – and this is why we need more senior female leaders in health."

"These experiences stay with me, motivating me to look out for other young women, and to push for the leaders we need to ensure that no woman is left behind when it comes to eye health."

So, what can be done? The Fred Hollows Foundation has joined with UN Women to launch a policy brief to drive progress towards gender equity in health (2). World Health Organization data shows that, though women make up almost 70 percent of the global healthcare workforce, they account for less than 25 percent of the most influential leadership positions (3).

As a female ophthalmologist, I have experienced gender discrimination throughout my career. I was six months pregnant with my first child when I joined my ophthalmology residency – a situation that did not please my lecturers. One day in class, I was confronted with a difficult question. Often, the lecturers did not ask me questions but because no one knew the answer, I spoke up.

The teacher looked at my classmates and said, "You are not serious. You don't know the answer, yet the pregnant woman knows!" At the time, I giggled and thought it was funny; only afterwards did I realize the insult. When I requested maternity leave, I was told I would have to do another year of training to make up for the time away. I had no desire to stay in training longer than necessary. So, instead of a three-month maternity leave, I opted to take three weeks of sick leave, during which I had my caesarean section.

I vividly remember sitting on the floor four weeks after my delivery, with my back against the foot of the bed, breastfeeding my baby in one arm and making study notes with my other arm, with a determination to get to the top of the class. I succeeded, but that first year of residency was tough.

By the time I graduated, I was seven months pregnant with my second child, and this time my situation was more "acceptable." A few months after graduation, I was pleased to learn that my experiences led to a policy shift: pregnant women in training were no longer required to train for an extra year.

These experiences stay with me, motivating me to look out for other young women, and to push for the leaders we need to ensure that no woman is left behind when it comes to eye health.

Ciku Mathenge, Professor of Ophthalmology at the University of Rwanda and Director of the Rwanda International Institute of Ophthalmology in Kigali, Rwanda.

Leave No Woman Behind

As part of the development of the joint Fred Hollows Foundation–UN Women policy brief, "Leave No Woman Behind – Closing the Gap on gender in eye health," a consultation was held with over 170 participants, including women with vision impairments, women's and girls' rights grassroots organizations, disability rights NGOs, national organizations for the blind, eye health professionals, and primary and hospital care providers from across the world.

Key recommendations include amplifying the voices and ensuring the meaningful participation of women who are blind or have vision impairment at all levels of decision-making, increased resources to policies and programs in all relevant sectors that impact women's eye health, upholding women's and girls' rights, tackling multiple and intersecting forms of discrimination, and eliminating gender barriers preventing women's access to eye care.

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Lighting the Way

Sitting Down With… Geoffrey Wabulembo,
Medical Director, Eye Health and NTDs at
Light for the World

Can you tell us about your transition from general medical practice to ophthalmology?

When I finished medical school, I worked in missionary hospitals in Kampala, Uganda, as a general doctor. I was exposed to patients with various ailments, including eye problems, but I realized that I hadn't learned enough from medical school to be able to treat them effectively or efficiently. I found myself becoming increasingly curious about ophthalmology.

At that time, the economy of the country was doing badly, and some of the more experienced ophthalmologists had left to work elsewhere. During my training, we had a shortage of faculty and had to do a lot of self-teaching. The equipment we were working with was quite poor; most of it had been purchased many years earlier. So we just had to go through the training with what we had. Afterwards, however, we had the opportunity to work in developed countries, where the ophthalmology departments were equipped well enough for us to become more skilled and work independently when we returned to Uganda.

Can you describe the eye care situation in Uganda when you first qualified as an ophthalmologist?

I would say it was a desperate situation. There were very few ophthalmologists in the country – around 11 in total. Maybe three of those were already retired and just doing low-level private practice work. So, wherever you positioned yourself as an ophthalmologist, you'd have a lot of patients. It also meant that we needed to do a lot of outreach work. We traveled around different parts of the country to offer mobile services. Sometimes we dealt with 500 patients a day. And when it came to surgeries, we would have long lists and be operating until 8 pm. Despite all that effort, you can't always offer the same services in outreach as you can in your own practice. Nevertheless, that's how eye care was delivered in Uganda back then.

How have things changed since that time?

A number of development partners have come to support the Ministry of Health with improving Uganda's eye care services, through training more ophthalmologists – with some partnerships providing scholarships – and through affirmative action and interventions. For example, there was a program supported by Light For the World called the National Intervention for Uncorrected Refractive Error. This mainly addressed uncorrected refractive errors among school children by training local eye care professionals in refraction and by providing spectacles to the children at an affordable rate. It was so successful that the Minister of Health now owns this type of service; it led to the current "1,2,3 I can see!" eye care program that Light For the World is implementing in Uganda and in other countries where we are involved, such as Ethiopia, Burkina Faso, and Mozambique.

What prompted you to specialize in pediatric ophthalmology?

During my clinical practice, I started seeing more and more children that needed either surgical intervention or refraction. Some of the most challenging groups of children were those who presented with congenital cataracts. Because of the lack of surgeons, some of these children had not been operated on by the age of five and were functioning with severe vision impairment. The professionals needed to handle these problems were simply not there. I had an interest in helping children. And because the need for pediatric ophthalmology was so great at that time, I got an opportunity – and a scholarship from Light For the World – to train at the University of California.

"It was a desperate situation. There were very few ophthalmologists in the country – around 11 in total."

What developments would you still like to see in ophthalmology within developing countries?

During the last two decades, we've seen a development of the infrastructure, including the building of eye departments in regional referral hospitals throughout the country. But they don't all have ophthalmologists at the moment. We'd still like to have more local professionals trained in ophthalmology, so that we can fill all these available positions.

At the same time, because of the wider use of the internet and an increase in awareness among the population, the demand for subspecialties has also increased. So, development of subspecialties is another thing that we would like to see progress – and progress quickly because of the demand.

How else could Uganda and other developing countries meet this demand?

One of the major needs is awareness – there are still many people who are not aware that they can be helped. One of Light For the World's strengths is in supporting eye health programs through school screening. When these children have interactions with eye health professionals, they go back and talk about eye health to their families. And that helps raise awareness in the whole community. It's something we need to promote further. If we can strengthen the eye health program by visiting schools, we will be able to reach many more people.

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Meet the Rising Stars! An interview with Arjan Hura

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