NOVEMBER/DECEMBER 2022 # 64

the Ophthalmologist™

How the Future Happens

Leaders in the field share their stories of commercializing ideas that have transformed eye care

For the treatment of all stages of neurotrophic keratitis (NK)

NOT JUST ANY SOLUTION

A RESOLUTION

Complete and long-lasting resolution of NK for most patients*[1-4]

- **Up to 72% of patients** achieved complete corneal healing in clinical trials*†[1-3]
- **80% of these patients** remained healed at 1 year (REPARO trial)*[4]

oxervate® (cenegermin-bkbj ophthalmic solution) 0.002% (20 mcg/mL)

* Resolution was evaluated in clinical trials as complete corneal healing, defined as the absence of staining in the lesion area and no persistent staining in the rest of the cornea after 8 weeks of treatment and as <0.5-mm lesion staining at 48-week follow-up.[1-3]

† Key study findings were after 8 weeks of treatment, 6 times daily. REPARO (Study NGF0212): 52 European patients with neurotrophic keratitis (NK) in 1 eye per group; 72% of patients completely healed; vehicle response rate 33.3%. Study NGF0214: 24 US patients with NK in 1 or both eyes per group; 65.2% completely healed; vehicle response rate 16.7%.[2,3]

Important Safety Information

WARNINGS AND PRECAUTIONS

Use with Contact Lens

Contact lenses should be removed before applying OXERVATE because the presence of a contact lens (either therapeutic or corrective) could theoretically limit the distribution of cenegermin-bkbj onto the area of the corneal lesion. Lenses may be reinserted 15 minutes after administration.

Eye Discomfort

OXERVATE may cause mild to moderate eye discomfort such as eye pain during treatment. The patient should be advised to contact their doctor if a more serious eye reaction occurs.

ADVERSE REACTIONS

In clinical trials, the most common adverse reaction was eye pain following instillation which was reported in approximately 16% of patients. Other adverse reactions occurring in 1% to 10% of OXERVATE patients and more frequently than in the vehicle-treated patients included corneal deposits, foreign body sensation, ocular hyperemia, ocular inflammation and tearing.

USE IN SPECIFIC POPULATIONS

Pregnancy

There are no data from the use of OXERVATE in pregnant women to inform any drug associated risks.

Lactation

The developmental and health benefits of breastfeeding should be considered, along with the mother's clinical need for OXERVATE, and any potential adverse effects on the breastfed infant from OXERVATE.

Pediatric Use

The safety and effectiveness of OXERVATE have been established in the pediatric population. Use of OXERVATE in pediatric patients 2 years of age and older is supported by evidence from adequate and well-controlled trials of OXERVATE in adults with additional safety data in children.

INDICATION

OXERVATE® (cenegermin-bkbj) ophthalmic solution 0.002% (20 mcg/mL) is indicated for the treatment of neurotrophic keratitis.

DOSAGE AND ADMINISTRATION

Instill one drop of OXERVATE in the affected eye(s), 6 times a day at 2-hour intervals for eight weeks.

To report ADVERSE REACTIONS, contact Dompé U.S. Inc. at 1-833-366-7387 or FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.

Please see the Brief Summary of full Prescribing Information for OXERVATE on the following page.

References: 1. OXERVATE® (cenegermin-bkbj) ophthalmic solution 0.002% (20 mcg/mL) [US package insert]. Boston, MA; Dompé U.S. Inc.; 2019. **2.** Bonini S, et al. *Ophthalmology*. 2018;125:1332-1343. **3.** Pflugfelder SC, et al. *Ophthalmology*. 2020;127:14-26. **4.** Data on File. Clinical Study Report (NGF0212). Dompé U.S. Inc., 2016.

See more clinical data
OXERVATE.com/hcp

Dompé

oxervate®
(cenegermin-bkbj ophthalmic solution) 0.002% (20 mcg/mL)

Brief Summary of full Prescribing Information

Consult the full Prescribing Information for complete product information, available at www.oxervate.com/prescribing-information.

INDICATIONS AND USAGE

OXERVATE® (cenegermin-bkbj) ophthalmic solution 0.002% is indicated for the treatment of neurotrophic keratitis.

DOSAGE AND ADMINISTRATION

General Dosing Information

Contact lenses should be removed before applying OXERVATE and may be reinserted 15 minutes after administration.

If a dose is missed, treatment should be continued as normal, at the next scheduled administration.

If more than one topical ophthalmic product is being used, administer the eye drops at least 15 minutes apart to avoid diluting products. Administer OXERVATE 15 minutes prior to using any eye ointment, gel or other viscous eye drops.

Recommended Dosage and Dose Administration

Instill one drop of OXERVATE in the affected eye(s), 6 times a day at 2-hour intervals for eight weeks.

WARNINGS AND PRECAUTIONS

Use with Contact Lens

Contact lenses should be removed before applying OXERVATE because the presence of a contact lens (either therapeutic or corrective) could theoretically limit the distribution of cenegermin-bkbj onto the area of the corneal lesion. Lenses may be reinserted 15 minutes after administration.

Eye Discomfort

OXERVATE may cause mild to moderate eye discomfort such as eye pain during treatment. The patient should be advised to contact their doctor if a more serious eye reaction occurs.

ADVERSE REACTIONS

Clinical Studies Experience

Because clinical studies are conducted under widely varying conditions, adverse reaction rates observed in the clinical studies of a drug cannot be directly compared to rates in the clinical studies of another drug and may not reflect the rates observed in practice.

In two clinical trials of patients with neurotrophic keratitis, a total of 101 patients received cenegermin-bkbj eye drops at 20 mcg/mL at a frequency of 6 times daily in the affected eye(s) for a duration of 8 weeks. The mean age of the population was 61 to 65 years of age (18 to 95). The majority of the treated patients were female (61%). The most common adverse reaction was eye pain following instillation which was reported in approximately 16% of patients. Other adverse reactions occurring in 1-10% of OXERVATE patients and more frequently than in the vehicle-treated patients included corneal deposits, foreign body sensation, ocular hyperemia, ocular inflammation and tearing.

USE IN SPECIFIC POPULATIONS

Pregnancy

Risk Summary

There are no data from the use of OXERVATE in pregnant women to inform any drug associated risks.

Administration of cenegermin-bkbj to pregnant rats or rabbits during the period of organogenesis did not produce adverse fetal effects at clinically relevant doses. In a pre- and postnatal development study, administration of cenegermin-bkbj to pregnant rats throughout gestation and lactation did not produce adverse effects in offspring at clinically relevant doses.

Lactation

Risk Summary

There are no data on the presence of OXERVATE in human milk, the effects on breastfed infant, or the effects on milk production. The developmental and health benefits of breastfeeding should be considered, along with the mother's clinical need for OXERVATE, and any potential adverse effects on the breastfed infant from OXERVATE.

Pediatric Use

The safety and effectiveness of OXERVATE have been established in the pediatric population. Use of OXERVATE in this population is supported by evidence from adequate and well-controlled trials of OXERVATE in adults with additional safety data in pediatric patients from 2 years of age and older.

Geriatric Use

Of the total number of subjects in clinical studies of OXERVATE, 43.5 % were 65 years old and over. No overall differences in safety or effectiveness were observed between elderly and younger adult patients.

NONCLINICAL TOXICOLOGY

Carcinogenesis, Mutagenesis, Impairment of Fertility

Carcinogenesis and Mutagenesis

Animal studies have not been conducted to determine the carcinogenic and mutagenic potential of cenegermin-bkbj.

Impairment of fertility

Daily subcutaneous administration of cenegermin-bkbj to male and female rats for at least 14 days prior to mating, and at least 18 days post-coitum had no effect on fertility parameters in male or female rats at doses up to 267 mcg/kg/day (1709 times the MRHOD).

In general toxicology studies, subcutaneous and ocular administration of cenegermin-bkbj in females was associated with ovarian findings including persistent estrus, ovarian follicular cysts, atrophy/reduction of corpora lutea, and changes in ovarian weight at doses greater than or equal to 19 mcg/kg/day (119 times the MRHOD).

Dompé

the Ophthalmologist

POWER *List*

NOMINATE NOW!

2023 will be the 10th anniversary of the Power List

The theme will be
'Ten years of Excellence and Impact in Ophthalmology'

Who do you think should be included on this prestigious list as we look to celebrate the leaders and influencers who have truly made a difference over the past decade?

NOMINATE AND TELL US NOW

Keep Fighting

In turbulent times – such as the 2020s – remember to fight for the profession and, most importantly, for your patients

We are barely three years into the 2020s and they are already proving to be one of the most tumultuous decades most of us remember. The most disruptive events of the recent years – the pandemic and the Russian invasion of Ukraine among them – have had a direct impact on medical professionals, including ophthalmologists, and it has been no different with the recent unrest in Iran.

The death of Mahsa Amini sparked a conflagration of anti-regime protests worldwide, with demonstrations in Iran seeing security forces use brutal force, including shotguns, against revolting crowds. With many protesters and bystanders being hit with dozens of pellets, shots in the eyes are not uncommon. Over 400 Iranian ophthalmologists have now signed a letter to the Iranian Society of Ophthalmology Secretary General, Mahmoud Jabbarvand, ensuring he is aware of security forces aiming to blind protesters (1). Since mid-September, eye care professionals in Iran have seen over 500 people blinded by pellets and bullets (2).

This is reminiscent of mass protests in the wake of George Floyd's death, which were met with brutal suppression tactics, including the use of rubber bullets. American ophthalmologists also made sure to advocate for their patients and the general public. In June 2020, the AAO released a statement, calling on "domestic law enforcement officials to immediately end the use of rubber bullets to control or disperse crowds of protesters" (3). In "No Magic Bullet," Ravi Goel wrote, "As ophthalmologists, it is our job to represent the best interests of our patients, whether in the exam room or the statehouse" (4), speaking for the thousands of patient advocates among you.

Although in these turbulent times, it may be difficult to look to the future with hope, being part of a strong, tight community can help – and ophthalmology certainly represents that. For The Ophthalmologist, 2023 will mark its tenth anniversary and see its 100th issue. Sadly, I will be celebrating it from a distance; after 40 issues, the time has come for me to move on, and leave the magazine in the capable hands of Editor Jon Greenaway and Associate Editors Oscelle Boye and Sarah Healey. I can sincerely say that the four years I spent with you all has been the most rewarding and exciting time in my career. The ophthalmology community is a welcoming and fascinating bunch of people and I will recall every conversation, interview, and interaction I had with you with genuine glee. Thank you for all your help, and I wish The Ophthalmologist another 10 years of success!

Aleksandra Jones
Editor

Reference

1. *The Guardian, "Iranian forces shooting at faces and genitals of female protesters, medics say" (2022). Available at: https://bit.ly/3FJoA3u.*
2. *Iran International, "Doctors say Iran's use of 'birdshots' blinded hundreds of people" (2022). Available at: https://bit.ly/3W8lP0U.*
3. *AAO, "Nation's ophthalmologists condemn use of rubber bullets" (2020). Available at: https://bit.ly/3nocfqc.*
4. *R Goel, "No Magic Bullet," The Ophthalmologist (2020). Available at: https://bit.ly/3hd7q4A.*

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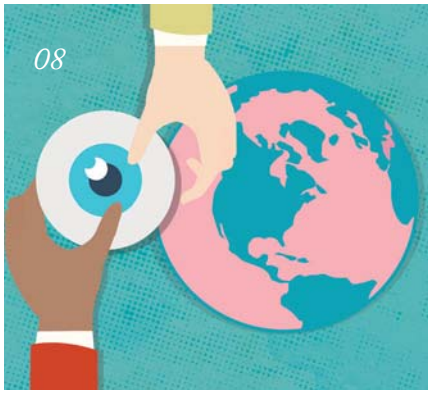

Practice Fundamentals

Sitting Down With...

the Ophthalmologist

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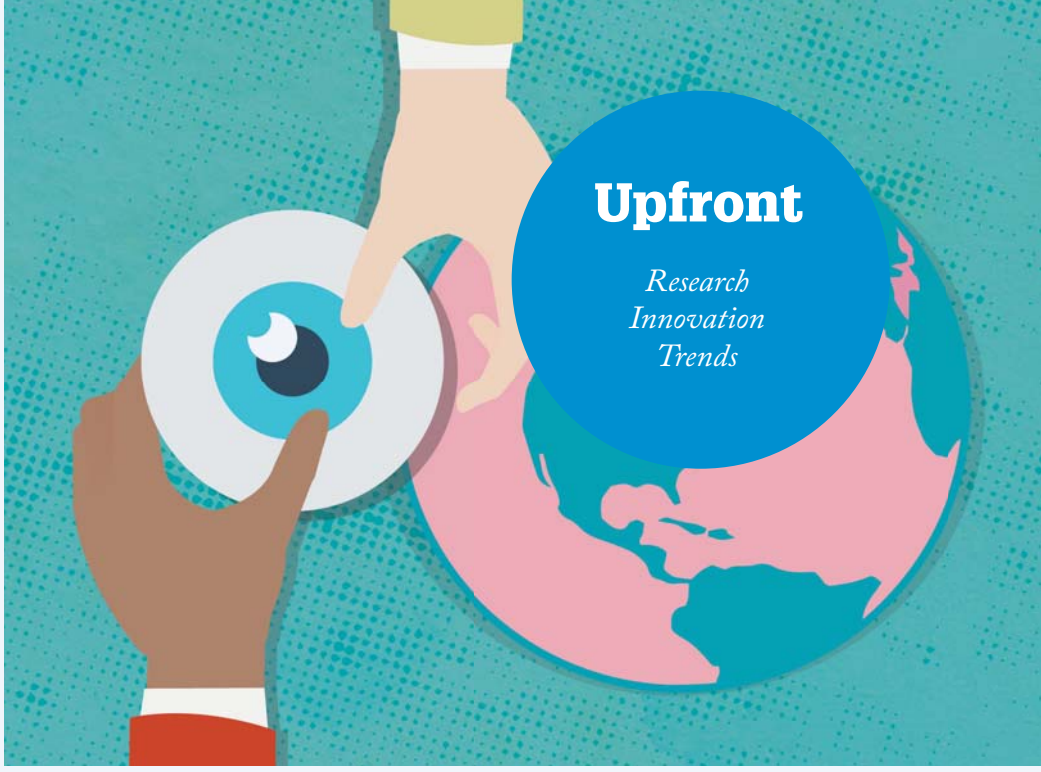


WHO Can Change Things?

Only 43 percent of people over 50 have received corrective treatment for refractive error

Researchers from the Vision Loss Expert Group, led by Rupert Bourne of Anglia Ruskin University and Cambridge University Hospitals, have analyzed data from 169 different studies worldwide to determine treatment coverage figures for refractive error in several regions. Perhaps unsurprisingly, coverage varies dramatically worldwide; though the treatment rate is 79 percent in high-income countries, it drops to just 5.7 percent in sub-Saharan Africa (1). Alongside geographical differences, the study also highlights lower levels of coverage for women in all defined world regions. Other than longer life expectancy among women, there is little evidence that biological sex-based differences contribute to this; rather, differences in healthcare access explain the observed gender inequity.

In response to the discouraging statistics, Bourne said, "There are multiple social and cultural reasons that influence coverage of treatment for refractive error [...]. The lower coverage among women is most striking. We believe that differences in access to healthcare and take-up of services are likely to be the main reasons for this gender inequality" (2). These findings echo a recent article by Syeda Asma Rashida on unequal access to healthcare in Bangladesh and highlight the urgency of addressing discrimination in healthcare settings (3).

To combat the issue, the WHO aims to increase treatment coverage for distance refractive error by 40 percent by 2030. To meet this target, countries must consider interventions to improve access to quality healthcare services. These will include better government oversight, more clinical regulation, and the standardization of training programs for refraction. Increasing the number of access points in low- and middle-income countries at the community and primary care level will increase the quantity (and therefore availability) of these services and pave the way for universal access to eyecare.

References

1. *RRA Bourne et al., Lancet Glob Health, [Online ahead of print] (2022). PMID: 36240807.*
2. *Anglia Ruskin University (2022). Available at: https://bit.ly/3UqFCrD.*
3. *SA Rashida, The Ophthalmologist (2022). Available at: https://bit.ly/3URGSnq.*

Photo Opportunity

Researchers partially restore vision using photoreceptor-like cells derived from human amniotic epithelial stem cells

A team from China has partially restored vision in rats with retinal degeneration by transplanting photoreceptor-like cells that were grown from human amniotic epithelial stem cells (hAESCs) (1).

To differentiate the hAESCs, the group treated them with agents designed to drive their growth into the desired cell type – producing cells that demonstrate the behavior of natural photoreceptor cells.

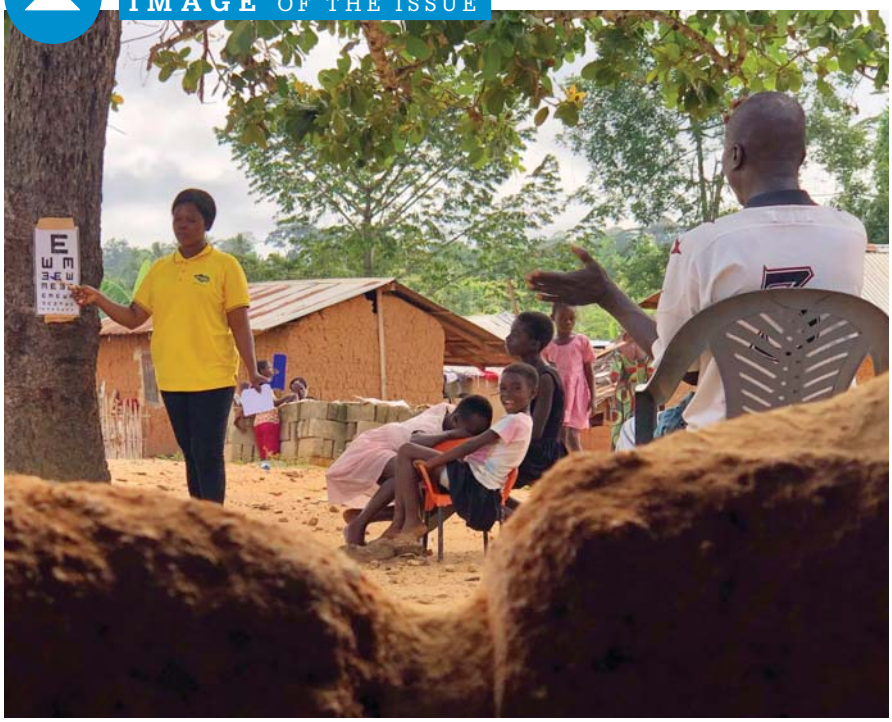
Contrary to immunogenicity concerns with embryonic stem cells (ESCs), hAESCs – and the photoreceptor-like cells grown from them have low levels of immunogenicity and were successfully transplanted.

Given the partial restoration of eyesight in rats and the efficient sourcing of tissue compared with other stem cell methods, the authors were hopeful about the future of this technique but noted the need for additional studies into optimal cell doses.

Reference

1. *J Li et al., Int J Mol Sci, 23, 8722 (2022). PMID: 35955866.*

IMAGE OF THE ISSUE



Global Blind Spot

The winning entry of the World Sight Day 2022 Photo Competition is our image of the issue

Credit: "Eye Screening at Jukwa, Ghana," by Kwame Yeboah, got this year's professional Photo of the Year award at the World Sight Day 2022 Photo Competition organized by the International Agency for the Prevention of Blindness (IAPB).

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

QUOTE OF THE MONTH

"I want us all to live in a society without discrimination and, it is important to me that people know their rights and that their voices are heard."

Syeda Asma Rashida, Sightsavers Project Manager, Dhaka, Bangladesh

Paint Blank?

New research indicates that the word "gun" in "paintball gun" should be taken more seriously

Paintball guns are often viewed as harmless toys, especially when compared with their bullet-firing counterparts. However, research from the University of Chicago Medicine, Illinois, USA, has yielded some alarming results upon examining the injuries inflicted upon innocent bystanders assaulted with paintball guns (1).

Drive-by paintball shootings have increased over the past few years – but things in Chicago seemed to come to a head in October of 2021. A single weekend that left eight paintball shooting victims in its wake prompted researchers to investigate the damage such weapons were causing. Assessing 20 patients who had received eye injuries from paintball gun assaults, the researchers found that most patients required surgical intervention and a quarter of those examined were left blind in one eye. Half of the patients who needed surgery suffered a ruptured globe and half of those eventually required an evisceration.

There are a number of potential solutions to prevent future injuries, including better regulating paintball gun sales and restricting their velocity.

See references online.

In My View

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

An Eye on Inclusivity

Promoting and advocating for LGBTQ+ inclusivity in ophthalmology

By César A. Briceño, Associate Professor of Clinical Ophthalmology, Penn Medicine, Philadelphia, Pennsylvania, USA

I first developed an interest in healthcare policy and equity surrounding the LGBTQ+ community in my first year of medical school, when I volunteered at the Gay and Lesbian Community Center of Baltimore. I came out as gay during my college years in a very open and permissive environment, but working at the GLCCB made me realize that not everybody grows up in New York City, where diversity is (mostly) embraced. I am now an oculoplastic surgeon at the University of Pennsylvania and have become an advocate for the LGBTQ+ community. Although LGBTQ+ health and ophthalmology may not seem directly linked at first, there are many little-known factors that impact quality health care.

Inclusivity at work

LGBTQ+ inclusivity consists of two distinct factors. The first is respecting LGBTQ+ diversity within our patients and accommodating their unique healthcare needs. The second is ensuring that we create friendly environments for our colleagues. In most societies, it is okay to talk about gender and sexual identity if you are cisgender and heterosexual, but these conversations quickly become taboo if you identify outside these constraints. A report commissioned by the Human Rights Campaign (1) found that 46 percent of LGBTQ+ workers are closeted at work and a further 31 percent report being depressed or unhappy in the work environment. Although improvements are being made, the report indicates that there is a long way to go.

Losing talent

This marginalization affects not only workers, but also employers. Many employers' anti-LGBTQ+ biases spur valuable employees to change jobs. LGBTQ+ individuals often lie about their personal lives, avoid work events because they are reluctant to bring a significant other, and eventually seek other employment. Normalizing openness and acceptance with respect to gender and sexual identity in the workplace would go a long way toward decreasing the stigma that often accompanies it. There is an unfortunate social mindset, that by speaking about sexuality and gender, you are implicitly referring to inappropriate and tawdry topics. This couldn't be further from the truth. When we speak about our husbands and wives, even in heterosexual relationships, we are speaking about sexuality and gender. This is where the double standard lies.

Implementing change

There are simple changes we can make to welcome people of all genders and sexual orientations. Avoiding specific gendered markers when greeting someone is easy; there is no need to use "Ma'am" or "Sir" when offering help. People are sometimes uncomfortable asking questions regarding pronouns in case they offend someone – but I think not asking risks even greater offense if your guess is wrong. A cisgender individual might take offense at being asked, but there are ways to diffuse this type of situation. One example would be making it a policy to ask for pronouns in your practice or workplace. That way, it's clear that you ask everyone, rather than suggesting that certain individuals' gender presentation may not fit into binary norms.

Improving ophthalmology

Ophthalmic evaluation has the benefit of being highly objective, but it is important not to underestimate the importance of a thorough social history. Determining whether a patient is trans, has HIV, or is undergoing hormone therapy is important for managing repercussions that may affect a patient's eye health. Creating a space in which patients feel comfortable telling their stories is therefore essential. Although not solely a LGBTQ+ problem, the issue of intimate partner violence (IPV) is also important to acknowledge in ophthalmology; Erin Shriver talks more about this in an article she published (2) about orbital fractures

born of IPV. Unless changes are made and questions become the norm, patients could go back to dangerous environments without the opportunity to voice their situation and seek help. Socioeconomic factors must also be considered. The LGBTQ+ community is not monolithic, but multifaceted and varied; in the USA, for instance, trans women of color are more likely to be in poverty, making it important to explore finances and to recommend affordable, accessible treatment when needed. We recognize many important social determinants of health in internal medicine; they should be equally recognized in ophthalmology. I think that, the more we can educate ourselves about our patients' social situations, the better we are as providers.

Small steps

The talk I gave at the American Academy of Ophthalmology (AAO) a few years ago about communicating with trans patients was the first of its kind at the AAO (3). I have since worked with a dedicated group of physicians and staff at the AAO on live and video sessions that specifically deal with treating marginalized patient populations. When the AAO launched their online community platform, they also created a space dedicated to LGBTQ+ members who wished to seek mentorship, share their experiences, and develop communities. These things may seem like small steps but, in a surgical subspecialty (especially in the US), they are significant. There is still work to be done – but if we make the pursuit of progress part of our everyday lives, we can create more inclusive working environments that benefit both patient and practitioner.

See references online.

Delivering Value-Based Eye Care

How one team is creating a surgical outcome-based registry that puts the patient at the center of care

By Erin McEachren, Regional Vice President, Europe, Middle East & Africa, Johnson & Johnson Surgical Vision

I am passionate about value-based healthcare for patients in Europe, the Middle East, and Africa. This is why, about two and a half years ago, my team and I began a surgical outcome-based registry project focused on gathering patient data from industry groups, NGOs, and major eye care institutions that have committed to being transparent. We asked these partners – including our customers – for their registries so that we could explore variations in ophthalmic patient surgical outcomes and ensure that they are more predictable and standardized in the future.

We have been entering into agreements with clinicians who are happy to participate in this project, collecting their pre- and post-op datasets, and tracking outcomes

using an application we have created that can be integrated into any hospital system. Recently, we have seen a significant increase in clinicians interested in participating in the project. Once we receive their data, we look at the whole spectrum of patient involvement – discussions prior to surgery, surgical techniques, and outcomes. We also consider standardized patient-reported outcomes measurement data. We then compare outcomes in different institutions and look for any variations.

We have found that the database we've created has already been helpful in reducing spend, in part because it encourages institutions to adopt market innovations. For me, though, improved patient-centric measurements are the most important part of this project.

Focus on the patient

This is why, following work with partners in France and Switzerland to gather patient comparisons from 10 different hospitals, we have started a value-based healthcare pilot in partnership with the Rotterdam Eye Hospital in the Netherlands. Working in Europe is interesting, but also challenging, because there are many different healthcare systems to navigate, each working differently. For partly or fully publicly funded healthcare systems and teaching institutions, it is crucial that datasets are available to justify the value of any product, device, or technology they may be considering. We have seen that ophthalmologists across Europe are keen to start conversations about standards and reducing outcome variability. We have received great feedback from clinicians, who hugely value our scientific and evidence-based approach and are keen to ensure that practice is not influenced by any biases or socioeconomic factors.

I believe that value-based healthcare is not just central to Johnson & Johnson Vision's strategy, but will be the foundation of ophthalmology's future. Creating standards and reducing outcome variability is exciting – and I feel inspired to be working with so many great partners to create a new, more patient-centric approach to care.

HOW **THE FUTURE** *HAPPENS*

Taking an idea all the way to a finished product or technology is not an easy or a quick process – it requires a lot of determination and patience. Here, top ophthalmic innovators – David Huang, Malik Kahook, and Sean Ianchulev – share their stories of commercializing ophthalmic ideas, and we present recent innovations that have made it all the way.

PEOPLE POWER

Finding the right people to help develop your idea – and sharing credit – is the secret to a successfully commercialized technology

By David Huang

My first ophthalmic innovation idea was optical coherence tomography (OCT), developed over 30 years ago when I was a PhD candidate at the Massachusetts Institute of Technology (MIT) and a medical student at the Harvard Medical School in Cambridge, Massachusetts, US – it was a joint MD/PhD program. At the time, I wasn't focusing specifically on ophthalmology but, having looked at several applications, my team saw OCT as likely to make a difference in retinal imaging. It was a success and has been developed, commercialized, and used very widely, which gave me a lot of confidence to innovate further.

When working on OCT, I was mainly involved in developing the prototype and doing the initial ex vivo experiment. My PhD supervisor, James Fujimoto, Professor in Electrical Engineering at MIT, our business partner, Eric Swanson, and the retina specialist who first used it, Carmen Puliafito, were the main people involved in setting up our startup. The first patent included swept-source OCT. We got a great team for our first clinical demonstration, marketed the invention to quite a few companies, and got a lot of interest. Eventually, it was picked up by ZEISS, although we had some early interest from Topcon.

Going it alone or in good company

I'm very familiar with the technology licensing model of commercialization. This was what happened with the anterior segment OCT, which I developed when I was based at the Cleveland Clinic with Joseph A. Izatt, then Assistant Professor of Biomedical Engineering at Case Western Reserve University, Cleveland, Ohio. With this licensing deal, I became a consultant for ZEISS for a number of years and was involved in developing the product concept. I also worked with Optovue, initially developing glaucoma analytics software and, later on, OCT angiography algorithms. I was a consultant for Optovue around 2006 for a short time; after that, I was a collaborating partner. Many of my patents have gone through university technology licensing.

One company that I started myself in 2011 is GoCheckKids – a smartphone flash photography-based technology used to detect refractive error and amblyopia risk factor in pre-school children. I ran the company as its CEO for a couple of years and then found a full-time CEO and venture capital to run it. The company has marketed a product and has already screened five million children. More recently, I have set up another startup focusing g on laser thermal conjunctivoplasty. It's quite unusual for me to focus on treatment rather than diagnostics, but devices used for treatment tend to generate more revenue. I'm interested in anything to do with optics, imaging, or lasers!

Who can help

Over time, I have seen many universities become more sophisticated when it comes to developing and licensing new technologies. I was lucky to have started at MIT, which has been leading the way with its strong technology licensing groups, and my current institution, the Oregon Health and Science University, has also done a good job. I hope this trend spreads to more academic institutions in the near future, because it is a great help to innovators.

When I first started in 2011, I wasted a lot of time by asking the wrong people for funding. It is important for inventors to have a good knowledge of the venture capital community and to address their pitches to people who specialize in ophthalmology or medical devices and know the field well. They are not only

more likely to invest in an idea, but may be able to offer advice and help find people with the right business expertise and experience, including the future company CEO, developers, and marketers.

Finding people with the right expertise and building a team is probably the hardest and most time-consuming part of the commercialization process. Among other things, you have to be able to convince clinicians to work with you on implementing the technology into practice and trying things out in the clinic. Clinicians and researchers often don't want to work on other people's ideas, so you may have to find a good way of distributing the credit; that way, people will be invested in working on your idea. There are many issues to solve as part of an implementation process, so it is not difficult to share credit with your partners who develop these solutions. It is always better to have a small part of a big pie than to have 100 percent of unrealized ideas worth nothing.

The ones that didn't work…

Around 2000, when I was still a resident, I wrote a patent for a laser thermal keratoplasty to correct astigmatism and keratoconus, but I never managed to secure funding to commercialize it. When I saw other similar devices on the market, I abandoned the idea. It was probably a good thing that I didn't spend too much time and money on commercializing it, because the clinical results of the other devices were quite poor.

Before developing OCT angiography, my team worked on measuring total retinal blood flow using Doppler OCT and published extensively on it. It didn't have many applications and the accuracy wasn't great, so it never got commercialized as a clinical product, but I am still interested in that research area. I have thoughts on how to make this solution much more accurate, with applications in ocular diseases and beyond. There are always ideas that flounder for decades, but then get reincarnated in a different application.

> "THERE ARE MANY ISSUES TO SOLVE…SO IT IS NOT DIFFICULT TO SHARE CREDIT WITH YOUR PARTNERS WHO DEVELOP THESE SOLUTIONS."

Innovators and innovations I admire

Mark S. Blumenkranz, Director of the Stanford Byers Eye Institute in Palo Alto, California, USA, is is very good at matching technology to ophthalmic needs. He has started a series of really impressive companies offering very useful solutions. I have also found Theo Seiler's idea of cross-linking to be at the intersection of widely divergent fields. To come up with a solution like that takes a lot of creativity – and it has made such a big difference in the field.

Recently, I have been very impressed with the Light Adjustable Lens developed by RxSight – the non-obvious chemical engineering material science idea got matched so well to an existing gap in cataract surgery. Matching technological and clinical insights is not common and I admire it greatly.

DAVID HUANG'S RECIPE FOR INNOVATION SUCCESS

- Build a good network of experts in the field and investors focused on your area of expertise.
- Come up with a technical solution.
- Check clinical applications and decide whether there is a big enough clinical need for your invention to make an impact.
- Look around and see if your solution is novel enough and better than what's currently available.
- Talk to experienced contacts to establish viability (you may consider acquiring a provisional patent first).
- Secure funding.
- Find the right team.
- Have patience!
- If, in five to 10 years, your idea is not yet developed, but the clinical need is still there and solutions are not forthcoming, it's definitely worth revisiting and making it a success.

David Huang is the Martha and Eddie Peterson Professor of Ophthalmology and Professor of Biomedical Engineering, Associate Director & Director of Research at the Casey Eye Institute, School of Medicine, Oregon Health & Science University in Portland, Oregon, USA.

LEARN FROM YOUR ELDERS

Serial ophthalmic inventor Malik Kahook – creator of the eponymous Kahook Dual Blade – talks about his successes… and his failures

Tell us about your first ophthalmic innovation idea and its commercialization process…

My first ideas for ophthalmic innovations came to me during my first week as a trainee at the University of Colorado, when I started examining patients and wondering how we could be more efficient in clinic flow and documentation. However, my excitement and focused attention to new ideas and inventions started in earnest when I entered the OR and did my first cases as a late first-year and into my second year of training. I was fortunate to have great support from my attendings and several of the ideas resulted in patents and one (the Verus capsulorhexis caliper) was commercialized a few years later.

What has the commercialization process been like for you?

I've been lucky to have had a few devices commercialized over the years and many were initially contemplated during my early training and into my first years as an attending at the University of Colorado. The Kahook Dual Blade was the first large-scale commercial product that came out of my lab, developed in partnership with New World Medical. Years of development resulted in a global launch in 2015 and we continue to collaborate and innovate in the space today. It has been a great partnership.

The process of ideation, developing, patenting, testing and retesting, clinical trials, and then commercialization is typically similar across different projects. There is of course some variability depending on the product and specific approach, but the steps are usually similar from one project to another. However, the commercialization effort varies considerably. Depending on the product and commercial fit, devices might be launched in only one region or – at times – globally. Reimbursement and competitive landscape enters into the equation and I have learned a great deal from companies – both large and small – about how they consider these different options for launch. This is not something doctors are not typically trained to do. I've now expanded my knowledge and expertise to the point where future product launch efforts now enter into my ideation and refinement routine so that commercialization realities are part of the early invention process.

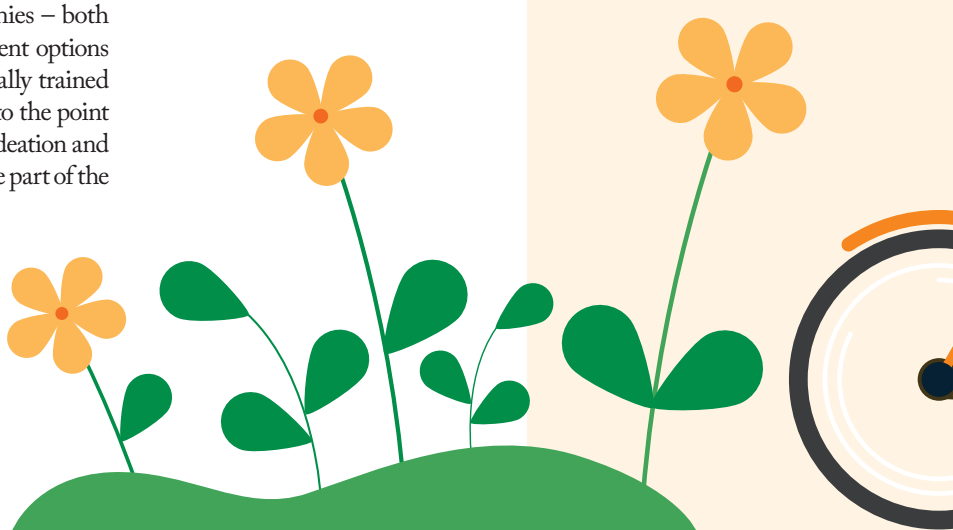
We've heard a lot about your successes, but have you had any failures?

I have had many failures along the way. Some of the devices that I have launched were successful in accomplishing the therapeutic goals, but market dynamics resulted in difficult uptake and adoption. This was the case with the Verus capsulorhexis ring that worked well and gained a significant following, but we lacked the commercial push to train and serve users appropriately. This was a great lesson for me to make sure we had the right partners to launch products once they were ready for wide use. There have been other devices that either did not meet our anticipated benefits or that failed to get needed funding along the way. The innovation process is as much perseverance and patience as it is design and development. Failure is just part of the journey.

> "THE INNOVATION PROCESS IS AS MUCH PERSEVERANCE AND PATIENCE AS IT IS DESIGN AND DEVELOPMENT."

What advice would you offer to young ophthalmic innovators?

My number one piece of advice is to seek mentorship from those who have traveled down a road you want to emulate. Having a resource available that can explain how to do things and how to avoid mistakes will cut out years of trial and error and provide guidance that will save both time and money. Networking in your field and reaching out to people who have skill sets different than your own is imperative.



Innovation in ophthalmology is still clustered within a small ecosystem. Find ways to become part of that ecosystem and expand your rolodex so that you know whom to call and when to call and that people will respond when that time comes. What we do is all about human connections.

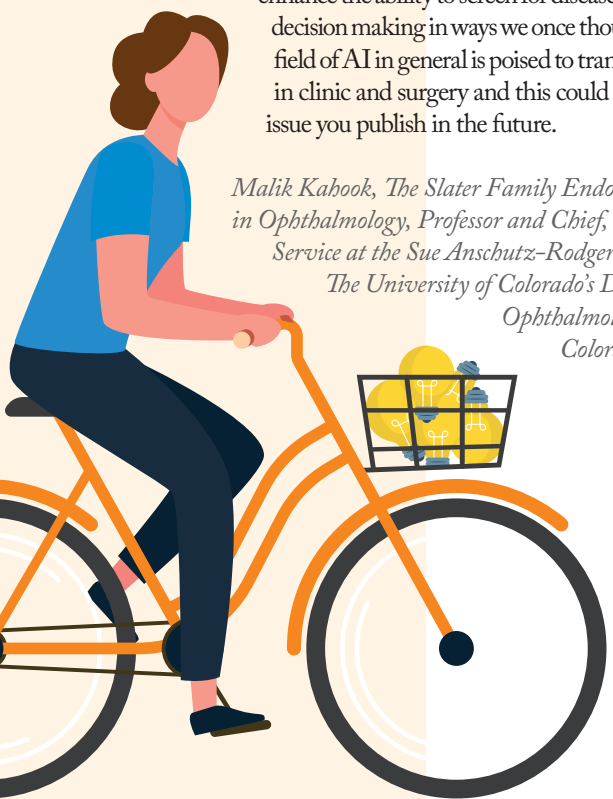
What projects or innovations are you working on now?

I am mostly focused on products coming out of our incubator, SpyGlass Ophthalmics, with the first product coming from a company called SpyGlass Pharma. SpyGlass is currently in clinical trials with a drug delivery approach that will allow for long-term treatment of glaucoma at a point of care that is different from other devices I have seen over the years. Stay tuned and follow www.spyglasspharma.com for near-term news that I think will be exciting for both surgeons and patients.

Which ophthalmic innovators are the ones to follow?

I'd like to mention a couple of my colleagues who certainly deserve a great deal of attention. Jayashree Kalpathy-Cramer, Chief of the Division of Artificial Medical Intelligence in Ophthalmology at the University of Colorado School of Medicine, who innovates in the AI space. I expect great things from her after joining our department and look forward to seeing how her team can create digital tools to transform our daily practice. Pete Campbell is a very innovative ophthalmologist from the Oregon Health and Science University in Portland,] USA, who is doing interesting work in AI and diagnostic devices. I've enjoyed reading his papers and having discussions with him about both software and hardware approaches that will enhance the ability to screen for disease and ultimately drive decision making in ways we once thought impossible. The field of AI in general is poised to transform our daily lives in clinic and surgery and this could be the topic of a full issue you publish in the future.

Malik Kahook, The Slater Family Endowed Chair in Ophthalmology, Professor and Chief, Glaucoma Service at the Sue Anschutz-Rodgers Eye Center, The University of Colorado's Department of Ophthalmology, Aurora, Colorado, USA.



The Ones That Made It…

THE LIGHT ADJUSTABLE LENS

The Light Adjustable Lens (LAL) from RxSight is changing the way cataract surgery is performed. Prior to the LAL, cataract surgeons used estimations to predict the vision each patient will be satisfied with after cataract surgery. With the LAL, it is the patient who trials and selects their final desired vision in real-world settings after the cataract has been removed and the eye has healed. One of the biggest surprises to the growing LAL user base of 343 practices, is the realization that the pre-surgical target is often irrelevant, even when the predetermined target is hit. Patients routinely select and are highly satisfied with unexpected final optimized vision after test driving the LAL for a couple of weeks. For the approximately 600 LAL-implanting surgeons in the US, the ability to adjust the lens is turning "bad chair time" into "good chair time" – particularly as the LAL also reduces negative patient interactions from unwanted visual symptoms because it does not split light due to its properties as a monofocal adjustable lens. Now, eye care professionals and cataract patients are quickly discovering the reality of truly customized vision with the LAL, and in the long term it is hard to imagine them accepting anything less.

PHOTOBIOMODULATION

LumiThera Inc. is a medical device company commercializing an in-office, multi-wavelength device that improves vision and slows the progression of vision loss in patients with degenerative eye disease. The company's focus so far has been on the treatment of patients with dry AMD. LumiThera has significant expertise in the use of photobiomodulation (PBM), which is the stimulation of cells using light of selected wavelengths.

LumiThera's Valeda Light Delivery System provides an innovative platform to address acute and chronic eye disease. The potential to develop noninvasive treatments for dry AMD, diabetic retinopathy and macular edema, Stargadt's disease, glaucoma, and other types of injury to the eye underscores a broad PBM treatment approach. The recent acquisition of biomarker devices such as electroretinogram (ERG) and the artificial intelligence (AI)-directed wearable AdaptDx dark adaptometer to identify patients early in disease and allow monitoring of treatment benefits has created a unqiue company with a robust portfolio that allows eye care providers to diagnose, treat, and monitor.

The future for LumiThera may provide a wearable design that can provide a voice-directed approach to transform the way we address degenerative disease.

ROI: RETURN ON INNOVATION

How you can be part of the near-future landscape of new ophthalmic technologies

By Sean Ianchulev

During my residency training, my team began to see a number of cataract surgery patients who had undergone LASIK, and it was quite tricky to figure out the correct power of the intraocular lens. This is when I came up with the idea of performing intraoperative biometry to calculate the IOL power. I patented this innovation, it was commercialized by Wavetech – later acquired by Alcon – and is now being used for millions of patients worldwide.

My second idea – developed around the same time – was also influenced by cases I was seeing in the hospital where I did my training, this time large numbers of glaucoma sufferers. The waiting time for glaucoma diagnostics was almost four months, soI came up with a solution that didn't require hardware: virtual remote monitoring and testing for glaucoma. Because both of those innovations were conceived when I was still in training, I make the point of telling my residents that they don't have to focus solely on patient care; they can start innovating early and come up with technologies that can transform that care in the future. I am currently mentoring a couple of innovators who have had great ideas and are trying to turn them into reality by setting up ventures.

The commercialization process

I started commercializing my innovations by just pursuing an idea and following a natural thread of speaking to people who could guide me through the process, assembling the right teams, and raising funds. I have compared starting a company to building a car; you need all elements to function properly independently – with different people having expertise in different fields – but you also need everything to work well together. When asked by other physicians who want to innovate about setting up a company, I try to make it clear that it isn't a linear process, and it certainly isn't easy – so sometimes licensing your idea may work better! However, I have found that people get so passionate about

their ideas and products that they prefer to pursue the pathway of privatization and raising capital to set up their own companies. Unfortunately, most physicians don't have the skills or experience to commercialize products or technologies. It's also not easy to do it part time and combine it with a busy surgical practice; it's often an all-consuming affair. In the past, and with simpler technologies, it was much easier, with no complicated research and development processes needed and no requirements for clinical trials, but the process has changed a lot.

These days, to develop a new medical solution, you have to go through a very sophisticated cross-functional matrix process, taking people and resources into account. The process can last between five and 10 years,and cost US$60-100 million. Doing that on your own from scratch and on a shoestring budget is almost impossible, so surrounding yourself with the right mentors is absolutely critical. There comes a point where you have to consider deploying capital to hire regulatory and manufacturing experts. You have to be able to lead and manage people efficiently and inspire them to follow a common goal, because they may be used to working for a big corporation, but you need to get the best out of them in a tiny start-up setting. You also have to be able to articulate your vision to "sell it" to investors.

Inspiring investors

I have learned that dealing with investors is like dealing with patients; they want to put their money to work and they want something meaningful in return. Often, you are the only person they are dealing with who knows the technology inside out, who understands the science, and who can explain it to them. This is exactly what investors want to see. You need to develop an almost paternalistic approach in which you address their questions and concerns and manage them just like you would manage a patient. Remember that most

THE OKUSTIM SYSTEM

Innovation in medical devices is a careful balance of patience, persistence, and relevance. Relevance in this field is, more than anything, directly related to patient centricity. Companies can only be relevant if their products and services make a positive difference to patients' lives.

Okuvision is confident that its innovation can immediately have a significant impact on the treatment pathway for inherited retinal dystrophies (IRDs) by giving patients and doctors an option to address a currently incurable ocular disease and, in the near future, other degenerative eye conditions. By enabling patients to take the management of their condition into their own hands and into the comfort zone of their private space, Okuvusion can take pressure off primary and secondary care facilities, not only within the treatment pathway but also by limiting vision-related A&E episodes. Okuvusion is working hard on improving accessibility to its therapy by initiating a shift from an out-of-pocket payment model towards commissioning by (national) health systems.

Disease and therapy awareness still have a way to go in the field of IRDs. Okuvusion sees its role here in the work with stakeholders from clinical and patient advocacy backgrounds to improve the situation for all patients. The company hopes that the initiatives that have begun in some countries to improve early diagnostics for IRD patients will improve further, and guidance and access to care become the norm, not an exception.

THE VISIOLITE® OPHTHALMIC LASER SYSTEM

The VisioLite Ophthalmic Laser system is Ace Vision Group's innovation in microporation therapeutics, a new field in ophthalmology. The first therapy developed in the company's series is laser scleral microporation (LSM) to address ocular rigidity or cross-linking of the sclera that occurs with age. Ocular rigidity is a known cause of loss of dynamic range of focus, resulting in loss of clear vision for near, intermediate, and far vision or the ability of the lens to dynamically adjust for various distances. In addition, ocular rigidity has been correlated with other ocular diseases such as glaucoma, certain types of cataracts, and AMD. To date, there has been no technology to address the etiology of the problem of aging eye or "presbyopia," which is not a refractive error, but an aging disease. The pathogenesis of presbyopia is rooted in the biomechanical dysfunction that is a result of the progressive cross-linking occurring in collagen bond within the connective tissue myofibril structure of the sclera in addition to similar pathogenesis that causes lens stiffness. LSM is the only noninvasive therapeutic solution that addresses the real problem of presbyopia, introducing "uncross-linking" for the first time to destruct the compressive forces of cross-linking and the accompanying biomechanical stiffness, which prevent the effective resultant forces of the ciliary muscle from accomplishing the visual tasks associated with the dynamic function of adjusting the eye's focus from near to far and far to near.

investors are risk-averse, so try putting yourself in their shoes, remove the risk from the project as much as possible and, if some remains, explain it very clearly. Investors usually have passion for healthcare and life sciences and don't want to miss a successful innovation, so they appreciate transparency and openness.

It all becomes easier once you have developed a track record of successful projects. If you are a new innovator who doesn't yet have a proven track record, make sure you surround yourself with people who do – invite them to your board and get them involved in research and development. These are the people who can vouch for you.

Failing to succeed – or succeeding to fail?

It is so easy for a success to become a failure and vice versa. I see almost every failure as a success in the making; most finished products were once a string of failures that have been overcome, because developing new technologies is anything but straightforward. What I tend to remember about a commercialized idea is not the day I knew it succeeded, but all the hard work throughout the years previous to that. Remember that succeeding at innovation often depends on where you are based. I immigrated to the US from Bulgaria, which opened a lot of possibilities for me. If I had been an ophthalmologist in Bulgaria, I may have played it safe and just focused on practice. If you're in an environment that doesn't support innovation and you are passionate about it, it may be worth considering a move.

A good question for a budding innovator to ask is, "What does success mean?" For me – speaking as a clinician – it's less about the return on investment, and more about the return on innovation. The sense of achievement that comes with seeing a specific product or technology that you helped develop used by your peers is unparalleled. Recently, my team went to Panama on a humanitarian mission with See International. We did around 200 cataract surgeries and donated miLOOPs – lens fragmentation devices I developed that got acquired by ZEISS – to the local surgical team. They told us they couldn't do without them; they use them for almost every other case.

Twists and turns

Some innovations – and Cypass may serve as a good example here – bring a great return on investment and financial success for investors, but may prove to be failures if they are not serving patients as intended. And they may have taken thousands of investigator years to research and develop and thousands of patient years when you consider clinical trial participation. The tricky part is that it is extremely difficult to predict which innovation is ultimately going to succeed even at the point of commercialization. The following five years, with all their twists and turns, are critical for the evaluation of the long-term viability of a specific technology.

Times and circumstances change and you may end up revisiting a failed project several years later. A good example of this is the virtual remote monitoring and perimetry testing for glaucoma that I mentioned earlier. When we developed it 20 years ago, we registered it with the FDA, but found that it wasn't easy to commercialize it at the time; Medicare ruled that physicians weren't allowed to bill for any diagnostic tests that weren't conducted in a doctor's office with the patient physically present at the clinic. This killed any hope of securing reimbursement for our solution, so we shelved this technology for commercial use in the US, but we didn't stop tinkering with it. We invented a second test for macular degeneration patients and deployed it as part of the work of our foundation for global health and outreach.

Fast forward to 2020 and the COVID-19 pandemic and we began receiving a lot of calls from clinicians asking about the online perimetry and macular degeneration tests! Glaucoma and wet AMD patients were losing

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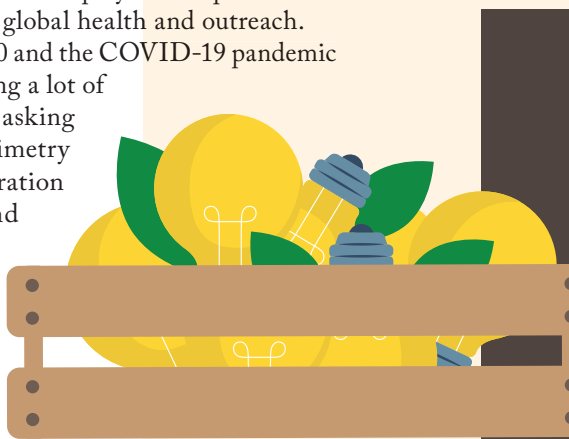


vision,and doctors didn't know which patients to prioritize and see in person. I decided to revisit this innovation, put the team back together, invested some funds, and – of course – reimbursement rules for telehealth changed. This is how KYS Vision (for "Keep Your Sight") came to life. It is now a platform for remote care and patient monitoring, with metrics fully virtually delivered to practices and patients. It is capable of screening and testing millions of patients at the same time in a scalable way.

My current projects

I have been working closely with a Dutch team developing a surgical ophthalmic robot that already has a CE Mark for use in the European Union, but we are working on getting it approved in the US, with clinical trials starting here. This project was recently acquired by ZEISS and I look forward to bringing robotics to ocular surgery.

I am also involved with a new MIGS venture, Iantrek, which uses a microinterventional technology, creating bio tissue stents that use the suprachoroidal approach. We already have registered devices, which we have been rolling out in selected US-based centers.

I have also been continuing work with the publicly traded company I founded, Eyenovia, developing smart drug delivery devices – essentially "inkjet printers for the eye." We are running multiple trials in progressive myopia and preparing presbyopia and glaucoma programs.

More recently, I have worked with a company developing a technology for AI-based screening for diabetic retinopathy. I'm an investor, I sit on the board, and have been mentoring the CEO, working hard on commercializing and rolling out this solution, for which we have just announced FDA approval with best-in-class efficacy.

"REMEMBER THAT MOST INVESTORS ARE RISK-AVERSE, SO TRY PUTTING YOURSELF IN THEIR SHOES, REMOVE THE RISK FROM THE PROJECT AS MUCH AS POSSIBLE AND, IF SOME REMAINS, EXPLAIN IT VERY CLEARLY."

What's out there...

When I was at Genentech, I was very involved in programs focusing on bispecific antibodies, and this field still fascinates and excites me. I see targeted therapies as bringing great opportunities to ophthalmology. In the gene therapy sphere, companies such as REGENXBIO are really shaping the landscape, aiming to solve the issue of sustained delivery. I see bio-engineered tissue approaches – including 3D printing – as able to replace some hardware solutions. Being able to 3D print collagen, and perhaps even corneas, will remove the great burden of harvesting corneal tissue from donors. There is a lot of great innovation coming from outside the US. I have noticed that Israel has been a focal point for it, and The Netherlands is also a hotbed of innovation, so it is worth keeping an eye on technologies coming from there.

Sean Ianchulev is Professor of Ophthalmology, New York Eye and Ear Infirmary of Mount Sinai, New York, USA; President and CEO, Eyenovia, Inc.

A FUTURE BEYOND THE CLOUDS

The ALLY™ System is the first platform to combine world-class imaging and next-generation dual-pulse femtosecond laser in a single system

Femtosecond laser-assisted cataract surgery (FLACS) is a technology that is growing and evolving, taking advantage of the "perfect storm" created by current market dynamics. The ALLY Adaptive Cataract Treatment System from LENSAR is the next stage of the FLACS evolution, taking a generational leap forward as the first platform to combine world-class imaging and next-generation dual-pulse femtosecond laser in a single system.

The continued introduction of premium IOLs is driving the need for better outcomes than the current generation of FLACS can offer. There is a growing body of clinical evidence supporting LENSAR-guided FLACS procedures and their contribution to improved patient outcomes compared with manual cataract surgery. More and more patients are looking for better post-op vision with a reduced need for glasses – and they are willing to pay a premium. Surgeons who offer FLACS are eager to support these patients by delivering superior results.

There has also been an increase in the number of private equity-owned ophthalmic groups. These practices are well funded and not only can afford a laser, but are often willing to make the investment to drive revenue, profitability, surgical efficiencies, and improved patient outcomes within the group, making FLACS an increasingly important offering to stay competitive. It is clear that use of this technology will only increase with time, so making sure FLACS is optimized to meet the needs of clinicians and provide optimal outcomes for patients is paramount.

Any innovation seeking to revolutionize a field must take into account the current state of affairs and users' unmet needs – and ALLY is no different. Developed to overcome the limitations of current-generation femtosecond lasers used in cataract surgery, ALLY makes significant strides in several key areas. The system's dual-pulse laser provides tissue-specific performance and is twice as fast in the lens and four times faster in the cornea than the current generation system. Its small footprint enables it to perform a completely sterile FLACS procedure in any operating room or office-based surgical suite, which can save up to 9.4 minutes per surgery. The system also provides a seamless transition from FLACS to phacoemulsification cataract surgery in the sterile environment, removing the need to move between rooms or beds and reducing the required prep, improving the experiences of surgeons, staff, and patients. The cutting-edge imaging allows surgeons to determine lens density and morphology so they can optimize fragmentation and reduce the overall energy delivered to the eye. The system's Streamline® Technology for astigmatic management can benefit between 70 and 90 percent of all patients with astigmatism. Finally, ALLY can integrate with over 90 percent of the market's preoperative devices, enabling precise, iris-registered astigmatic guidance accounting for cyclotorsion without concern for transcription errors.

With six significant upgrades in the last five years, LENSAR is the established leader in laser-assisted cataract surgery. This focus on innovation is what allows LENSAR lasers to perform 78 percent more procedures than the US average (1). Introducing the ALLY Adaptive Cataract Treatment System to market is a testament to LENSAR's aim of equipping clinicians with new tools and methods to carry out their procedures more efficiently and with superior results. With the ALLY system in the early launch phase in the US, the future of FLACS is bright… and clear.

Reference

1. *2022 Cataract Surgical Equipment Market Report: A Global Analysis for 2021 – 2027, Market Scope LLC.*

the Ophthalmologist

THE INNOVATORS

BE NOT AFRAID OF GREATNESS!

Ophthalmology is in constant evolution; here, we present some of the newest innovations, pioneering therapeutics, and cutting-edge technology shaping the future of the field

TO INFINITY... AND BEYOND

Glaukos' iStent infinite® represents a safe interventional glaucoma option for a variety of patients

Over the past decade, Glaukos – a global leader in developing MIGS devices – has invested more than US$500 million into research and development to provide surgeons with unique solutions designed to advance the standard of glaucoma care, ultimately benefiting a wide variety of patients who require glaucoma management.

One key innovation resulting from this investment is the iStent infinite®. Designed to provide foundational, 24/7 therapy, the iStent infinite gives surgeons the power to deliver optimized treatment to glaucoma patients who have failed prior medical and surgical intervention, while minimizing unwanted side effects that can be associated with more invasive treatment options (1).

iStent infinite is designed to safely offer interventional glaucoma, a truly micro-invasive alternative to medications and more invasive procedures for these patients, helping address rampant rates of patient non-compliance and disease progression. This first-of-its-kind, standalone implantable alternative provides surgeons the versatility to treat a variety of patients as it can be used in patients as a standalone or combo-cataract procedure, regardless of disease state. To this day, too many patients continue to experience disease progression and visual field loss despite being prescribed topical glaucoma medications. As an example, in one study reviewing a 20-year period of glaucoma patients on medication, 13.5 percent of patients progressed to blindness in one eye and 4.3 percent of patients progressed to bilateral blindness (2). With iStent infinite, specialists now have the opportunity to intervene surgically in a safe and effective manner in patients who are eligible, delaying or hopefully preventing the more invasive procedure.

Infinite in detail

So, how does the iStent infinite work? With three wide-flange, anatomically-designed, heparin-coated titanium stents preloaded into an elegant, precision-engineered injector system, iStent infinite is a first-of-its-kind standalone implant that uses these powerful technologies to deliver long-term IOP control. By restoring physiologic outflow – creating arcs of flow spanning up to 240° (or eight clock hours) around Schlemm's canal – iStent infinite offers broader coverage than other MIGS procedures, while minimizing tissue disruption (1).

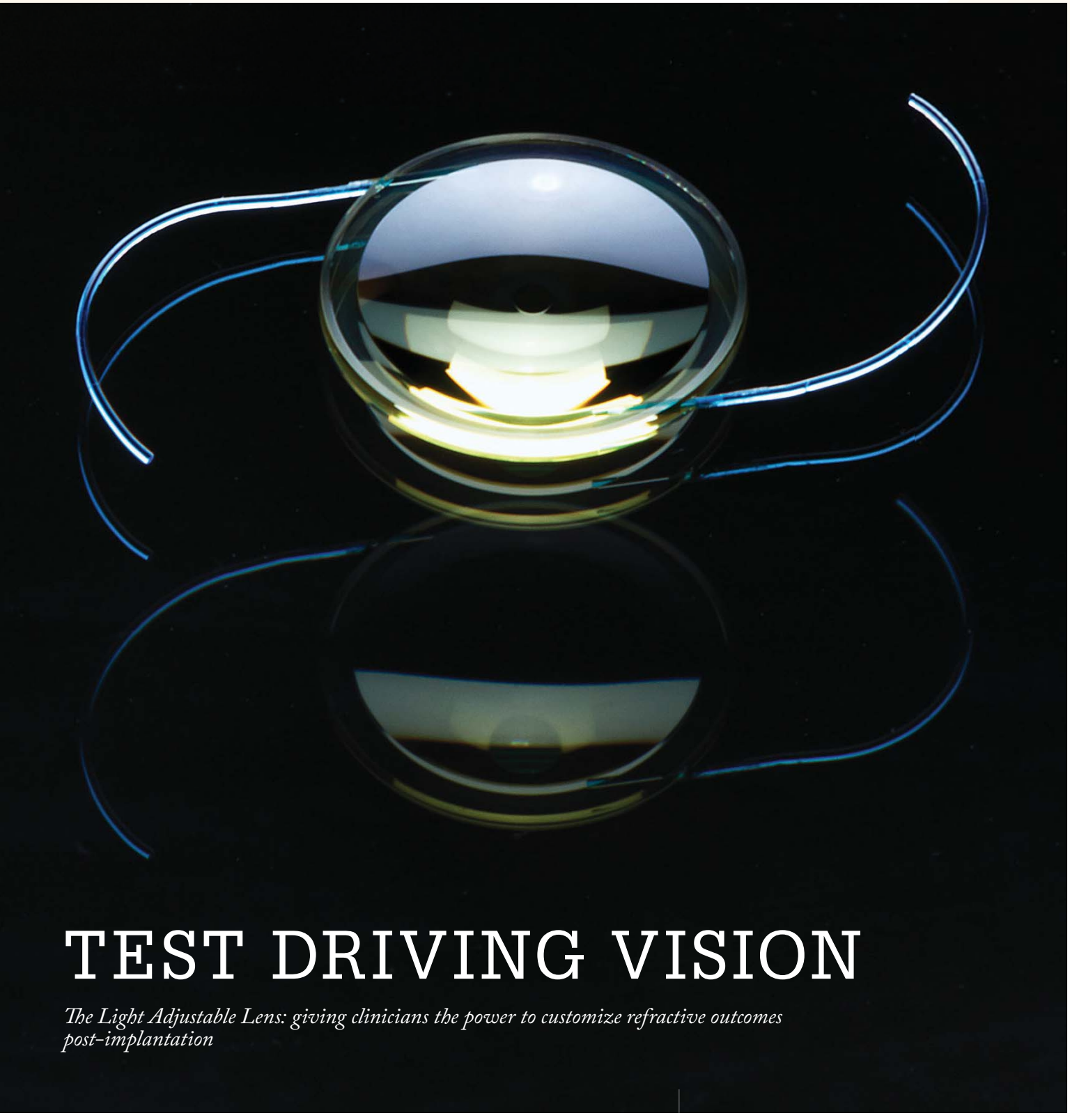
Additional unique features of the iStent infinite injector system include a stent delivery button designed for smooth stent deployment – with an unlimited number of delivery attempts, a singulator designed to position and prepare each stent for deployment, an 8-degree-angled insertion tube designed to minimize incision interference and provide greater access to deliver stents widely, and an ergonomic, tapered handpiece for comfort and control. Last but not least, the auto-retracting introducer tip is designed for seamless entry through the corneal incision and protects against viscoelastic egress during implantation, helping maintain a firm chamber.

Supported by strong pivotal data, highlighting favorable safety and effectiveness, and the first FDA-cleared standalone implantable alternative, iStent infinite gives surgeons the power to do more for their patient.

https://www.glaukos.com/important-safety-information/istent-infinite/

References

1. *Glaukos Data on File.*
2. *JA Olayanju et al., "Trabeculectomy-related complications in Olmstead County, Minnesota, 1985 through 2010," JAMA Ophthalmol, 133, 574 (2015). PMID: 25742023.*



TEST DRIVING VISION

The Light Adjustable Lens: giving clinicians the power to customize refractive outcomes post-implantation

Despite numerous advances in modern cataract surgery technologies in the recent years, only six out of 10 cataract patients achieve their targeted vision and an even smaller percentage achieve excellent vision at all distances (1). Ahead of cataract surgery, it can be difficult to predict how the eye will heal after the procedure and therefore accurately calculate the lens power. Surgeons are acutely aware of the dangers of overpromising great outcomes to cataract patients, and patient satisfaction can be based on very subjective criteria.

With that in mind, how often have you wished that you were able to change the intraocular lens parameters after implantation, according to the patient's individual needs, and without having to exchange the lens or use LASIK enhancements? The Light Adjustable Lens (LAL) from RxSight – the only IOL that can be adjusted after surgery – realizes this dream. LAL patients can trial vision and modify settings up to three times during the adjustment phase, making it a truly customizable solution. It's a "vision test drive" that enables patients to experience their lens settings in real-world scenarios and choose vision properties that work best for them. Clinicians now have the ability to customize and accurately titrate the refractive power to an individual target for each patient.

How does it work?

The LAL is made of a special photosensitive material that changes the shape and power of the lens in response to ultraviolet (UV) light. The lens incorporates proprietary silicone photoreactive additives – macromers – that are distributed throughout it. When light is directed to a specific area of the lens, macromers in the path of the light attach to the ends of other additives, forming polymers. The remaining unreacted macromers physically diffuse into the exposed area, causing a highly predictable change in the shape and refractive power of the lens.

Steven Silverstein, of Silverstein Eye Centers in Kansas City, Missouri, USA, has this to say about the LAL and the Light Delivery Device (LDD), also available from RxSight: "Every decade or so, a technology emerges that shifts the balance of our clinic or surgical paradigm and provides the next level of scientific achievement. I have been following the progress of the LAL technology as it moved through the different phases of the clinical trials; the data is frankly remarkable. There was no question that this new lens and its associated light delivery system (LDD) is the most important advance since premium lens implants hit the market 25 years ago. It is the IOL I will have in my eyes, and we recommend it for every appropriate candidate in our practice."

In a recent post-market study, which reported on 143 patients at 21 clinical practices, 85 percent of patients saw 20/20 or better at distance, and 75 percent were J1 or better. 97 percent saw 20/25 or better and 89 percent were J2 or better (2). These outcomes at distance and near are thanks to the accuracy and precision of the LAL (in the same study, 93.5 percent of eyes were within 0.5 D of target). As the LAL is a monofocal IOL, clinical studies have not shown an increase in dysphtopias that are commonly reported with multifocal IOLs (3).

Mark Vital, corneal surgeon at Houston Eye Associates in Houston, Texas, USA, shares his experience with the LAL: "Being a non-refractive cornea doctor, I tend to be very skeptical and conservative about new technology for refractive solutions. The LAL has delivered such incredible results, I might not be able to call myself a non-refractive cornea doctor anymore! Correcting the non-biological element of surgery (the IOL) is inherently more accurate and precise than being subject to the unpredictable results of patient healing."

If you are ready to enter into a whole new partnership with your patients, helping them "test drive" their vision to obtain more satisfaction and better visual outcomes, introducing the LAL with the Light Delivery Device to your practice is the way forward.

The LAL is currently approved and marketed in the US. The company will announce plans to expand soon.

References

1. *Market Scope 2020 IOL Market Report: A Global Analysis for 2019 to 2025.*
2. *RxSight PMCS-002. Clinical Outcomes of Patients Bilaterally Implanted with LAL.*
3. *RxSight P160055: Data on File.*

Learn more at www.rxsight.com

ELEVATING ORBITAL SURGERY

Reynaldo M. Javate discusses a new, easy-to-use porous orbital implant with a unique suturing platform that increases tolerability

Professor and Former Chairman at the UST Hospital Eye Institute, Chief of the Lacrimal, Orbital and Oculofacial Plastic Surgery Section at the University of Santo Tomas Hospital, University of Santo Tomas Espana in Sampaloc, Manila, Philippines,specializes in lacrimal, orbital, and oculofacial plastic surgery. Javate is Past President of the Philippine Society of Ophthalmic Plastic and Reconstructive Surgery; Founding President of the Asia-Pacific Society of Ophthalmic Plastic and Reconstructive Surgery; President of 10th International Society of Dacryology and Dry Eye; and Fellow of the American Society of Ophthalmic Plastic and Reconstructive Surgery.
Here, he shares his experience with the Ezypor® orbital implant from FCI S.A.S. (Paris – France), which can be used after enucleation or during secondary orbital implant surgery.

Figure 1. The Ezypor® implant with its revolutionary suturing platform.

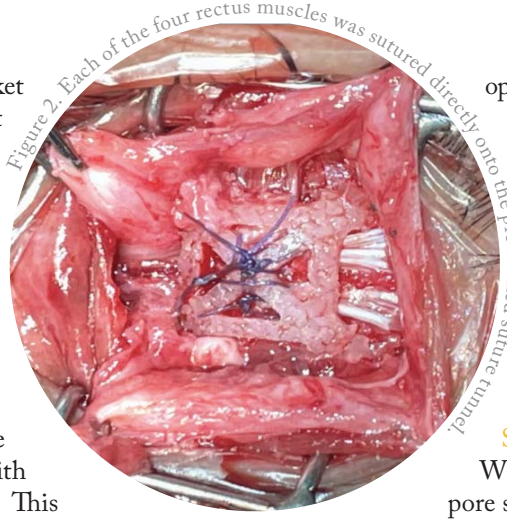


Figure 2. Each of the four rectus muscles was sutured directly onto the pre-drilled suture tunnel.

Management of the anophthalmic socket is challenging, and a decision on implant selection and wrapping material should ideally be made during pre-operative planning. Orbital implants are used to replace the orbital volume and allow some amount of realistic movement of a prosthetic eye. Porous orbital implants are most commonly used to fill the anophthalmic socket following enucleation, but despite a variety of these implants being available on the market, specialists still see patients with complications following implantation. This is why a new, reliable orbital implant has been designed and manufactured by FCI S.A.S., to increase tolerability, make the procedure easier and more time-efficient for surgeons, and improve patient outcomes.

Porosity matters

This innovative product – the Ezypor® orbital implant – is made of Ultra High Molecular Weight PolyEthylene and has a good porosity structure. It features an innovative and patented smooth anterior suturing platform that enables the extraocular muscles to be sutured directly onto the implant. It is generally well tolerated in the anophthalmic socket, without the need for wrapping material or an autologous graft. Additionally, it offers multiple suturing options to suit different surgeons' preferences. Ezypor®'s porosity is between 40 percent and 60 percent, as it is designed for optimum colonization of fibrovascular tissue – a good base for fibroblast integration. The implant has eight suture channels to facilitate needle insertion and muscles fixation that allow easy attachment to the extraocular muscles.

Figure 3. The images show a patient before and after enucleation, left using Ezypor® Orbital Implant.

Figure 4. The images show a patient who had vehicular accident on the left eye, he underwent repair of zygomaticomaxillary fracture, primary enucleation using Ezypor® orbital implant and Frontalis sling suspension using FCI Ptose Up.

Smoother surface

Why choose an orbital implant with a larger pore size? This type of implant demonstrates better fibrovascular ingrowth, and I have observed increased frequency of spontaneous healing of exposures, whenever they occur. Other porous polyethylene structures have relatively rough surfaces that may promote breakdown of the overlying tissue by mechanical pressure, and friction between the prosthesis and anterior surface of the implant, leading to anterior exposure. That's why Ezypor®, with its smooth surface tunnel porous polyethylene, is such a key innovation in the field of orbital surgery.

Conclusion

To summarize: why do I choose Ezypor® in my practice? The implant's smoother anterior surface minimizes the rubbing effect against the tissues to decrease the risk of implant exposure. It has a good porosity structure, which is a good base for fibroblast integration, and it is less abrasive than other porous implants. Importantly, the cost and time of the surgery is reduced as the implant doesn't need wrapping material. With better tolerability and fewer complications, this is my orbital implant of choice.

FCI S.A.S. is committed to fostering a close relationship with key opinion leaders in the company's two strategic fields: oculoplasty and vitreoretinal surgery. Since the company's creation in 1984, significant resources have been directed to R&D, making FCI a world leader in its two specialties. Despite a significantly reinforced regulatory environment, innovation is part of FCI's DNA. This will help us shape the future leading solutions in oculoplasty and vitreoretinal procedures.

Ezypor® is both CE-marked for use in the EU and FDA-approved for use in the USA.

READY WHEN YOU ARE

Haag-Streit's imaging module offers slit lamp documentation at the push of a button

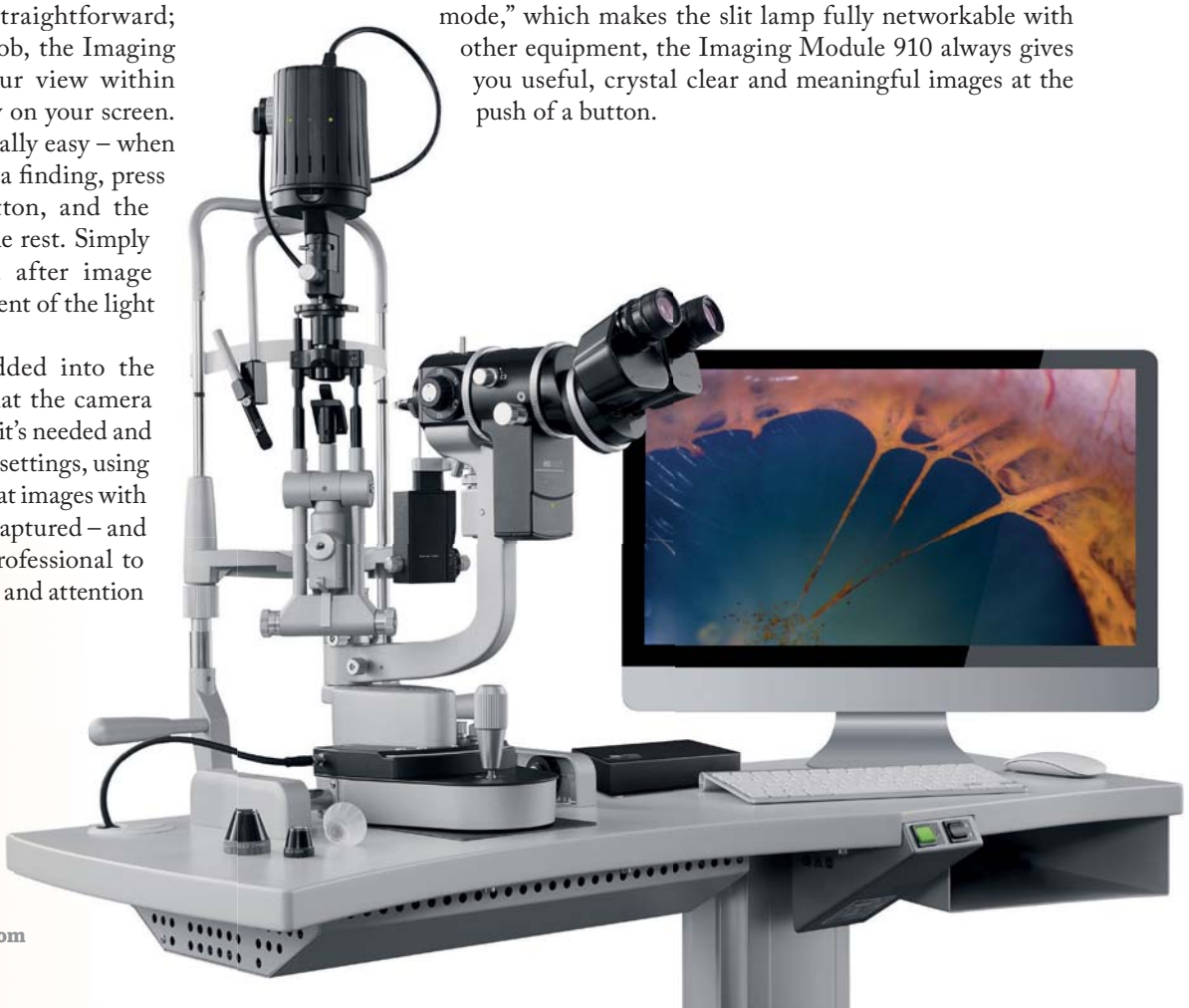
The slit lamp camera is a key tool in modern ophthalmic practice but the success rate of images captured on these cameras is often disappointing. For ophthalmologists, spending more than a couple of seconds on image capture can be heavily disruptive to clinical workflows. Moreover, slit lamp imaging can be cumbersome to set up, and depends upon having both dedicated software and a PC in the examination room, while taking a lot of light out of the microscope.

Happily, Haag-Streit – a global leader in slit lamp imaging – has released a new module that aims to solve these problems. Designed to be integrated into the slit lamp, using the module is extremely straightforward; with just a turn of a knob, the Imaging Module 910 shares your view within your microscope directly on your screen. Capturing images is equally easy – when you decide to document a finding, press the camera trigger button, and the software takes care of the rest. Simply switch off the camera after image capture and get 100 percent of the light back into the eyepieces.

The computer embedded into the imaging unit ensures that the camera is always ready whenever it's needed and automatically controls all settings, using an algorithm to ensure that images with optimum sharpness are captured – and allowing the eye care professional to give their undivided time and attention to their patients. Additionally, the processing unit allows the video to be streamed directly to a monitor via HDMI or DP, which means there is no need to interact with an additional PC to display the live stream, as is the case with classic slit lamp cameras.

The Imaging Module 910 was launched in March 2022 and is now available worldwide. Replacing the previous generation (the Imaging Module 900), the new module also has an improved sensor that offers 4 times higher resolution.

Whether you are in "standalone mode," storing your images directly to your electronic medical records, or in "EyeSuite mode," which makes the slit lamp fully networkable with other equipment, the Imaging Module 910 always gives you useful, crystal clear and meaningful images at the push of a button.



DELAYING DEGENERATION

How Okuvision's new at-home treatment slows progression of retinitis pigmentosa and other degenerative retinal diseases

Despite being the most common inherited retinal dystrophy, retinitis pigmentosa (RP) suffers a dearth of effective treatments. Noticing this gap in clinical care, Okuvision developed OkuStim therapy – a system that allows patients to take charge of their own condition from the comfort of their homes.

The OkuStim system uses transcorneal electrical stimulation (TES) to exert a neuroprotective effect on photoreceptors, which slows down degeneration and subsequent progressive loss of the visual field. Boasting an excellent safety profile, TES can treat RP without the common side effects found in pharmaceutical products, while ensuring that the retina is not affected by invasive interventions.

Although OkuStim therapy is encouraged at every disease state, there is a strong rationale for starting the application as soon as possible after diagnosis. At this early stage, the central retina is largely intact, meaning that there is a better chance of preserving the largest possible visual field area.

Reducing burden

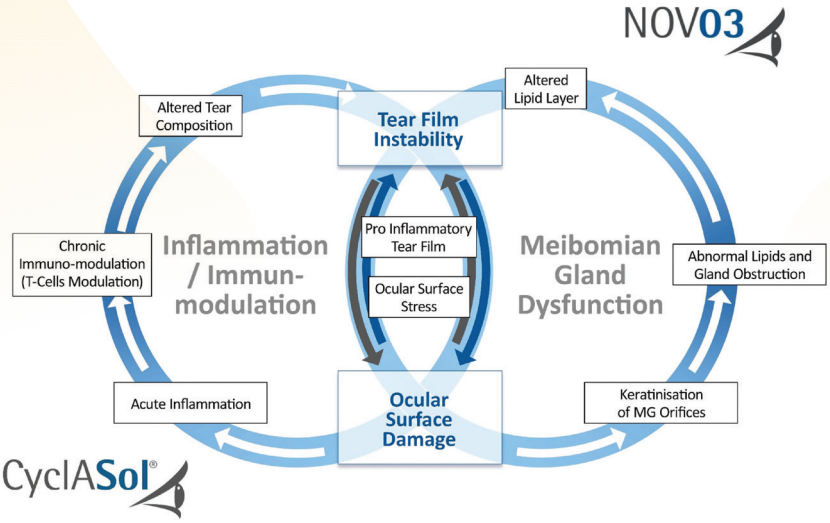
Associated with reduced mobility, financial burden, and reduced autonomy, the psychological impact of RP can adversely amplify disease development. OkuStim alleviates these challenges by providing patients with a non-invasive, at-home therapy that only requires 30 mins once per week. And because patients don't need to travel to outpatient care, the burden on specialist care clinics and general practitioners is also relieved. Self-management of RP can also reduce the total costs attributable to IRD that in 2019 amounted to an estimated £523.3 million in the UK (1).

Comfortable and cost-effective, the innovative OkuStim system is easy to adopt for both ophthalmologists and patients. Equally important, it addresses a patient pathway that currently offers no treatment options for early-to-late stage RP (nor other generalized retinal dystrophies, such as choroideremia and cone-rod dystrophy).

OkuStim is a CE-marked medical device and available today in a growing number of European countries. Looking to the future, Okuvision plans to continue providing state-of-the-art treatment options for people with degenerative retinal diseases, and making these more widely available. Drawing from new scientific findings, Okuvision values high-quality communication with patients, opticians, and ophthalmologists and continues to shape its products with patient feedback in mind.

Reference:

1. *O Galvin et al., "The Impact of Inherited Retinal Diseases in the Republic of Ireland (ROI) and the United Kingdom (UK) from a Cost-of-Illness Perspective," Clin Ophthalmol, 14, 707 (2020). PMID: 32184557.*



H2-NO! A WATER-FREE REVOLUTION IN EYE CARE

How Novaliq is using novel water-free technology to tackle dry eye disease

Novaliq's proprietary, water-free EyeSol® technology has been on the market in Europe, Australia and New Zealand -- first registered as ophthalmic medical devices in 2015. This year the company made significant progress with two accepted new drug applications which are currently in review by the U.S. Food and Drug Administration for the treatment of patients with dry eye disease. The company has bold plans to set a new gold standard in dry eye disease – but it doesn't plan to stop there.

EyeSol® Technology

Novaliq's EyeSol® technology opens completely new opportunities to cure, relieve, and prevent diseases in a range of therapeutic areas. The proprietary water-free technology uses ultrapure semifluorinated alkanes (SFAs) that are physically, chemically, and physiologically inert, thus exhibiting excellent biocompatibility and an excellent safety profile. Overcoming the limitations of water or oil-based topical therapies, EyeSol® technology therefore leads to higher bioavailability of active pharmaceutical products all as it stabilizes sensitive active substances, including proteins or peptides. The absence of preservatives, surfactants, oils, osmolarity, and a pH also leads to increased tolerability and higher rates of patient satisfaction.

Treating dry eye disease – taking two distinctive angles

Distinct from all anti-inflammatory and immunomodulatory agents, NOV03 (perfluorohexyloctane) was specifically designed to treat the signs and symptoms of dry eye disease associated with Meibomian gland dysfunction (MGD). With its unique mode of action, NOV03 directly affects the lipid layer of the tear film preventing evaporation.

CyclASol, a cyclosporine ophthalmic solution, was designed to better address the chronic inflammation causing keratitis and the progressive corneal surface damage. This first-of-its-kind anti-inflammatory eye drop solution should bring a more favorable efficacy/tolerability profile and better bioavailability compared to other marketed therapies for dry eye disease; given that patients with moderate to severe DED associated with keratitis benefit most from the rapid onset of action, this differentiation will be pivotal.

If approved by the FDA, NOV03 and CyclASol® will all be game-changers in addressing important unmet needs in the treatment of dry eye disease that affects more than 16 million Americans (1).

Water-free therapies as a novel drug category

Beyond dry eye treatments, the EyeSol® technology will help develop entirely new product families across multiple therapeutic areas. The company has multiple exciting ongoing research programs beyond DED and is planning to use small and large molecules to make the next big step into topical therapies for the treatment of retinal diseases.

Reference:

1. *American Optometric Association, "New study focuses on scope of dry eye disease in U.S" (2017). Available at: https://bit.ly/3UFUZwa.*

AN END TO CHOICE PARALYSIS

Which IOL is best for you and your patient? RayPRO+ provides cataract surgeons with both surgical and service performance insights to help smooth decision making.

As most people can attest, making any kind of decision can be difficult. Contemplating the menu in your favorite restaurant may be a lengthy process, but failing to make the optimum choice is rarely serious. When it comes to delivering the best outcomes for your patients, choosing the optimum option is the only option. Today's cataract surgeons are presented with an increasingly long menu of IOLs – and the process of navigating the technological landscape and deciding which options work best is becoming increasingly complicated.

Enter RayPRO+ – a one-of-a-kind digital platform free to Rayner lens users that proactively collects an insightful blend of long-term patient reported outcomes (PROs) to provide you with the data you need to make informed decisions when selecting IOLs for your patients.

Developed specifically for ophthalmic surgeons who perform cataract surgery, RayPRO+ provides increased insight into surgical and service performance with little effort by clinical staff. Patients can be registered on RayPRO+ within seconds, alongside the details of the lens used in the surgery; notably, this isn't just for Rayner lenses – the platform is lens agnostic. Following surgery, patients are invited to confidentially answer five short online questionnaires over the course of three years about their satisfaction, spectacle independence, dysphotopsias and follow-up procedures. RayPRO+ then analyzes these responses and displays aggregated trends about patients, clinics, and IOLs via web browser or an intuitive app available to both iOS and Android users

RayPRO+ has been constructed with several features intended to add as much value as possible to the clinical workflow of the surgeon. The account managed service allows for comparative data analysis – including both comparison of IOL outcomes data between different manufacturers and peer comparison based on patient outcomes – and supports the data provided being used for marketing purposes, clinical studies and as evidence during appraisals and recertification. Alongside the information it provides, RayPRO+ also aids its users in auditing IOL usage and promotes surgical services to new patients.

The only service of its kind, RayPRO+ redefines the space, but Rayner is not complacent; rather it is committed to continually refine the platform. After all, it is only fitting that, as IOL technology choice grows, so should the surgeon's ability to navigate all the options to make the correct decision for themselves and their patients.

Learn more and register at www.Rayner.com/RayPRO+

Image courtesy of Karl Brasse, MD

STABLE STEPS FORWARD

The Tango Reflex™ Neo YAG laser provides a simpler, more consistent method of performing capsulotomies with the PROcap™ technique

The advent of premium IOLs, advanced laser technologies, precise diagnostics, and evolving techniques have all shaped cataract surgery, making it more akin to elective refractive surgery, with high-quality outcome expectations from both surgeons and patients. Before the introduction of premium IOLs, YAG capsulotomies were delayed until the capsule had significant opacification or the patient voiced strong complaints. But because modern patients are more aware of vision quality and are more sensitive to the impact of even mild posterior capsule opacification (PCO) in eyes implanted with a multifocal or EDOF lens, there is a growing need to perform more precise YAG capsulotomies. After all, these patients have higher post-procedure expectations than ever.

However, despite all the progress, there are still no standardized techniques for precise Nd:YAG laser capsulotomies. Now, Lumibird Medical's Tango Reflex™ Neo YAG laser with PROcap™ (Premium Refractive Outcome Capsulotomy) capabilities overcomes the obstacles befalling YAG lasers of the past, offering clinicians a simpler and more consistent way of performing capsulotomies.

Nd:YAG capsulotomies should be performed with the same level of precision and predictability as cataract surgery. Clinicians need to ensure that they do not pit or shift the IOL, that the capsule's edges are perfectly positioned, and that the capsulotomy is symmetric, leaving an overlapping edge around the optic. Capsulotomies must also be perfectly sized. A capsulotomy that is too small may induce glare, halos, and other dysphotopsia; one that is too large may allow vitreous to escape or the lens to move, inducing refractive error, such as hyperopia. Premium IOLs may be impacted even more by the variability in technique of the procedure. As a result, the previous generation of YAG lasers, which had less predictable energy delivery, were less reliable tools that delivered variable results between procedures – even those done consecutively.

Consistent control

The first issue that the Tango Reflex Neo laser resolves is that of energy delivery, which is characterized by a sharper

rise and fall relative to other lasers, reducing the size of the plasma convergence zone and creating more efficient energy delivery without causing significant disruption to the vitreous or surrounding tissues. Additionally, the Tango Reflex Neo laser's combination of second generation true-coaxial illumination tower, efficient energy profile and its degree of up to 2 mm posterior offset enables standardization of the disruption of the posterior capsule and the creation of a more precise, predictable, and perfectly round and well sized capsulotomy. Alongside this, PROcap uses the jet-effect from a collapsing cavitation bubble formed by the laser to cleanly dissect tissue, allowing careful construction of the capsule opening (which occurs symmetrically, outwards from the center), which adequately exposes the properties of premium IOL optical zones. The efficiency of the laser means that capsulotomies can be performed using fewer shots and with little risk of pitting the IOL.

Energy delivery is further aided and stabilized by the Tango Reflex™ Neo's internal fan-cooled laser cavity that mediates the inherent inefficiency of YAG lasers which lose large amounts of energy to heat resulting in less predictable energy delivery and, if not properly managed or with sustained use, overheating and shutdown. Less variability in the laser's energy delivery gives clinicians assurance that it will stay the same between cases, regardless of how many capsulotomy procedures are performed consecutively within their practice (1). The Tango Reflex Neo laser also comes with the Imprint™ discrete heads-up display within the oculars, which provides real-time feedback of current energy levels. Coupled with a switch mechanism on the joystick for increasing and decreasing laser energy, surgeons are allowed to focus on the procedure rather than looking away to view settings on the touch screen interface.

Although Nd:YAG capsulotomy is a common procedure, every part of cataract surgery is undergoing constant evolution. Everything practitioners do can always be incrementally improved, and the accumulation of those improvements is how Lumibird Medical achieves pristine outcomes. Nd:YAG laser capsulotomies can have a significant impact on patients' quality of life. Whether they are paying more for a premium IOL or not, patients' expectations are on the rise, and clinicians need to raise their game to deliver the most precise capsulotomies possible.

Reference

1. *IP Singh, "The impact of an active air-cooling system on the consistency and stability of energy delivery in the treatment of vitreous opacities." Presented at the 37th ASCRS Annual Meeting; May 5-7, 2019; San Diego, California, USA. Electronic poster.*

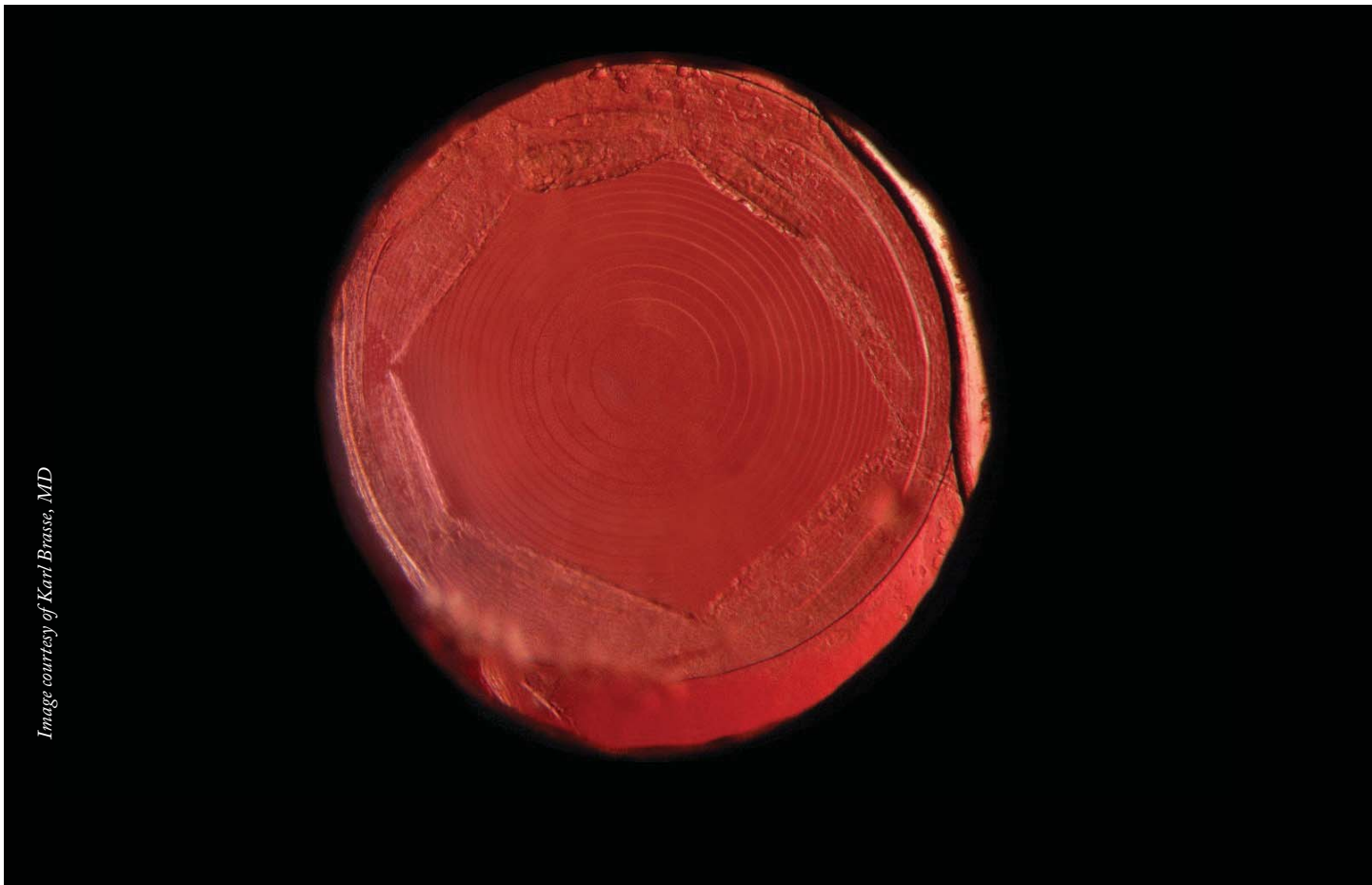


Image courtesy of Karl Brasse, MD

LIGHTING THE PATH FORWARD FOR DRY AMD

LumiThera sets a new standard for treating dry AMD using photobiomodulation

As the world's population ages, degenerative ocular diseases are increasingly common. Particularly affecting people over the age of 65, AMD accounts for 8.7 percent of all blindness worldwide and is the most common cause of blindness in developed countries (1). With dry AMD affecting approximately 85-90 percent of AMD patients, the current lack of viable treatment options – other than vitamin supplementation and lifestyle modifications – is a serious issue (2).

Setting the standard

LumiThera aims to tackle this issue head on with the launch of the Valeda® Light Delivery System – the first ophthalmic treatment using photobiomodulation (PBM).* Now approved in the EU and multiple countries around the world, Valeda has been shown to improve visual acuity, contrast sensitivity, and reduce central drusen volume in patients with dry AMD. Valeda uses multiwavelength PBM – also known as low-level light therapy – to stimulate critical targets of cellular function, leading to improved energy production within the mitochondria, improved cellular function, and reduced inflammation. This non-invasive treatment also boasts an excellent safety profile with no signs of phototoxicity (3).

To assess the safety and efficacy of PBM in subjects with intermediate dry AMD, LumiThera completed a 13-month analysis from the LIGHTSITE III study; a prospective, double-masked, randomly assigned, multi-center clinical trial. Study findings showed a statistically significant difference between the PBM and Sham treatment groups ($p = 0.02$). PBM treatment with Valeda provided a sustained and improved best corrected visual acuity (BCVA) with a mean of 5.4-letter change (least squared means) from baseline letter gain ($p < 0.0001$) (4).

Synergistic diagnostic and monitoring biomarkers of AMD disease

In addition to developing and launching Valeda therapy for AMD, LumiThera's vision is to address degenerative eye disease early, before permanent vision loss. LumiThera acquired Diopsys electroretinography (ERG) systems in February 2022 and purchased the MacuLogix AdaptDx assets in July 2022, both of which add to its ophthalmology porfolio. The Diopsys ERG system allows doctors to detect vision dysfunction early, track disease progression, and monitor treatment protocols by providing objective, quantitative, and functional vision measures. The AdaptDx Pro® – formerly owned by MacuLogix and backed by over 20 years of proven clinical research – measures dark adaptation speed, which can indicate the presence of AMD up to three years earlier than other tests.

Data from the two year pivotal LIGHTSITE III trial in earlier diseased patients with intermediate dry AMD will be used to support Valeda approval in the US pending FDA review. Valeda is lighting the path forward for future AMD treatment and developing a unique treatment modality with potential translation for additional eye diseases.

** Valeda is in clinical trials and not approved by the FDA in the US.*

References

1. *S Resnikoff et al., "Global data on visual impairment in the year 2002," Bull World Health Organ, 82, 844 (2004). PMID: 15640920.*
2. *J Ambati, BJ Fowler, "Mechanisms of age-related macular degeneration," Neuron, 75, 26 (2012). PMID: 22794258.*
3. *MR Hamblin, TN Demidova, "Mechanisms of low level light therapy," SPIE BiOS (2006).*
4. *Munk et al., LIGHTSITE III (13-Month Topline Analysis): Evaluation of Multiwavelength Photobiomodulation in Dry Age-Related Macular Degeneration Using the LumiThera Valeda Light Delivery System. Invest Ophthalmol Vis Sci. 2022; ARVO E-Abstract 3713186.*

DETECT TO PROTECT WITH INFLAMMADRY

How QuidelOrtho's new test improves access to the right treatment

Dry eye disease affects at least 16 million Americans and is one of the leading reasons for people choosing to visit eye care professionals (1). Although extremely common, this medical condition can have serious consequences for ocular health – especially in cases that are not detected early.

Now, there is a new breakthrough from QuidelOrtho, called InflammaDry, that detects increased levels of MMP-9 – an inflammatory marker that is consistently elevated in the tears of patients with inflammatory dry eye disease. Notably, InflammaDry is the first and only rapid, in-office test able to give insight on this important biomarker.

The advantages of using InflammaDry are two-fold. First, point-of-care testing enables more rapid diagnosis of dry eye disease, which gives patients early information about their prognosis. Second, point-of-care testing not only informs treatment choice but also allows clinicians to monitor progress using a given therapeutic, both of which facilitate operational decision making and efficient resource utilization.

Beyond QuidelOrtho, a number of leading voices are highlighting the importance of ocular inflammation. For example, the Tear Film and Ocular Society Dry Eyes Workshop report of 2017 recognized ocular inflammation's central role in the loss of ocular homeostasis (2). And, in a move that acknowledges the importance of early detection, the ASCRS Cornea Committee developed a new algorithm for pre-op evaluations for ocular surface disease (OSD). (3) Notably, InflammaDry was integrated into this new protocol as an essential resource to maximize pre-operative to post-op outcomes. In short, InflammaDry can be an enormously useful tool for cataract, refractive or corneal specialists who need to monitor ocular inflammation as part of surgical care.

Identifying which symptomatic dry eye patients have underlying inflammation may predict patient responses to treatment and influence clinical and therapeutic management strategies.

QuidelOrtho Corporation's power is fueled by a shared mission of developing and manufacturing innovative technologies that raise the performance of diagnostic testing and create better patient outcomes across the entire healthcare continuum.

InflammaDry is available in the US, Canada, South America, Europe, and South Korea.

References

1. *"Dry Eye", National Eye Institute. Available at http://bit.ly/3OaS4K9.*
2. *Tear Film and Ocular Surface Society, Dry Eyes Workshop report. Available at http://bit.ly/3gfj26O.*
3. *Christopher E. Starr, et. al,. "An algorithm for the preoperative diagnosis and treatment of ocular surface disorders." Journal of Cataract & Refractive Surgery, Vol. 45, p 669, (2019).*

IRRIGATION/ASPIRATION, NOW AVAILABLE IN A MIGS DEVICE NEAR YOU

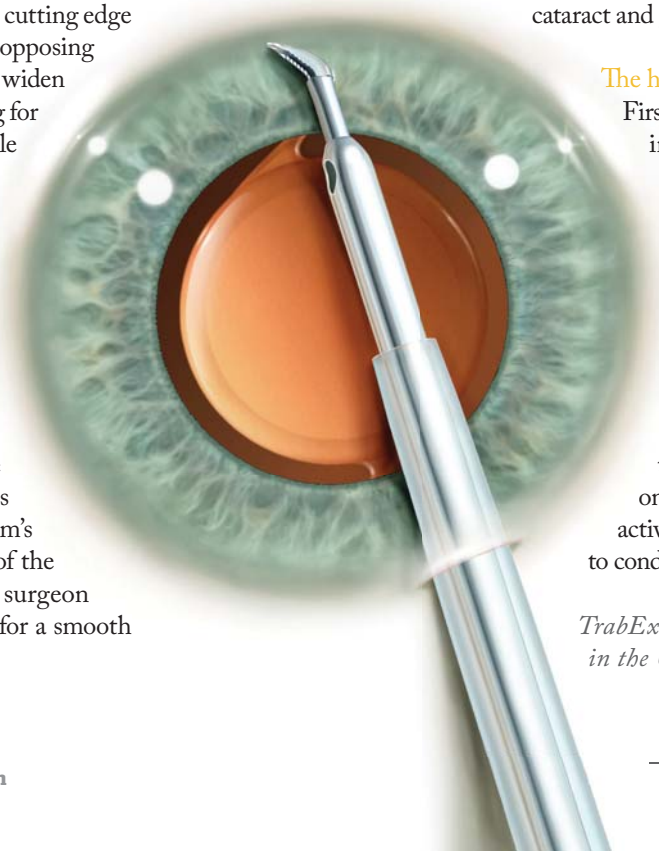
TrabEx Pro – a new angle on glaucoma management

Angle-based glaucoma procedures are among the most specialized cases in ophthalmology. While Minimally Invasive Glaucoma Surgery (MIGS) created a novel path for comprehensive ophthalmologists to surgically treat glaucoma, these procedures require new techniques and training. New surgical landscapes, (in some of the smallest tissue structures of the eye) can cause stress even for the most skilled ophthalmologists. TrabEx Pro is an innovation that provides confidence in surgery and minimizes the potential obstacles of the MIGS space.

Introducing TrabEx Pro

MicroSurgical Technology (MST) aims to simplify angle-based surgical procedures with the latest addition to its line of glaucoma solutions. TrabEx Pro is a new device designed for the removal of diseased Trabecular Meshwork (TM) that incorporates Irrigation/Aspiration (IA). The device features laser-honed, serrated blades that are configured in a trapezoidal orientation. The cutting edge of the blades start narrowly opposing each other and progressively widen farther up the blade allowing for the potential to make variable excisions for each section of tissue, instead of the one-size-fits-all approach of other goniotomy blades.

The blade-head is custom engineered to be sharp where it contacts trabecular meshwork, yet protective of the surrounding tissue. The rounded, distal foot provides gentle contact with Schlemm's Canal while the curvature of the posterior heel guides the surgeon around the arch of the eye for a smooth surgical sweep.



Each aspect of the device handle has been carefully molded to provide ultimate user comfort. The weight distribution and rotational grooves are designed to provide maximum surgeon comfort and control intraoperatively, while the directional indicator gives tactile input for blade direction, further enhancing user confidence and control when using the device.

Visibility, my old friend

Of the greatest advancements in anterior segment surgery in recent decades, the most notable have been around improving chamber stability and visibility during surgery. TrabEx Pro makes the connection between those legacy advancements and novel MIGS technology. The device connects to any phacoemulsification platform and incorporates IA to maintain high chamber stability and visibility during surgery. TrabEx Pro features a flexible silicone infusion sleeve to accommodate incisions ranging from 2.2 to 2.4mm and facilitate a smooth transition in combined cataract and goniotomy procedures.

The history and the future

First described in the 1930's, then redesigned in 2006 with Trabectome for adult patients, goniotomy has a longstanding history in the treatment of glaucoma. Clinically, it has been evaluated in adult and pediatric patients, with cataract surgery or as a standalone procedure, as well as open-angle, narrow-angle, pseudoexfoliative, pigmentary, mild, moderate, and severe glaucoma. MST looks to further contribute to the extensive body of clinical literature on goniotomy moving forward. They are actively engaging and seeking opportunities to conduct research on TrabEx Pro.

TrabEx Pro is now commercially available in the US.

UNLOCKING THE RECOVERY OF DYNAMIC RANGE OF FOCUS WITH MICROPORATION THERAPEUTICS

Laser Scleral Microporation (LSM) is a therapy which represents the first biomechanical solution to the biomechanical problems of progressive presbyopia. The therapy is performed using the VisioLite® Ophthalmic Laser system developed by Ace Vision Group (AVG).

Today, having no biomechanical option able to meet the loss of dynamic range of focus (DRoF) that occurs with progressive presbyopia, the need remains unmet. Current solutions involve the exchange of refractive power either at the cornea or the lens with the newest solution being a variety of pharmacological miotic eye drops that artificially stimulate the iris muscle to create a "pinhole effect" to see more clearly at near.

As cross-linked proteins accumulate over time, they damage cells and tissues, resulting in increased tissue stiffness and the slowing down of processes. The lens stiffness and ocular rigidity that increases in the sclera impacts the biomechanical needed to maintain our youthful DRoF which allows us to see clearly at all distances. Similar to Botox®, used to treat the progressive and persistent problem of wrinkles that occur with age, LSM is focused on a resolvable but progressive problem that must be addressed over an aging life cycle. Both therapies address the aging problem through minimally invasive and quick therapeutic applications that are immediately effective and can be dosed over time.

Laser Scleral Microporation (LSM), represents an innovative solution to tackle ocular rigidity by uncrosslinking scleral microfibrils to decrease biomechanical stiffness allowing a recovery of DRoF function inside of the eye that lie beneath the rigid scleral tissue all done without touching the optics of the eye. Since ocular rigidity is correlated with age-related eye diseases, such as presbyopia and AMD, the LSM therapy may have far reaching ocular health benefits.

The VisioLite® Ophthalmic Laser's compact footprint allows the LSM procedure to be easily performed in an in-office environment. The touchless, painless therapy is completed in 10 minutes for both eyes with no down time to the patient allowing LSM to be the first 'lunch time' procedure. The minimally invasive LSM procedure brings opportunity for an ophthalmic practice to have an adjunct or primary presbyopia therapeutic option to offer a large unmet population of patients.

Unlike all other devices, which work on the pupillary axis, the VisioLite works on areas of the eye that don't impact the patient's distance vision. The aim of LSM is to rejuvenate the ability of the eye to achieve DRoF for all distances while not affecting optics. Additionally, the capability to restore DRoF function gives patients with refractive errors in the presbyopic age range an option to receive Laser Vision Correction (LVC) without exchanging distance correction glasses for presbyopic reading glasses. This would open the door to a new stream of patients that could now enjoy a glasses free life for distance, near and everything in between and an added revenue stream for refractive surgeons to do combination LVC and LSM procedures for presbyopes.

The future of presbyopia therapeutics is only in its infancy. Pharmacological therapeutics in the form of Miotic drops have just entered the field and biomechanical Microporation Therapeutics in the form of LSM is in an early clinical stage and set to enter the market in 2023.

LSM has the potential to redefine presbyopia therapeutics, bringing forth an innovative solution to presbyopia that can be tailored to each patient's progression through the aging process. Such a procedure ultimately has the capabilities to address the presbyopic loss of DRoF through progressive vision recovery for those already in various stages of utilizing reading appliances. In addition, LSM has the potential to provide vision loss prevention to those at younger ages possibly delaying or reducing the need for reading appliances out further in the aging cycle. Unlocking all of these potentially groundbreaking benefits of the Microporation Therapeutics innovations is an exciting aspect of AVG's current innovation.

"A PAINTER TRIES TO CONVEY TO US A PICTURE OF THE WORLD AS HE SEES IT; AN OPHTHALMOLOGIST TRIES TO ENABLE US TO SEE THE WORLD AS IT REALLY IS."

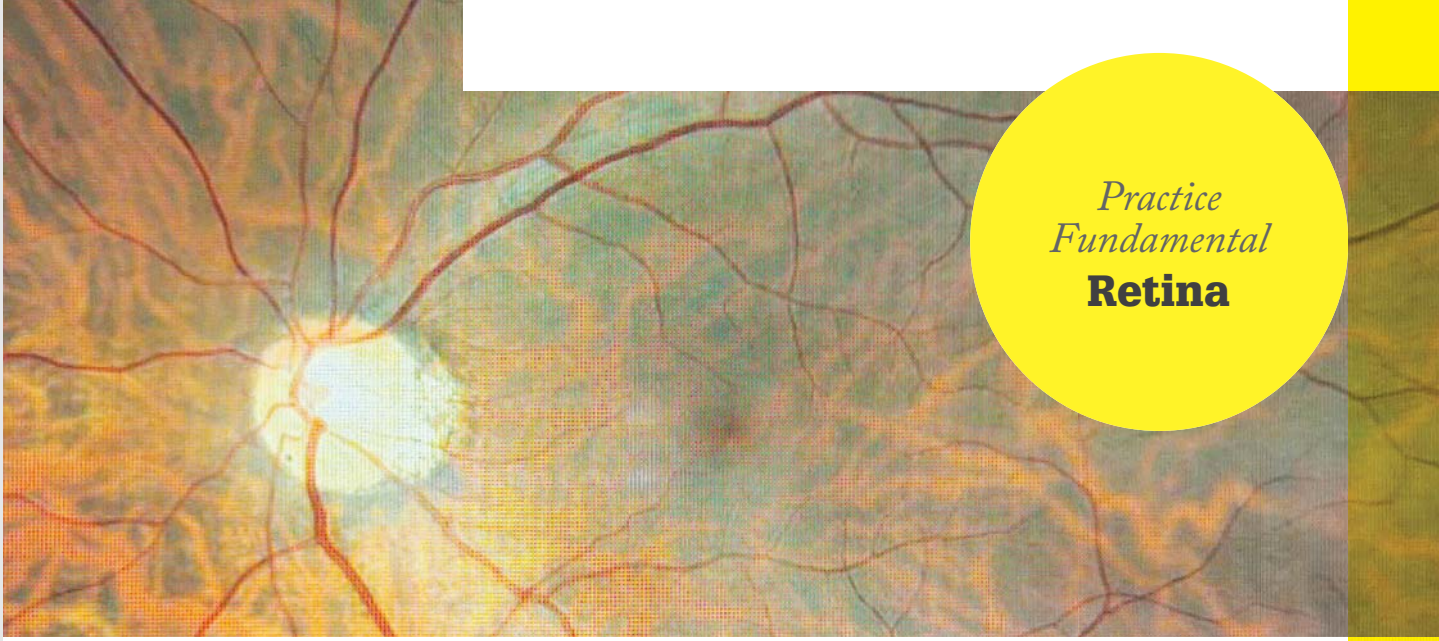
Enable your patients to see the world as it really is,
with premium laser technology for premium refractive outcomes.

Lumibird Medical (formerly Ellex | Quantel Medical) has premium laser solutions for SLT and YAG applications including Premium Refractive Outcome Capsulotomies (PROcap), and Iridotomies.

TANGO REFLEX™ NEO
PREMIUM YAG | SLT

LUMIBIRD MEDICAL

FORMERLY ELLEX | QUANTEL MEDICAL
www.lumibirdmedical.com



Mapping the eye. Researchers from the National Eye Institute have created a high resolution map that reveals complex DNA organization within human retina cells. Using deep Hi-C sequencing, a tool used for studying 3D genome organization, the map details 704 million contact points within retinal cell chromatin. Researchers added to this by integrating the chromatin topology map with datasets on retinal genes and regulatory elements. The resulting comprehensive network provides a dynamic picture of interactions within chromatin over time and provides insights into the regulations of gene expression and retinal function in both rare and common eye diseases (1).

Battling blindness. A new drug, named pegcetacoplan, has been found to slow the progression of geographic atrophy by preventing cell death in the retina. Also known as a complement system inhibitor, the new drug reduces the area of atrophy by 16 to 18 percent in patients treated every other month and by 19 to 22 percent in patients taking a monthly dosage over a one-year period. Although the results are promising, researchers emphasize that the new drug does not reverse vision loss and, if approved by the FDA, patients will likely require treatment for an extended period of time (2).

Skipping treatment. The eye care community is urged to be more proactive when reminding, educating, and empowering AMD patients to seek treatment. Although anti-VEGF eye injections allow more than 90 percent of patients to keep their vision, patients are required to attend follow-up appointments every one to three months. The failure to attend these appointments can result in irreversible eye damage and blindness. Of patients diagnosed between 2013 and 2015, 11 percent did not follow up over the following four years and researchers suggest that, since the pandemic, the rates may be even higher. With one in nine people foregoing sight-saving injections, the need to find alternative treatments that require fewer follow-up visits is paramount, says AAO (3).

Getting to the heart of it. Researchers from the Beijing Eye Study have been investigating the links between the thickness of a single layer of the retina and blood pressure. Using OCT and a multiple surface segmentation solution the researcher could analyze single layers of the retina one at a time. Higher blood pressure was correlated with a thinner retinal nerve fiber layer and a thinner ganglion cell layer. At the same time, the research found links between increased blood pressure and a thickening of the inner nuclear layer of the retina. This study's segmentation of the various retinal layers offers ways in which the detection of a whole range of retinal diseases can be detected more precisely (4).

IN OTHER NEWS

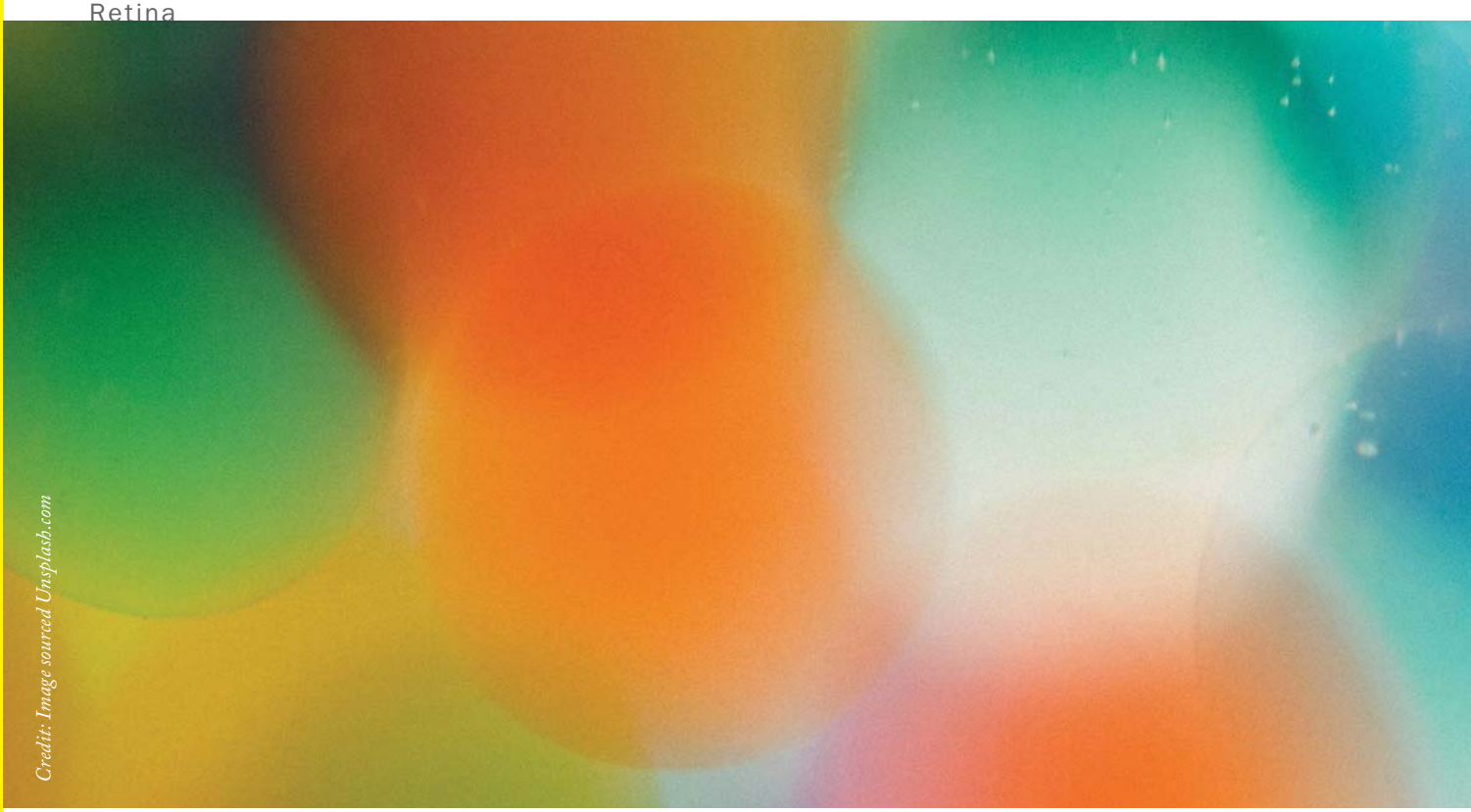
Predicting Disease. *New research finds that AI-enabled imaging of the retina can accurately predict cardiovascular disease and death without the need for blood tests or blood pressure measurement (5).*

Retina Representation. *A cross-sectional study comparing the demographics of US-based diabetic macular edema and retinal vein occlusion found that clinical trials were not representative of the racial and ethnic diversity of the general population (6).*

Capturing Cells. *A new, ultra-high-speed multimodal and multifunctional adaptive optics system achieves exquisite resolution for viewing retinal cells and structures (7).*

Reducing Inflammation. *A powerful new enzyme has been found to reduce oxidative stress and inflammation in the retina in patients with diabetic retinopathy and retinopathy of prematurity (8).*

See references online.



Credit: Image sourced Unsplash.com

PVR: Saved by the Gel

A hydrogel-based scarring solution for retinal detachment and beyond

By Xinyi Su

Wound healing is so important, yet subsequent scarring is a major pathological factor in many diseases. Following surgery, scar tissue within the eye can cause problems; for example, proliferative vitreoretinopathy (PVR) occurs in more than 75 percent of failed retinal detachment surgeries (1). PVR causes the retinal pigment epithelium (RPE) layer of cells to undergo epithelial to mesenchymal transition (EMT), hyperproliferation, and abnormal migration to form intra-ocular scarring membranes. These fibrous-cellular membranes contract and cause the retina to detach again.

Current treatment options are limited to surgical removal, but we've been investigating ways in which biomaterials such as hydrogels can prevent scarring. Hydrogels have tunable and versatile physical and chemical properties – ideal for biomedical application. Our research demonstrated that a bio-functional thermogelling polymer can prevent retinal scarring in a preclinical rabbit model of PVR (2). We observed that this anti-scarring effect was primarily mediated via RPE cell internalization of the polymer, which led to impairment of EMT, suppression of hyperproliferation and migration. Genome-wide transcriptomic profiling revealed that this polymeric internalization upregulates the nuclear factor erythroid 2-related factor 2 (NRF2) signaling pathway – a master regulator of antioxidant response homeostasis, the key sensor and effector whose activation was sufficient to prevent scarring.

The science

Treatment of PVR is an unmet clinical need; the current surgical option is far from ideal. Our bio-functional polymer serves the dual function of a vitreous substitute for retinal detachment surgery, yet also elicits specific anti-scarring effects. This unique bio-functionality of the polymer may be applicable beyond ophthalmology, anywhere an anti-scarring outcome is desired.

Our hydrogel has a reversible physical behavior; the manipulation of temperature can be used to tweak its physical state. In total, it has three states that depend on the number of individual polymers forming bonds with each other: single polymer, polymeric micelles, and hydrogel. When injected, it easily flows at its low bonded state, but in the relative heat of the eye the polymer is in hydrogel form. In hydrogel form, it undergoes slow erosion that releases polymeric sub-micron-range micelles, which interact with the retinal cells to initiate a cascade of cellular reactions. The most important of these reactions is the aforementioned upregulation of the master regulator, NRF2.

"We demonstrated that a bio-functional thermogelling polymer alone is able to prevent retinal scarring."

A better alternative

PVR has defied the preventative efforts of many researchers. Current agents used during vitreoretinal surgery include expansile gases and silicone oil, which have been used since the 1960s. These have many inherent limitations, such as requirement for prolonged postoperative position, raised intraocular pressure, and risk of cataract formation.

Our polymer, with its intrinsic anti-scarring properties, is a potential "replacement" in vitreoretinal surgeries. From a surgical perspective, the polymer's spontaneously gelates upon contact with the eye (from a liquid state), retains viscosity despite injection via small-bore needles, retains optical clarity to ensure good immediate postoperative vision, eliminates the need for postoperative heat posturing, and is biocompatible and biodegradable.

The polymer used in the lab is currently being developed by Vitreogel Innovations Inc, a spin-off from the Translational Retinal Research Laboratory (TRRL), which is dedicated to developing polymer-based therapeutics for ophthalmology indications. Vitreogel Innovations Inc is an ISO 13485 (Medical Device Quality Systems) accredited company and is currently establishing a manufacturing process for large-scale polymer production under current good manufacturing practice (cGMP) guidelines. Our work serves as a proof of concept for the application of polymers to address PVR and will expand the pipeline of therapeutics being developed by the company.

Research ahead

Although the bio-functional polymer prevented retinal scarring in a large-eyed rabbit preclinical model, the safety and efficacy of this polymer in PVR prevention will have to be tested in more clinically relevant non-human primate disease models prior to translation to the clinic.

We will also continue to work on biomaterials to produce the next generation of bio-functional gels. Future studies will be focused on targeted modifications to the polymer to understand how changes in chemical structure affects biological activity. We plan to extensively characterize possible compositional variations and perform structure to function correlation studies. Beyond ophthalmology, the unique bio-functionality of the polymer could be applied to areas such as orthopedics, where intra-articular joint scarring may be a problem.

BACKGROUND CHECK

I balance my time as a consultant retinal surgeon at the National University Hospital (NUH) in Singapore, leading a retinal research program as Division Director & Senior Principal Investigator at the Institute of Molecular and Cell Biology (IMCB, A*STAR), Research Director at the Department of Ophthalmology, National University of Singapore (NUS), and Clinician-scientist at Singapore Eye Research Institute (SERI).

I was awarded a nationally competitive biomedical engineering grant to develop a biodegradable vitreous substitute in 2017. These early successes kick-started my efforts into establishing one of Singapore's first retinal stem cell biology and biomaterial labs.

*Xinyi Su is the Director of the Division of Innovative Technologies, Institute of Molecular Cell Biology, A*STAR, Singapore.*

Relevant disclosure: Co-founder of Vitreogel Innovation.

References

1. *JC Pastor et al., "Proliferative vitreoretinopathy: risk factors and pathobiology," 21, 127 (2002). PMID: 11906814.*
2. *BH Parikh et al., "A bio-functional polymer that prevents retinal scarring through modulation of NRF2 signalling pathway," Nat Commun, 13, 2796 (2022). PMID: 35589753.*

Under the Umbrella

How can ophthalmologists help patients access the latest innovations – and how does Retina International assist?

By Avril Daly

I don't need to tell readers how significant an issue vision loss poses to the world – the work ophthalmologists do is crucial to addressing this, but there are ways in which we can further improve access to diagnosis and treatment within the retina community. Retina International is a global umbrella of 43 patient-led organizations on all continents; we work to improve access to diagnosis and treatment for those living with retinal conditions. We do this by embracing three pillars designed to support a continuous pipeline of treatments and cures for retinal diseases: patient education and outreach, participation and representation in advocacy and policy development, and fostering research and innovation.

Spreading the word

Retina International was a voluntary organization founded in 1978 by people living with rare and inherited retinal diseases who believed genetic research held the key to discovering treatments. Over time, patient groups emerged to fund and support research and Retina International began to disseminate scientific information. Retina International brought like-minded groups together to discuss issues pertinent to them. As research evolved in rare retinal disease, the organization began to support patients affected by more common diseases; as we engaged with more organizations, the innovations in genetic research for IRDs and the emergence of treatments for AMD resulted in the growth of the retina community. All of this led to a decision by members of Retina International to formalize into a secretariat in Dublin in 2016, bringing together the community to ensure that all members worked together on consensus driven policy actions and communications in order to have the best chance of achieving our goals.

Confronting issues

Having a patient explain their condition and individual needs is not enough to ensure action is taken and policy changes. What is needed is an explanation of not only the condition but the cost of dismissing it: the burden of the disease, the promise of innovation, and the need for access to the outcome of that innovation. That is what Retina International does.

Our focus now is on supporting organizations that fund research and innovation in the retinal space to understand where their voice, experience, and perspective fits in the research continuum. This allows us to foster these organizations through their own networks and countries to ensure that the infrastructure for retinal research is robust. Our member organizations understand that the process of "curing" blindness is a journey from bench to bedside – from concept to delivery - and each part of the journey needs patient involvement and engagement.

"Educate, Participate, Innovate"

Our straightforward tagline is meant

to educate our membership. When we talk about education, we refer to explaining the process of innovation and development, understanding what the patient community needs, and demonstrating how researchers, patients, and policymakers can work together. An important part of that is knowing when something doesn't work for patients and addressing it. We have an obligation to support patient preferences by educating people on patient-reported outcome measures and endpoints and their importance in clinical trial outcomes. Then there's education to enable participation; when you sit on an advisory board, you should understand what's being asked and what you need to know to answer. We have members who sit on government decision-making committees and their knowledge must be continually updated to correspond with a highly dynamic space.

Because we appreciate the importance of staying up-to-date and aware, we generate and analyze evidence from our membership to understand the impact of retinal disease on the community. Our approach is scientifically oriented and informed by economic modeling. With our members, we develop surveys to address fundamental questions; the results support advocacy communications and educational initiatives.

Our Retina International Education Hub is a three-month course for patients that includes modules on genetic testing, diagnostics, ethics, patient-reported outcome measures, registers, health futurism, regulation, and health technology assessment. This course prepares our patient community with the tools to be heard.

Hope for the future

There are many reasons for optimism. In the IRD space, I think the advent of durable gene therapies is a game changer. There's also interesting work in gene-agnostic approaches to IRDs, which offer hope to those with little light perception. Gene editing, cell therapies, and other advanced therapies are all in the pipeline. Crucially, we must recognize that innovation will require more capacity for delivery and, as a community, we must discuss how these breakthroughs fit into general treatment frameworks.

Retina International believes that early detection is the key to better outcomes for patients and wider society. We are often shocked at the poor understanding the public has about eye conditions, particularly at-risk groups. Patients arrive in clinics with bleeds that are too far progressed for any sort of intervention – an all-too-familiar scenario to readers in the context of diabetes-related d eye disease.

"Our member organizations understand the process of 'curing' blindness is a journey from bench to bedside."

Screening for diabetic-related eye diseases is effective and reduces the incidence of sight loss where programs have been implemented. Unfortunately, they have not been implemented everywhere. We're working with stakeholders to help decision-makers understand that systematic screening can prevent sight loss and reduce societal burden. AI technologies are emerging as potential diagnostic and monitoring tools.

A call to action

Ophthalmologists play a critical role in all of Retina International's programs of work as advisors, collaborators, and educators. Their support and guidance through our international Scientific and Medical Advisory Board has been immense. However, I have seen the great energy and enthusiasm and ideas of young ophthalmologists disappear under the weight of healthcare systems bursting at the seams. We don't want to lose that energy and Retina International strongly believes that the ophthalmic community at large needs to collaborate in a structured way to address current and future challenges.

Our key message for ophthalmologists is to engage with us and tell us what they need.

Avril Daly is CEO of Retina International, Dublin, Ireland.

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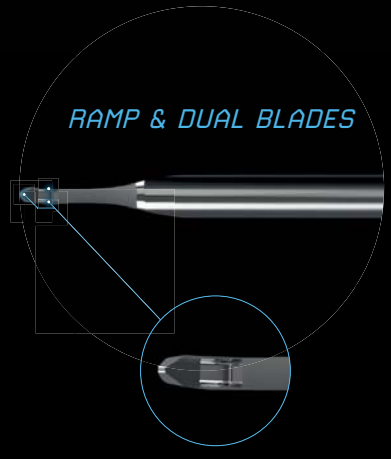

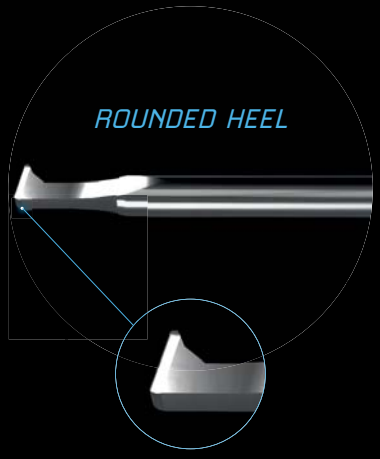

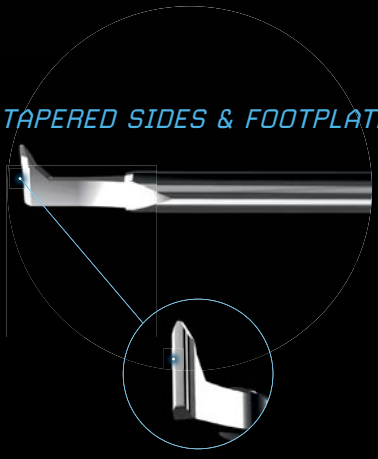

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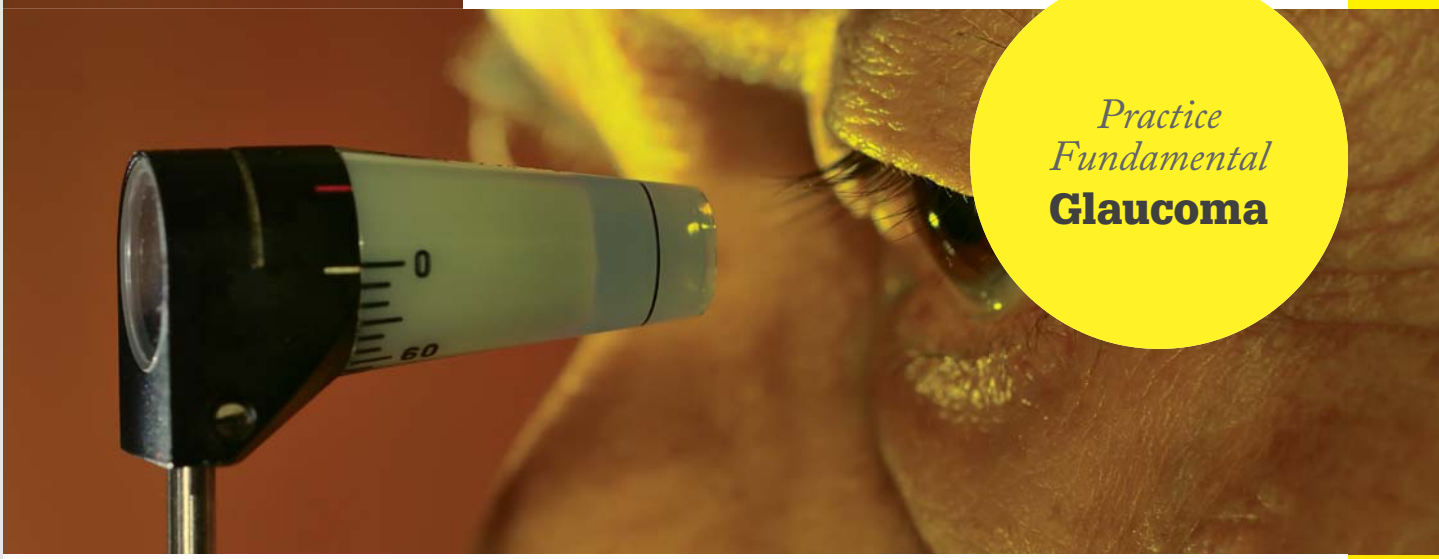


Practice Fundamental

Glaucoma

Thinner and faster. Is macular ganglion cell complex thinning associated with central visual field loss in patients with glaucoma? To answer this question, researchers performed a 4.7-year retrospective cohort study of 202 eyes in 139 patients at a tertiary glaucoma center (1). The results demonstrated that increased rates of macular thickness thinning during an initial follow-up period are associated with faster rates of central visual field loss over an extended period; they support the use of longitudinal macular OCT scans to assist with clinical glaucoma decision-making and guide possible therapy intensification in high-risk patients.

Crash pressures. Data from three French national databases assessed the potential effects of both glaucoma-associated visual defects and anti-glaucoma medication on driving. Analysis of 201,497 drivers showed that those in treatment (whether prescribed one or multiple medications) were less frequently involved with crashes than controls; there was no association between these prescriptions and crash responsibility (2).

Psychological power. An evaluation of current research investigating the impact of psychological interventions in glaucoma patients was conducted through a literature review that assessed both physical and mental health results by looking at psychological symptom modulation and glaucoma control support. The analysis determined that psychological interventions, especially meditation, can play a role in the holistic care of patients with glaucoma, alleviating the mental health burden of the disease and controlling disease progression when used alongside conventional approaches (3).

Detection to diagnosis. Researchers conducted a cohort study to determine the length of the preclinical detectable phase (PCDP) of open-angle glaucoma (OAG). Data from a population-based OAG screening performed between 1992 and 1997 on 32,918 patients aged 57 to 77 revealed that the mean PCDP of the 2,029 included patients, when calculated twice using two different methods of analysis, was around 10 years, suggesting that reasonably long screening intervals – for example around five years – are acceptable (4).

Data diaries. A new study from Oregon Health & Science University describes the methods used to process a dataset of clinical notes from the electronic health record (EHR) that had been annotated for glaucoma treatments (5). The final dataset contains 5,520 annotated sentences, with and without medications, from the clinical notes of 480 office visits by patients seen for glaucoma between the start of 2019 and the end of August 2020.

See references online.

IN OTHER NEWS

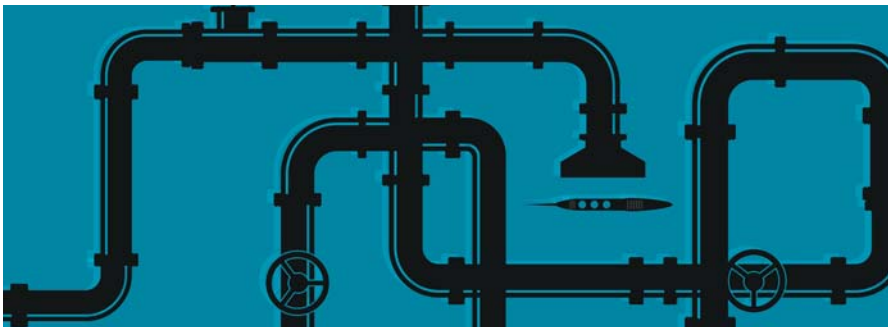
Testing time. *When following glaucoma patients using OCT, frequent testing results in shorter time to detect progression; a six-month interval provides a reasonable trade-off (6).*

Power of pliability. *Quality of life in Chinese glaucoma patients is low; resilience is an important positive factor, but sleep disturbance mitigates its effect (7).*

Painless picking. *The evolution of anesthetic agents has resulted in increased safety, efficacy, and comfort – but all stakeholders' needs must be considered when developing anesthetic plans for surgery (8).*

Pandemic problems. *Interruption of glaucoma clinic visits during the COVID-19 pandemic – and the inability to have medications prescribed – led to increases in medication nonadherence (9).*

Modest mitigations. *Ultrasound cyclo plasty reasonably controls IOP and reduces the burden of antiglaucoma medication in POAG, but the success rate is modest (10).*



My MIGS of Choice, with Kin Sheng Lim

One of the most promising MIGS procedures revolutionizing glaucoma surgery is canaloplasty

By Kin Sheng Lin

Glaucoma is caused by inadequate drainage of aqueous humor, resulting in raised intraocular pressure, damage to the optic nerve, and vision loss. The majority of aqueous drainage – between 70 and 95 percent – occurs in the conventional pathway via the trabecular meshwork, Schlemm's canal, collector channels, and episcleral veins (1, 2). The uveoscleral pathway contributes to the remaining aqueous outflow via the supraciliary and suprachoroidal space. Resistance to outflow in the conventional pathway plays a fundamental role in the development of primary open angle glaucoma (POAG); the uveoscleral pathway is not significantly different between glaucoma patients and healthy individuals (3).

The primary causes of outflow resistance occur in the trabecular meshwork, Schlemm's canal, and collector channels of the conventional pathway. Endothelial cell loss results in the fusion of trabecular columns (4) and the accumulation of extracellular matrix and banded fibrillar elements embedded within different glycoproteins, creating "plaque material" that causes stiffness within the trabecular meshwork (5,6,7). Such herniations of the trabecular meshwork tissue frequently block collector channels within glaucomatous eyes (8,9), likely resulting in elevated IOP when compared with healthy eyes (10). Glycosaminoglycans – whose levels are elevated in glaucoma – attract and retain water, reducing the space available for fluid outflow. Loss of vacuoles in the inner wall of Schlemm's canal also contributes to increased outflow resistance (11). Additionally, Schlemm's canal in POAG eyes is shorter, narrower, and often collapsed, reducing the effective outflow area and obstructing the flow of aqueous drainage from the anterior chamber into the bloodstream via the anterior ciliary veins (12).

A treatment modality addressing all these potential areas of resistance and providing effective reduction of IOP to preserve the optic nerve offers significant utility in clinical practice.

The science behind canaloplasty

Canaloplasty is an implant-free procedure that preserves the trabecular meshwork and can be deployed across the entire glaucoma disease spectrum. The surgical technique involves the insertion of a flexible microcatheter for 360° catheterization of Schlemm's canal. Subsequent viscodilation of Schlemm's canal occurs upon withdrawal of the microcatheter alongside simultaneous injection of high-molecular weight hyaluronic acid (HA)-based ophthalmic viscosurgical devices (OVD) along the length of Schlemm's canal. This ensures complete dilation and improves aqueous outflow in both Schlemm's canal and the collector channels.

Canaloplasty can be performed via one of two surgical techniques:

- Ab externo approach – performed in eyes with severe glaucoma through a conjunctival incision. A suture is left in tension to facilitate aqueous outflow.
- Ab interno approach – performed in cases of mild to moderate glaucoma via a clear, self-healing corneal-limbal incision.

Canaloplasty improves outflow facility through mechanical, hydrostatic, and biophysical mechanisms. The 360° catheterization of Schlemm's canal mechanically breaks adhesions within the canal while pushing herniations of the trabecular meshwork out of the collector channel ostia to improve outflow. The hydrostatic pressure caused by OVD delivery stretches the trabecular meshwork, possibly creating microperforations within the anterior chamber, while also dilating Schlemm's canal and the collector channels (6, 7, 8). Another hypothesis is that the pressurized injection of HA-based OVD into Schlemm's canal may bind with sCD44, reversing cytotoxicity in POAG eyes and improving the cellular function, architecture, and outflow.

Read the rest of the article online at: theophthalmologist.com

Kin Lim has no financial conflict or disclosure with any procedure or product in this article.

Kin Sheng Lim is a consultant ophthalmic surgeon at St Thomas' Hospital and Professor of Glaucoma studies (Ophthalmology) at King's College London. He is currently the glaucoma service's clinical lead, the ophthalmology departmental lead for research, and the director of KCL Frost Eye Research Department at St Thomas' Hospital.

See references online.

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Arosemena A. MicroPulse TLT allows immediate continuation of lifestyle following glaucoma treatment. Glaucoma Physician, December 2022.

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Jumping After Your Passions

Sitting Down With… Janey Wiggs, Paul Austin Chandler Professor of Ophthalmology and Vice Chair for Clinical Research, Harvard Medical School/Massachusetts Eye and Ear, Cambridge, Massachusetts, USA

When did you first consider becoming a physician? Did you have any role models?
I was actually the first person in my family to go to a four-year university. I was really fascinated by science, so I spent time in an undergraduate research laboratory and then went to graduate school for a PhD in biochemistry and molecular biology. It was during that time that I realized the impact molecular biology can have on humans. I became really interested in inherited disorders so, at that point, I decided to go to medical school.

When did you decide to focus on ophthalmology?
Ophthalmology was the result of my collective experiences in medical school. I really enjoyed medicine, surgery, and pathology. I enjoyed taking care of both young people and older people. Ophthalmology is one of few disciplines in which you can do all of those things. As an additional factor, there are a number of inherited ocular disorders that fascinated me because of my interest in human genetics, so ophthalmology presented a perfect opportunity to combine my clinical and research interests.

What highlights do you recall from your residency or fellowship days?
Initially, I worked with Ted Dryja as a pre-residency fellow, studying the retinoblastoma gene. Working on retinoblastoma introduced me to inherited retinal disorders, and I had in mind that I would pursue these diseases in the future. However, when I was a senior resident I became fascinated by glaucoma. It's a complex disease that is interesting clinically and genetically. At that point I shifted my focus from retina to glaucoma specifically the study of genes that cause or predispose to glaucoma.

Have you ever imagined following a different path in life?
When I was little, I was always outside doing stuff. I used to collect rocks, so I had an enormous rock collection (that my mother was not thrilled about moving when she left our childhood home). When I first started college, I planned to be a chemical engineering major because I felt a social responsibility to develop alternative fuels. It's a field that is strongly related to geology, which has always interested me – and still does, but these days only as a hobby.

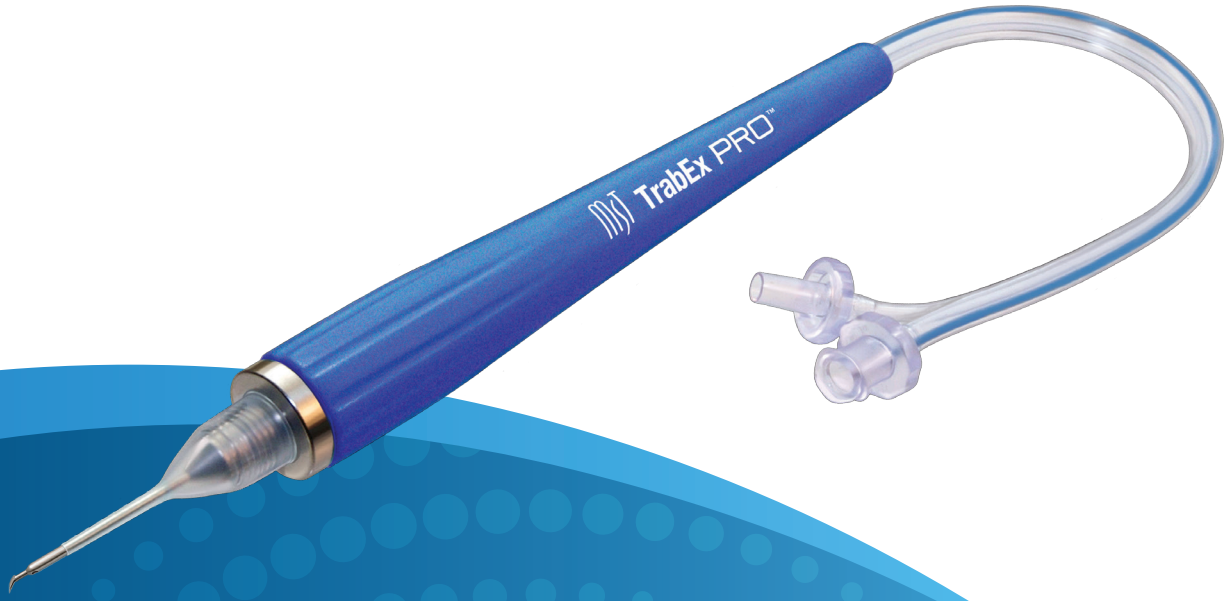
Was there ever a moment when you knew you made the right choice?
At the moment, pretty much every week! I think one of the things that has been most rewarding is the fact that we now have a collection of genes that we know cause inherited early-onset forms of glaucoma – either autosomal dominant or autosomal recessive. It has been wonderful to do genetic testing for some of the families we see because we can give them real information about disease risk for individuals in the family. We can tell them that not all of the children are at risk and we can identify those who are and develop appropriate treatment plans for them. We can also reassure the children who don't carry disease-causing mutations (and, of course, their parents). That has been a really important and exciting thing to do.

What will make the biggest difference in glaucoma in the next few years?
I think an amazing advance in genetics overall has been the concept of the polygenic risk score. People who have a really high burden of glaucoma-associated genes tend to have earlier onset of disease, more severe disease, and are more likely to require surgical treatment. This is exciting for our field because, one, there are so many people at risk for glaucoma and two, it's so difficult to screen populations to identify people at early stages of disease when current treatment is effective. The polygenic risk score gives us a real opportunity to stratify people according to risk. I think this is going to make a significant difference in the way we care for patients going forward.

Who have been the most important figures in your career?
I think one of my most important early mentors was Ted Dryja, in whose lab I worked as a fellow. He taught me a lot about critical scientific thinking and gave me the opportunity to apply human genetics to disease in a way that really helps patients. The next person was David Epstein, who was the head of the glaucoma service when I was a Mass Eye and Ear resident. He was a thinker who really understood the pathophysiology of glaucoma and would challenge his fellows to think critically about what was causing the phenotypes we saw in patients. The third person is my current chair, Joan Miller, who was one of the first women chairs in ophthalmology. She is an incredible role model for clinician-scientists and especially for women.

What messages do you have to ophthalmologists at the start of their careers?
Find your passion! When the field of glaucoma genetics was first developing, I told David Epstein I wanted to study glaucoma genes – the field was at such an early stage that this decision was a big academic risk but he told me to follow my passion. That's exactly what I would say to young people – you need to be passionate about what you do. My job is something I look forward to every day and I want young clinician-scientists to feel the same way.

What are your interests outside of work?
I love riding my bike. My commute is about 10 miles each way and I ride my bike almost every day (there are some exceptions in the winter!). I do a 100-mile bike ride every summer with my son and, this summer, I also did a 60-mile bike ride around Lake Winnipesaukee in New Hampshire. I also enjoy playing the flute. My best days are when I have time to spend with my family and my two black Labrador dogs.



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