

the Ophthalmologist®

The Art of Eyes

Presenting our 2025 collection of the finest images, illustrations, and paintings produced by practitioners working in the field.

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Gary Barth: from wine country to war zones



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Vision

We are excited to announce that The Ophthalmologist is now officially part of Conexiant Vision!

Home to a number of titles including Ophthalmology Management Contact Lens Spectrum and Glaucoma Physician this strategic integration brings together The Ophthalmologist's trusted expertise in ophthalmology with Conexiant Vision's cutting-edge technology and innovative vision solutions.

This partnership allows us to expand our commitment to providing comprehensive, patient-centered eye care. By combining advanced diagnostic tools, treatments, and resources, we are positioned to deliver enhanced vision care that sets new standards in the field of ophthalmology.

We look forward to the exciting opportunities ahead as we continue to lead the way in vision care innovation. Stay tuned for more updates as we embark on this new chapter together!

Enriching the Mystery

This year's Art of Eyes feature foregrounds ophthalmic practitioners further exploring their understanding of eye disease through art

The painter Francis Bacon once remarked that “the job of the artist is always to deepen the mystery.” These words might be interpreted as a warning not to shy away from the uncertainties of one's life. And we could apply them to ophthalmology, as practitioners and researchers persevere with ongoing, unresolved problems, such as the causes of glaucoma or the current lack of curative therapies for diseases like retinitis pigmentosa.

Our 2025 Art of Eyes feature also unites the medical practitioner and the artist, and a running theme of these artworks is exploring – or deepening – the mysteries surrounding eye disease. For example, Sharon Whinston's “A Look at Keratoconus” attempts to visualize and understand the fear she felt as a child when her brother was diagnosed with the condition... Meanwhile Jackson Bloch depicts an abstract watercolor landscape of a retina infected with neuro-invasive West Nile virus, a lone figure rowing through the scene “struck by the surrealness of disease.”

We very much enjoyed sifting through all of the great submissions and selecting ones that not only deepen but also enrich how we might view these diseases – as well as those responsible for treating and managing them. We hope you enjoy them too.

Alun Evans,
Deputy Editor




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Cataract Surgery: Fear is the Key

What is it that deters some patients from undergoing cataract surgery?

Fear of vision loss and blindness can prevent some cataract patients from choosing to undergo the operation, according to new University of Cincinnati (UC) research.

A qualitative study in *The Journal of Clinical Ophthalmology* used the Rapid Estimate of Adult Literacy in Medicine–Short Form (REALM-SF) to assess the health literacy and cataract surgery perceptions of a 42-person cohort based at Hoxworth Eye Clinic.

“The blanket theme in our research study was building trust, encouraging patient-centered decision making, and identifying the etiologies of fear, which are deeply complex and highly individualized,” explains Stephanie Wey, study author and an ophthalmologist at Scheie Eye Institute, University of Pennsylvania.

Of the 42 patients surveyed – all diagnosed with cataract by ICD-10 and/or a physical exam, and with no history of prior cataract surgery – 36 percent reported having a fear of cataract surgery, with over half of these patients (53 percent) noting that fear of vision loss was a contributing factor.

Contrary to their initial hypothesis, the researchers found that there was no significant association between lower health literacy and an increased fear of surgery. Instead, it was the quality of a patient’s vision that influenced how fearful they were: cataract patients with better vision (BCVA worse than 20/40 in neither eye) were more anxious than those with already limited vision (BCVA worse than 20/40 in both eyes or one eye). Thus, patients with already poor vision perceive the potential benefits of vision improvement outweigh

the documented risks of cataract surgery, the authors suggest.

“Our study found that fear was an issue, but not why fear was an issue,” says study author Lisa Kelly, Endowed Professor-Educator and Director of Medical Student Education in Ophthalmology at UC’s College of Medicine. “We speculate that for each patient, the etiology behind that fear may be mixed and highly personalized, with a fear of undergoing surgery being tied to the perceived risk surrounding potentially worsening vision.”

“While our findings parallel other studies that show a lack of an association between health literacy and fear of cataract surgery,” adds Samantha Hu, corresponding study author and a medical graduate at UC, “we cannot speak definitively to the generalizability beyond our patient population in urban academic

hospital-based clinic settings.”

The authors recommend that clinicians prioritize clarifying the goals of surgery and addressing any fears directly, particularly in the early stages of patients displaying “non-visually significant cataracts.”

Wey concludes: “It is critical that clinicians are conscientious that fears of vision loss and cataract surgery may be widespread, regardless of the individual patient risks, so taking the time to walk through the procedure and its potential benefits and risks remains important for every patient.”

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Beware the Eyeliner

Survey finds that eyeliner use can increase the risk of dry eye symptoms in patients



Looking at a diverse public sample made up of survey respondents from 28 countries, a China-based team of researchers have employed the Ocular Surface Disease Index (OSDI) to determine the association between the use of eyeliner and dry eye symptoms (1).

With OSDI scores 13 or higher taken as evidence of pre-existing dry symptoms, the researchers report that patients who used eyeliner had significantly higher

rates of dry eye symptoms than those who reported using no eyeliner at all.

The team's findings suggest a possible link between eyeliner usage and ocular surface health, with the authors noting this harmful impact "is often overlooked in routine assessments and discussions."

Interestingly, it was found that application of eyeliner specifically to the inner side of the lash line contributed significantly to elevated OSDI scores. The authors speculate that because the inner lash is closer to the eye surface, contact between cosmetic particles and both the ocular surface and tear films could "compromise the integrity and function of the ocular surface and the meibomian glands."

Going forward, the authors propose practitioners follow a set of guidelines when encouraging eyeliner users to maintain their ocular health, including avoiding inner lash application, regularly removing residual makeup from eyelids and eye lashes, and selecting hypoallergenic and preservative-free makeup products.

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The Personality Link to DED

How different personality types could influence a patient's experience of dry eye disease (DED)



To examine how personality might influence dry eye disease (DED) and its associated symptoms, a multinational team of researchers looked at three of the Big Five personality domains – neuroticism, extraversion, conscientiousness.

The study found that higher neuroticism and lower conscientiousness were both associated with increased odds of DED. Both traits, the authors note, may contribute towards increased subjective symptoms, meaning they should be considered as important factors when it comes to clinical care and management of DED.

"Among other things, the discrepancy between [DED] signs and symptoms seen in some patients could in part be caused by personal factors not yet fully mapped," says study co-author, Morten S. Magnø. "A greater understanding of the factors influencing this [could] help better tailor DED treatment and help physicians... better understand the disease."

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QUOTE of the month

"Reflecting on my own journey, I can see the fingerprints of great mentors at every stage."

Liam Bourke, Irish College of Ophthalmologists

The Art of Mentorship

Incorporating the 4 A's into surgical training: lessons learned from the worlds of ophthalmology and high-performance sport

By Liam Bourke

Few careers demand as much technical mastery, resilience, and emotional fortitude as surgery. The road to becoming a consultant surgeon is long and arduous, paved with lengthy hours, high-pressure decision-making, and the constant pursuit of excellence. However, one factor often determines whether a trainee thrives or merely survives: mentorship.

Having walked the path of an ophthalmic surgical trainee and having previously navigated the world of high-performance sport, I have been fortunate to experience mentorship in its various guises. As a former semi-professional rugby player representing Ireland, the Irish Universities, and the USA at underage level, I have benefited from the structured guidance of coaches, captains, and senior teammates. Likewise, in my surgical training I have been shaped by exceptional trainers whose influence extends far beyond the operating room.

Mentorship in surgery is often framed in technical terms – teaching the latest techniques, refining a trainee's surgical hands, and guiding them through complex cases. While these are all crucial components, I believe that true mentorship is much broader in scope. The best mentors instill confidence, provide emotional support, and foster an environment where learning can flourish. This holistic approach mirrors the most effective leadership in sport – it is not just about skill development, but also about

cultivating resilience, decision-making, and self-belief in mentees.

The 4 A's: pillars of excellence in ophthalmic practice

One of my most valued mentors, a highly respected ophthalmic surgeon, often speaks about the “4 A's” as the key pillars of being a great doctor and surgeon: Availability, Affability, Affordability, and Ability. This simple yet profound framework encapsulates what defines excellence in clinical practice.

- **Availability.** A great doctor must be present, both physically and emotionally, for their patients and colleagues. The best surgeons are not just available in emergencies, but foster a sense of accessibility for those who need their expertise and guidance.
- **Affability.** Being a skilled surgeon is not enough; a doctor must also be approachable and compassionate. Patients facing vision-threatening conditions need reassurance and empathy, just as colleagues and trainees benefit from an environment where open communication is encouraged.
- **Affordability.** While traditionally

this refers to financial accessibility, in practice it also extends to the generosity of time, knowledge, and effort. The best ophthalmologists recognise their role in a broader healthcare ecosystem, ensuring that high-quality care is available to all, regardless of socioeconomic status.

- **Ability.** Technical skill and clinical acumen remain the bedrock of an outstanding surgeon. However, true ability is not just about dexterity in the operating room; it includes sound decision-making, lifelong learning, and the capacity to adapt to evolving medical advancements.

Beyond technical skills: the hidden curriculum of surgical mentorship

Mentorship in surgery is often described in terms of technical skill transfer, but the most profound lessons occur within the so-called “hidden curriculum.” This encompasses the unwritten rules of surgical culture, career progression, and professional identity formation.

One of the most significant aspects of mentorship is role modeling. Trainees subconsciously absorb the behaviors, attitudes, and ethical standards of their mentors. Whether it is how a surgeon



speaks to patients, handles stress in the operating room, or balances career and personal life, these lessons help shape the next generation.

The hidden curriculum also includes guidance on career strategy. As an aspiring surgeon, knowing which subspecialty to pursue, how to navigate fellowship applications, and how to position oneself for leadership roles can be daunting. A mentor provides clarity, helping a trainee make informed choices rather than relying on guesswork.

Lessons from sport: mentorship as a culture, not an event

In elite rugby, mentorship is embedded into the team culture. Younger players are expected to learn from their senior counterparts, and more experienced athletes naturally take on a guiding role. This inherent culture of mentorship is not reliant on formal structures – it is a shared responsibility across the team.

I believe surgical training could benefit from a similar model. While formal mentorship programs exist, they often lack the dynamism of natural, embedded mentorships. Encouraging a culture where mentorship is organic – where senior trainees mentor juniors, and consultants actively cultivate the next generation – would lead to a more supportive and effective training environment.

Moreover, the best rugby coaches do not just focus on performance; they consider the person behind the player. They recognize that a player going through a tough period off the field will struggle to perform on it. The same is true in surgery – trainees juggling exams, personal challenges, relationships, and professional pressures need mentorship that extends beyond the technical domain.

Modern challenges in surgical mentorship

Despite its importance, mentorship in surgical training faces several challenges. Increasing service pressures mean that senior surgeons have less time to devote to

teaching. The move toward competency-based training models, while beneficial in some respects, risks reducing mentorship to a checklist exercise rather than a dynamic relationship. Additionally, the rise of portfolio careers means that trainees may rotate frequently, limiting long-term mentor-mentee relationships.

To counteract this, we need to prioritise mentorship at all levels. Hospitals should create protected time for mentoring, recognising that this is an investment in the future workforce. Trainees should also be encouraged to seek multiple mentors – no single individual can provide every aspect of guidance needed.

Mentorship in surgical training is often informal and lacks a standardized framework. This is particularly true in ophthalmology, where the structure of mentorship programs varies widely across institutions, if it even exists at all. In a scoping review I recently published, my co-authors and I analysed the literature on mentorship in surgical training, identifying five key domains where mentorship has the most significant impact:

1. **Burnout.** Effective mentorship can act as a buffer against stress and fatigue, which are common in high-stakes surgical training.
2. **Surgical skill and performance.** Mentees with structured mentorship demonstrate improved surgical outcomes and confidence in the operating room.
3. **Career paths and professional development.** Strong mentorship facilitates career progression, subspecialty choice, and research engagement.
4. **Diversity promotion.** Mentorship is a powerful tool in fostering diversity and inclusion in surgical training.
5. **Work-life balance.** Good mentors help trainees navigate the demands of surgery without sacrificing their personal well-being.

Through this review, we proposed

a conceptual framework tailored to ophthalmology trainees, offering a structured approach to mentorship that could be adopted at an institutional level. The review highlights mentorship not as a luxury, but as an essential pillar of modern surgical education.

“The road to becoming a consultant surgeon is long and arduous, paved with lengthy hours, high-pressure decision-making, and the constant pursuit of excellence.”

Lasting impact

Reflecting on my own journey, I can see the fingerprints of great mentors at every stage. From the rugby coaches who instilled discipline and teamwork to the ophthalmic surgeons who honed my clinical and surgical acumen, mentorship has shaped me not just as a professional but as a person.

For those in training, my advice is simple: seek out mentors who embody the 4 A's. Absorb their lessons, not just in technique but in how they navigate their careers and support others. And when the time comes, pay it forward. The best way to honour great mentorship is to become a great mentor yourself. Because in the end, mentorship is not just about skill transfer – it is about legacy. And that is as true in surgery as it is in sport.

Shiny Happy People?

Wonderful new eye therapies don't necessarily improve every aspect of our patients' lives

By Michael Crossland

Recent advances in the treatment of blinding eye disease have been amazing – it seems that every month a new paper on gene therapy is published, offering hope to people with previously untreatable inherited retinal diseases; new electrode arrays and other developments may make retinal prostheses a realistic prospect for visual restoration in the next few years. Away from the clinic, artificial intelligence (AI) scene description on smartphones and wearable devices (e.g., the BeMyEyes app on Meta Ray-Bans) can give instant detailed descriptions of the world to people with vision impairment.

But do these sight-restoring therapies and technologies actually make people happier?

Intuitively, the answer should be a resounding “yes” – it seems obvious that seeing better should improve a person's happiness. After all, it's well documented that people with vision impairment have higher rates of depression and anxiety than those with better sight (1, 2). My colleagues and I recently observed that, even in people without vision impairment, mental wellbeing was still related to self-reported eyesight, with those describing their vision as “very good” having better recorded levels of wellbeing than those self-describing their vision as “good” (3).

However, if we delve into historical accounts the experience of some individuals who've had their sight restored tells a different story. In the 1960s, psychologist Richard Gregory performed a detailed report of “SB,” a 52-year-old man who had his sight



restored after decades of blindness. After a series of fun-sounding experiments (such as taking SB to London Zoo to see if he could identify animals from a distance, a trip which ended with his subject throwing cabbages into the mouth of a hippopotamus – “his aim was good,” reports Gregory), SB became withdrawn and distressed, dying only a year after his ostensibly successful procedure. “He was not a man to talk freely, but was obviously depressed, and we felt that he had lost more than he had gained by recovery of sight... When his handicap was apparently swept away, as by a miracle, he lost his peace and his self-respect,” wrote Gregory at the time (4).

More recently, the well-known

motivational speaker and former president of the San Francisco Lighthouse for the Blind, Mike May, described the difficulties he encountered when his vision was restored by limbal stem cell transplantation and keratoplasty at the age of 43. In his biography, *Crashing Through: A True Story of Risk, Adventure and the Man Who Dared to See* (5), May is described as someone who also struggled with the transition back to sight. Activities which had seemed remarkable to someone with severe vision impairment – traveling independently, downhill skiing – became remarkably mundane for someone who saw well.

In a case report from 2021, Dickens and colleagues describe a patient having their sight restored as experiencing a

period of euphoria, followed by a period of emotional upheaval. They feel that the psychological consequences of sight restoration may be “grossly under-recognized” (6), and I tend to agree.

Of course, visual acuity will remain the most important outcome measure for most treatment trials in ophthalmology, while in other related studies, visual field, contrast sensitivity, colour vision, and reading speed might be the most appropriate endpoints. But I would argue that we can’t know anything about the global effect of any intervention unless we consider its impact on wellbeing and vision-related quality of life.

Luckily we already have rigorous instruments in place to evaluate these outcomes. The Warwick Edinburgh Mental Wellbeing Scale is a very well-established 14-item questionnaire that assesses multiple aspects of wellbeing (7). Similarly, work from Bob Massof’s group at Johns Hopkins University has led to the Activity Inventory, a way to measure the impact of vision loss on multiple aspects of daily life (8), while vision-related health utility scales like VisQoL assess the effect of vision loss on concepts like confidence, safety, and friendships (9).

When we prioritize patients’ wellbeing, it means we can then ensure that appropriate support is put into place around the time of treatment. Currently, I’m leading a study funded by Moorfields Eye Charity and the Medical Research Foundation to examine what happens to the wellbeing of young people receiving sight-restoration therapy – and, crucially, to ask them what support they feel they need around the time of treatment (10). Together with a group of clinical psychologists, our team will investigate whether positive changes in vision really do predict better wellbeing, and also how we might reduce the instances of reactive depression as detailed in the experiences of SB, Mike May, and others.

It is a key part of clinical training to think “beyond the eye” and consider the

“Even though wonderful new therapies exist for some types of eye disease, it doesn’t mean that they will improve every aspect of our patients’ lives, nor that their visual benefits necessarily outweigh the psychological impact to a patient.”

whole patient. Even though wonderful new therapies exist for some types of eye disease, it doesn’t mean that they will improve every aspect of our patients’ lives, nor that their visual benefits necessarily outweigh the psychological impact to a patient. Only once we have good studies which include a careful evaluation of wellbeing can we truly advise our patients on whether any new treatment will have a positive impact on their life. Bearing this in mind, it would be wise to heed the words of Richard Gregory recorded many years after SB’s sight restoration and ensuing death: “I don’t think those of us who tried to look after him realized what a traumatic situation it was for him, so I think to some extent we were to blame for this” (11).

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RayOne EMV: Enhancing Vision

RayOne EMV's non-diffractive design provides a versatile and effective solution for post-laser vision correction eyes – and more

Selecting the right intraocular lens (IOL) is always an involved process, but it becomes more complicated in post-laser vision correction (LVC) patients.

The post-LVC patient population present unique challenges that can impact IOL power calculations, compromising patient outcomes, such as depth of focus and overall visual acuity.

Here, David A. Goldman, MD, founder and CEO of Goldman Eye (Palm Beach Gardens, Florida, USA), describes how RayOne EMV rises to these post-LVC patient challenges, and further explains how it is applicable to a wide range of cases.

What are the distinct visual challenges of post-myopic and post-hyperopic LVC patients?

When we operate on patients who've had prior LVC, there's always a concern about refractive surprise. And sometimes, laser ablation can leave the patient with some corneal irregularity causing irregular astigmatism, or the patient might have a decentered ablation. In a worst-case scenario, the patient may have corneal ectasia.

What proportion of your cataract patients receive LVC?

I would say about 10 to 15 percent of our patients. It's more prevalent now. LASIK patients tend to have a milder cataracts compared to the traditional cataract patients, but their visual demands are

significantly greater. We're also seeing younger cataract patients coming in, particularly post-LASIK patients, because they are used to having "perfect vision." When they experience any sort of dysfunction in their visual acuity, they're eager to get it corrected.

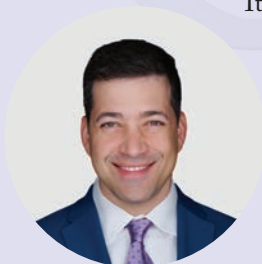
What are the limitations of traditional IOL options for these patients?

It depends on the shape of the cornea. We perform a corneal topography on most, if not all, patients when they come in as part of their preoperative testing. If the testing shows any forms of irregularity, we lean away from the multifocal class of lenses, for example. In addition, patients can often have

halos and glare from their prior LASIK, so if you add an optic that also contributes to glare and halos, you may compound the problem. Obviously, an optic that minimizes those types of dysphotopsias can be very beneficial.

What is RayOne EMV's role in this space, and what distinguishes it from other IOLs, such as EDOFs?

Diffractive optics separate the light into segments, and in dividing the light they can lose image quality. Unlike many extended depth of focus (EDOF) and multifocal lenses that rely on diffractive technology, RayOne EMV's non-diffractive optic uses positive spherical aberration to extend range of vision. This avoids the problems that can arise with diffractive lenses, such as chromatic aberration, glares and halos. A recent study, for example, showed a significantly smaller halo size at all measured degrees except at the 0° position with RayOne EMV compared with Alcon's Vivity lens when tested with the Aston halometer. The same study demonstrated that RayOne EMV delivered distance-corrected and uncorrected binocular visual acuity comparable to Vivity across far, intermediate, and near distances (1).



Because RayOne gives you that extended range of vision without diffractive optics, the physician also has a bigger "sweet spot," a much bigger window to hit the refractive target, when it comes to prior LASIK patients. A lot of patients who've had LASIK have had monovision LASIK, and they want to maintain the results of that. With RayOne EMV, you've not only got the extra benefit of that bigger sweet spot, but you can give patients extended-depth-of-focus monovision profile without compromising binocular distance vision. If you hit the target, the patient's dominant eye is going to have distance and intermediate vision, and their near eye will have intermediate to near vision. So, you get the whole complement of vision.

What are the benefits of the design of the RayOne EMV optic?

I would say one of the benefits of the design is that it maintains the extended depth of focus characteristics you get with positive spherical aberration without losing the contrast sensitivity you would find in other +SA lenses. The use of positive spherical aberration shifts the wavefront myopically and works in collaboration with most patients' naturally occurring corneal spherical aberration. As a result, the change to the IOL's surface profile is less pronounced compared to

"I like to say it's a premium lens in monofocal lens clothing; it gives an exceptional range of vision that is really unparalleled."



going to get the benefit of extended range of vision.

Where would you say RayOne EMV sits within the evolving landscape of IOL offerings?

It is definitely at the top of the mountain. It's by far one of the easiest lenses to use from a technician and surgical nurse perspective; our surgical techs can prep and load and hand off the lens within seconds. It does not slow us down in the OR in terms of injection. It's a very simple plunger system that delivers directly into the bag.

Also, because of the design, I've seen almost no negative dysphotopsia with RayOne EMV. I've used other lenses that have a very high incidence of negative dysphotopsia, and it's upsetting to have a patient who is 20/20 but is miserable because of something out of the surgeon's control. But both intraoperative and postoperatively, I think RayOne EMV is better.

For a non-astigmatic patient who is looking to have excellent visual acuity after cataract surgery, I think RayOne EMV is almost always going to be the number-one choice lens.

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 **Rayner**

other optic designs. (2)

In fact, clinical studies have shown that the depth of focus characteristics of the RayOne EMV lens is similar to other EDOF IOLs (3), while the contrast sensitivity is similar to the most popular monofocal IOLs used in the US (4).

What preoperative assessment strategies do you offer cataract surgery patients?

When a patient presents for cataract surgery, we do macular OCT and corneal topography, in addition to the traditional optical biometry. We look at things such as the patient's current corneal spherical aberration, in case it is significantly high, or if the patient has a wildly irregular cornea, for example, post-LASIK ectasia, keratoconus, or keratoglobus. For those patients I'll lean more towards a spherically neutral lens.

But if their cornea and macula are within normal limits, then we talk to patients about all their lens options, depending on what their lifestyle demands. In the past, when patients asked for a multifocal lens, they were focused on getting good reading vision. They didn't drive much at night, so halos were not a major concern. Today, patients have more active lifestyles. They drive more often at night and no longer read print newspapers; instead, they use iPads or computers. As a result, strong up-close near vision is not as much of a priority; rather, they desire distance and intermediate vision. For this reason, a lens such as RayOne EMV is much more preferable.

What are the wider applications of RayOne EMV, particularly for patients with irregular corneas, prior refractive surgery, and other unique visual demands?

For virgin corneas, it is probably the best monofocal lens available in the US market. I like to say it's a premium lens in monofocal-lens clothing; it gives an exceptional range of vision that is really unparalleled. In my experience, other monofocal lenses that claim to offer extended range of vision often provide only around 0.75 diopters of depth of focus. Clinical studies and our own in-office results show that RayOne EMV consistently delivers about 1.5 diopters of depth of focus, which is an exceptional range for a monofocal lens. If you target distance in both eyes with this, the patient is going to have excellent distance vision and be able to work on the computer without glasses.

What other patient populations might benefit from RayOne EMV?

There are patients with regular corneas, for example, who have keratoconus, but the keratoconus is such that if they wear rigid gas permeable (RGP) or scleral lenses, they will need to continue wearing them after surgery. These patients are great candidates for RayOne EMV, because when they put their RGP or scleral lens back in their eye, they're

The Art of Eyes 2025

Showcasing artwork and images from across the spectrum of ophthalmology

This year's feature saw an influx of visually arresting and thought-provoking submissions from a whole range of practitioners working in and around the field of ophthalmology all over the world.

Here we present a selection of the most dynamic and eye-catching images we received. We hope you enjoy them as much as we do!

RETINAL HORIZONS: A SUNSET WITHIN THE EYE

Hridya Abhilash is an Assistant Professor in the Department of Ocular Oncology at Malabar Cancer Center, India. Her work explores the subtle intersections between ophthalmology and visual storytelling, transforming clinical imagery into meditations on beauty, impermanence, and the unseen narratives of the eye. Abhilash invites viewers to pause, reflect, and look beyond the surface.

"[This] image blends the intricate beauty of the human fundus with the serene hues of a sunset, symbolizing the delicate interplay between vision and nature," she says. "The rich reds, oranges, and yellows mirror the vibrant glow of the evening sky, reminding us that the eye itself holds landscapes as breathtaking as the world it perceives. A fusion of science and art, this image serves as a creative tribute to the wonders of ocular anatomy and the beauty hidden within."



Jackson Bloch

RESERVOIR

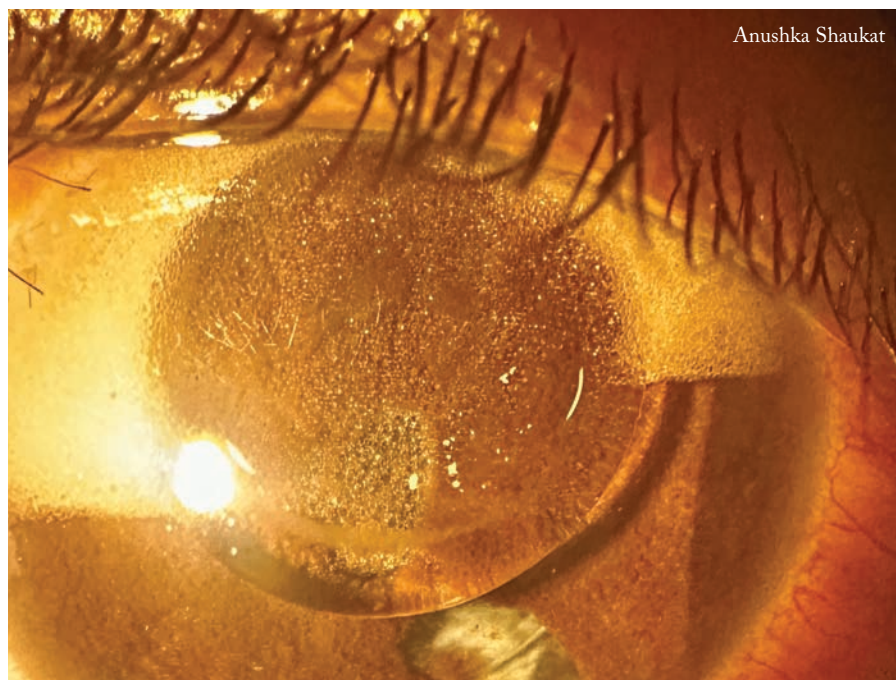
Jackson Bloch is a third-year medical student at the Mayo Clinic Alix School of Medicine in Rochester, MN. He has pursued an interest in ophthalmology during school, inspired by the central role vision plays in patients' quality of life and independence as they age. He has found that ophthalmology dovetails with the visual focus and fine motor craftsmanship of his background in ornithologic illustration.

Bloch observes: "This piece abstracts a retina infected with neuro-invasive West Nile virus. Crows, a common reservoir for the virus, perch among the branching vasculature of the retina, depicted here as a tree and its reflection. Behind the vessels, lesions track linearly along the nerves that radiate from the optic disc, similar to the way the disease presents. Finally, a medical student rows through the scene, mesmerized by the complexity and beauty of the anatomy, and struck by the surrealness of disease."

ANTERIOR CHAMBER INTRUDER

Anushka Shaukat completed her ophthalmology residency at PAF (Pakistan Air Force) Hospital, Islamabad (2019–2023). Following her board certification, she joined Al Shifa Trust Eye Hospital, Rawalpindi, one of the country's leading tertiary eye care centers, renowned for its clinical excellence, ophthalmic research, and extensive outreach programs across Pakistan.

She explains that her image, "Anterior Chamber Intruder," depicts a "silicone oil migration in the anterior chamber of a young male patient's eye."

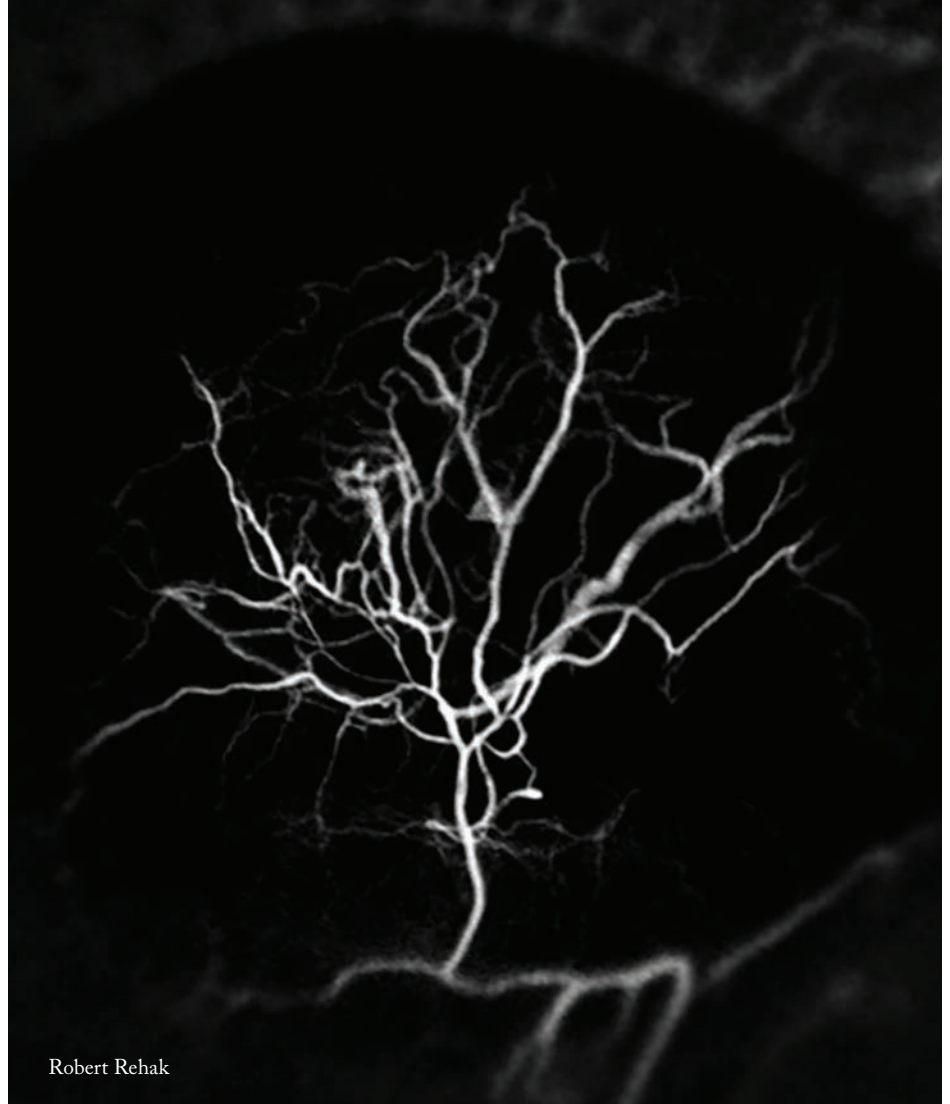


Anushka Shaukat

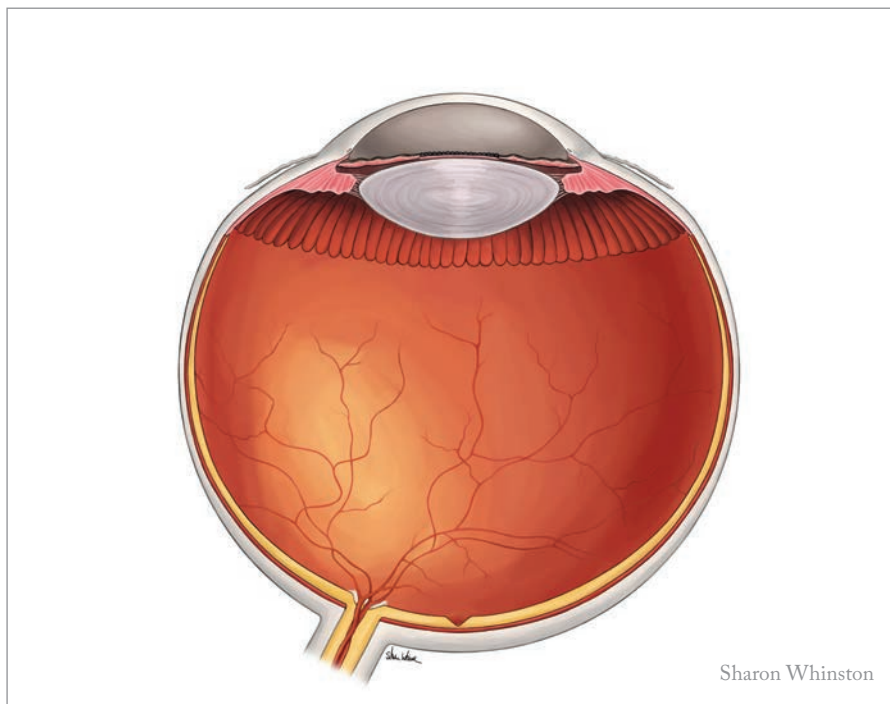
HOPE

Robert Rehak is a Practice Educator for Ophthalmic Vision and Science in Gloucester, UK. He is originally from Slovakia, from Trebisov, a town close to the Hungarian and Ukrainian borders.

Rehak says: “This image was captured during an anterior segment fluorescein and indocyanine green angiography (FFA/ICG) for a patient with corneal neovascularization. Despite the severity of the condition, I feel this image of the pathology looking like a tree represents hope that things will get better. It also represents the idea that we should try to see through negatives and take out the positives. I would like to dedicate this image to my parents who passed away years ago, as a reminder of the origins of my inspiration and my dedication to the work I love.”



Robert Rehak



Sharon Whinston

A LOOK AT KERATOCONUS

Sharon Whinston is a pre-medical and medical illustration student. She earned her associate's degree in digital art and design from Queensborough Community College, New York, before transferring to the Kendall College of Art and Design, Michigan, where she studied medical illustration. Sharon has been fascinated by the complexity of eyes and eye conditions from a young age.

“When I was 11, I learned that my brother had keratoconus,” explains Whinston. “This confused me as a child and made me worry about getting it myself. Now, I aim to visualize and understand what scared me back then.”

IN THE PERIPHERY

Margaret Tharp is a fourth-year medical student at Indiana University School of Medicine in Indianapolis. Her artistic style typically involves a combination of drawing and collage. She enjoys repurposing used materials for her work, and is a proponent of environmental sustainability in ophthalmology and healthcare as a whole. This piece was completed while pursuing a Master of Public Health with a concentration in Global Environmental Sustainability and Health at the Johns Hopkins Bloomberg School of Public Health. Tharp utilized discarded medical supplies taken from two cataract surgeries at an ambulatory surgical center in Indiana.



Margaret Tharp



Jacqueline Jeon-Chapman

THE FLOATER SPRITES

Priyanka Patil is a young ophthalmologist who has worked with various charitable and NGO trusts, providing health care in rural India. She loves to learn and work with different mediums of art.

"This watercolour painting depicts soot sprites (Susuwatari) as floaters, while Satsuki and Mei (from 'My Neighbor Totoro') observe their own floaters," explains Patil. "It is an attempt to portray how a patient experiences floaters."



Priyanka Patil

FLOATERS

"Jacqueline Jeon-Chapman is a medical student at Frank H. Netter School of Medicine in Connecticut, USA. Last year, she completed a research fellowship at Boston Children's Hospital Department of Ophthalmology."



THE WINDOW WITHIN

Ninglu Weng is a final-year medical student from Canada with strong interests in both the visual arts and a career in ophthalmology.

“This palm-sized sketch reflects my quiet fascination with the anatomical and emotional detail of the eye, glimpsed each day through the slit lamp,” explains Weng. “That same sense of awe guides my drawing process, where each millimeter of detail contributes to the whole.”



Menna Shaker

THROUGH YOUR EYES I SEE THE WORLD

Menna Shaker is an Intern Physician at Kasr Al-Ainy School of Medicine, Cairo University, Egypt, and the Founder of Medical Students Hub, a platform empowering future healthcare professionals. A passionate advocate for sustainability and youth leadership, she serves as a United Nations Development Program (UNDP) Youth4Sustainability Ambassador and a certified sustainable development goals trainer.

“Ophthalmology is more than eye care – it is about restoring vision, yes, but also about preserving human connection, identity, and the way we interpret life,” Shaker says. “This painting explores the idea that when an ophthalmologist peers into a patient’s eye, they are not just diagnosing – they are sharing in a deeply human exchange.”

IRIS OF A SURGEON (SELF PORTRAIT)

Kayur Shah is an ophthalmologist based in Los Angeles and the creator of the EyeDropAlarm app. He is passionate about teaching and mentoring ophthalmology residents. His love for art began during his studies at Oxford, where he took an art history course. His oil paintings are often inspired by the beautiful landscapes he encounters during family vacations. Shah donates the proceeds from print sales of his artwork to the Foundation Fighting Blindness charity.



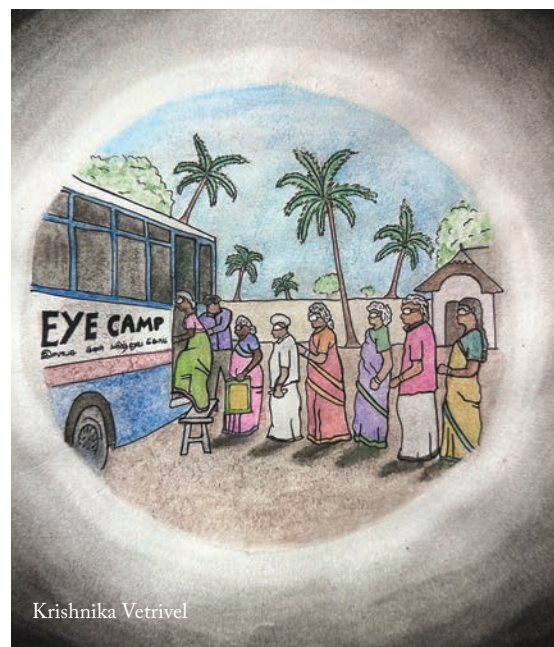
Kayur Shah

Rhian Pearson



THE INTRAVITREAL INJECTION

Rhian Pearson is an Ophthalmic and Vision Science Practitioner, originally from South Wales and currently working in Gloucestershire, UK. With a strong foundation in photography, Pearson holds a BA (Hons) in Photography from the University of South Wales and went on to achieve a distinction in the Postgraduate Certificate in Clinical Photography at Cardiff University. She began her journey as a trainee clinical photographer, and has since combined her artistic skills with a passion for healthcare. Outside of work, she enjoys drawing, painting, and capturing moments through her camera lens.



Krishnika Vetrivel

THROUGH NEW EYES

Krishnika Vetrivel is a medical student at King's College London, with a keen interest in global health and the intersection of art and medicine.

MICKEY UNDER THE MICROSCOPE!

Md Iftekher Iqbal is a prominent glaucoma specialist from Bangladesh, known for his work in minimally invasive glaucoma surgery (MIGS). His contributions to advanced and innovative approaches to complex glaucoma care have earned him international distinction, including the APAO Young Ophthalmologist Rising Star recognition.



Md Iftekher Iqbal

Introducing the Ahmed ClearPath® ST: Evolving Design for Evolving Needs in Glaucoma Surgery

The Ahmed ClearPath® ST (ACP ST) represents the latest advancement in glaucoma drainage device design, offering surgeons a smaller-lumen, non-valved implant engineered to address evolving surgical challenges and techniques in the management of refractory glaucoma.

Building upon the clinical success and adoption of the original Ahmed ClearPath®, a non-valved device introduced to the market in 2019, the ACP ST offers a refined solution for glaucoma surgeons seeking greater flexibility, predictability, and patient comfort in the management of refractory cases. A distinguishing feature of the ACP ST is its smaller tube lumen, with an inner diameter of 127 µm and 457 µm outer diameter.

“For patients with prior conjunctival glaucoma surgeries, ACP ST’s smaller tube will provide a reliable and controlled option to achieve target IOPs and may reduce the risk of tube erosion,” says Dr. Gabriel Lazcano-Gómez, Associate Professor at the Department of Glaucoma, Asociación para Evitar la Ceguera en México (APEC).

To streamline intraoperative efficiency, the ACP ST is delivered as a fully integrated surgical system, packaged with a 6-0 Prolene ripcord suture pre-threaded into the tube and an included 25-gauge needle



for the scleral tunneling. These enhancements reduce variability and simplify the procedure.

“Utilizing the ripcord from the same manufacturer ensures consistency in flow control,” explains Dr. Lazcano-Gómez.

“Minor differences in 6-0 Prolene from various suppliers can influence performance and clinical outcomes, so this uniformity is clinically meaningful.”

The ACP ST also incorporates a flexible, globe-conforming plate material that facilitates a natural fit and encourages the formation of a diffuse, low-lying bleb. The device is available in two plate sizes: the model 250, which supports true single-quadrant implantation without rectus muscle isolation, and the model 350, which features a winged design to bypass rectus muscle attachment points. “The flexibility of the 250 model is excellent. You can roll the plate and insert it through a smaller incision with minimal manipulation,” Dr. Lazcano-Gómez shares. “Its low-profile design also helps avoid the formation of high, thick blebs that can cause patient discomfort or cosmetic concerns.”

Another surgical refinement is the anterior positioning of the suture eyelets,

which facilitates posterior plate placement and improves intraoperative handling. “The anterior eyelets allow me to secure the plate without enlarging the peritomy,” adds Dr. Lazcano-Gómez. “This preserves more conjunctiva and reduces potential scarring, particularly valuable in eyes that may need future surgical interventions.”

From a postoperative standpoint, Dr. Lazcano-Gómez has observed that the ACP ST offers meaningful clinical advantages. In ligated tube scenarios, outcomes are comparable to the original Ahmed ClearPath® at six weeks. However, in non-ligated cases, surgeons may observe significant IOP reductions as early as postoperative day one, a benefit not consistently seen with other non-valved tubes in the market.

As glaucoma treatment paradigms advance, the Ahmed ClearPath® ST represents a thoughtful convergence of design innovation, surgical efficiency, and patient-centered performance. It reflects New World Medical’s continued commitment to supporting glaucoma specialists with refined tools that elevate outcomes and surgical confidence.



ANTERIOR SEGMENT

Considering Positive Spherical Aberration

Positive SA is a patient-friendly approach to extending depth of focus

By Kendall E. Donaldson

The ongoing evolution of IOLs that extend depth of focus offers a myriad of opportunities to enhance patient outcomes after cataract surgery. Navigating the nuances of lenses designed for this purpose, however, can spark healthy debates about the best strategy. While some believe IOLs with positive spherical aberration (SA) offer the most benefit without significantly compromising visual performance, others argue that IOLs with negative SA yield better quality vision for some patients (1-4). Ongoing dialogue aside, the modulation of rotationally symmetric wavefront aberrations – such as SA – has been shown to provide a wider range of vision than a single focal point (4-6). Additionally, evidence demonstrates that both positive and negative SA may increase depth of focus and produce favorable clinical outcomes (7-12). In my clinic, I may choose an IOL with positive SA for one patient and an IOL with negative or zero SA for another. My preference depends on which lens I feel will benefit a patient the most.

Understanding spherical aberration

Lower-order aberrations such as myopia, hyperopia, and regular astigmatism typically impact vision to a greater extent than higher-order aberrations such as SA. In patients who are candidates for premium IOLs, however, SA can play an important role in visual quality after surgery (13).

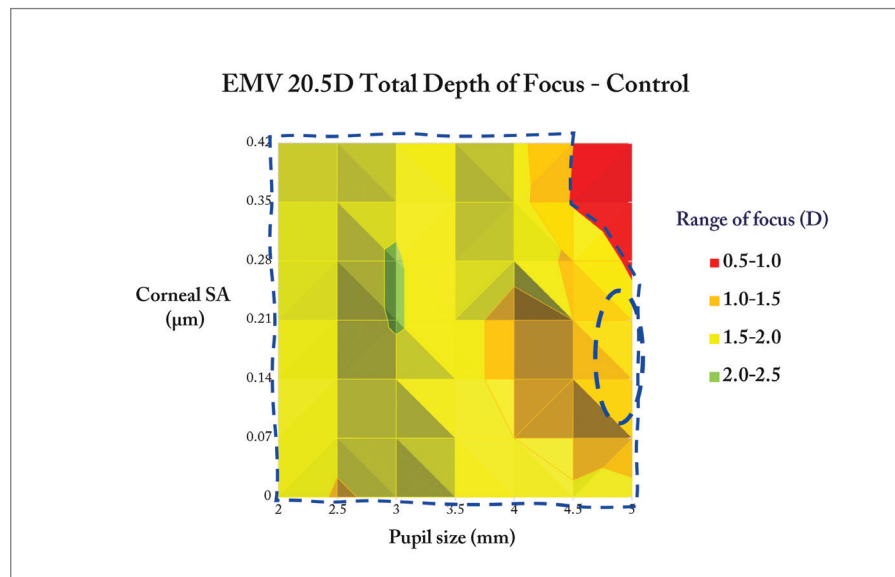


Figure 1. The depth of focus with RayOne EMV is 1.50 D or more over a wide range of pupil sizes and corneal spherical aberration. (Courtesy of Damien Gatinel)

Negative SA occurs when peripheral rays of light cross the center of the cornea and converge on a point anterior to the peripheral rays. Conversely, positive SA occurs when peripheral rays of light focus in front of the central rays on the retina.

Unlike an aspheric IOL with negative SA optimized for a single focal point, an IOL with positive SA creates a broader focal zone. In my clinical experience, IOLs designed with positive SA strike a delicate balance between extending depth of focus and avoiding unwanted visual side effects. They provide a modest enhancement in the range of vision and maintain distance vision without creating the glare, halos, and contrast sensitivity loss often seen with some multifocal IOL designs (14, 15). While a positive SA IOL may not achieve the same range of vision as an extended depth of focus (EDOF) technology, it is an excellent choice for a large number of patients who desire a broadened focal point without significant blur and other visual side effects.

Potential candidates and patient satisfaction

IOLs with controlled positive SA

are particularly well-suited for many patients, including those outlined here.

- **Highly aberrated eyes.** Some patients with a history of refractive surgery, especially myopic LASIK, may have a certain degree of induced positive spherical aberration, which may benefit from a lens with negative or zero spherical aberration. Patients with a history of hyperopic LASIK or PRK typically have induced negative spherical aberration, which may be balanced by a lens with positive spherical aberration or with no aberrations. These patients often have a significant degree of higher-order aberrations associated with loss of contrast sensitivity, so they may be particularly sensitive to photopic phenomena associated with multifocal or EDOF lenses.
- **Small pupils.** Positive SA IOLs are appropriate for a broad range of patients. Unlike some lenses with a small central optical zone, the RayOne EMV's design does not rely on pupil size to optimize its performance (Figure 1). With that

said, in my experience eyes with a small pupil usually achieve greater depth of focus with positive SA. Additionally, age-related miosis enhances depth of focus naturally, making positive SA IOLs even more effective in this group to increase the depth of field.

- **A compromised ocular surface.** Unlike some premium IOL models, lenses with positive SA are more forgiving of mild corneal irregularities. Patients may therefore maintain high-quality vision even in the presence of residual higher-order aberrations.

Patient satisfaction often hinges on managing their expectations. When explaining the benefits of an IOL with positive SA, I emphasize its ability to provide excellent distance vision with a practical improvement in intermediate vision, aiding in tasks like computer use, reading menus, and engaging in face-to-face conversations. I also explain that the IOL may avoid disruptive visual artifacts common with other premium lens designs (14, 15). I have found positive SA delivers a high level of predictability and safety, broadening the patient candidate pool compared to EDOF and multifocal lenses.

Addressing common misconceptions

Critics of IOLs with positive SA cite data suggesting that positive SA decreases near vision quality and contrast sensitivity (1). While laboratory studies using adaptive optics simulations may demonstrate these effects in tightly controlled settings, clinical outcomes paint a more detailed picture. In real-world conditions, many patients achieve a broader range of functional vision with positive SA without perceiving the slight reductions in contrast sensitivity that may appear in optical bench testing.

My clinical observations align with studies highlighting the functional advantages of positive SA. Research by Rocha and colleagues demonstrated that both positive and negative SA can extend

depth of focus, though their effects differ (2). While some studies question the benefits of positive SA (1), I've found these lenses not only provide excellent distance vision but may also improve intermediate vision to a greater extent than negative SA and aspheric IOLs.

Overall, patient satisfaction has been high with positive SA IOL like the RayOne EMV and the SensAR40e (Johnson & Johnson Vision) (Table 1). Most of my patients report gaining additional range of vision, and the extension of the focal point is minimal enough that they don't typically notice any blur or contrast loss like they may with an EDOF or multifocal IOL. With both multifocal lenses and full monovision technology, as the range of vision increases, so does the potential for optical side effects. I generally advise patients that this compromise is inherent to gaining additional freedom from glasses. If a patient is not willing to tolerate any degree of dysphotopsia, I find that advanced monofocal technology is preferable to extended range of focus lenses (EDOF and multifocal technology).

Results with other enhanced monofocal IOLs such as AcrySof Clareon (Alcon) and Eyhance (Johnson & Johnson Vision) are also promising for reducing the potential for dysphotopsias through the use of negative spherical aberration (16, 17). With all of these lenses, the depth of focus is increased in patients with smaller pupils, which is a well-known trend with increasing age.

Future refinements

The refinement of SA technology continues. Advances such as the Light Adjustable Lens (LAL; RxSight), which allows us to fine-tune the visual outcome postoperatively to meet individual patient needs, incorporate SA to increase depth of focus. Such innovations demonstrate the flexibility of SA in achieving tailored outcomes without compromising optical quality.

Compared to monovision, less myopic offset in the nondominant eye is needed to gain an increased range of vision with

"I emphasize the ability an IOL with positive SA to provide excellent distance vision with a practical improvement in intermediate vision."

the LAL as compared with standard monofocal monovision. This helps patients achieve adequate binocular distance and near vision. The less anisometropia, the better it is for the summation of vision and maintenance of depth perception.

Conclusion

Positive SA is a patient-friendly approach to extending depth of focus. While not a panacea, lenses like the RayOne EMV offer meaningful advantages for a broad range of patients. As clinicians, we must continue to weigh the evidence and integrate our experiences to guide patients toward the best options for their unique needs.

Kendall E. Donaldson, MD, MS, is Professor of Clinical Ophthalmology, Cornea/External Disease/Refractive Surgery, and Medical Director, Bascom Palmer Eye Institute, Plantation, Florida. Financial disclosure: AbbVie, Alcon, Bausch + Lomb, BVI, Carl Zeiss Meditec, Johnson & Johnson Vision, Lensar, Rayner

See references online.

GLAUCOMA

Glaucoma Management with MITS

Performing minimally invasive tube surgery (MITS) with the eyePlate-300, writes Faisal Ahmed

Glaucoma remains the leading cause of irreversible blindness in adults worldwide. Traditionally, glaucoma drainage devices (GDDs) have been the mainstay treatments for managing intraocular pressure (IOP) in patients with advanced glaucoma and in those for whom other treatments have been unsuccessful. However, GDD procedures are often associated with significant risks and complications.

The advent of Rheon Medical's eyePlate-300, and the development of a novel technique known as minimally invasive tube surgery (MITS), offer a less traumatic and potentially more effective solution. The eyePlate was originally designed to be used with the eyeWatch system, an adjustable glaucoma drainage implant that allows surgeons to modify IOP noninvasively following the implantation of a nonvalved tube shunt. Made from silicone, the eyePlate is available in two sizes, the eyePlate-200 and the larger eyePlate-300. The tube has the same internal and external diameter as a standard Baerveldt or Ahmed FP7 GDD. The plate is almost square in shape, meaning it can still have a relatively large surface area with a smaller width, allowing it to fit just between the recti muscles, with the width of the eyePlate-300 being almost nearly half the width (18.5mm) of the Baerveldt 350 at 32 mm. This negates



the need for a large peritomy and recti muscle slinging, which is more tissue-traumatic. The plate is thinner than the Baerveldt or Ahmed FP7, which should lead to lower bleb heights and thin bleb walls, associated with lower IOP. Additionally, the plate's flexibility means it sits flush with the sclera when sutured and can also be folded.

Surface area and bleb height

One of the critical factors influencing the success of GDDs is the surface area of the plate and the height of the bleb formed post-surgery. The larger the surface area and the lower the bleb height, the more effective a GDD is. The eyePlate-300 boasts a substantial surface area of 300 mm², making it one of the largest available on the market, second only to the Baerveldt 350. This large surface area is crucial as it provides a more extensive interface for aqueous humor drainage, thereby enhancing the device's ability

to lower IOP effectively. The almost square shape of the eyePlate-300 allows it to fit snugly between the recti muscles, while still maintaining a large surface area. Surgically, this means that the recti muscles do not need to be slung, unlike in conventional GDD surgery.

Bleb height is another critical factor in the long-term success of GDDs. Taller blebs are often associated with thicker fibrous walls and higher IOPs, whereas flatter blebs tend to have thinner walls and lower IOPs. The eyePlate-300 is designed to promote a flatter bleb profile. Its thinner plate (0.8 mm) compared to the Baerveldt (0.9 mm) and Ahmed FP7 (1.0 mm) allows it to sit more snugly against the sclera, resulting in a lower bleb height.

I was part of a group that published the first ever paper on the eyePlate 300 as a standalone GDD using the traditional limbal peritomy technique (1). The study showed promising results; 16 eyes were included, in which mean eye pressure

was reduced from 31.5 mmHg to 10.7 mmHg. The mean number of drops reduced from 3.1 to 0.7; the results also showed that nearly 50 percent of patients did not require glaucoma drops at one year. No further surgery was required for lowering eye pressures at one year.

“GDDs have been the mainstay treatments for managing IOP in patients with advanced glaucoma and where other treatments have been unsuccessful. However, GDD procedures are often associated with risks and complications.”

MITS: A novel surgical technique

Traditional GDD implantation techniques often require large conjunctival incisions and extensive manipulation of ocular tissues, leading to significant post-operative discomfort and longer recovery times. The MITS technique is less invasive. The eyePlate-300 is implanted through a smaller, less traumatic incision – the eye is retracted inferonasally to expose the superotemporal quadrant. A subconjunctival injection of bupivacaine with adrenaline is administered to ensure adequate exposure and induce hemostasis.

A vertical radial incision is made 5 mm behind the corneal limbus, extending approximately 8–10 mm posteriorly. The eyePlate-300 is folded in half “taco style” (with a folded width of approximately 9 mm) and inserted through the small conjunctival pocket. Care is taken to unfold the plate under the tenons, ensuring it sits between the lateral and superior rectus muscles. The eyePlate-300 is then sutured to the sclera using a 9/0 prolene suture or a Gore-Tex suture. The tube is trimmed to a bevel and inserted into the anterior chamber via a sclerostomy made 2 mm from the limbus. A 3/0 prolene stenting suture is placed in the tube to also prevent post op hypotony and is removed in the clinic no earlier than 2 months post surgery. An occluding 7/0 VICRYL suture is tied around the tube to prevent early hypotony. A double layer of Tutoplast Allograft tissue is glued with Tisseel fibrin sealant, and the smaller radial peritomy is closed with Tisseel fibrin sealant glue and a 10/0 nylon suture. A subconjunctival steroid and antibiotic are administered to complete the surgery.

Advantages of MITS

The MITS technique offers several advantages over traditional GDD implantation methods:

- **Reduced tissue trauma.** The smaller conjunctival incision preserves corneal limbal anatomy and reduces tissue trauma, potentially leading to faster recovery times and improved post-operative comfort.
- **Minimized risk of diplopia.** The narrow profile of the EyePlate-300 allows it to fit between the recti muscles, reducing the risk of post-operative diplopia.
- **Improved cosmesis.** The limbal architecture remains unaffected, improving post-operative cosmesis.
- **Simplified procedure.** The radial wound used in MITS is easier to close, requiring fewer sutures and reducing the risk of post-operative leaks.

MITS clinical outcomes

A retrospective analysis of 13 eyes implanted with the eyePlate-300 using the MITS technique showed promising results without the use of adjunctive Mitomycin-C (2). The primary outcome was successful, defined as achieving an IOP > 5 mmHg and < 21 mmHg without the need for eye drops. Secondary outcomes included best-corrected visual acuity at 12 months, complications, reduction in the number of drops, and the need for further pressure-lowering surgery.

Twelve eyes (92 percent) achieved a lower IOP. The mean pre-operative IOP was 35.69 mmHg, which was reduced to 11.08 mmHg post-operatively ($p < 0.001$). The mean pre-operative drops were 3.462, reducing to 0.85 at 12 months ($p < 0.001$). With nine of the 12 requiring no more than one IOP lowering drop at 1 year. There was no significant change in mean best-corrected visual acuity.

No intraoperative complications were recorded, and no further IOP-lowering surgeries were required during the 12-month follow-up period.

Conclusion

The eyePlate-300 and the MITS technique offer a new, less traumatic approach to glaucoma drainage device implantation. By reducing tissue trauma and improving post-operative outcomes, this method has the potential to significantly enhance the quality of life for patients with advanced glaucoma. Of note, Mitomycin-C was not used in any of the surgeries as a surgical adjunct. Further research and clinical trials will help solidify its place in the future of glaucoma management.

While the author is listed on Rheon Medical's website as the first surgeon to use the eyePlate-300, he has no financial interest in the product or the company.

See references online.

RETINA

Retinal Examination in Babies and Young Children

The retinal imaging space is prime for innovation, writes Damien Yeo of Alder Hey Children's Hospital, UK

With retinal disorders becoming a major cause of childhood blindness worldwide (1), thoroughly and regularly examining the retina in children has become more important than ever. While indirect ophthalmoscopy (IDO) is the traditional standard for retinal examination, accurate visualization of the peripheral retina tends to be operator-dependent, and the procedure can often be distressing for children (2). By contrast, digital retinal imaging provides objective and extensive information in a much faster and convenient manner. It serves as a valuable complement to clinical examinations, particularly in eyes with media opacities or inadequate pupil dilation.

Changing diagnostic paradigms: digital retinal imaging

Traditional retinal examination using an indirect ophthalmoscope headset or a condensing lens on a slit lamp presents several practical challenges, especially when examining children. For instance, neonates can be kept still through swaddling, but uncooperative older children may require anaesthesia, carrying potential neurotoxic risks (3). The need for skilled examiners, long examination times, and subjective documentation with fundus drawings are some other drawbacks. Conventional fundus photography, which captures 30°–50° of the fundus (or up to 100° with montaging) (4), has been used for decades, but clinicians have realized that this field-

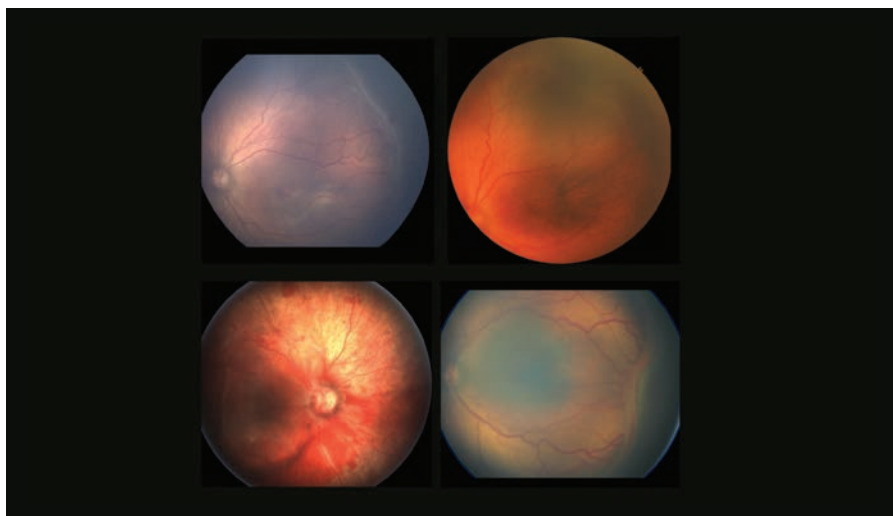


Figure 1. Widefield retinal images captured by (clockwise from top left) the RetCam Envision, 3nethra Forus Neo, Suoer SW-8000 and the Phoenix ICON imaging systems. Image courtesy of Damien C.M. Yeo

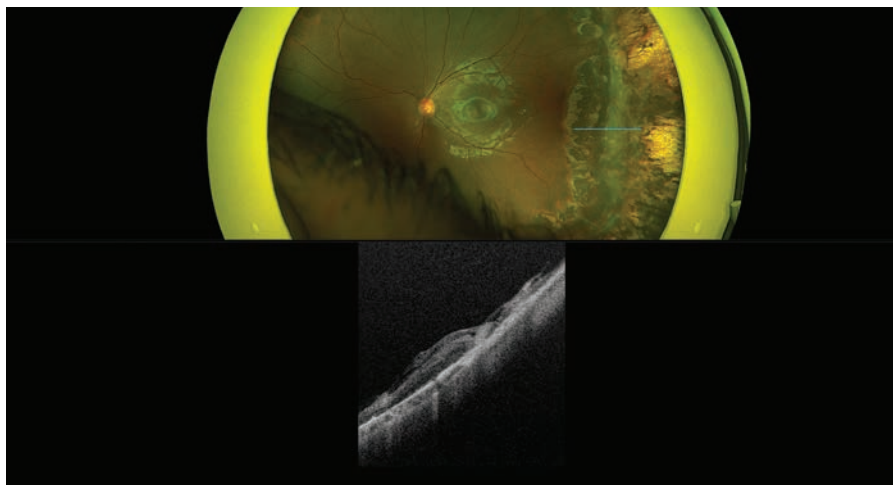


Figure 2. Ultra widefield image of the retina till the far periphery obtained by the Silverstone. This is an example of an older child with previously treated retinopathy of prematurity. The blue line indicates the location of the corresponding cross-sectional B-scan. Image courtesy of Damien C.M. Yeo

of-view (FOV) can be inadequate in pediatric vitreoretinal pathologies, such as retinopathy of prematurity (ROP), familial exudative vitreoretinopathy (FEVR), and Coats' disease, which can have significant peripheral manifestations (5).

Widefield (WF) imaging is defined by the International Widefield Imaging Study Group as capturing retinal anatomy beyond the posterior pole but posterior to the vortex vein ampullae in all four quadrants. Ultra widefield (UWF) imaging, by contrast, extends further to capture details anterior to the vortex vein ampullae in all quadrants (6). These imaging systems provide fovea-

centred images covering 60°–100° (WF) and 110°–220° (UWF) of the retina in a single capture, thereby combining the advantages of digital imaging, such as accurate documentation and reproducibility, with the ability to visualize peripheral retina that is inaccessible with traditional fundus photography (4).

Among the WF systems that are used in pediatric ophthalmology, the RetCam 3 (Clarity Medical Systems, Inc., Pleasanton, CA, US) is probably the most well-known device (4), although there are now newer machines, including an updated version of the RetCam known as the Envision

(Natus Medical Inc., Pleasanton, CA, US) (7). Other 100°–140° examples include the Phoenix ICON (Phoenix Technology Group, Pleasanton, CA, US) (7), the 3nethra neo (Forus Health, Bangalore, India) (8), the PANOCam (Visunex Medical Systems, Inc., Fremont, CA, US) (8) and the SUOER SW-8000 (Tianjin Suowei Electronic Technology Co., Ltd., Tianjin, China) (9). Figure 1 compares images obtained by various WF retinal imaging devices.

These WF systems are contact-based (requiring a topical anaesthetic, a coupling gel between the tip of the camera and the cornea, and frequently, a speculum), which limit their use to neonates, smaller babies, or older children under anaesthesia. These cameras need multiple captures in various directions to visualize retina beyond the vortex veins, that is, the far peripheral retina. All of them are mydriatic-based systems, so the image quality is very sensitive to poor pupillary dilation.

A newly described prototype of a contact-based optical system I find particularly creative is the PedCam, which utilises trans-planar illumination to achieve whole retinal illumination. In theory, this affordable smartphone-based non-mydriatic handheld camera can achieve up to 240° of effective retinal visualisation with two photographs, which would be very advantageous for ROP screening (10).

UWF imaging systems on the other hand depict the retina till the far periphery (anterior to the vortex vein ampulla in all four quadrants (6)) in a single capture. An example is the Clarus fundus camera (Carl Zeiss AG, Jena, Germany), which covers 133° in a single true-colour image, and requires a stitch or montage of two images to achieve a 200°-wide image (11).

In our practice, we rely on a commonly utilized UWF device (Silverstone, Optos PLC, Dunfermline, UK), which employs scanning laser ophthalmoscopy to capture 200° of the retina in a single image, with montaging extending the FOV to 220° (4). It is a non-contact procedure that does not require dilatation or sedation in children (5, 12). Interestingly, the origin of

this company has a close connection with pediatric ophthalmology – Optos was founded by Douglas Anderson after his young son was blinded when a peripheral retinal detachment was missed during a routine examination. The Optos imaging systems are traditionally equipped with the red-green imaging modality, and have recently added the true colour modality of red-green-blue imaging (13, 11).

One thing to note is that these table-top UWF imaging systems require patients to be upright, which can present unique challenges in the pediatric population. Achieving optimal image quality can involve some trial-and-error to determine the best alignment and patient-device distance (12). Previous studies have shown that infants can be successfully imaged with the “flying baby” technique (12, 14), in which the chest and chin is supported on one arm and the head is stabilized with the other hand.

In our high-volume pediatric clinic, UWF imaging has become an essential tool, especially for retinal screening. Obtaining a baseline UWF image during any patient's first visit, where feasible, is a practice I strongly advocate, as it often uncovers unexpected retinal pathologies that might otherwise go unnoticed. UWF also allows for rapid screening of genetic conditions – such as retinal dystrophies, Coats' disease, and FEVR or retinoblastoma – in patients as well as their relatives. With further technological advancements, digital imaging is likely to become more indispensable in pediatric eyecare. In particular, the upcoming integration of artificial intelligence in retinal imaging holds promise for reducing the burden of retinal blindness (8).

Multimodal imaging for a comprehensive retinal evaluation

Advanced imaging modalities, such as optical coherence tomography (OCT), OCT angiography (OCTA), fluorescein angiography (FA), and fundus autofluorescence (FAF), provide crucial additional diagnostic insights and can reveal subclinical changes not apparent

on IDO or standard colour photography.

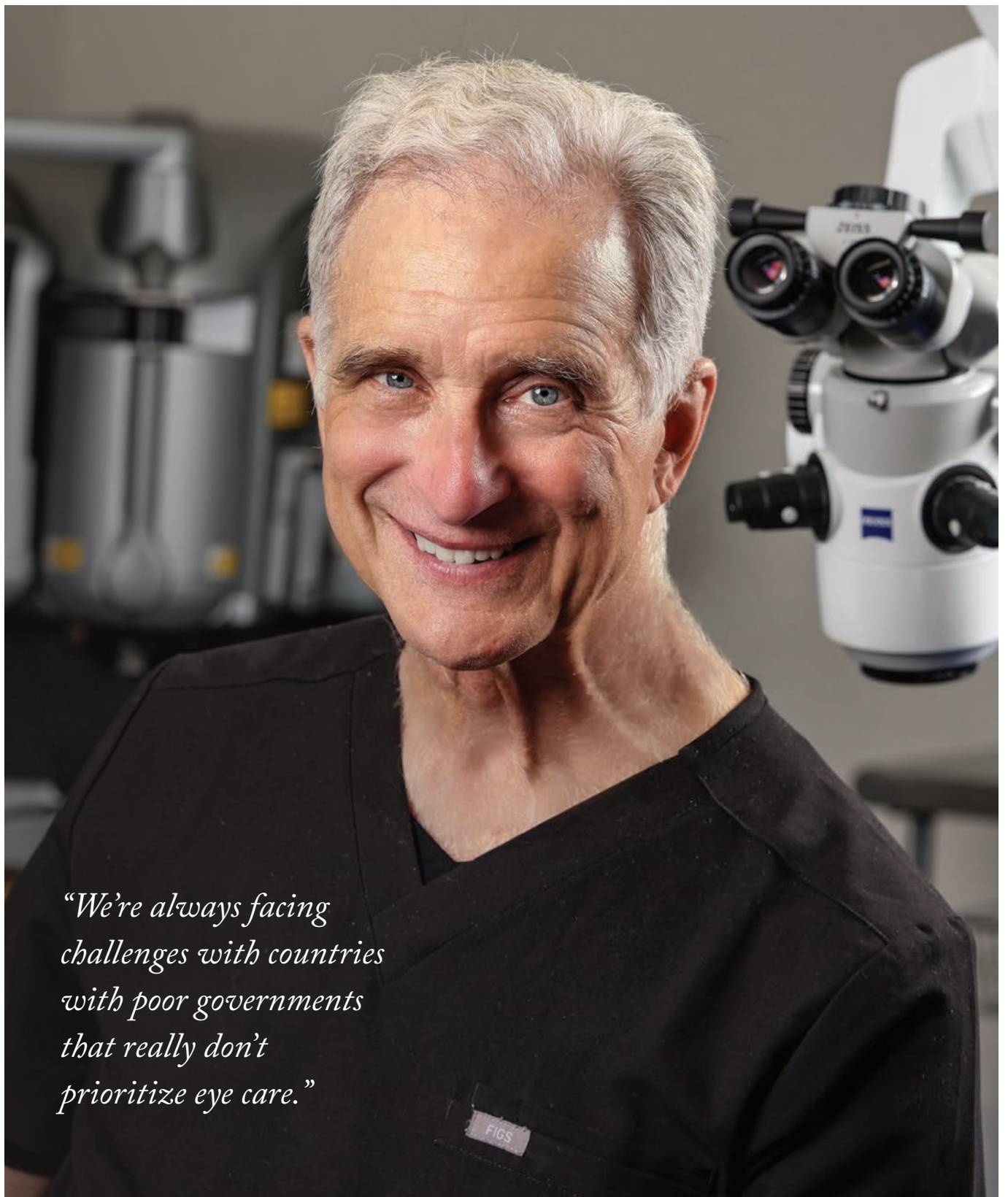
OCT and OCTA are particularly valuable in documenting microstructural changes in various pediatric retinal disorders, especially vascular conditions like ROP (8). Among table-top systems, the Silverstone (Optos) device combines UWF imaging with swept-source OCT (Figure 2). Recently, WF handheld OCT and OCTA prototypes have also emerged, with their applications expected to be increasingly explored in future research (15, 16). This is a very exciting development, as the portability of such devices will enhance the clinical characterization of pediatric retinovascular disease, particularly ROP, to a whole new level.

FA remains critical for the detection, staging, and monitoring of retinal nonperfusion, neovascularization, and exudation in retinal vascular disorders (8). UWF imaging has significantly facilitated the use of FA in children due to its large area of capture in a single shot and a quick acquisition time. The use of oral fluorescein – a less invasive alternative to intravenous FA – has demonstrated comparable image quality and clinical utility (17), providing another alternative to further reduce distress during the procedure for children (and their parents or guardians as well).

Conclusion

While there are a variety of retinal imaging technologies to choose from, most are optimized for adult patients, leaving significant challenges when applied to pediatric populations. Successfully imaging children requires innovative examination techniques and solutions tailored to their unique needs. Future advancements in retinal imaging should prioritize manoeuvrability, ease of use, and comfort while expanding imaging modalities to maximize diagnostic potential. By addressing these gaps, the next generation of imaging systems can better support early detection, accurate diagnosis, and improved outcomes for pediatric patients.

See references online.



From Wine Country to War Zones

Sitting Down With...
Gary Barth

Gary Barth, ophthalmologist at Barth Vision & Optical and President/Founder of BBH Eye Foundation, discusses his long-term humanitarian work in conflict zones and remote areas of the world.

How and why did you become an ophthalmologist?

I spent my junior year in college in India, where I saw so much blindness. Later, I worked as a general physician with the Dalai Lama in his refugee camp, and I realized just how impotent I was as a family doctor. Family doctors can't make much headway in developing countries. But since I did my eye training, I've been back 26 times – feeling each time that now I add a measure of value.

What major projects are you currently involved with?

In March, we'll be heading back to Myanmar and Nepal. Of course, Myanmar is a war zone. Last time I had to buy casket repatriation insurance in my wife's name, as well as death and dismemberment insurance. It's a very difficult country to visit, but we stay safe in the cities, and we no longer travel to some of the hospitals we've been to before because they're just too contested now.

Myanmar's Ministry of Health is basically dysfunctional, and so we're mostly working in the Buddhist monastery system with abbots and men of faith in the charity sector. There are pretty much no International NGOs working in Myanmar right now, and so we're working under the radar in the Buddhist sector. The Ministry of Health doesn't even know we're there – we work, we leave some money and some strategic plans, we leave, and then we go back again. **Are there things you would still like to**

accomplish within ophthalmology?

In terms of overseas, the private foundation I set up with Jack Blanks and Gary Hahn, BBH Eye Foundation, is very focused on providing access to care in these underserved regions. We've opened 23 – soon to be 25 – primary eye care centers in western Nepal. These are in "eye care deserts" – cities of municipalities of 20 to 50,000 people that have zero access to eye care. We give them everything to start a clinic – lens blanks, frames, edging equipment, medicines, diagnostic equipment, and we turn it over to the municipalities or the government. Everything is given in a trust-based philanthropy way. We want to keep on opening these centers, as much as we can.

If I could do one more thing before I quit, it would be to install a mid-level ophthalmic training school in Myanmar. It's a huge country, but there are no optometrists and no ophthalmic assistants anywhere. The only people that can prescribe glasses are the ophthalmologists, and they're either concentrated in the big cities, or they've left the country because of the war. So there's a real need for optometrists or ophthalmic assistants that can refract and prescribe glasses.

Our foundation tried to start an ophthalmic assistant school there in 2019. We had the syllabus from Aravind, we had classrooms, lodging, food, and we'd even picked out the students. But then COVID-19 hit, and the war broke out soon after. So we have never been able to bring in the teachers we would need from Nepal or India to teach at this school.

What are the main obstacles you have faced in your career?

We're always facing challenges with countries with poor governments that really don't prioritize eye care. That's probably our biggest issue. If we could just shake the ministers of health and finance in these countries and say, "If you let us give people vision and get rid of cataracts, we will improve your tax base, we'll provide you with more workers."

That is my biggest frustration – these outdated laws and ideas that are

unique to each country, without any acknowledgement of those neighboring countries that are doing well because they have licensed ophthalmic assistants.

What are the proudest moments of your career?

Over a decade ago, I started an eye bank here in California and we performed a lot of corneal transplants. I was then asked to start the first corneal transplant service in western Nepal. There was only one pre-existing service in Eastern Nepal, in Kathmandu, and so I traveled over with a bunch of California corneas in a box a couple of times, and we set up a viable corneal transplant service that now serves both Nepal and Northern India. That service line is now one of the busiest corneal transplant services in Asia.

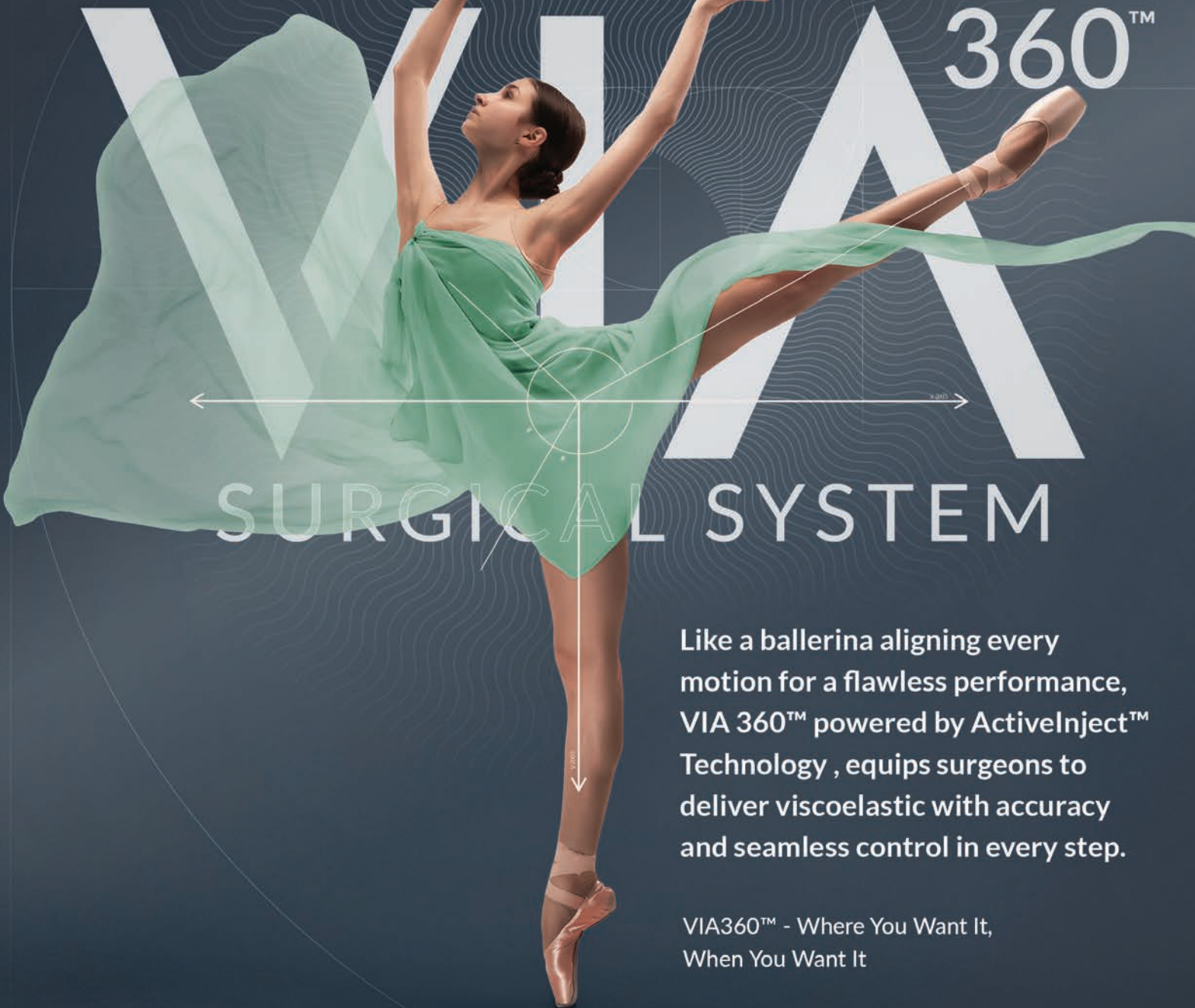
What future developments would you like to see within ophthalmology?

I've been thrilled with the success of the Light Adjustable Lens (LAL) made here in America. It gives me enormous pleasure to help people get better than 20/20 vision. It's having that ability to give patients the vision they choose, because they can keep coming back until they have refined it in the way they want. I believe the penetration of this technology should be greater. Ideally, more surgeons would have access to it, but at the moment it's just too expensive for many people.

What are the most important changes you've witnessed in your career?

In America, I think the success of eye surgery brings more patients to the surgeons. Patients are no longer afraid; those who would have once delayed their surgery are now accessing it earlier. That's probably the biggest shift I've seen – the penetration of surgical success has percolated down now to people in their sixties, and they're eager to improve their vision and maintain their current lifestyles. That's very rewarding to see. From wine country to the developing world, the goal is improving access to care and making a difference in quality of life.

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