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SIMPLE SOLUTION for COMPLEX CORNEAS

Small-aperture optics offer premium outcomes

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Academia and industry team up to boost rare diseases research
OZURDEX® (dexamethasone intravitreal implant) 0.7mg

Real world evidence is collected outside of controlled clinical trials and has inherent limitations including a lesser ability to control for confounding factors.


OZURDEX® (Dexamethasone 700 micrograms intravitreal implant in applicator)

**Abbreviated Preparing Information: Presentation:** Intravitreal implant in applicator. One implant contains 700 micrograms of dexamethasone. Disposable injection device, containing a rod-shaped implant which is not visible. The implant is approximately 0.46 mm in diameter and 6 mm in length.

**Indications:** Treatment of adult patients with macular oedema following either Branch Retinal Vein Occlusion (BRVO) or Central Retinal Vein Occlusion (CRVO), inflammation of the posterior segment of the eye presenting as non-infectious uveitis and visual impairment due to diabetic macular oedema. OZURDEX® is not recommended for patients who are considered insufficiently responsive to, or unsuitable for non-steroidal anti-inflammatory therapy.

**Dosage and Administration:** Refer to the Summary of Product Characteristics. Before presenting, for full information, OZURDEX must be administered by a qualified ophthalmologist experienced in intravitreal injections. The recommended dose is one OZURDEX implant to be administered intra-vitreally on repeat dosing intervals less than 6 months. There is currently no experience of repeat administration in posterior segment non-infectious uveitis or beyond 3 implants in Retinal Vein Rejection. If OZURDEX is used in patients with a history of device migration to the anterior chamber, OZURDEX should be used with caution and only following a careful risk benefit assessment.

**Warnings/Precautions:** Intravitreal injections, including OZURDEX can be associated with endophthalmitis, intravitreal inflammation, increased intravitreal pressure and retinal detachment. Proper aseptic injection techniques must always be used. Patients should be monitored following the injection to permit early treatment if an infectious/inflammatory process occurs. Monitoring may consist of a check for perfusion of the optic nerve head immediately after the injection, examination within 30 minutes following the injection, and binoculometry between two and seven days following the injection. Patients must be instructed to report any symptoms suggestive of endophthalmitis or any of the above mentioned events without delay. All patients with posterior capsular tear, such as those with a posterior lens (e.g. due to cataract surgery) and/or those who have an iris opening to the vitreous cavity (e.g. due to iridectomy) with or without a history of cataract surgery, are at risk of implant migration into the anterior chamber.

**Precautions:** Impairment to the anterior chamber may lead to re-treatment. A persistent severe central oedema could progress to the need for vitreolysis. Other than those patients contraindicated where OZURDEX should not be used, OZURDEX should be used with caution only following a careful risk benefit assessment. These patients should be closely monitored to allow for early diagnosis and management of device migration. Use of corticosteroids, including OZURDEX, may induce cataracts (including posterior subcapsular cataract) or increase IOP. Steroid-induced glaucoma may result in secondary ocular infections. The rise in IOP is normally manageable with IOP lowering medication. Corticosteroids should be used cautiously in patients with a history of ocular herpes simplex and not be used in active ocular herpes simplex. OZURDEX is not recommended in patients with macular oedema secondary to PDR with significant retinal oedema. OZURDEX should be used with caution in patients taking anti-cancer or anti-angiogenic medicinal products. OZURDEX administration to both eyes consecutively is not recommended. Visual disturbance may be reported with systemic and topical corticosteroids. OZURDEX patients present with symptoms such as blurred vision or other visual disturbances, consider evaluating for possible causes which may include cataract, glaucoma or rare diseases such as central serous chorioretinopathy (CSCR) which have been reported after use of systemic and topical corticosteroids. OZURDEX should be used cautiously in patients with a history of steroid induced glaucoma and may result in secondary ocular infections. The rise in IOP is normally manageable with IOP lowering medication. Corticosteroids should be used with caution in patients taking anti-cancer or anti-angiogenic medicinal products.

**Adverse Effects:** Adverse effects considered to be related to the intravitreal injection procedure rather than the dexamethasone implant. Please refer to Summary of Product Characteristics for full information on side effects.

**Marketing Authorisation Number:** EU/1/10/638/001

**VAT** per pack containing 1 implant.

**Legal Category:** POM.

**Date of Preparation:** May 2019.

**Marketing Authorisation Holder:** Allergan Pharmaceuticals Ireland, Carrick Road, Tuam, Co. Galway, Ireland.
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in memoriam

MJH LIFE SCIENCES CHAIRMAN
MICHAEL J. HENNESSY SR
REMEMBERED

It is with great sadness that Ophthalmology Times Europe reports the death of Michael J. Hennessy Sr, who passed away unexpectedly on 21 November 2021 at the age of 61.

Mike Hennessy was the beloved chairman and CEO of MJH Life Sciences, parent company of Ophthalmology Times Europe. Mr Hennessy spent his career turning his passion for building businesses and creating jobs into a run of successful ventures and brands.

Following his graduation from Rider University in 1982, he started his career in medical publishing as a sales trainee, eventually advancing to the position of chief operating officer. In 1986, Mr Hennessy became chief operating officer of Medical World Business Press, which was part of the launch of medical newspapers and other media products. The company prospered and was eventually sold to a venture capital firm based in Boston, Massachusetts, United States.

Mr Hennessy launched Multimedia Healthcare, LLC, in 1993 and built a portfolio of award-winning clinical journals. In 2001, Freedom Communications, Inc. acquired Multimedia HealthCare, about the time that Mr Hennessy was pioneering a new approach to print and digital publishing with Intellisphere, LLC (now part of MJH Life Sciences). Guided by the principles of innovation and entrepreneurial spirit, and reflecting its founder’s dedication to improving quality of life through healthcare research and education, Intellisphere publishes a variety of integrated print and digital products focusing on a range of topics in research and clinical medicine.

To build a comprehensive multimedia and education platform, Mr Hennessy added further companies and capabilities to the MJH Life Sciences portfolio. In 2004, he acquired Healthcare Research & Analytics (HRA), which has been the leader in healthcare market research for over 30 years.

In 2005, Mr Hennessy acquired ArcMesa Educators, LLC, leaders in online certification for physicians, pharmacists, nurses and other healthcare professionals. Reflecting his lifelong interest in politics, Mr Hennessy acquired Campaigns & Elections magazine
in 2005, publishing the journal through Political World Communications, LLC. He sold the publication to Biteback Media Ltd in 2011.

In February 2008, Mr Hennessy acquired the rights to the journals Pharmacy Times® and The American Journal of Managed Care®, both recognised in their respective markets as authoritative, trusted media platforms that provide essential information to a large audience of healthcare professionals.

In April 2011, MJH Life Sciences acquired Physicians’ Education Resource®, LLC (PER), an accredited continuing medical education company that is an industry leader in producing high-quality, first-rate oncology and haematology meetings and conferences. The PER acquisition included a variety of multi-channel enduring educational activities, as well as the rights to legacy medical meetings, such as the annual Miami Breast Cancer Conference®.

Mr Hennessy’s commitment to improving the lives of patients with cancer is deeply rooted within the halls of MJH Life Sciences. As a complement to the industry leading OncLive® platform, he developed the Giants of Cancer Care awards to honour the leaders and pioneers who often go unrecognised for their contributions to advancing oncology care.

He further strengthened his commitment to education by acquiring CURE Media Group in 2014, followed by the purchase of the Chemotherapy Foundation Symposium, in his quest to provide oncology professionals with focused education on innovative cancer therapy.

In 2019, MJH Life Sciences made its largest acquisition to date with the Healthcare and Industry Sciences divisions of UBM Medica, which nearly doubled the size of the organisation and added legacy titles such as Medical Economics®, Ophthalmology Times® and Ophthalmology Times Europe®.

This acquisition made the organisation the largest independently owned medical communications company in North America. In addition to acquisitions, Mr Hennessy organically developed ancillary in-house agency divisions with Proximyl Health®, Truth Serum NTWK®, and MJH Global Medical Affairs.

Later in 2019, Mr Hennessy elevated his own role to chairman while nominating his son, Mike Hennessy Jr, to assume the leadership role of the organisation and carry on the family legacy. Under Mike Jr’s leadership, the company enhanced its global potential by entering into a long-term partnership with BDT Capital Partners, LLC, in November 2021.

Owing to his broad business and educational experience and his understanding of the challenges facing New Jersey, Mr Hennessy’s counsel and insight had been sought by several organisations, including his alma mater Rider University, where he served on the Board of Trustees and was elected to the executive committee. In addition to being active in state and national politics, Mr Hennessy also had a long record of service at the local level, where he was a strong advocate for veterans and environmental issues.

Mr Hennessy’s true passion was his relationship with his wife, Patrice “Patti” Hennessy. Ever since they met in college, Mr Hennessy devoted his life to Patti and his family, raising four wonderful children – Shannon, Ashley, Mike Jr and Chris. Mr Hennessy was Patti’s rock as she bravely battled cancer for almost 10 years until her death in January 2020. He recently honoured Patti by making a donation to Rider University to expand the Science and Technology Center at their alma mater. The Mike & Patti Hennessy Science and Technology Center is set to be completed in 2022.

Mr Hennessy’s legacy and “family first” mantra will live on through his children; their spouses, Matt, Phil, Rachel and Jordan; and his 10 grandchildren. He will be greatly missed by his family and friends, and by his MJH Life Sciences family.
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Deep sclerectomy has become one of the most widely used non-penetrating surgeries in primary open-angle glaucoma.
—READ FULL STORY ON PAGE 26
A NEW LOOK, SAME GREAT CONTENT

Welcome to the new look of Ophthalmology Times Europe.® With our design refresh, we will continue to deliver the latest news on cutting-edge advancements affecting ophthalmology.

The redesign project was spearheaded by our design team, including senior art director Nicole Slocum and art director Jennifer Toomey, along with input from the Ophthalmology Times Europe® team to create a new face for the publication.

The newly enhanced Ophthalmology Times Europe® logo brings ophthalmology to the forefront with a modern design. As you turn the pages of the publication, you will notice that we have refreshed the look of the publication, with modern fonts, page headers and colours. We also continue with our core sections, focusing on the cutting-edge trends and innovations readers have come to expect. Those core sections are cataract and refractive, cornea, retina, glaucoma, paediatrics and gene therapy.

These core sections are delineated by colour keys, making it easier to navigate throughout the publication. All of these touches are designed with the reader experience in mind.

The new design also features innovative new ways of using images, charts and graphic elements to create an aesthetically pleasing presentation from cover to cover. From the first page to the back cover, the new design offers all of the cutting-edge content that you have come to expect from Ophthalmology Times Europe.®

This issue’s cover article features a look at a simple solution for complex corneas. Prof. Sathish Srinivasan outlines the various categories of complex corneas, stressing how imperative it is that surgeons intentionally seek out and identify these patients before proceeding with surgery. An IOL should not introduce additional aberrations to an already aberrated cornea.

We hope that you enjoy the new look and design of Ophthalmology Times Europe.® We also look forward to your feedback.

MIKE HENNESSY JR.
President and CEO of Ophthalmology Times Europe®’s parent company, MJH Life Sciences®

WHAT’S TRENDING
See what the ophthalmic community is reading on Europe.OphthalmologyTimes.com

Retinal age gap linked to heightened death risk, study finds
Electronic health records: how the pandemic highlighted the future of practice management
Removing opioid prescriptions from cataract surgery
Complex corneas present a conundrum for IOL selection, having characteristics stemming from ocular histories and corneal shapes that make cataract surgery more challenging. These complexities can be pre-existing due to genetics and disease, or induced by prior surgery or trauma.

The prevalence of different types of irregular cornea varies globally based on factors that include genetics, ethnicity and environmental and economic factors, and may be significantly higher than is appreciated by cataract surgeons. Owing to the impact the cornea's status has on the success and visual outcomes following cataract surgery, it is imperative that surgeons intentionally seek out and identify these patients before proceeding with surgery.

Categories of complex corneas

**Surgically induced**
The most commonly seen patients with complex corneas are those who have had previous laser vision correction (LVC), with the next most common being those who have had radial keratotomy (RK).

**Disease induced**
Disease-induced complexities are seen in patients who have inherited diseases of the cornea such as keratoconus or any shape abnormality; the IOL power calculations and pre-operative measurements become very challenging. Other diseases causing corneal irregularities include corneal ectasias; dystrophies;

An IOL should not introduce additional aberrations to an already aberrated cornea.
degenerations; epithelial basement membrane dystrophy; Terrien’s marginal degeneration; Salzmann nodular degeneration; and pellucid marginal degeneration.

**Trauma induced**

Trauma such as a fully or partially penetrating eye injury can cause an irregular cornea. Surgery to repair trauma can result in scarring, oedema and other abnormalities that make treating the cornea complex.

**Prevalence**

One review of 200 eyes in 400 patients found that approximately 25% of patients scheduled for cataract surgery who had not had previous corneal surgery had abnormal corneal topography. Ten per cent of such resulted from irregular astigmatism or suggested dry eye; 9% had borderline pellucid marginal degeneration, forme fruste keratoconus or superior steepening; and the remaining 6% had topographic findings consistent with forme fruste keratoconus, pellucid marginal corneal degeneration or keratoconus.

Along with eight other surgeons, I participated in a recent panel discussion seeking areas of consensus around corneal irregularity. For this specific group, it was determined that 24% of our preoperative cataract patients have irregular corneas.

The breakdown was: 7% naturally occurring, 7% surgically induced, 8% due to disease and 2% due to trauma. In my own practice, about 30% of cataract patients have naturally occurring corneal irregularities and 10–15% have irregularities that are disease induced.

The panel determined that a careful slit-lamp examination and corneal topography or tomography should be performed as part of the workup for all preoperative cataract patients. I perform corneal topography and tomography on all previous LVC patients as well as those who have visual symptoms without an obvious explanation. I also calculate higher-order aberrations for patients who have indicated an interest in premium implants.

**IOL options for complex corneas**

### Post-LVC

When it comes to lens selection in patients with previous LVC, there are, generally speaking, two schools of thought. One subgroup of surgeons would not use any of the available advanced technology implants in these individuals but would choose to implant a standard aspheric monofocal lens. The other group is brave enough to consider presbyopia-correcting IOLs.

Before the extended-depth-of-focus (EDOF) lenses came to market, a monofocal lens was the preferred option because the power calculations can be difficult in complex corneas. With EDOF lenses, however, the technology is a bit more forgiving than with the traditional presbyopia-correcting lenses.

Before the extended-depth-of-focus (EDOF) lenses came to market, a monofocal lens was the preferred option because the power calculations can be difficult in complex corneas. With EDOF lenses, however, the technology is a bit more forgiving than with the traditional presbyopia-correcting lenses.

Although difficulties with IOL power calculations remain, the pinhole optics principle on which this IOL is based makes it a more forgiving lens than the other presbyopia-correcting technologies. Yet the result is similar to that achieved with new technology implants. After implantation of this IOL at the time of cataract surgery, patients can achieve a reasonable amount of spectacle independence.

### Post-RK

Most surgeons stay away from putting a presbyopia-correcting IOL in patients who have had previous RK — I previously counted myself as one of them and used monofocals in these situations. Now I have a group of approximately 20 post-RK patients who have received the new IOL and have done very well.

**Inherited corneal diseases**

Once again, almost all surgeons...
would avoid using any complex presbyopia-correcting IOL in this group because of the difficulty of obtaining accurate measurements. Be that as it may, using the new small-aperture IOL instead of a monofocal is a good choice because patients can achieve some enhanced reading and intermediate vision, which a monofocal does not provide. Even if the power calculation is a little bit off target, the lens is quite forgiving, so it does not have an impact on patients’ visual improvement following cataract surgery.

**Post-corneal transplant**

What lenses to implant in cataract patients post-corneal transplant is hotly debated. Although I personally have no experience here, many of my colleagues report successful outcomes with the small-aperture IOL in these patients.

**Challenges presented by complex corneas**

In addition to the challenges presented by complex corneas when it comes to power calculations and measurements, there is the problem of visual quality. In a patient with previous LVC, for example, the cornea is aberrated. Removing the cataract and implanting a presbyopia-correcting IOL introduces additional aberrations inherent in the lens, thereby compounding the already aberrated cornea.

This, in turn, has a great impact on quality of vision for these patients. This is why I strongly believe it is important to refrain from using a complex IOL that can itself produce aberrations in patients who have an aberrated cornea.

The IC-8 IOL is a very clean technology lens with no aberrations. Small-aperture optics act to filter out peripheral light rays that become defocused. This simple principle can enhance the depth of focus in an already aberrated cornea without adding to pre-existing issues.3,4 Because many of the patients have been living with aberrated corneas for decades, their brain has adapted — this IOL enhances their vision.

The IOL can be associated with slightly decreased contrast in some situations, such as night-time driving. This is especially noticeable when the lens is implanted in just one eye, as patients will try to compare vision between their eyes. In the real world, the effect is typically negligible and accepted by patients, with some proper education on the matter.

In return for this very small trade-off, patients have good unaided distance, intermediate and near vision. It is certainly superior to the vision achieved with a monofocal lens and likely superior to that with a different presbyopia-correcting IOL.

**Conclusion**

Corneal complexities may occur in patients more frequently than is currently appreciated, and they have a significant impact on the visual outcomes that can be achieved following cataract surgery. The most common presentation of the complex cornea is in those who have had previous IVC, and these specific patients often have increased expectations for their vision following cataract surgery.

This significant group of individuals, as well as many others who have aberrated corneas due to a variety of causes—both naturally occurring and induced—can enjoy premium outcomes with technology that relies on a simple principle. Small-aperture optics are a presbyopia-correcting solution for a large category of patients who otherwise may not be well served by current advanced-technology IOLs.

Sathish Srinivasan, FRCSEd, FRCOphth, FACS  
E: sathish.srinivasan@gmail.com  
Prof. Srinivasan is a professor of health and life sciences at the University of West of Scotland, Ayr, Scotland. He is a consultant to Acufocus; Alcon; Carl Zeiss Meditec; DORC; Medicontur; Scope; Ophthalmalics; and Thea.

**REFERENCES**

Ophthalmologists can now prescribe a corticosteroid for the treatment of dry eye disease (DED) with the confidence that they are doing so on-label, following the recent United States Food and Drug Administration (FDA) approval of a topical corticosteroid for short-term (up to 2 weeks') use.

Loteprednol etabonate ophthalmic suspension 0.25% (Eysuvis, Kala Pharmaceuticals) has a favourable adverse effect profile and a unique mechanism of action that is worth a closer look.

The drug product was studied in the largest clinical programme in DED to date, including more than 2,800 patients. In results from the STRIDE 1 and STRIDE 2 trials conducted by Kala Pharmaceuticals, it illustrated a beneficial safety profile, demonstrating similar intraocular pressure (IOP) levels to the vehicle arm. In treatment and vehicle groups, respectively, 0.2% and 0% of participants experienced a 10 mm Hg or greater increase from baseline, resulting in an IOP measurement of 21 mm Hg or greater at any post-baseline visit up to 29 days.

In the STRIDE trials, investigators observed statistically significant improvement in the measures of conjunctival hyperaemia and patient-reported ocular discomfort severity scores. Participants assigned to treatment with the loteprednol etabonate suspension product experienced rapid relief, with improvement in symptoms as early as Day 4.

The ophthalmic suspension has a novel formulation which utilizes Kala Pharmaceuticals’ proprietary mucus-penetrating particle technology. These nanoparticles of approximately 300 nm in diameter are coated to facilitate their penetration through the mucus barrier. This controlled delivery system enables the drug to spread more uniformly on the ocular surface to achieve longer retention and allow enhanced penetration to the target tissues, specifically the cornea and the conjunctiva. The formulation has demonstrated broad-spectrum anti-inflammatory action, leading to a more efficient and effective nanoparticle drug that rapidly reduces the symptoms and signs of DED, including in those patients with periodic acute exacerbations of worsening symptoms referred to as dry eye flares.

**Relieving chronic disease and flares**

DED is an inflammatory disease in which an unstable and hyperosmolar tear film sets off a cascading sequence of inflammatory activity on the ocular surface. As with other chronic inflammatory conditions, such as asthma and rheumatoid arthritis, most patients with DED have chronic disease with dry eye flares. The Tear Film & Ocular Surface Society Dry Eye Workshop II notes that patients can initially present with...
episodic dry eye in the absence of chronicity.

Myriad triggers with varied intensity such as wind; low humidity; air conditioning; prolonged reading/visual tasks; and exposure to increased ozone concentrations have been shown to increase the incidence of flares. These inflammatory spikes occur in approximately eight out of 10 patients with dry eyes, and approximately half of patients with DED experience flares without continuous symptoms four-to-six times per year. Particularly in relation to the COVID-19 pandemic, I have seen more patients presenting with acute dry eye symptoms who have never before been symptomatic. Many are spending 10–12 hours a day staring at computer screens. Additionally, the data show that there is an under-diagnosis and under-recognition of DED overall.

In general, I prescribe loteprednol etabonate ophthalmic suspension 0.25% for patients who have periodic exacerbations of dry eye, including those who are self-medicating with artificial tears, those with ocular allergies, or those with contact lens-associated issues; patients with chronic DED who need induction therapy to quell surface inflammation quickly in order to initiate chronic therapy; and patients with breakthrough dry eye flares who are on chronic therapy.

Recent cases
Two recent examples from my practice are discussed as follows.

Case 1
A 42-year-old female contact lens wearer was referred to me for consultation for dry eye due to irritation from dust created by construction work on a nearby office. She had swelling in the left eye, with severe discomfort and complaints of dryness in both eyes for 5 weeks, and it was getting progressively worse.

The patient had initially been placed on tobramycin-dexamethasone 0.3%/0.1% twice a day and had a 95% improvement within the first week; however, on re-examination, her IOP had gone up to 35 mm Hg.

She was then prescribed brimonidine-timolol 0.2%/0.5% (Combigan, Allergan) to decrease the pressure.

However, her symptoms worsened when she had an allergic reaction to the brimonidine-timolol 0.2%/0.5%. Although the drops were discontinued, her symptoms continued to worsen, with significant discomfort and redness, and she needed artificial tears every hour.

By the time she saw me, it was her 11th visit to a doctor in 5 weeks and she was desperate for relief.

I gave her a diagnosis of allergic conjunctivitis, contact lens overwear and dry eyes. I discontinued all previous drops and put her on loteprednol etabonate ophthalmic suspension 0.25% every other day, four times a day, for 2 weeks; preservative-free tears four times a day; and extra-strength over-the-counter olopatadine 0.7% (Pataday, Alcon) twice a day.

Within 1 week, she had great improvement in all her symptoms and felt that her eyes were back to normal.

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Case 2
A 78-year-old woman with a variety of medical problems including multiple myeloma and colon cancer was referred for evaluation of severe dryness in both eyes. In particular, she was experiencing copious tearing from her right eye for the past
issue feature
CONTROLLING CORNEAL CONDITIONS

several weeks, stating that her eye watered so much it felt as though she was looking through a “puddle”.

The patient had been taking cyclosporine ophthalmic emulsion 0.05% (Restasis, Allergan) for years, which she felt helped her, and recently had been given lifitragast ophthalmic solution 5% (Xiidra, Novartis) to use in addition to Restasis, but she was still experiencing tearing. She was also using artificial tears, warm compresses and over-the-counter olopatadine 0.1% for allergic conjunctivitis.

On examination, the patient had evidence of chronic inflammation including conjunctivochalasis and corneal staining. I kept her on cyclosporine ophthalmic emulsion 0.05% and added loteprednol etabonate ophthalmic suspension 0.25% in both eyes four times a day for 2 weeks.

Within days, her tearing resolved and her vision improved from 20/40 to 20/25. The patient was very happy that she was no longer tearing and was thrilled with the improvement in vision.

Conclusion
When it comes to prescribing corticosteroids for DED, I am much more proactive and confident prescribing loteprednol etabonate ophthalmic suspension 0.25% for my patients because of its rapid onset and strong safety profile. I have had great success with the drop in many straightforward to complex cases, including patients with glaucoma, and have had no pressure increases measured at follow-up examination in my clinical experience so far. My patients and I are impressed by how quickly the ophthalmic suspension works to quieten symptoms.

Having an on-label enhanced loteprednol formulation for short-term use in treating the signs and symptoms of DED is a welcome addition to our armamentarium. Dry eye can have a significant impact on patient quality of life and daily activities. Patients are extremely grateful and relieved to feel rapid relief from their DED symptoms, especially when they experience dry eye flares.

Lisa Nijm, MD, JD
Dr Nijm is the founder and medical director of Warrenville EyeCare & LASIK, a clinical assistant professor of ophthalmology at the Eye and Ear Infirmary at U1 Health in Chicago, Illinois, US, and creator of MDNegotiation.com and RealWorldOphthalmology.com. She is a consultant for Alcon, Allergan, Kala Pharmaceuticals and Novartis.

REFERENCES
Dextenza approval in US provides NEW ALLERGIC CONJUNCTIVITIS OPTION

Ophthalmic insert is first physician-administered, preservative-free method

The United States Food and Drug Administration (FDA) has approved the supplemental new drug application for dexamethasone ophthalmic insert 0.4 mg (Dextenza, Ocular Therapeutix). It is the first FDA-approved, physician-administered intracanalicular insert, freeing patients from the need to apply eye drops by hand.

This most recent approval increases Dextenza’s approved uses to three. It means that the product can now be used to treat ocular itching from allergic conjunctivitis; the two other approved uses are for ocular pain after surgery and ocular inflammation after surgery.

Lower risks
The insert delivers a preservative-free preparation of the drug, thus lessening the risks of inflammation and damage to the tear film. One administration can last for up to 30 days; at the end of this period, the insert is resorbed and cleared via the nasolacrimal duct.

In a news release, Dr Michael Goldstein, president of ophthalmology and chief medical officer at Ocular Therapeutix, said: “We are really excited about this label expansion and the potential benefits for patients.” He continued, “The use of topical steroids is an important part of our current clinical armamentarium in the treatment of allergic conjunctivitis.”

Dr Steven Silverstein was an investigator in the Phase 3 trial of dexamethasone ophthalmic insert 0.4 mg. He stated, “Using skills that all ophthalmologists already possess, we now have the opportunity to remove the patient from drug administration, thus eliminating [nonadherence] as a potential cause of treatment failure.”

Dr Steven Silverstein was an investigator in the Phase 3 trial of dexamethasone ophthalmic insert 0.4 mg. He stated, “Using skills that all ophthalmologists already possess, we now have the opportunity to remove the patient from drug administration, thus eliminating [nonadherence] as a potential cause of treatment failure.”

He went on to say, “We found remarkable success in the reduction or
CONTROLLING CORNEAL CONDITIONS

elimination of the signs and symptoms of allergic conjunctivitis in the Phase 3 study.”

Steven Silverstein, MD
E: ssilverstein@silversteineyecenters.com
Dr Silverstein is in private practice in Kansas City, Missouri, US. Dr Silverstein discloses that he was part of the original FTA clinical trial and lectures on behalf of the product referred to throughout. He also serves on advisory boards relating to the product.

REFERENCES

A SUCCESSFUL HISTORY

Dexamethasone ophthalmic insert 0.4 mg (Dextenza, Ocular Therapeutix) was originally approved by the FDA in November 2018 to treat ocular pain after ophthalmic surgery. In June 2019, it was approved to treat ocular inflammation after ophthalmic surgery.

The latest approval of the drug to treat ocular itching associated with allergic conjunctivitis was based on the results of three randomised, multicentre, vehicle-controlled studies with a total of 255 participants.1-3 All participants had a positive history of ocular allergies and positive skin test reaction to perennial and seasonal allergens.

“In all three trials, Dextenza demonstrated lower mean ocular itching scores compared with the vehicle group at all time points throughout the study duration of up to 30 days,” the investigators said. “In two of the three studies, a higher proportion of patients had significant reductions in ocular itching on Day 8, at 3 minutes, 5 minutes and 7 minutes after the challenge in the Dextenza group compared [with] the vehicle group.”

Safety track record
The safety profile was also found to be favourable, and patients in all three studies tolerated the drug well.

When the data from the three studies were pooled, the most common ocular events were increased intraocular pressure (IOP) in 3% of participants, increased lacrimation and ocular discharge and reduced visual acuity, in 1% of participants each. Headache was the most common non-ocular adverse reaction to dexamethasone ophthalmic insert 0.4 mg, in 1% of the patient population treated for allergic conjunctivitis. The FDA approval was based on the results of a study published in the *American Journal of Ophthalmology*.5

Importantly, dexamethasone ophthalmic insert 0.4 mg is contraindicated in patients with active corneal, conjunctival or canalicular infections, including epithelial herpes simplex keratitis (dendritic keratitis); vaccinia, varicella; mycobacterial infections; fungal diseases of the eye; and dacryocystitis.
Simplifying cataract surgery in patients with complex pathology

Ring device can be used to stabilise the capsule and dilate the small pupil

By Prof. Boris Malyugin

Modern cataract surgery is generally a successful procedure. Recent advancements—which involve the use of pre- and intraoperative pharmacological protocols combined with optimal instrumentation—allow for well-tolerated and effective procedures in the vast majority of patients.¹

However, there are certain preoperative factors that increase the likelihood of complications in cataract surgery. These need to be managed effectively if we want the capsule to remain intact at the completion of surgery.

The small pupil presents one such challenging case for the ophthalmologist. When it is combined with the pathology of the zonular apparatus, the risks during and after cataract surgery increase even further.

Several techniques have been described in the literature for the management of insufficient mydriasis combined with zonular pathology, ranging from pharmacological to surgical strategies involving mechanical pupil dilation.² To avoid complications in patients, it is essential to enlarge the pupil while also stabilising the capsule to maintain its integrity.

Another option

When dealing with patients who present with inadequate mydriasis as well as compromised zonules, in recent years I have come to rely on the Malyugin Ring (MicroSurgical Technology; MST) together with the MST capsule retractors, Chang modification. I find the capsule retractors to be very useful in overcoming zonular weakness and giving support to the equator of the capsular bag.

However, in some cases it is possible to use the ring to simultaneously address the small pupil and stabilise the capsular bag, giving us yet another option in treating these cases. Let me demonstrate my clinical reasoning and surgical technique with the help of a case study, as follows.

Complicated cataract

A 75-year-old patient had a cataract complicated by pseudoexfoliation syndrome with sub-optimally dilated pupil. The patient has been taking the drug tamsulosin for several years to treat benign prostate hyperplasia.

Because the patient’s zonules were loose and the lens was mobile during the capsulorhexis procedure, my strategy was to use the ring to address the small pupil and to stabilise the capsular bag. To perform the continuous curvilinear capsulorhexis, I used the 23G Seibel

IN SHORT:
The Malyugin Ring 2.0 simplifies challenging cases of small pupils with zonulopathy by both stabilising the capsular bag and dilating the pupil.

To avoid complications, it is essential to enlarge the pupil.
capsulorhexis forceps (MST), which feature a sharp tip and a rhexis ruler to allow for visibility and control during the procedure.

In many cases associated with a weak zonular apparatus, the lack of counter-traction on the capsule could unintentionally result in a smaller rhexis diameter. A smaller rhexis may not only increase the risk of damage to the capsular edge during the procedure but may also cause capsular phimosis in the postoperative period.

My approach was to use the ring to both stabilise the capsular bag and dilate the pupil, so I enlarged the rhexis to prevent the damage to the capsule that may occur while engaging the scrolls with the capsular edge. The lens nucleus was fixed with the chopper to avoid excessive movement during the enlargement of the capsulorhexis.

A 7.0 mm ring was inserted into the anterior chamber. I engaged the iris to support and enlarge it while simultaneously catching the edge of the anterior capsule with the scrolls of the device.

This was done bi-manually with the ring manipulator in one hand and the micro-hook retracting the capsular edge in the other hand (Figure 1). In these cases, you only need up to three scrolls for the fixation: if you try to use four scrolls, there might be too much stress placed on the capsule.

Because I was using the ring alone, I did not have the same stability at the capsular bag equator as with capsular hooks. Therefore, the area with the loose zonules needed to be carefully monitored. One option is to continuously inflate the capsular bag with dispersive ophthalmic viscosurgical devices to create a viscoelastic cushion and prevent the aspiration of the capsule equator.

I then inserted the conventional capsular tension ring and was able to safely remove the last fragments of the lens by stabilising the capsular bag equator. After removing the

**FIGURE 1. Insertion and positioning of the Malyugin Ring 2.0.**
cortical material, I disengaged the scrolls of the ring from the rhexis and repositioned them to the iris to maintain pupil dilation (Figure 2).

When the anterior capsule was released, I could implant a single-piece IOL in the capsular bag. Finally, the ring was removed from the eye and triamcinolone acetonide suspension was injected into the anterior chamber to check for the possible presence of the vitreous strands.

**Conclusion**
Cases of complex small pupil cataract complicated by zonulopathy are particularly challenging. Surgeons need to carefully evaluate multiple factors, such as pupil size, rigidity of the iris, sphincter fibrosis and level of zonular weakness, among other considerations, to choose their strategy. The Malyugin Ring 2.0 alone or in combination with capsule retractors helps alleviate complexities in these cases.

**TAKEAWAY POINTS**
- It is essential to base your choice of instruments for small pupil cataract surgery on the characteristics of the iris (e.g., floppiness or stiffness of the stroma, sphincter fibrosis).
- To enlarge a small pupil and stabilise the capsule, the ring can be used alone if the iris has sufficient flexibility.

**Boris Malyugin, MD, PhD**
E: boris.malyugin@gmail.com
Prof. Malyugin is professor of ophthalmology and deputy director general, S. Fyodorov Eye Microsurgery State Institution, Moscow, Russia. He receives royalties from MST.

**REFERENCES**

**FIGURE 2. Repositioning the ring after removal of the cortical material. (Photos courtesy of Prof. Boris Malyugin)**

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**Toric IOLs for beginners:**
What to consider before and during surgery and in the postoperative period.
LASIK has a long-standing history of success in the treatment of myopia, hyperopia and astigmatism. But what about presbyopia? Recent data estimate that close to 2 billion people worldwide have this condition, and, with many finding glasses inconvenient for their lifestyles, the need for a laser-based solution is clear.

I have been performing laser vision correction on presbyopic patients for the past 25 years. However, with no commercially available solution, to begin with I had to find my own way to provide my patients with something more than monovision.

Initially, I achieved this by using dual zone laser vision correction, but, although it worked, it always felt like a temporary solution to a permanent problem. We needed a standardised protocol to meet the growing need for customised multifocal vision correction for people with presbyopia. Fortunately, the past decade has given rise to major advancement in this domain with the advent of commercially available presbyLASIK platforms.

Supracor outcomes
In my practice I use Supracor (Technolas Perfect Vision GmbH, part of Bausch + Lomb), which obtained a CE mark in 2011 after a 2-year clinical trial, to which I contributed. It is a presby-LASIK-based software algorithm that offers the ability to deliver multifocal laser vision correction while preserving the best-corrected visual acuity. It comes with three pre-programmed settings, (mild, regular and strong) and offers a completely customisable and adjustable treatment course that does not induce artifacts such as halos or glare.

Since its introduction, the algorithm has been used mostly for mild and moderate hyperopic patients, and sometimes for myopic patients, and its efficacy has been demonstrated in published literature. It has been shown to deliver a binocular uncorrected near visual acuity of Parinaud 3 (Jaeger 2) or better in the majority of patients, without affecting distance vision, which remains at least 20/25.

My experience as a patient
I started using the algorithm immediately after its European introduction in 2011, and since then I have used it to treat thousands of eyes. Whereas there is certainly potential for some regression of near visual acuity, the overall stability of the procedure is remarkable: I have followed patients for a decade and observed good stability with no loss in near and distance visual
acuity in most of them. The treatment also offers good reproducibility and can be customised to fit the profile of each patient.

Whilst observing these encouraging outcomes among my presbyopic patients, I could not ignore the fact that my own vision was troubling me. I am a 62-year-old presbyopic and slightly hyperopic (+1.25 D in both eyes) ophthalmologist, and I was having increasing difficulty during consultations and whilst performing surgery.

Even though contact lenses helped with clarity, they were uncomfortable and constraining, and I could not shake the feeling that I needed a permanent solution. I decided that it was time to undergo the presbyLASIK procedure myself.

First, I had to find a fellow surgeon willing to operate on me. Fortunately, that did not prove too difficult and by November 2020 it was time for me to become the patient. So, how did I find the operative and postoperative experience? In all, the surgery was uneventful. The lid retractor felt uncomfortable but the laser itself was not bothersome.

During surgery I experienced different feelings in my right and left eye, which I believe could make some patients feel anxious if they have not been suitably warned that this may happen. I also noticed some glare during the procedure, which made fixation difficult, and I experienced photophobia and tearing for a few hours after surgery.

However, as I was a well-informed patient, I knew exactly what to expect, which made the healing process easier. Days later, everything was back to normal, and, despite some morning eye dryness, I was fully rewarded with crisp spectacle-free near vision with no loss of distance vision – I was at 20/25, 1 week postoperatively.

Now, 8 months after surgery, I am free of contact lenses and glasses, I have Parinaud 2f (Jaeger 1) near vision with good light, Parinaud 3 (Jaeger 2) in everyday life, and 20/20 distance binocular vision with a natural visual continuum. I have regained approximately the vision of my forties. Given my age, I expect to be stable for a long time.

**My experience as a surgeon**

During my time using the algorithm for my patients, I have found that the learning curve can be challenging, and this is why surgeons have to opt for the standardised protocol on carefully selected patients when they first begin. Once the surgeon gains confidence, outcomes become very predictable and they can begin to add further customisation for each patient.

In terms of patient satisfaction, getting a feel for a patient’s goals and how they use their eyes can provide considerable insight into whether they will make a good candidate or not. A school bus driver has different visual needs from an elderly retiree and these considerations must be incorporated into the surgical plan and the personalisation of surgery.

It is also essential to manage the patient’s expectations appropriately. They should be informed to expect some compromise. I like to tell patients, “I’m going to take your vision back to the way it was 15 to 20 years ago.”

That helps to put things into perspective, so they can temper their outlook and not expect to regain the vision they had in their twenties, which is unattainable. It is important to relay all this information before the procedure, as this will ultimately lead to higher overall satisfaction.

**Advantages and disadvantages**

Besides stability, predictability, reproducibility and customisation, another key strength of this procedure is that it does not complicate future cataract or glaucoma surgery. This eliminates a common worry associated with performing refractive surgery, especially on presbyopes, and these patients will only require a standard multifocal lens implant, which I favour over diffractive IOLs because of optical axis issues.

**A school bus driver has different visual needs from an elderly retiree.**

The treatment does have some disadvantages, and, like any refractive surgery treatment, it can induce eye dryness or aggravate pre-existing dry eyes. In some cases, this can turn into serious discomfort that interferes with proper healing and visual recovery, so it is vital to treat dry eyes thoroughly before the procedure.

Considering that patients who undergo presbyLASIK tend to be older, the issue of dry eyes impacting visual outcomes is particularly relevant, making it even more important to treat dry eye prior to
the procedure and more so during recovery after surgery.

**The road ahead**

As both surgeon and patient, I have experienced first-hand the impact presbyLASIK can have on the life of the average presbyopic individual who wants to have the clear vision and to enjoy life without the inconvenience of spectacles and contact lenses. It is clear that there is a demand for presbyopic laser vision correction, and new technologies are ensuring that such correction can be provided both safely and reliably, and with results remaining stable over time for the majority of patients.

In my opinion, Supracor Presby-LASIK sits at the top of the list of these technologies, helping to better meet patient needs by offering a complete range of treatments to enhance their overall vision.

![Dr Antoine Roure](antoine.roure@orange.fr)

Dr Roure is a private ophthalmologist at the Vision Future Nice (Nice, France) specialised in cataract and refractive surgery. He is a consultant for Bausch and Lomb but has no financial interest in this article.

**REFERENCES**


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The Port Delivery System (PDS) with ranibizumab (Susvimo, Genentech) has ushered in a new treatment era for patients with wet age-related macular degeneration (AMD). In addition to the efficacy of this device, the treatment burden for patients needing monthly anti-vascular endothelial growth factor (VEGF) injections is reduced dramatically.

The LADDER Study evaluated the overall good safety and efficacy results of the PDS for treating neovascular AMD with 10-, 40- and 100-mg concentrations. The results showed that with the highest concentration, about 80% of patients went 6 months or longer before needing a refill (median time to refill was nearly 16 months). The refill was carried out in the clinic.

The 2-year, Phase 3 ARCHWAY Study compared the PDS containing 100 mg of ranibizumab to monthly ranibizumab injections in patients with recently diagnosed wet AMD. The results showed that 98% of patients did not need additional treatment in the PDS group and the drug was well tolerated. The Portal study, an open-label extension study, will evaluate the outcomes for patients after more than 2 years.

**Considerations in this new treatment era**

Dr Chirag Jhaveri, from Retina Consultants of Austin, and an investigator at the Austin Research Center for Retina, Texas, United States, emphasised: “As we embark on this new era for the treatment of wet macular degeneration, it is important that we use all resources available … as well as company representatives to help maximise our patient outcomes.”

The PDS is approved to treat neovascular AMD. The device is surgically inserted via the pars plana area, in the superotemporal quadrant of the eye, to deliver continuous slow release of the anti-VEGF drug to the posterior segment.

Picking the surgical candidates is an important step. While the procedure to insert the PDS is generally well tolerated, a preoperative evaluation is important. Dr Jhaveri reported that the Phase 2 LADDER Study found a high rate of vitreous haemorrhages, which was addressed and lowered substantially by adding laser cautery of the corneal bed.

Surgeons should also be aware of the infection risk and possible exposure of the device if it is not covered adequately or if the conjunctiva is not closed properly. Because the conjunctiva is thin, erosion may occur. “Preoperative evaluation and meticulous care to close the conjunctiva is very important,” Dr Jhaveri stated.

In addition to the conjunctival status, the tissue should have good mobility in order to facilitate adequate access to the subconjunctival and sub-Tenon spaces. Surgeons should look for areas of potential scleral thinning that can affect creation of the wound, and avoid those areas to prevent wound dehiscence or other potential issues.

Dr Jhaveri explained that his patients...
who are stable on monthly or 2-monthly injections without the presence of intraretinal fluid may be good candidates for implantation of the PDS. Surgical education and training are important for surgeons implanting the PDS.

Dr Jhaveri noted that as the device comes into more common use, it is important to review videos before the PDS is implanted, and that surgical simulators are available to provide hands-on experience. In addition, the company representatives will be helpful to guide surgeons through their first surgeries.

He also mentioned that detailed descriptions of the implantation and refilling procedures are in the process of being approved. These and any videos can be obtained by contacting Genentech representatives.

**Positive impact of the PDS**

In addition to decreasing the treatment burden, the continuous exposure of the retinal tissue to ranibizumab might even modify the disease process. As Dr Jhaveri pointed out, the fact that 98% of people in the ARCHWAY Study did not need additional treatment before the first refill may imply that the disease is modified to the point of potential quiescence for some patients.

Another plus for the product is the high patient satisfaction postoperatively; the implantation process is painless, and patients may report only slight itchiness or mild irritation 1–2 days postoperatively.

“They notice the disease stability after implantation of the PDS. The refill process is also easy. It is actually more tolerable because there is no transscleral penetration of a needle,” Dr Jhaveri explained.

The future of the PDS is bright. “The PDS has a lot of potential for wet AMD,” he said; however, he cautioned: “I highly encourage surgeons to use all of the information available, and the company representatives, to maximise the surgical outcomes.”

Studies are also underway to evaluate use of the PDS to treat diabetic macular oedema and diabetic retinopathy. “As better compounds are developed that may be more efficacious, such as by specific molecules, marrying the PDS platform with these new molecules may yield even better results for our patients,” Dr Jhaveri concluded.

Produced in partnership with Roche.

X-linked retinitis pigmentosa (XLRP) is a rare inherited retinal disease for which there is not only a major unmet treatment need but also a need for greater understanding and awareness of its personal and societal burdens, according to authors of a recent literature review.

The paper presents the findings from a literature search and review conducted to identify and describe the clinical, humanistic, and economic burdens of XLRP or retinitis pigmentosa (RP). Although the search found a paucity of relevant literature, it is reasonable to conclude from the available evidence that XLRP clearly carries a significant humanistic and economic burden, according to Dr Nan Li, co-author of the paper.

From the latter publications, it was learned that with progression of RP, affected individuals experienced a range of psychosocial, functional, physical and economic burdens.

The identification of the gap in research to characterise the burdens of XLRP is an important first step in assessing how best to support people affected by the condition. “Our hope is to more fully understand the myriad ways the therapies currently in development for XLRP can potentially improve the lives of patients and families,” Dr Li said.

**MORE ON RETINA**

X-linked retinitis pigmentosa (XLRP) is a rare inherited retinal disease for which there is not only a major unmet treatment need but also a need for greater understanding and awareness of its personal and societal burdens, according to authors of a recent literature review.

The paper presents the findings from a literature search and review conducted to identify and describe the clinical, humanistic, and economic burdens of XLRP or retinitis pigmentosa (RP). Although the search found a paucity of relevant literature, it is reasonable to conclude from the available evidence that XLRP clearly carries a significant humanistic and economic burden, according to Dr Nan Li, co-author of the paper.
Home monitoring of wet AMD offers high-quality scans

Patients can achieve real-time disease monitoring with self-operated device

By Lynda Charters; Reviewed by Dr Anat Loewenstein

The feasibility of home optical coherence tomography (OCT) monitoring with a patient self-operated device, automated data transmission, and analysis for disease surveillance was demonstrated in a longitudinal at-home pilot study1 in patients with wet age-related macular degeneration (AMD). The senior author of the paper, Dr Anat Loewenstein, stated that such daily monitoring can result in fewer clinic visits.

Home monitoring can also enable fluid recurrence to be detected earlier, resulting in faster re-treatment, and eliminate unnecessary routine injections of anti-vascular endothelial growth factor (anti-VEGF). The technology whose performance Dr Loewenstein and her colleagues evaluated was the Notal Home (Notal Vision).

This system includes a spectral-domain OCT device by which patients perform self-imaging. It uploads the imaging data to a secure cloud-based system and applies a deep learning algorithm for automated OCT analysis. The goals of the study, Dr Loewenstein explained, were to evaluate the technology’s performance in daily image acquisition and automated analysis, and to characterise the dynamics of retinal fluid exudation in patients with neovascular AMD.

Pilot design

The prospective, observational, longitudinal study included four patients (mean age: 73.8 years) with unilateral or bilateral neovascular AMD who were being treated with anti-VEGF therapy. The participants monitored themselves at home using the OCT device for up to 3 months.

Each time they completed the self-imaging, the macular cube scans were uploaded automatically to the Notal Health Cloud. The Notal OCT Analyzer and human graders evaluated the scans for fluid, segmentation and volume. Dr Loewenstein set out the main aims of the study: to determine that the daily self-imaging had been completed correctly; to assess image quality and acquisition time; to evaluate agreement between the automated and human grading of retinal fluid; and to assess the temporal dynamics of fluid volume.

The four patients initiated a total of 240 self-imaging attempts. Of these, 211 (87.9%) were completed successfully. Of the completed attempts, 97.6% had satisfactory image quality. Regarding the presence of retinal fluid, the automated analysis and human graders agreed in 94.7% of cases.

When the investigators looked at a subset of 24 scans in which fluid was present, the correlation coefficient between the measurements of fluid volume by the automated and the human graders was 0.996, and the mean absolute
The scans demonstrated wide variations in the dynamics of fluid exudation and treatment responses, according to Dr Loewenstein. Based on the results, the investigators concluded that the study patients were able to perform daily self-imaging at home and generate macular cube scans that were of satisfactory quality.

The agreement between the automated analysis and the human graders was high. In addition, the technology facilitated characterisation of the dynamics of fluid exudation and showed wide variation between eyes, which may lead to relevant disease biomarkers.

“Home OCT telemedicine systems provide an alternative method for physicians to monitor disease and may allow highly personalised re-treatment decisions, with fewer unnecessary injections and clinic visits,” Dr Loewenstein concluded.

“The review of remote OCT data will offer new billing opportunities for ophthalmologists who utilise the service of a remote monitoring centre that provides Home OCT service to patients.”

Data generated from daily Notal Home OCT self-imaging of a patient, OD and OS. The charts show intraretinal fluid (red) and subretinal fluid (yellow) volume trajectories from Notal OCT Analyzer segmentation. Retinal fluid exposure, indicated by the area under the curve between treatments (blue), differs significantly between eyes, despite similar fluid volumes measured on the day of clinic treatment visits, illustrating the medical insights gained from daily OCT imaging at home.

(Image used with permission of Notal Vision, Inc.)
Deep sclerectomy surgery trumps traditional techniques
Biometric changes and endothelial cell loss findings favour newer procedure

By Dr Abdelwahhab Azzawi

In recent decades, safety concerns have fuelled progress in glaucoma surgery techniques. Standard trabeculectomy (TE) has well-known complications such as hypotony; choroidal detachment; flat anterior chamber; hyphema; acute or late endophthalmitis; and, in some cases, surgery-induced cataract.

Many new methods, including non-penetrating surgical procedures, have been developed in the search for an alternative approach. Deep sclerectomy (DS) has become one of the most widely used non-penetrating surgeries in primary open-angle glaucoma (POAG), and there is good evidence as to its efficacy and safety.1

In DS, removing the inner wall of Schlemm’s canal and the juxta-canalicular trabecular meshwork enhances aqueous outflow. The trabeculo-Descemet’s membrane (TDM) remains intact to control and prevent excessive aqueous outflow, which offers an advantage in comparison with TE.

The low complication rates of DS offer an opportunity to perform the surgery at an earlier stage of glaucoma, and it can be considered as first-line therapy in cases when eye drops are not enough to control the IOP or if laser treatment is unavailable.2 DS can also be considered if the compliance of the patient is uncertain.

Furthermore, DS is preferred in uveitic glaucoma with open angle as it causes less inflammation than penetrating procedures.3 Another indication with which DS is the more appropriate choice of procedure is high myopia, which has a higher risk of choroidal detachment.4

In the presence of risk factors for inflammation such as chronic blepharitis, or for patients with dementia, DS could be considered to reduce the risk of endophthalmitis. Cataract surgery in glaucoma patients is a good indication to reduce the IOP through combined surgery (phaco with DS).5–7 On the other hand, neovascular glaucoma is considered as a contraindication to DS, since the TDM filtration can be decreased or stopped by the fibrovascular membrane over the irido-corneal angle.

Similarly, cases of iridocorneal endothelial syndrome are contraindicated for DS. A narrow angle is considered as a relative contraindication because of possible anterior synechia formation or iris incarceration following surgery.8 Eyes with damaged trabeculae (e.g., post-traumatic angle recession, post-laser trabeculoplasty) are also relatively contraindicated for DS, as surgical success depends on the integrity of angle structures.1

The different biometric changes following TE and DS, which may be important in cases such as combined surgery, are discussed as follows.

**Biometric changes after TE and DS**

**Astigmatism**

Claridge et al. studied and controlled 29 patients admitted for TE.9 Subjective and automated refraction, manual keratometry and corneal topography were assessed pre- and postoperatively, and the results confirm that glaucoma surgery has an influence on astigmatism.

After TE there was an increase in vertical keratometry producing with-the-rule (WTR) astigmatism. Subjective and automated refraction, manual keratometry and corneal topography were assessed pre- and postoperatively, and the results confirm that glaucoma surgery has an influence on astigmatism.10

On the other hand, in a report by Corcostegui et al. reviewing 38 eyes of 35 patients, there was no clini-
cally significant refractive change following phaco-DS surgery. This could be down to the flat bleb after DS. Moreover, the sutures in DS should not be tight like those in TE. A recent review by Chan et al. suggests that the astigmatism change stabilises at 3 months after TE.

Anterior chamber depth
Anterior chamber depth (ACD) is another variable after glaucoma surgery. Husain et al. analysed 122 patients over 5 years after TE and found that the mean decrease in ACD from baseline was 0.11 mm at all postoperative visits. However, Bouhéraoua et al. evaluated parameters including ACD in 20 eyes of 20 patients who underwent DS for POAG. Measurements were taken 1 day pre-op, then on Days 1, 7 and 30 post-op, and surgery was not found to affect ACD. This could be a result of the controlled filtration through TDM in DS.

Axial length
Husain et al. reported that, 5 years after TE, axial length (AL) was shorter by about 0.16 mm compared with the value before surgery. This has an effect of about 0.4 D, which is sometimes significant visually.

On the other hand, Garcia et al., who studied 22 patients who had undergone DS, reported that the decrease in AL 1 year after DS was 0.08 mm. The difference is thought to be related to the amount of filtration after glaucoma surgery.

Endothelial cell loss
Phaco surgery can result in damage to the endothelium in the cornea. Glaucoma surgery is another well-known cause of endothelial cell loss (ECL), but it occurs less with DS than with TE.

Arnaville et al. studied 62 eyes of 62 patients and reported ECL values of 7% after TE and 2.6% after DS 3 months after surgery, then, 12 months after surgery, 9.6% with TE and 4.5% with DS. Some surgeons prefer to include paracentesis in DS surgery to reduce the aqueous humour in the anterior chamber, which reduces the chances of perforating the TDM. This procedure may be the cause of more ECL occurring in DS.

Reduced endothelial cell count may lead to corneal decompensation in the long term and this should be considered in combined surgery: it is wise to measure the endothelial cell count before surgery. Regardless of this, DS offers an advantage to the patient with reduced endothelial cell count.

Overall, DS has many advantages that may make glaucoma surgery or combined surgery in many patients safer and more successful. This is particularly relevant in developing countries, where minimally-invasive glaucoma surgery (MIGS) might be difficult to afford or unavailable; also, MIGS might not reduce the IOP enough to reach the target pressure.

References
Combining laser-based treatment with MIGS to reduce IOP levels
Prompt, careful use of laser minimises postoperative adverse effects

By Dr Sebastian B. Heersink

Elevated intraocular pressure (IOP) is the most significant risk factor for developing glaucoma and the only known risk factor that is currently treatable. In patients who already have glaucoma, reducing IOP slows the progression of the disease.¹

I am primarily a cataract and refractive surgeon with a high-volume practice in Dothan, Alabama, United States. People travel from far away for cataract surgery and are usually referred by optometrists. When we do the cataract procedures, we also have this one chance to improve patients’ IOP. When patients come in with early-to-moderate glaucoma, I combine laser with several minimally invasive glaucoma surgeries (MIGS). In over 90% of cases, I perform MicroPulse cyclophotocoagulation (CPC) as well as a canaloplasty and a trabecular meshwork (TM) bypass. In my experience, the effect of the combination is additive.

I use either iStent (Glaukos) or Hydrus (Ivantis) to allow aqueous fluid to bypass the TM and flow out. The canaloplasty, using the Omni Surgical System (Sight Sciences), dilates Schlemm’s canal and the collector channels to enhance the natural outflow system. The combination of TM bypass stents and canaloplasty with cataract extraction has been shown to be more effective at lowering IOP than the TM bypass alone with cataract extraction.²

There are a lot of misconceptions about CPC treatments. Some think of CPC as an aggressive, end-stage procedure that can cause significant adverse effects and inflammation. A decade ago, CPC was seen as a last resort. Now that you do not have to use as much power, the procedure creates much less inflammation and the effect appears to be quite robust. I have not had issues with hypotony, and inflammation has only been an issue in very limited cases, such as a patient with uveitic glaucoma, and these cases were able to be controlled with topical steroids.

In more advanced glaucoma cases, when I am targeting a bigger reduction in IOP, I use the Cyclo G6 Laser with the continuous wave G-Probe delivery device (both Iridex). The continuous wave laser energy is absorbed by melanin in the ciliary processes, and coagulative necrosis of the ciliary body reduces aqueous production. I have found the process to be effective and repeatable, but it involves tissue ablation and there can be more inflammation than with the MicroPulse CPC.

Transscleral laser

More commonly, for mild-to-moderate glaucoma, I use the MicroPulse P3 delivery device with the Cyclo G6 Laser to perform transscleral laser therapy (TLT). MicroPulse technology divides the laser beam into microsecond bursts that are interspersed with longer resting intervals. This allows the tissue to cool between pulses and reduces thermal build-up within the tissue targeted by the laser.

These lasers do not cause thermal necrosis.³⁴ Instead, they create a stress response that induces a biological effect.⁵

In my opinion, MicroPulse TLT is an under-utilised non-incisional treatment, although its use is increasing. Iridex reports that 180,000 patients have been treated with its TLT in 80 countries.

IN SHORT

While patients are having cataract surgery, ophthalmologists are doing them a service if they also address glaucoma.
I have started using the procedure more often and earlier in the overall IOP reduction process. MicroPulse TLT is 60–80% successful at lowering IOP by at least 20%.\(^6\) I have increased my power setting from 2,000 mW to 2,500 mW and slowed the speed of the three sweeps I do across each hemisphere to deliver more power to the tissues. This is a manufacturer recommendation, and I find it to be more effective.

Using the recommended 31.3% duty cycle, I now treat each hemisphere for 60–80 seconds by doing three sweeps of 20–25 seconds each. I avoid about 30 degrees at the 3 o’clock and 9 o’clock positions because there are long ciliary nerves there.

I am now using the revised MicroPulse P3 Probe. It is a little thinner and it is easier to position, especially in patients with deep-set eyes. It has two plastic pieces—which look a little like bunny ears—that are placed on the limbus and help with alignment. It is very straightforward and quick.

I prefer to operate in an ambulatory surgery centre, and I do the CPC laser in the preoperative area, after the patient has received a peribulbar block, while the operating theatre is being prepared. This has created a very efficient flow for us.

**Post-surgical approach**

After the cataract extraction and the other MIGS treatments, the postoperative procedure is identical to my usual cataract postoperative regimen, which is generally an intracameral corticosteroid and antibiotic and a non-steroidal anti-inflammatory drop for 1 month. Slightly fewer than 5% of patients develop cystoid macular oedema (CMO). This includes all patients, even those with epiretinal membrane and diabetes, so the rate of CMO does not seem to be any different from that for the standard cataract populations in my hands.

There is a less than a 10% risk of postoperative hyphaema with canaloplasty and trabecular bypass shunts. One tip when using shunts and stents is to leave the pressure somewhat higher at the end of surgery; this will reduce reflux into the anterior chamber. Now that I do this, targeting a maximum pressure of 25 mm Hg, my hyphaema rate is probably between 2% and 4%.

After I perform the procedures, follow-up consultations are carried out by the patient’s referring doctor. Some of the referring doctors are located hours away from my practice. This makes it especially important for us to use procedures that will not cause pressure spikes or leave the patient’s eyes inflamed.

Together with sending back patients who have quiet, unproblematic eyes, successful co-management requires communication and education. Before the procedure, the referring doctor should know that you perform CPC laser and MIGS procedures. The doctor can then begin preparing the patient, both through discussions and by initiating medication for patients with mild-to-moderate glaucoma, as insurance companies require that patients be on medication before they have a trabecular bypass stent procedure.

After surgery, our clinic sends information to the referring doctor. For patients who have MIGS procedures, the postoperative follow-up schedule is generally no different from that for uncomplicated cataract procedures.

While patients are having cataract surgery, we are really doing them a service if we also address glaucoma, which is a long-term threat to their vision. I support being proactive and using all three procedures together. In my experience, this has been very safe and effective, and more than 60% of patients treated in this way are able to come off drops and reach target IOP.

**Sebastian B. Heersink, MD**

1. 001-800-467-1393

Dr Heersink is an ophthalmologist with Eye Center South in Dothan, Alabama, US. Dr Heersink is a paid speaker for Iridex.

**REFERENCES**

Computer vision syndrome (CVS) is a group of eye problems associated with computer and mobile phone use. In this digital era, people spend much of their time looking at a screen. The number of people with exposure to digital media is growing exponentially—there are more than 4 billion Internet users in the world—and thereby the prevalence of CVS. One of the most common manifestations of CVS is asthenopia. The term is derived from the Greek words asthenopia, meaning weak eye condition. It manifests as nonspecific symptoms such as fatigue, headache and pain in and around the eyes; burning of the eyes; and blurred or double vision. It is brought on by concentrated use of the eyes for tasks such as reading, computer work or close visual work, activities that cause tightening and spasm of the eye’s ciliary muscles. Apart from refractive errors, binocular and accommodative vision anomalies are among the most common visual disorders in children. Asthenopia is proving to be a major problem in school-age children, especially with the new norms of virtual classes and with constant and continuous near work. It is imperative that a complete binocular vision assessment is made in these children, with the prescription of a targeted therapy to ensure relief from symptoms.

People who do prolonged near work might have accommodation insufficiency or accommodation infacility, two conditions that cause blurred near vision, discomfort and strain; fatigue; as well as difficulty with attention and concentration whilst reading. Prolonged near work can also have a significant effect on binocular stability, with the potential development of convergence insufficiency, characterised by exophoria at near, increased near point of convergence (>10 cm), low fusional convergence amplitude (<15–20 prism D) and significant symptomatology. Various studies have proved converged insufficiency and accommodation infacility to be leading causes of asthenopia. Despite the symptomatic evidence, there has been little research into how to improve the visual symptoms associated with prolonged near work and/or digital technology. Specifically, to date, no study has examined the effect of vision training on patients with vergence or accommodation issues. To help address this lack of research, our research group recently analysed the change in asthenopia score after vision training in subjects with CVS and associated accommodative or binocular disorders.

**Study design**
A total of 76 subjects with symptoms of asthenopia, eyestrain and difficulty focusing after working on computers or following near work were recruited. The mean ± standard deviation age was 23.3 years ± 12.3 years; 58% of those recruited were women and 32% men. Patients with any ocular pathology or who had undergone any previous vision training were excluded. Comprehensive examination of the enrollees included objective and subjective refraction followed by anterior and posterior segment evaluation. Diagnostic tests were performed using a new validated software package, Bynocs, which allows the

**IN SHORT:**
A new online platform for vision training reduces asthenopia score and significantly improves binocular and accommodative abilities in people suffering from computer vision syndrome.
measurement of different aspects of visual function (visual acuity, contrast sensitivity, phoria, fusional vergences or stereopsis) as well as providing specific types of visual exercises. This cloud-based software for assessment and management in binocular vision disorders requires the use of a computer or laptop with Internet connectivity, and a pair of anaglyph glasses and flippers to perform the tests.

The software has several advantages over conventional visual function tests and training, such as the use of engaging activities and real-time control of compliance, allowing successful home-based visual assessment and treatment. Tests include measurement of fusional divergence (break and recovery point), fusional convergence (break and recovery point) and accommodative facility (cycles per minute).

The presence of asthenopia was confirmed with the Asthenopia Symptoms Survey, with calculation of the asthenopia score. Each subject was given ten sessions of therapy using the software (Figure 1). Fusional divergence exercises were repeated five times in each of the first five sessions and three times in each of the next five sessions.

Fusional convergence exercises were repeated five times in each of the first three sessions, seven times in each of the next three sessions, then ten times in each of the last four sessions. Each of the ten sessions also included 4 minutes of accommodation exercises.

Subjects were reviewed in the clinic 10 days after finishing the therapy, and diagnostic tests of fusional divergence amplitudes (break and recovery point), fusional convergence amplitudes (break and recovery point) and accommodation facility were conducted.

Three groups were created after the initial visual assessment:
- Fusional vergence dysfunction (FVD) group (subjects with normal accommodation and vergence response impairment);
- Accommodative infacility (AI) group (subjects with normal vergence and a reduced level of accommodative facility); and
- Fusional vergence dysfunction with accommodative infacility (FVD+AI) group (subjects with impaired vergence and accommodation).

The Shapiro–Wilk normality test showed the data variables to be normally distributed. Parametric statistical tests were applied for data analysis.

**Results**

Overall mean asthenopia score significantly changed from 20.3 ± 3.1 before therapy to 11.7 ± 2.8 after therapy (P < 0.001). Specific findings in each of the three groups are described as follows.

**FVD group (n = 31)**

In this group, statistically significant improvements were observed after therapy in fusional divergence break point; fusional divergence recovery point; fusional convergence break point; fusional convergence recovery point; and mean accommodation facility. After finishing therapy, most subjects (84%) reported an improvement in symptomatology, although three subjects continued to report disturbances despite an improvement in the visual parameters evaluated.

These patients were carefully re-examined to see if another condition might be the cause for the residual disturbances. The remaining two patients experienced a mild improvement, and more sessions of training were prescribed (Figure 2).

**AI group (n = 6)**

In this group, no significant changes were found in the parameters characterising the vergence response, but accommodative

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**FIGURE 1.** Bynocs screens. Top right, measurement of phoria; top left, fusional vergence measurement and training; bottom, optotypes for accommodative training.

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facility improved significantly with training (4.1 ± 2.2 cycle/min vs 7.9 ± 1.5 cycle/min; P = 0.008). All subjects experienced a significant improvement in symptomatology (Figure 2).

**FVD+AI group**

The FVD+AI group demonstrated significant improvements in all the variables evaluated. Symptomatology improved after therapy in most subjects (85%), although four subjects continued to experience disturbances despite an improvement in the visual parameters evaluated. These patients underwent careful re-examination to see if another condition might be the cause for the residual disturbances. The two remaining patients experienced a mild improvement, and more sessions of training were prescribed (Figure 2).

**Conclusions**

In the presence of CVS, it is important to conduct a complete accommodative and binocular vision assessment because an anomaly in these aspects can contribute significantly to symptomatology compatible with CVS. If a binocular or accommodative disorder is detected, it can be managed successfully with visual training.

The new software platform described in this article can be helpful for this purpose, facilitating a significant reduction of asthenopia score and a significant improvement in the subject’s binocular and accommodative abilities. More studies are needed to further investigate the efficacy of visual training therapy with this online platform.

**REFERENCES**

Approximately 7,000 rare diseases have been identified, affecting as many as 30 million Americans, according to the National Institutes of Health (NIH) in the United States, but gene therapies have received US Food and Drug Administration (FDA) approval for only two inherited diseases. However, in unity there is strength: the FDA and NIH are partnering with 15 private organisations to increase the numbers of effective gene therapies for rare diseases.

The Bespoke Gene Therapy Consortium (BGTC), which is part of the NIH Accelerating Medicines Partnership (AMP) programme and project managed by the Foundation for the National Institutes of Health (FNHI), has also been formed. The goals of BGTC are “to optimise and streamline the gene therapy development process to help fill the unmet medical needs of people with rare diseases”.

The 10 private partners in this endeavour are Biogen; Janssen Research & Development; Novartis Institutes for BioMedical Research; Pfizer; Regenxbio; Spark Therapeutics; Takeda Pharmaceutical Company; Taysha Gene Therapies; Thermo Fisher Scientific; and Ultragenyx Pharmaceutical. They are joined by five non-profit partners: Alliance for Regenerative Medicine; American Society of Gene & Cell Therapy; CureDuchenne; National Organization for Rare Disorders; and National Institute for Innovation in Manufacturing Biopharmaceuticals.

“Most rare diseases are caused by a defect in a single gene that could potentially be targeted with a customised or ‘bespoke’ therapy that corrects or replaces the defective gene,” said former NIH Director Dr Francis S. Collins. “There are now significant opportunities to improve the complex development process for gene therapies that would accelerate scientific progress and, most importantly, provide benefit to patients by increasing the number of effective gene therapies.”

Standardisation: key to efficiency
Developing gene therapies is a highly complex process that is time-consuming and expensive. In addition, the development process has limited access to tools and technologies and no standards across the field, and only one disease is addressed at a time. A standardised therapeutic development model with a common gene delivery technology (i.e., a vector) would facilitate a more efficient approach to developing gene therapies.
“By leveraging on experience with a platform technology and by standardising processes, gene therapy product development can be accelerated to allow more timely access to promising new therapies for patients who need them most,” said Dr Peter Marks, director of the FDA’s Center for Biologics Evaluation and Research.

"Gene therapy has shown to be particularly powerful for many inherited disorders that by nature are rare."
– Dr Vandenberghe

A primary aim of BGTC is to improve the understanding of the basic biology of a common gene delivery vector, the adeno-associated viral (AAV) vector. The investigators plan to examine the biological and mechanistic steps involved in AAV vector production, delivery of genes via vectors into human cells, and how therapeutic genes are activated in target cells. The results of this will provide important information to improve the efficiency of vector manufacturing and enhance the overall therapeutic benefit of AAV gene therapy.

BGTC will also develop a standard set of analytic tests to apply to the manufacture of AAV vectors created by the investigators, with the goals of improving and accelerating the processes of vector manufacturing and production processes. Such tests could be broadly applicable to different manufacturing methods and make the process of developing gene therapies for very rare conditions much more efficient.

BGTC will then fund four to six clinical trials focused on different rare diseases that result from single-gene mutations and currently have no gene therapies or commercial programmes under development. Different types of AAV vector that have been employed in previous clinical trials will be used in these trials.

BGTC will also aim to shorten the path from studies in animal models of disease to human clinical trials, whilst another of its aims is finding ways to streamline regulatory requirements and processes for the FDA approval of safe and effective gene therapies, including developing standardised approaches to pre-clinical testing (e.g., toxicology studies).

Further AMP projects
BGTC is the first AMP initiative to focus on rare diseases. Other AMP projects bring together scientific talent and financial resources from academia, industry, philanthropy and government, and focus on improving the productivity of therapeutic development for common metabolic diseases, schizophrenia, Parkinson’s disease, Alzheimer’s disease, type 2 diabetes and autoimmune rheumatoid arthritis.

Dr Luk Vandenberghe, director of the Grousbeck Gene Therapy Center and the Grousbeck Family Chair in Gene Therapy at Massachusetts Eye and Ear and associate professor of ophthalmology at Harvard Medical School in Boston, said that the consortium effort around bespoke gene therapies led by the FDA and FNIH and supported by several leading industry group is timely and needed.

“Gene therapy has shown to be particularly powerful for many inherited disorders that by nature are rare,” he said. “Over the past years, through academia and industry efforts, the technology has shown its remarkable potential; however, the development of gene therapies for many diseases stalls due to the limited number of patients.”

According to Dr Vandenberghe, the small number of patients brings practical challenges in conducting trials, and also a limited commercial appeal – which, together, limit investments in gene therapies for these very rare indications.

“This sad irony is particularly true for inherited retinal degenerations (IRDs), caused by over 200 genetic aetiologies of disease and thus arguably in need of distinct solutions for each of them,” he concluded. “On the one side, Luxturna [voretigene neparvovec-rzyl, Spark Therapeutics], an IRD gene therapy, was the first FDA-approved AAV gene therapy, but on the other side, similar programmes for other retinal disorders with equally compelling biology struggle to move forward in development due to their low prevalence.”

Luk H. Vandenberghe, PhD
E: luk_vandenberghe@meei.harvard.edu
Dr Vandenberghe is a consultant to Novartis Gene Therapies and Albamunity, Inc. He holds patents for AAVCOVID and various AAV and adeno gene therapy and vaccine technologies, for which he receives royalties from University of Pennsylvania and Mass General Brigham, US.
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