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Cutting-edge Advancements

SEPTEMBER 2022

ISSUE FEATURE:
ESCRS preview
12 Congress of the ESCRS reaches milestone age

in this issue

CATARACT & REFRACTIVE
8 A new lens option for enhanced monovision performance

RETINA
14 The ocular manifestations of neuromyelitis optica spectrum disorder

GENE THERAPY
22 Genetic testing facilitates earlier recognition of keratoconus

PEDIATRICS
25 Circumnavigating the bumpy road to vernal keratoconjunctivitis: Time is key

CORNEA
28 The pathophysiology and pathomorphology of corneal ectasia: Part 3

GLAUCOMA
34 Poor post-pandemic follow-up care in glaucoma patients prompts concern

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FROM THE COVER
14

When genetic testing is coupled with advanced imaging, the chances of identifying keratoconus early are greater.
—READ FULL STORY ON PAGE 22

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SEPTEMBER 2022

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ESCRS MILESTONE IN MILAN, WHY ‘TIME IS RETINA’ AND MORE THIS MONTH

Excitement is building for this year’s 40th Congress of the European Society of Cataract and Refractive Surgeons (ESCRS), to be held 16-20 September in Milan, Italy. As attendees finalise their travel itineraries, be sure to read up on what to expect at this year’s Congress in our meeting preview article (page 12).

Advancements in cataract and refractive surgery are sure to be top of mind given the timing of the ESCRS. We learn about a new lens option for enhanced monovision from Mr Alastair Stuart. The IOL offers extended depth of vision without the limitations of standard monofocal IOLs or the side effects associated with diffractive multifocals (page 8).

In this month’s Ophthalmology Times Europe® cover story, Prof. Friedemann Paul explains that ‘time is retina’ when considering the ocular aspects of neuromyelitis optica spectrum disorder (NMOSD). Although the disorder is rare, delays to diagnosis can be reduced if ophthalmologists and optometrists are mindful about the NMOSD’s ocular hallmarks, which can be sight-threatening (page 14).

Turning to gene therapy, Dr Sumit Garg shares how genetic testing facilitates earlier recognition of keratoconus. Patient location and genetic make-up are often key factors in diagnosis (page 22).

When it comes to treating paediatric patients, Dr Leonard Bielory helps ophthalmologists with circumnavigating the bumpy road to vernal keratoconjunctivitis. Early recognition of disease leads to improved outcomes for patients (page 25).

Prof. Dan Reinstein and Dr Tim Archer take a deep dive on epithelial imaging in Part 3 of our cornea series. This article highlights how OCT epithelial thickness measurements allow monitoring of corneal changes (page 28).

In glaucoma, poor post-pandemic follow-up care in patients prompts concern, explains Ms Catherine Wang. A study finds that elderly patients, in particular, missed their periodic evaluations. The consequences highlighted by the current study should lead to an evaluation of policies about patient follow-up and the need for establishing novel approaches to provision of care, Ms Wang believes (page 34).

As always, thank you for reading.

MIKE HENNESSY JR.
President and CEO of MJH Life Sciences®,
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INDICATION FOR USE: The iStent including neovascular glaucoma, because the device would not be expected to work in such situations. In patients with retrobulbar tumor, thyroid eye disease, Sturge-Weber Syndrome or any other type of condition and a subsequent reduction in intraocular pressure. The device is safe and effective when implanted in combination with cataract surgery in those subjects who require intraocular pressure reduction and/or would benefit from glaucoma medication reduction. The device may also be implanted in patients who continue to have elevated intraocular pressure despite prior treatment with glaucoma medications and conventional glaucoma surgery. CONTRAINDICATIONS: The iStent inject® System is contraindicated under the following circumstances or conditions: • In eyes with primary angle closure glaucoma, or secondary angle-closure glaucoma, including neovascular glaucoma, because the device would not be expected to work in such situations. • In patients with retrobulbar tumor, thyroid eye disease, Sturge-Weber Syndrome or any other type of condition that may cause elevated episcleral venous pressure. WARNING/PRECAUTIONS: • For prescription use only. • This device has not been studied in patients with uveitic glaucoma. • Do not use the device if the tweezers lid has been opened or the packaging appears damaged. In such cases, the sterility of the device may be compromised. • Due to the sharpness of certain injector components (e.g., the insertion sleeve and locators), care should be exercised to grasp the injector body. Dispose of device in a sharps container. • iStent inject® W is MR-Conditional; see MRI information below. • Physician training is required prior to use of the iStent inject® W System. • Do not re-use the iStent(s) or injector, as this may result in infection and/or intraocular inflammation, as well as occurrence of potential postoperative adverse events as shown below under “Potential Complications.” • There are no known compatibility issues with the iStent inject® W and other intraocular devices (e.g., viscoelastic or glaucoma medications). • Unused product & packaging may be disposed of in accordance with facility procedures. Implanted medical devices and contaminated products must be disposed of as medical waste. • The surgeon should monitor the patient postoperatively for proper maintenance of intraocular pressure. If intraocular pressures are inadequately maintained after surgery, the surgeon should consider an appropriate treatment regimen to reduce intraocular pressure. • Patients should be informed that placement of the stent, without concomitant cataract surgery in phakic patients, can enhance the formation or progression of cataract. ADVERSE EVENTS: Please refer to Directions For Use for additional adverse event information. CAUTION: Please reference the Directions For Use labelling for a complete list of contraindications, warnings and adverse events. © 2022 Glaukos Corporation. Glaukos, iStent inject® and iStent inject® W are registered trademarks of Glaukos Corporation. PM-EU-0209
Patients who present for cataract surgery are increasingly younger and more active, and are therefore interested in a greater degree of spectacle independence without the limitations of standard monofocal IOLs. The loss of intermediate vision may have a particular impact on these patient’s lives, as they spend more time in front of computers and smart phones.

To provide a balance between distance and near vision, the use of monofocal IOLs to produce a monovision set-up has been well established. Although we often see a high level of patient satisfaction with this approach, monovision has its limitations, including tolerance issues due to anisometropia, loss of binocular stereoacuity and asthenopia.

By using Rayner’s RayOne EMV IOL (RAO200E; Figure 1), my patients are achieving an extended depth of vision without the limitations of standard monofocal IOLs or the side effects associated with diffractive multifocal IOLs. The lens offers an extended depth of field via controlled positive spherical aberration, which can be used with and without monovision to increase the patient’s range of focus.

This lens has a non-diffractive optic and is therefore not expected to produce the side effects that are usually

**FIGURE 1.** The lens increases depth of focus through induction of positive spherical aberration.
associated with diffractive IOLs, such as night vision disturbance and loss of contrast. Although a high level of spherical aberration may induce night vision disturbances when certain thresholds are exceeded, there is a therapeutic range of spherical aberration in which night vision disturbances are not experienced because they are effectively filtered and processed by the brain.

In fact, while treating patients who had problems with night vision and loss of contrast in low light, which were common in patients with very small optical zones who had undergone laser surgery in the 1980s and 1990s, Prof. Dan Reinstein found that some degree of spherical aberration was therapeutic. At these levels of spherical aberration, depth of field was increased, but no night vision disturbances were experienced by the patient.

In my patients who receive this lens, my goal is to produce “modified monovision”. The additional controlled spherical aberration produces superior distance vision in the non-dominant eye and superior near vision in the dominant eye compared with what could be achieved with a standard monofocal IOL in a “standard monovision” setup (Figure 2).

I usually target plano in the dominant eye, and I choose a target refraction of −1.50 D in the non-dominant eye. This latter target is consistent with an offset my colleagues and I have already used successfully in the settings of PRESBYOND and LASIK, which also combines spherical aberration induction and monovision.

The outcomes achieved with this strategy avoid patient intolerance and the other drawbacks seen with standard monovision. This approach provides a broad range of spectacle independence across the visual range, and the wide range of functional vision achieved allows for a better range of refractive error tolerance.
without glare and halos or drop in contrast.

In patients who have already had corneal laser refractive surgery, I am sometimes hesitant to use this lens since they will likely already have a raised level of corneal spherical aberration. Raising it further may risk exceeding the therapeutic level. In these patients, I explain that their eyes already have increased depth of focus due to their previous laser treatment and that standard monofocals can be used to achieve “modified monovision”.

Managing patient expectations

My patient interactions begin by establishing their daily visual needs and asking what they hope to achieve with their cataract surgery. In those with substantial cataracts, I explain that any option will result in improved quality of vision.

Beyond this initial expectation, the question then becomes the amount of spectacle independence that they hope to achieve with surgery. I review both monofocal and multifocal options and explain the potential limitations to multifocal IOLs such as the potential impact on night vision and loss of contrast.

I first discuss the option of standard monofocal vision with one eye set for near vision and one eye set for distance vision, without synergy between eyes, which is tolerated by about two-thirds of our patients. I explain that intermediate vision is not likely to be covered in this scenario.

I then discuss the concept of “modified monovision” as a strategy to overcome these limitations, with one eye set to predominantly manage distance vision and one eye to predominantly manage near vision but working in synergy to provide a better depth of field and some degree of intermediate vision that is independent of spectacles.

I feel that it is important to under-promise and over-deliver, and the fact that multiple strategies currently exist to improve vision in patients undergoing cataract surgery suggests that no solution is perfect for every patient. I explain to all patients that no presbyopic treatment can guarantee complete independence from glasses. For instance, most patients will continue to require spectacles for reading the small print of medicine bottles or watching live performances at far distances.

Overall, I have aimed for a target vision goal of −1.50 for the reading eye and have yet to find a patient needs follow-up laser surgery to address anisometropia. However, I do explain to my patients that a LASIK enhancement is a safe option to reduce the myopia if they do not tolerate it.

In contrast, if a patient does not tolerate a multifocal IOL then only lens exchange will remedy the situation. Overall, I have seen excellent levels of patient satisfaction in those who have received the RayOne EMV with this goal of modified monovision, and I have been very pleased with the results so far.

Suggestions for those new to modified monovision

Surgeons who are not comfortable attempting a modified monovision setup and who do not typically manage presbyopia may still see promising results with a standard plano target with this lens. This is because the depth of field offered will likely enable the patient to read text of a reasonable size in good light.

As the surgeon develops confidence, with patient experience, they may begin to target some myopia in the reading eye to increase the range of spectacle independence achieved.

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ESCRS MILAN VISIT US AT ESCRS 2022: EXHIBIT X11, X13, X15
By Caroline Richards

The European Society of Cataract and Refractive Surgeons (ESCRS) plans to welcome delegates to the Milano Convention Centre in Milan, Italy, for the fortieth time this year, and, judging by the preliminary online programme overview, there is a great variety of ophthalmology sessions on offer.

Taking place from 16–20 September 2022, and following the success of last year’s congress, the 40th ESCRs will again be a face-to-face event but supported by a virtual conferencing platform that will allow the sessions to also be streamed.

At the time of going to press, the ESCRs had not released the full, in-depth programme, however, a range of symposia, programmes, video sessions and workshops will be on offer and are discussed in this brief preview article. There will also be a daily exhibition, enabling delegates to learn about the latest technological advancements in ophthalmology and providing networking opportunities.

Friday 16 September
New for 2022 is the ESCRs Innovation Day. The agenda for Innovation Day includes discussions on the most urgent clinical needs and the use of technology to address them, along with perspectives from the European investment, regulatory and research communities. In parallel to this, the World Society of Paediatric Ophthalmology will be holding their Subspecialty Day.

Also new this year are the “Cornea Day” and “Glaucoma Day” streams that are due to take place throughout the day. Cornea Day topics will include cataract surgery in patients with ocular comorbidities; ocular surface and anterior segment surgery; and developments in posterior lamellar keratoplasty, keratoconus and cross-linking, whilst Glaucoma Day will cover profiling glaucoma patients, hints for cataract surgeons who are considering MIGS, surgical complications and surgical controversies.

The Main Symposium to be held at the end of the afternoon will be on the topic of “Emerging Treatment Options for Corneal Endothelial Disease”. There will also be an IME Symposium with the title “Phaco complex cases.”

Three instructional courses to be held at the end of the day will cover the topics of “Different Ways of Secondary IOL Implantation without Capsular Support”, “DALK: From Basic to Advanced” and “Endophthalmitis after Cataract Surgery”.

Finally, the Exhibition Hall will start at 1pm on Friday and remain open until 6pm.

Saturday 17 September
Saturday sees the Opening Ceremony of the Congress take place at 10am, which should provide attendees with a feel of what to expect during the yearly event. This is due to be followed at 11am by the Main Symposium on “Demystifying IOLS optics”.

Elsewhere, the “Young Ophthalmologists Programme” is running “Starting Phaco” which includes video cases submitted by young ophthalmologists. This programme also offers junior ophthalmologists the chance to network and pick up useful information.

At 4pm there will be an IME Symposium on Presbyopia IOLs and at 5pm a Video Symposium on the topic of “Challenging Cases”.

A three-part Refractive Surgery Didactics Course will be ongoing on Saturday. The first session at 8.30am covers diagnostic techniques, the second session at 10.45am is entitled “Therapeutic Techniques: Intraocular Surgery” and the final session at 2pm covers “Therapeutic Techniques: Corneal Surgery.”

Throughout the day, Clinical Research Symposia will be held on: “Digital Medicine – 6 Steps for a Better Future”, “Ocular Tissue Engineering”, “Advancement of IOL Optic – How Far Can We Go?” and last-but-not-least, on the very hot topic in ophthalmology at the moment: gene therapy.

A total of 28 instructional courses will be running throughout the day on Saturday. The majority of these are 90 minutes long and start at...
8.30am, 10.30am, 2pm and 4pm. Shorter one-hour courses begin at 2.30pm. Free Paper Sessions and Presented Poster sessions will also be taking place and the Exhibition Hall will be open from 9am to 6pm.

**Sunday 18 September**
The Main Symposium, on “High Volume Cataract Surgery”, will take place at 11am on the Sunday. The JCRS Symposium will be held at 2pm and a Video Symposium at 4.15pm entitled “Surgical Complications: You Make the Call” is sure to draw curious ophthalmologists. Early evening sees the IIIC Symposium at 6.15pm on “The Perfect Save: Challenging Cases Managed by International Experts”.

Workshops on Visual Optics will be being held throughout the day, starting with “Visual Function – Visual Behaviour” at 8.30am, “Ocular Biometrics/IOL Optics and Calculation” at 10.50am and finally “Imaging of the Human Eye” at 2pm.

Also at 2pm, a “Case Report” Session aims to delve into “Preoperative Complications and Difficult Manoeuvres”. Meanwhile, there will be a Young Ophthalmologists Session at 4.30pm on “Cataract and Corneal Issues”. A Practice Management Masterclass, on how ophthalmologists can optimise the patient experience, will also take place on the Sunday; the exact timings for this are yet to be confirmed.

A further 27 Instructional Courses will be held, starting at 8.30am, 10.30am, 2pm, and 4.30pm. These cover a broad range of topics including “Corneal Regeneration Therapy and Surgery”, “Enhanced Monofocals and EDOF IOls” and several aspects of cataract surgery.

**Monday 19 September**
Monday morning has two Main Symposia, beginning with the Heritage Lecture at 10.30am and followed at 11am by a session entitled “Where Are We in Intracorneal Implantation?” An IME Symposium on the subject of “3D Cataract Microscope Visualisation” will be held at 1pm.

A Video Session on “Getting Into Trouble” should provide delegates with some useful tips on overcoming surgical challenges at 2pm. Throughout the day there will be the opportunity to attend Practice Management workshops and the Free Paper Sessions and Presented Poster Sessions continue to run.

At 4.15pm the CSCR Symposium will be held on the subject of “The Patient Journey in Cataract Surgery.” There will also be an ISRS Symposium at 6.15pm to end the day.

Instructional Courses also continue with 33 taking place, again starting at 8.30am, 10.30am, 2pm and 4pm. Topics covered include “The Art and Science of Personalizing Refractive Outcomes in Cataract Surgery and Beyond”, “When Cataract Meets Glaucoma”, “All You Need To Know About Contact Lenses as a Refractive Surgeon” and “Phaco Nightmares and Worst Case Scenarios”.

**Tuesday 20 September**
The final day of the Congress starts at 8am with an Orbis Symposium on “Innovative Ophthalmology in Conflict Zones” and a concurrent Presbyopia Workshop entitled “Is there a change in the paradigm of presbyopia correction?” The final Main Symposium of the ESCRS at 10.30am is on the eye-catching subject of “How Not to Be Surprised by Refractive Surprise”.

The Free Paper Sessions continue, as do a series of Wet Labs starting at 8am and 10.30am. There will be a final twelve Instructional Courses starting at 8.30am and 10.30am, including courses on “Tips and Tricks for Challenging Cataract Surgery” and “Ocular Trauma Assessment and Management”.

The Congress finishes with the ever-popular “Best of the Best” session starting at 12.45pm which highlights the best parts of the meeting.

The American Society of Retina Specialists held its 40th Annual Meeting in New York, New York, United States, from 13-16 July, 2022. While data was presented for all topics in retina, new revelations in age-related macular degeneration, diabetic retinopathy and diabetic macular oedema dominated the conversation.

Check out our ASRS roundup with more information on real-world safety and efficacy of faricimab for neovascular AMD; the 24-week results for UBX1325 for the treatment of chronic DMO, wet AMD; and the relationship between outer retinal integrity, subretinal fluid may affect treatment outcomes and more.
Optic neuritis (inflammation of the optic nerve) arises from numerous causes including infections such as herpes zoster and Lyme disease, adverse events from vaccines and autoimmune diseases. It is the presenting symptom in about 20% of multiple sclerosis (MS) cases. However, acute optic neuritis also characterises neuromyelitis optica spectrum disorder (NMOSD), a rare but severe autoimmune disease.

In at least 70–80% of NMOSD cases, immunoglobulin G (IgG) autoantibodies to the water channel protein aquaporin-4 (AQP4) are detectable in the serum and play a relevant role in disease pathogenesis. Many of the remaining cases arise from autoantibodies targeting myelin oligodendrocyte glycoprotein (MOG). As the name suggests, oligodendrocytes as well as myelin sheaths express MOG. Patients should not receive an NMOSD or MS diagnosis if they have anti-MOG antibodies; such cases should be diagnosed as a separate disease entity, myelin-oligodendrocyte glycoprotein antibody-associated diseases (MOGAD).

Although NMOSD is rare, ophthalmologists and optometrists need to remain aware of it as a potential differential diagnosis. Early diagnosis and rapid treatment maximise the chances that patients will fully recover their vision. When it comes to this disease, ‘time is retina’, and it is important to reduce the delay to diagnosis by considering NMOSD’s ocular hallmarks.

### Epidemiology

The incidence of NMOSD is between 0.4 and 2 per 1,000,000 person-years and the prevalence 0.5 to 4 per 100,000. Ethnicity largely accounts for the variation. AQP4-NMOSD is more common in people of Afro-Caribbean descent than in other ethnic groups. Several human leukocyte antigen (HLA) alleles and other polymorphisms seem to be associated with the risk of developing NMOSD. The particular HLA alleles depend on the population studied. So, as with other autoimmune diseases, genetic predisposition seems to be influential in determining NMOSD risk.

Age at presentation can help to differentiate NMOSD from MS. The peak age of diagnosis for MS is between 25 and 35 years of age, whereas, in European studies, the median age at onset for AQP4-NMOSD and MOGAD was 40 and 31 years, respectively. As a rule of thumb, the age of onset is about a decade later in NMOSD than in MS.

Moreover, MOGAD is the most common neuroinflammatory disease in children, whereas paediatric AQP4-NMOSD is uncommon.

Most autoimmune diseases are more common in females than males. Indeed,
Comparison of the epidemiology and symptoms of neuromyelitis optica spectrum disorder (NMOSD) and myelin-oligodendrocyte glycoprotein antibody-associated disease (MOGAD).

<table>
<thead>
<tr>
<th></th>
<th>NMOSD</th>
<th>MOGAD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Peak age of diagnosis</td>
<td>40 years</td>
<td>31 years</td>
</tr>
<tr>
<td>Prevalence in childhood</td>
<td>Uncommon</td>
<td>Common</td>
</tr>
<tr>
<td>Sex-related epidemiology</td>
<td>Much more common in females</td>
<td>No difference between sexes</td>
</tr>
<tr>
<td>Prevalence of transverse myelitis</td>
<td>52%</td>
<td>34%</td>
</tr>
<tr>
<td>Symptoms of cerebral involvement</td>
<td>Headache, vomiting, persistent hiccups</td>
<td>As NMOSD but also impaired consciousness, altered behaviour, psychiatric symptoms, neuropsychological deficits</td>
</tr>
<tr>
<td>Incidence of optic neuritis</td>
<td>50% incidence; Recovery rate poor</td>
<td>74% incidence; Recovery rate good</td>
</tr>
<tr>
<td>Phenotype of optic neuritis</td>
<td>Predominantly posterior optic nerve with chiasma involvement</td>
<td>Predominantly anterior optic nerve with posterior lesions, retinal haemorrhages or macular stars present</td>
</tr>
<tr>
<td>Pain presentation</td>
<td>62-91% experience central neuropathic pain</td>
<td>86% experience eye movement pain</td>
</tr>
</tbody>
</table>

females account for between 70% and 90% of relapsing AQP4-NMOSD cases.\(^{10,14}\) MOGAD, in contrast, shows little sex-related epidemiological difference.\(^{11}\) The incidence and prevalence of NMOSD will probably increase over the next few years, reflecting greater awareness, improved differential diagnosis and earlier diagnosis.\(^{4}\)

**Pathogenesis**

NMOSD is characterised by attacks of acute optic neuritis and transverse myelitis (inflammation of the spinal cord).\(^4\) The spinal cord involvement offers another point of differentiation from MS.

Long spinal cord lesions that extend over three or four vertebral segments, which are very rare in MS, often show on magnetic resonance imaging (MRI) of people with AQP4-NMOSD.\(^{15}\) In some cases, the autoimmune attack involves the brainstem, and spinal cord lesions can extend into the medulla oblongata.\(^7\)

The optic nerve often shows longitudinally extensive lesions on MRI, occasionally involving the chiasm.\(^{16}\) In contrast, MS tends to cause short lesions.\(^4\)

AQP4 is expressed predominantly by astrocytes, which have numerous roles including regulating the development and permeability of the blood–brain barrier. Increased permeability of the blood–brain barrier may allow IgG to access the central nervous system (CNS).

Astrocytes also contribute to information processing, dispose of old and damaged organelles and modulate neurotransmitter levels in the CNS.\(^{4,17,18}\) AQP4 regulates changes in the extracellular volume that modulate the concentration of solutes and, in turn, neuronal electrical activity. As such, AQP4 modulates neuronal transmission and excitability.\(^{18}\)

In people with NMOSD, the autoimmune attack on AQP4 produces dysfunctional astrocytes and can cause astrocyte death. The autoimmune attack also triggers bystander inflammation, which exposes other, usually hidden, autoantigens and can damage oligodendrocytes and neurons.\(^4\)

So, testing for IgG antibodies which target AQP4 offers a highly specific serum test for AQP4-NMOSD. Indeed, the antibody assay enables the diagnosis of AQP4-NMOSD at the first event.\(^{19}\) Again, this differs from MS, in which neurologists typically wait for MRI-confirmed dissemination in time and space following optic neuritis or another element of the...
clinically isolated syndrome before making a diagnosis.²⁰⁰
Ophthalmologists should bear in mind that the sensitivity and specificity of cell-based AQP4-IgG assays are much better than for other techniques such as enzyme-linked immunosorbent assay.²¹
Oligodendrocytes, which produce myelin, and neurons do not express AQP4.⁴,¹⁷ Between 10% and 40% of NMOSD patients who are negative for AQP4-IgG in the best cell-based assay have IgG autoantibodies to MOG, which is expressed on the surface of oligodendrocytes and the outside of myelin sheaths.¹
MOG accounts for only 0.05% of CNS myelin proteins.² Nevertheless, the autoimmune attack can still cause clinically significant demyelination.¹ It is important to bear in mind that the clinical phenotype of MOGAD only partly overlaps with that of AQP4-IgG-NMOSD.
There is some evidence of remyelination and other repair mechanisms, predominantly in animal and ex-vivo models of NMOSD.²² Although it is an area of active research, drawing conclusions about the clinical relevance to humans would be premature. Moreover, compensatory mechanisms seem to be more common in MS than NMOSD.
Less commonly, other conditions, including sarcoidosis, infections, connective tissue disorders and paraneoplastic neurological disorders, can be associated with or trigger NMOSD.

Risk factors
An increasing number of risk factors are associated with the likelihood of developing NMOSD. Smoking may adversely affect NMOSD progression and severity, for example. Low vitamin D levels are common in people with NMOSD, although whether this predisposes to NMOSD or is secondary to neurological disability is unclear.⁴
Acute infections (usually respiratory) precede about one-third of NMOSD attacks. Moreover, the gastrointestinal microbiota in NMOSD seems to differ from that in healthy controls and MS patients.²¹,²⁴
Clostridium perfringens seems particularly enriched in people with NMOSD compared with healthy controls. Whereas MS patients also showed higher C. perfringens populations, the increase was of marginal statistical significance and, unlike in NMOSD, no longer remained significant after multiple comparisons.²⁴
These observations raise the prospect that molecular mimicry (environmental and other proteins expressing epitopes similar to those on AQP4) may contribute to NMOSD.¹⁹ For instance, the epitope for AQP4 in NMOSD is homologous with a sequence expressed by C. perfringens.²³ The altered gastrointestinal microbiota may also regulate cellular and humoral immunity, such as the relative abundance of T cell subpopulations.²³,²⁴

Manifestations of the disease
NMOSD is a multi-system disorder: 52% of patients with AQP4-NMOSD and 34% of those with MOGAD show transverse myelitis on presentation, which can cause symptoms that range from mild sensory abnormalities to bladder, bowel and erectile dysfunction and to very severe quadraparesis (weakness in all four limbs).³
Cerebral involvement can result in headache, intractable vomiting or persistent hiccups.⁴ In addition, MOGAD can trigger impaired consciousness, altered behaviour, psychiatric symptoms (e.g., depression), neuropsychological deficits (e.g., poor attention and memory) and epileptic seizures.¹
Optic neuritis is also common in people with NMOSD: 50% of patients with AQP4-NMOSD and 74% with MOGAD show optic neuritis alone or with other symptoms at presentation. The ocular changes associated with NMOSD vary widely. Acute optic neuritis can be mild, causing, for example, hazy vision and poor high-contrast visual acuity as assessed by a Snellen chart.
Some people find that the optic neuritis affects only low-contrast visual acuity or colour vision. Many people with NMOSD report scotomas.⁴ In most people, optic neuritis can progress to complete, uni- or bilateral functional blindness.
Even after treatment for the attack, recovery from optic neuritis is usually poorer in AQP4-NMOSD than in MOGAD or MS.³ Bilateral optic neuritis is more common in MOGAD than AQP4-NMOSD and MS. Over time, however, optic neuritis will affect both eyes in AQP4-NMOSD.⁴
The ocular phenotypes of AQP4-NMOSD and MOGAD differ. For example, optic neuritis in people with AQP4-NMOSD predominantly affects the posterior optic nerve and often encompasses the chiasma.¹⁸ Optic neuritis associated with MOGAD more frequently involves the anterior optic nerve and
can present in patients as papillitis or papilloedema.

However, optic neuritis in people with MOGAD can cause posterior lesions, retinal haemorrhages or macular stars. In such cases, ophthalmologists and optometrists should consider the possible differential diagnoses.4

Pain is among the most common and debilitating NMOSD symptoms.4 Between 62% and 91% of NMOSD patients experience central neuropathic pain.4,25 Ocular pain, pain on eye movement or both often precedes or accompanies optic neuritis. Indeed, studies have found that 86% of patients with optic neuritis due to MOGAD have reported pain when they move their eyes.4

**Diagnostic imaging**

Early diagnosis helps to minimise the impact on visual acuity. Optical coherence tomography (OCT) can detect optic nerve damage, sometimes even before symptoms become clinically apparent.4,8

OCT reveals that optic neuritis caused by autoantibodies to AQP4 can markedly thin the retinal nerve fibre and ganglion cell/inner plexiform layers. The thinning of these layers is, on average, more pronounced in AQP4-NMOSD than MS.4 People with AQP4-NMOSD may also show a thickened inner nuclear layer compared with healthy controls.24

Moreover, in contrast to MS, most clinically unaffected eyes of people with AQP4-NMOSD are normal on OCT.4 Ongoing studies at my centre and elsewhere are using the pattern of retinal damage on OCT to train diagnostic artificial intelligence algorithms.27,28 We hope that these will be ready for clinical use in the next few years.

**Treatment**

Intravenous methylprednisolone for at least 3–5 consecutive days, plasma exchange or immunoadsorption are the usual treatment for acute attacks.4,29 In addition, patients may need treatments to alleviate symptoms such as pain and depression.30

Symptoms can completely resolve after acute attacks, especially if treated rapidly.4 For example, starting intravenous methylprednisolone within 4 days of the onset of optic neuritis due to AQP4-NMOSD and MOGAD can increase the chance of full visual recovery, whereas treatment 7 days or more after onset is associated with a higher risk of poor visual recovery.4,7

Nevertheless, the visual loss arising from NMOSD is not always fully responsive to high-dose corticosteroids. European studies, for example, reported no or incomplete recovery after 66% and 48% of optic neuritis attacks in patients with AQP4-NMOSD and MOGAD, respectively.4

In the studies, around one-quarter of patients who experienced optic neuritis due to MOGAD had uni- or bi-lateral functional blindness. Another 10% of patients showed severe visual deficiency. Around half had some visual loss.4 In many patients, visual quality of life is severely impaired.31

Maintenance treatment with agents (e.g., rituximab, azathioprine, mycophenolate mofetil) that deplete B-cells (which develop into antibody-producing plasma cells) may be needed to prevent relapse. Several monoclonal antibodies (eculizumab [Soliris, Alexion], satralizumab [Emspryng, Roche] and inebilizumab [Uplinza, Horizon Therapeutics]) that target the complement system, interleukin-6 or CD19-positive B cells have been approved for AQP4-NMOSD.4,5,32

In people with AQP4-NMOSD, interleukin-6 may increase survival of plasmablasts (which are plasma cell precursors), stimulate the production of antibodies against AQP4, disrupt the integrity and functionality of the blood–brain barrier and enhance proinflammatory T cell populations.33

Future drugs targeting specific abnormalities in NMOSD and therapies that induce immune tolerance could transform prospects for people with NMOSD.34 These may become available in the next 5–10 years.

In conclusion, although NMOSD is rare, ophthalmologists and optometrists need to remain aware of it as a potential differential diagnosis. After all, in people with NMOSD, ‘time is retina’.3

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REFERENCES


Introduction
Since its introduction in 2011, small incision lenticule extraction with SMILE using the VisuMax femtosecond laser (Carl Zeiss Meditec, Jena, Germany) has become a well renowned procedure, with over 6 million surgeries performed by more than 2,500 surgeons globally. The VISUMAX 800 femtosecond laser (Carl Zeiss Meditec, Jena, Germany) was released in 2021 as the successor of the VisuMax with the aim of improving practicality, compatibility, the patient experience, the user experience, as well as clinical outcomes.

Case Report
On the 24th August 2021, a 34-year-old woman presented for a corneal laser refractive surgery assessment at the London Vision Clinic, London, United Kingdom, after experiencing frustration and discomfort from her contact lenses. On examination, the patient had uncorrected distance visual acuity (UDVA) of 20/100 in the right eye, with a manifest refraction of -2.00 -3.00 x 126 (20/16 -2), and 20/50 in the left eye, with a manifest refraction of -0.75 -2.75 x 126 (20/16 +1). Central corneal thickness was 572 µm in the right eye and 568 µm in the left eye. Slit lamp and dilated fundus examination were unremarkable in both eyes. Corneal topography, tomography, epithelial thickness profile, and aberrometry were within normal limits for an eye with high astigmatism, so the patient was deemed suitable for corneal laser refractive surgery.

The patient was scheduled for bilateral sequential SMILE with the VISUMAX 800 with an experienced surgeon (DZR) on the 22nd of September. The target refraction was +0.27 dioptres (D) in both eyes based on our protocol algorithm targeting hyperopia based on age in accommodating patients. Lenticule and incision programming was according to the Standard Protocol with an intended cap thickness was 135 µm, the cap diameter was 8.0 mm, and the optical zone was 7.0 mm with a 0.10 mm transition zone. A primary 2.0 mm superotemporal small incision and a reserve superonasal 2.0 mm small incision was created in both eyes.

For the afternoon surgery list, our technicians rearranged the operating theatre shifting the cataract surgery setup from the morning (ARTEVO®, Centurion™) for SMILE in the afternoon (Figure 1). The VISUMAX 800 was rolled from a corner of the operating room, where it is stored when not in use, to the centre of the room next to the surgical bed used for both intraocular and corneal refractive surgery. The VISUMAX 800 possesses a design of two fully retractable arms, a laser delivery arm for femtosecond cutting, and a second arm with a high quality ZEISS surgical microscope. When these arms are left in the vertical position, the laser controls a small footprint, and therefore can be tucked away at the side of the room.

Figure 1. (Left) Operating room setup for cataract surgery with the digital microscope ARTEVO® 800 while the VISUMAX 800 is tucked away in the corner. (Right) Later that afternoon the cataract equipment was moved to the side setting up the room for SMILE.
Once the operating theatre was prepared, the nurses brought the patient into the room and guided her to the operating theatre slit lamp. Here, I placed 3 corneal markings on the horizontal and vertical planes to use for referencing the cyclotorsion overlay tool during treatment. The patient was then assisted onto the surgical bed. With the laser arms in the upright position, there is unimpeded access to the bed, providing an open sky experience for the patient, compared to other systems where the device creates an enclosure over the patient.

After proceeding with our standard operating data entry checks, I began the treatment session by pressing the button to lower the laser delivery arm to the horizontal position above the patient. Video 1 shows the whole case. The side and top view cameras include an overlay of the resting position of the laser arm to guide my adjustment of the height of the laser before lowering the arm. With the laser arm in position, the laser began recording the internal video, along with side view, top view, and room audio. The contact glass was attached to the treatment cone, and the system calibrates for the individual contact glass geometry. The right eye was taped shut, anesthetic drops were applied and the speculum was inserted on the left eye, the eye to be treated first.

I began by slowly lowering the laser delivery arm towards the eye by gently rotating the joystick while under video visual control. This patient-centred design means that the patient remains static through the procedure, which from my observation produces a much more relaxed experience than when the patient is moved on the bed towards the contact glass under an enclosed space. During docking, the new CentraLign® assistant function produces an overlay depicting the vector difference between the corneal vertex and the current position of the treatment cone (Figure 2 and Video 2).

The overlay consists of a cross-hair reticle with a 0.2-mm diameter circle at the center of the contact glass. As the eye approaches the contact glass, the pupil edge is automatically identified and displayed as a blue dotted line. The location of the corneal vertex is calculated relative to the pupil center according to the data entered in advance from the topography scan. The corneal vertex is indicated by a small circle, which is connected by a straight line to the center of the contact glass (i.e. the treatment center). This “lollipop” overlay is initially coloured yellow. Minor horizontal adjustments are made using the joystick to align the corneal vertex with the treatment center. The lollipop changes to green once the corneal vertex is within 0.2 mm of the treatment center.

Once satisfied with the centration, I initiated suction to immobilise the eye at very low vacuum (50 mmHg) which the patient does not even perceive as having started. At this point, the software displayed the Oculign® cyclotorsion screen that shows a reticle guideline overlay representing the horizontal axis of the contact glass (Figure 3 and Video 3). I used the joystick to rotate the reticle guidelines to be aligned with the corneal marks for perfect cyclotorsion control.

I pressed the foot pedal to begin the femtosecond cutting. The laser head and delivery optics are essentially identical as in the VisuMax. The main difference is that the VISUMAX 800 possesses ultra-high-speed deflecting mirrors enabling the laser head to operate at a pulse...
The lenticule dissection and extraction technique was performed using the Standard Technique as described previously. Once extracted, the lenticule was distended on top of the cornea and, as dictated by the Standard Technique, was inspected for completeness using the built-in slit projecting illumination in the presence of fluorescein dye under cobalt blue illumination. Moxifloxacin and Tobramycin/Dexamethasone eye drops were instilled as prophylaxis, and the procedure was repeated on the right eye. The total treatment time for both eyes is 9 minutes.

Once the surgery was complete in both eyes, the nurse assisted the patient to the operating theatre slit lamp for examination. Fluorescein dye was instilled, and using a dry micro-spear, the redundant portions of the cap were distributed to the periphery to avoid microfolds and delayed visual recovery. The patient was then instructed to use artificial tears every hour, as well as standard antibiotic and anti-inflammatory eye drops, and sent home to rest.

One month after surgery, the patient returned with no subjective complaints. The UDVA was 20/16 in both eyes, with a manifest refraction of +0.25 -0.50 x 23 in the right eye, and +0.50 -0.25 x 125 in the left eye. Corneal topography was as expected and showed a perfectly centred treatment in both eyes (Figure 4). Optical coherence tomography B-scan revealed no irregularities at the interface level in both eyes. All further ophthalmic examinations were unremarkable.

**Discussion**

The present case report has shown SMILE to be effective for treating high compound myopic astigmatism with the VISUMAX 800. Using the new CentraLign® and OcuLign® assistant functions, the VISUMAX 800 was able to effortlessly achieve essentially perfect centration (Figure 3). Currently, the CentraLign® function requires manual data entry of the x and y coordinates of the corneal vertex relative to the pupil border, as obtained by ATLAS topography (Carl Zeiss Meditec), and the OcuLign® function requires corneal markings at the slit lamp. However, both these features are soon to be imported automatically from an iris registration image acquired before in a future update.

Additionally, the new Refractive Workplace (Carl Zeiss Meditec), is expected to be released shortly. This new treatment planning software is a plug in, based on FORUM patient data management (Carl Zeiss Meditec, Jena, Germany), which enables surgeons to plan the treatments such as SMILE pro remotely. It will be able to integrate measurements from diagnostic devices and treatment plans can be imported on the refractive laser devices. It is to be expected that surgeons will be able in the future to remotely plan laser refractive procedures such as SMILE pro using centration data from topography, thickness data from OCT tomography and iris registration data such as the IOLMaster 700. Automated data import will not only improve workflow efficiency but safeguard against the possibility of data errors currently requiring multiple layers of cross-checks. Overall, the VISUMAX 800 to me represents a true generational leap from the first generation lenticule extraction devices currently available.
Great strides have been made in recognising and treating keratoconus. Recent imaging technologies, such as optical coherence tomography, have identified thinning of corneal tissue over the cone, and wave-front aberrometry shows higher-order aberrations that may facilitate the diagnosis.

Yet the pathway to diagnosing the condition is not always free of roadblocks, according to Dr Sumit Garg, professor of cataract, corneal and refractive surgery at the Gavin Herbert Eye Institute, University of California, Irvine, California, United States. Dr Garg said that keratoconus has two components: genetic and environmental. The latter, he said, includes allergies and eye rubbing (during waking and sleeping hours), which is a huge driver of keratoconus progression. If eye rubbing persists, progression can occur despite cross-linking treatment.

Dr Garg also pointed out that the diagnosis can depend on where a patient lives and their genetic make-up. “The keratoconus prevalence is individualised and [keratoconus] can be prevalent in up to 5% of particular populations as shown in a recent study,” he said.1 With the rapid advancements in this field, the next step is determining the role of genetic testing in this patient population.

**Figure 1.** Results from 32-year-old patient.
Assessing the risk

Genetic testing in patients at risk of keratoconus is in its infancy. Dr Garg reported that AvaGen75 (Avel-lino) is a test—the first of its kind—that looks at variants of genes reported to be associated with keratoconus. “The test, which looks at 75 genes and more than 2,000 variants, provides a scale ranging from 0 to 100 that defines the genetic risk of a patient developing keratoconus,” Dr Garg said.

The manufacturer reports that the test provides a risk score from data based on multiple gene clusters that have a high correlation with keratoconus, with the goal of providing an early diagnosis. Dr Garg emphasised that keratoconus is polygenic and not binary (i.e., the presence of genes does not necessarily mean that a patient has clinical evidence of keratoconus). He also cited a study that found that when genetic testing is coupled with advanced imaging, the chances of identifying keratoconus early are greater.

In his practice, he is offering genetic testing as an option, especially when there is a suspicion of keratoconus. Those who request a refractive surgery and those with family members who have been diagnosed with keratoconus are also offered testing.

Representative results of genetic testing

Dr Garg reported the case of a woman aged 32 years, who was referred for an ocular evaluation for a possible LASIK procedure. The patient was highly myopic with high cylinder, but her vision had been stable. The best-corrected vision was 20/20 bilaterally; she denied eye rubbing.

The topography maps indicated possible posterior changes, with some steepening in the corneal centre, and changes on the ABCD score. The Kmax values were generally thin overall. The patient had no family history of keratoconus.

Genetic testing showed moderate-to-high risk of keratoconus (Figure 1). The decision was made not to perform the refractive procedure and to perform a follow-up examination in 6 months. If the changes were progressive, corneal cross-linking could be considered. If follow-up showed no progression, an implantable collamer lens could be considered.
A second case was that of a woman aged 31 years, who presented after being evaluated for LASIK in another practice, where a photorefractive keratectomy was recommended. The patient, who was a mild myope with low cylinder, had no recent refractive changes and she denied eye rubbing.

The patient's best-corrected vision was 20/20. The maps did not show any abnormality and the genetic testing was inconclusive (Figure 2). The patient became pregnant and any refractive considerations were postponed.

A third case was that of a man aged 27 years, who presented for a LASIK evaluation. The patient was a mild myope and previously wore contact lenses. The refraction was stable. His maps showed slight corneal thinning but a good residual stromal bed. His father had a history of keratoconus. Dr Garg said that for this patient, genetic testing is the next step and may help in the treatment plan.

“Genetic testing is new and holds a lot of promise,” Dr Garg concluded. “It helps us to risk-stratify our patients, help with clinical quandaries, and hopefully will facilitate earlier diagnosis and screening for keratoconus. It is important that the disease is not binary but rather a spectrum. Patients must understand that if they undergo genetic testing it will not determine whether they have keratoconus. Genetic testing will provide another data point to help identify keratoconus.”

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This article is adapted from Dr Garg’s presentation at the American Society of Cataract and Refractive Surgery’s annual meeting in Washington, D.C., US. He is a consultant to Avellino and Glaukos.

REFERENCES

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IT’S TIME TO CHANGE

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Circumnavigating the bumpy road to vernal keratoconjunctivitis: **Time is key**

Early recognition of disease leads to improved outcomes for patients

By Lynda Charters; 
Reviewed by Dr Leonard Bielory

Vernal keratoconjunctivitis (VKC) is a progressive, vision-threatening condition. However, it is rare and may not be in the forefront of clinicians’ minds when evaluating a child with a persistent allergic ocular surface complaint. In fact, 88% of clinicians in one study noted that primary care physicians and paediatricians commonly under- or misdiagnose the disorder—which then goes untreated or undertreated—largely because the later involvement of the cornea can be misleading.

This finding was reported by Dr Leonard Bielory, a professor of medicine, allergy, immunology, and ophthalmology at Hackensack Meridian School of Medicine in Nutley, New Jersey, United States. The limited awareness of VKC is the focus for Dr Bielory, who emphasised it as a barrier to timely identification and management of this disruptive ocular surface disorder. Frequently, VKC is initially misidentified as an allergy or infection, and referral to a specialist is often delayed until symptoms have become severe.

**The VKC enigma**

VKC begins in the warmest months worldwide. This characteristic can lead clinicians to confuse it with springtime (or “vernal”) allergic conjunctivitis. The corneal inflammatory component, however, emerges later and is recurring. As Dr Bielory stated, “The condition is thought to mislead clinicians into thinking it is just a seasonal problem [but it] may also have a perennial component that develops with time.”

The key factor, Dr Bielory said, is that VKC should be considered in children who present with a persistent ocular allergic complaint, which may be the more pronounced type of conjunctivitis that can affect the cornea. A clue to diagnosis may emerge when parents report that their child is using over-the-counter (OTC) ocular treatments to no avail.

“The condition is thought to mislead clinicians into thinking it is just a seasonal problem [but it] may also have a perennial component that develops with time.”

Then, possibly during the second
and third seasons, a great degree of progression may be seen during the year of sensitisation, bearing in mind that there are individual degrees of progression among patients. The patient then moves into the clinical phase.

Dr Bielory explained that a confounding factor in the diagnosis of VKC is how allergies develop (i.e., over time) in infants and young children. Immunoglobulin G antibodies inherited from the mothers protect babies for about 6 months. Immunoglobulin E, the allergy antibody, requires exposure to an offending agent over time, followed by development of the immune response against that agent.

Allergies may begin to manifest in babies 6–9 months after birth. Allergies exhibit nasal and ocular symptoms (rhinoconjunctivitis) in almost equal proportions, as physicians should know.

During the second year for children with developing VKC, symptoms worsen and become more unresponsive to treatment. An allergy work-up is needed, but, Dr Bielory stated, when ocular corticosteroids are prescribed and the patient does not improve, clinicians should suspect something more than seasonal allergic conjunctivitis (i.e., the vernal component).

**The condition’s appearance**

Minor VKC symptoms include photophobia, tearing, burning and pruritus, with minimal impact on a patient’s quality of life. This scenario is often misdiagnosed as pink eye or allergic conjunctivitis.

Moderate VKC symptoms include photophobia, pruritus and discharge of mucus, with moderate sizes and numbers of cobblestone papillae in the upper tarsal conjunctiva or around the edge of the cornea (limbal form of VKC). Patient quality of life is moderately affected.

Severe symptoms of photophobia, pruritus and discharge of mucus are accompanied by large cobblestone papillae, punctate epithelial erosions and Horner-Trantas dots. Quality of life is substantially affected.

**Treatment considerations**

As mentioned, OTC ocular treatments will not work. Use of oral antihistamines may cause increased ocular dryness over and above the abnormal tear film development in the vernal component.

“With antihistamines, there begins to be an increase in tear film dysfunction that comes with the allergy affecting the ocular surface,” Dr Bielory said. “However, in VKC, over-production of tears in response to corneal irritation usually leads to practitioners increasing the use of antihistamines, compounding the ocular surface issue,” he added.

Nevertheless, within this less-than-clear clinical picture, several treatments can be called into play. Treatment of the ocular surface progresses from lubricants to ophthalmic antihistamines to corticosteroids. Dr Bielory uses the steroid burst treatments over 1–2 weeks to avoid increases in intraocular pressure.

He advised that physicians should be aware of the chronic inflammation that induces the activity of certain cell types that will lead to corneal involvement. At this point, Dr Bielory explained, steroid-sparing treatments should be introduced, such as ciclosporin, which decreases the overall immune response of IL-2 and the cytokines.

Ciclosporin ophthalmic emulsion 0.1% (Verkazia, Santen), a steroid-sparing drug, is the first and only topical immunomodulator approved by the United States Food and Drug Administration for treating adults and children with VKC. In addition, Sinusol Breathe Easy (DRBRX), a non-steroidal OTC product, works by clearing nasal mucus and decongestion, which also benefits the ocular symptoms associated with allergies.

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In addition to his role at Hackensack Meridian School of Medicine, Dr Bielory is an adjunct professor at the Center of Aerobiological Research at Rutgers University in New Brunswick, New Jersey, US; and director of the Center of Aerobiological Research at Kean University in Union, New Jersey. Dr Bielory is a consultant to Santen Pharmaceutical and DRBRX.
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Cornea

The pathophysiology and pathomorphology of corneal ectasia

Part 3: OCT epithelial thickness measurements allow monitoring of corneal changes

By Lisa Stewart, PhD; Reviewed by Dr Omid Kermani, Prof. Dan Reinstein and Dr Tim Archer

Prof. Reinstein began his talk by introducing the concept of the epithelial thickness profile, explaining that he had been the first to publish 10-mm epithelial thickness maps of the normal virgin cornea with 1 µm precision. As expected, he found the central thickness to be around 50 µm but, going against everything that had been published previously, found that the epithelium does not have an even profile, being an average of 6 µm thinner superiorly than inferiorly and about 1 µm thicker nasally than temporally. Right and left eyes have mirror asymmetry. His group has now published around 40 papers on the epithelium alone. "OCT is now confirming many of the things that we discovered originally with ultrasound," he explained. "What we have learned is that the epithelium changes in all situations where you change the stromal surface curvature."

According to Prof. Reinstein, looking at how the epithelium behaves in different situations allows four basic rules to be written on how the epithelium acts and how it remodels after a stromal surface change, as follows.

1. The epithelium thickens to fill any relative depressions.
2. The epithelium thins over relative peaks within the stroma.
3. The change in the epithelium is proportional to the change in the stroma. Higher myopic ablation produces more central epithelial thickening and peripheral thinning; higher hyperopic ablation produces more peripheral epithelial thickening and central thinning. Epithelial changes are more marked the more severe the keratoconus.
4. The amount of change is defined by the rate of change of curvature (or curvature gradient). For example, a depression from a corneal ulcer that is 1-mm wide and 200-µm deep will be almost entirely smoothed by the epithelium, but a 4.5-mm zone depression made in the stroma by PRK is compensated for less. This corresponds with the improvement in refractive stability and reduction in regression when using larger optical zones.

Epithelial changes in keratoconus

The cornea has a front (stromal) surface and a back surface. In keratoconus, the front and back surfaces extrude and the epithelium remodels over the peak to become thinner, but it also becomes thicker around the peak to form a "doughnut" shape. As Prof. Reinstein explained, interestingly, when you have a very mild back surface extrusion yoked to a very mild front surface extrusion, the epithelium is able to fully compensate. This leads to focal thinning of the epithelium in a doughnut pattern overlying the back surface elevation, which is eccentric. The front and
back surface data alone may get lost in the soup of statistical variation and therefore fail to signal keratoconus with enough sensitivity.

Commercially, what has become of interest, and what spawned the OCT epithelial thickness industry, was Prof. Reinstein’s demonstration that you could have inferior steepening that could be confirmed by an epithelial thickness map not to be keratoconic but rather due to a thicker inferior epithelium.

His study of 1,500 eyes demonstrated that mapping the epithelium allowed exclusion of keratoconus in 84% of these highly equivocal back surface elevation abnormalities. This then led to an increase in patients eligible for excimer laser surgery.

Having studied the epithelial thickness profile in keratoconus and established that the more advanced the keratoconus, the thinner the epithelium becomes over the cone and the thicker it becomes around the doughnut, Prof. Reinstein then sought to try and parameterise how this difference in epithelial modelling could be exploited in the very mildest keratoconic cases.

In one of the earliest machine-based pattern-recognition studies from topographic maps, Prof. Reinstein’s researchers set up around 160 variables in epithelial profiles that they thought might be relevant with respect to keratoconus screening, only six of which turned out to be relevant. This provided an automated algorithm with exceedingly high specificity and sensitivity for keratoconus. It detects a 1- or 2-µm change in epithelial thickness profile, which is much more sensitive than the 1- or 2-µm elevation detected by a topographic or tomographic device with back surface mapping.

Prof. Reinstein explained that the epithelial thickness profile can be used as an adjunctive tool in cases of suspected keratoconus and has applications in cases with seemingly normal topography, cases where both topography and tomography are suspicious, and most importantly, those that have normal topography and normal tomography.

Figure 1 shows a case with normal front surface topography, normal Belin/Ambrósio and BAD-D (Belin/Ambrósio display, D value) and nothing remarkable between the back and front surfaces. The epithelial thickness profile shows quite significant focal thinning in the centre of the cornea and the pattern deviation map also shows inferior thinning in an unexpected location.

The Reinstein-Silverman-Keratoconus (RSK) score in this case implies a definitive keratoconus diagnosis.
Prof. Reinstein said, "The point is that keratoconus can be detected with high sensitivity. This avoids false negatives when screening for keratoconus using only topography by proving that the epithelial thickness profile has the doughnut configuration. [It also avoids] false positives in cases that machine algorithms classify as keratoconic … but use of an epithelial profile shows a thicker epithelium over the zone where there is increased steepening."

Epithelial pliability
Prof. Reinstein explained that the epithelium is a dynamic layer that changes easily with all kinds of conditions and therefore contact lens warpage, anterior basement membrane dystrophy, tear film abnormalities, meibomian gland dysfunction, dry eye and eyelid forces can lead to epithelial redistribution. Figure 2 illustrates a cornea that (left) has been out of a soft contact lens for 3 days and appears very keratoconic and then (right) looks less keratoconic after 2 weeks; the difference is epithelial remodelling.

Anterior basement membrane dystrophy (ABMD) produces a very abnormal epithelial profile with duplication of the basement membrane and, therefore, thickening of the epithelium. Figure 3 shows an example of the epithelial profile showing doughnut-shaped thinning, which might well be mistakenly interpreted as being keratoconus but is actually ABMD.

As a way of indirectly proving that it is the eyelid forces that cause epithelial thickness changes, Figure 4 shows a patient with a Bell's palsy, who does not
blink very much with one of his eyes. The epithelium is thickened significantly in that eye, producing a myopic shift, whereas the epithelial thickness profile is much more even in the eye that blinks normally.

Thus, performing refractive surgery without epithelial maps, when there are multiple commercially available devices to provide such a map, seems unwise. Instead of relying entirely on machine learning, it is better to use one’s clinical skills in order to screen for keratoconus.

**The debate**

Following Prof. Reinstein’s presentation, Dr Archer debated its content with the other presenters—Dr Kermani (Germany), Prof. Damien Gatinel (France), Prof. Renato Ambrosio Jr. (Brazil) and Prof. Farhad Hafezi (Switzerland).

*(The responses in italics were not given at the time, because of time constraints, but have been provided during the review process.)*

**DR KERMANI:** Epithelial mapping seems to be a very important step in diagnosis in both keratoconus and ectasia. Do you use high-speed ultrasound or OCT?

**DR ARCHER:** There are variety of machines on the market to map the epithelium. Most of the maps we showed in this presentation were from the ArcScan Insight 100 very-high-frequency digital ultrasound device but we also showed quite a few maps from the MS-39 OCT device, so yes, we use both systems.

**DR KERMANI:** If you look at epithelial mapping from a clinical perspective, if the epithelium is so delicate, would that be a reason not to do topo-guided LASIK? Or is that a procedure in which the epithelium already masks the effect of whatever we do to the stroma?

**DR ARCHER:** Most topography-guided systems derive the ablation algorithm using the front surface topography, which means that it will be less accurate in eyes with an irregular epithelium. Most patients have a reasonably regular epithelium but some do not. In eyes with an irregularity on the epithelium, this will throw off the topography-guided algorithm and you may end up with an outlier.

If you have a global irregularity, like a decentration or a small optical zone, the epithelial remodelling is more global; most of the irregularities show through on the topography and topography-guided treatment works very well.

If you have localised irregularities, there is a lot more epithelial remodelling, which masks the defect, and so topography measurements cannot see the actual shape of the stroma. In this case, topography-guided treatments do not work very well and can actually make things worse.

The link between epithelial thickness and topography is very important. Topography-guided treatments should not be done without first measuring the epithelial thickness and ensuring that it is reasonably regular.

**DR KERMANI:** Damien, what is your opinion on epithelial mapping? Is it so sensitive and helpful in our daily diagnosis that we really need to add it to our multi-modality diagnostics? Do you use it?

**PROF GATINEL:** My view is that I have not yet seen a patient for whom the epithelium was altered from what you expect in a normal patient, yet the cornea was not deformed on the anterior or posterior surface. I do not believe that there is a primitive deformation of the epithelium. As eye rubbing is exerted directly on the epithelium, you may expect to see some deformation, but it is not clinically obvious.

Of course, when you have keratoconus you have a specific pattern, which usually shows as a regularisation pattern. What I find fascinating is how the epithelium remodels itself. If I were involved in epithelial research I would hire a real surface scientist or a physicist or mathematician specialised in those things to understand what drives the epithelium to remodel itself. I know we blink 10,000 times a day but still, how does this work?

The epithelium feels the defects but it is fascinating that it remodels, probably in response to both biological and physical elements like surface tension. When you put a drop of water on a surface it takes a shape that depends on the hydrophilicity or hydrophobicity of the surface but also obeys physical laws. The epithelium probably obeys the same laws but I would be interested in seeing some research in that direction.
It is good that the epithelium regularises the cornea, but how much and how can we predict it? This is really fascinating to me. In refractive surgery, if you could predict how the epithelium would react to a specific profile of ablation you could maybe anticipate it and correct for it.

**PROF REINSTEIN AND DR ARCHER:**
We agree with Prof. Gatinel that there would not be epithelial thickness changes in an eye with keratoconus without a deformation of at least the posterior surface. However, the point that we are making is that the epithelial thickness profile is used as an adjunctive tool to confirm or exclude keratoconus in eyes with equivocal changes on tomography.

In general, keratoconus screening is improved with the addition of further measurement modalities. Epithelial thickness mapping and Corvis biomechanical measurements are two examples of how keratoconus screening can be improved beyond topography and tomography alone.

**DR KERMANI:**
Kanellopoulos and Kahn performed hyperopic LASIK in combination with cross-linking and showed that the results are more stable with regard to regression and stability than without cross-linking,19 so your point is valuable and we should look into this.

**PROF REINSTEIN AND DR ARCHER:**
We do not agree with this statement. The Kanellopoulos study is interesting; however, the population included only 34 patients so the results have a very low statistical power and have not been replicated to date. As a comparison, our published results for hyperopic LASIK using the MEL 90 demonstrated better stability than the group that included cross-linking in the Kanellopoulos study.11

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Poor post-pandemic follow-up care in glaucoma patients prompts concern

Study finds that elderly patients in particular missed their periodic evaluations

By Lynda Charters;
Reviewed by Ms Catherine Wang

A high percentage of patients diagnosed with glaucoma missed follow-up evaluations 15 months after glaucoma appointments had been cancelled during the COVID-19 pandemic in the United States, according to investigators. After examinations resumed, the researchers found that many of the established patients who did not return for follow-up evaluations tended to be elderly.

A retrospective chart review study was conducted by Ms Catherine Wang, of the University of Illinois College of Medicine at Chicago, Illinois, United States—along with colleagues from the Illinois Eye and Ear Infirmary, Department of Ophthalmology and Visual Sciences at the University of Illinois at Chicago. They examined the percentages of patients who returned for evaluations at 6 months, 12 months and later, following cancellation of their examinations.

The study also sought to determine the demographic and socioeconomic factors related to the patients who did not return for evaluation after 15 months, as well as the effects that the lack of follow-up care had on patients with glaucoma.

Chart review findings

The investigators found that 1,057 appointments had been cancelled between 15 March and 30 April 2020. More than half (55.8%) were appointments intended for established glaucoma patients, whereas 12.6% were for new, as-yet-unevaluated patients.

Of those diagnosed with glaucoma, 56.8% returned for a follow-up visit within 6 months, 65.9% returned within 12 months and 69.6% returned within 15 months. At the 15-month mark, 30.4% of the established patients had not returned for follow-up visits following the lockdown.

Age seemed to be the predominating factor in these results, whilst travel and socioeconomic factors did not. When the ages of the patients in the glaucoma service were analysed, those who did not attend a follow-up examination tended to be older, according to Ms Wang.

Those who were 82 years and older were disproportionately represented. However, the area of residence was not a significant factor. Ms Wang also noted that outreach is needed to determine whether the patients sought eyecare from other facilities.

Ms Wang pointed out that the American Academy of Ophthalmology Preferred Practice Patterns’ state that patients with glaucoma should be evaluated by an ophthalmologist at a minimum of every 12 months. "Our study showed that a high rate of established patients missed follow-up visits at 15 months after examinations were cancelled because of COVID-19 mandates," she said.

Ms Wang emphasised that with future potential outbreaks of the virus, examinations may again decrease, and the consequences highlighted by the current study should prompt an evaluation of policies about patient follow-up and the need for establishing novel approaches to provision of care for the vulnerable elderly population.

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This article is adapted from Ms Wang’s presentation at the 2022 American Glaucoma Society Annual Meeting in Nashville, Tennessee, US. She has no financial interest in this subject matter.

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