

RCCL®

REVIEW OF CORNEA & CONTACT LENSES

Using Topography to Guide Your CL Fits

Learn the maps and images that can best visualize any issues prior to placement or troubleshooting



OFFER PATIENTS AN EXCEPTIONAL LENS EXPERIENCE

Eye Care Professionals across the nation are sharing their success with Bausch + Lomb INFUSE®. See the impact it can have on your practice and patients, too.



SCAN CODE TO WATCH PEER TESTIMONIALS



HERE'S A SNEAK PEEK AT WHAT YOUR PEERS ARE SAYING:

"INFUSE® has great comfort, vision, and oxygen transmissibility."

- Dr Michelle Mumford

"The lens speaks for itself."

- Dr Scott Moscow

"INFUSE® helps address symptoms of contact lens dryness."

- Dr Kevin Nehaul

"INFUSE® has what I call 'the WOW factor.'"

- Dr Richard Goellner

Using Topography to Guide Your CL Fits

Learn the maps and images that can best visualize any issues prior to placement or troubleshooting.

By Shalu Pal, OD

Page 22

- Fighting Mail Order Contact Lenses, *p. 14*
- An Evidence-Based Approach to GPs, *p. 18*
- Make Contact Lens Discomfort Extinct, *p. 28*



MiSight[®] 1 day

is the **ONE** for myopia control*

MiSight[®] 1 day soft contact lenses are specifically designed for myopia control and are FDA approved* to slow the progression of myopia in children aged 8-12 at the initiation of treatment[†]



MiSight[®] 1 day
for daily wear



FDA-Approved*

How can myopia control with **MiSight[®] 1 day** benefit your practice?

Learn more at [CooperVision.com](https://www.CooperVision.com)

***Indications for use:** MiSight[®] 1 day (omafilcon A) soft (hydrophilic) contact lenses for daily wear are indicated for the correction of myopic ametropia and for slowing the progression of myopia in children with non-diseased eyes, who at the initiation of treatment are 8-12 years of age and have a refraction of -0.75 to -4.00 diopters (spherical equivalent) with ≤ 0.75 diopters of astigmatism. The lens is to be discarded after each removal.

[†]Compared to a single vision 1 day lens over a 3 year period.

Reference: 1. Chamberlain P, et al. A 3-year randomized clinical trial of MiSight[®] lenses for myopia control. *Optom Vis Sci.* 2019;96(8):556-67.



IN BRIEF

■ Researchers recently found that **smokers and individuals with a high BMI showed significantly lower lipid layer grades and tear meniscus height scores** compared with controls. The majority of normal subjects had a lipid layer thickness of ~80nm, while a more compact formation (30nm-50nm) was common in those with a high BMI; among smokers, thickness was 50nm-80nm. The assessment of tear film parameters supported findings of previous studies that **implicated smoking and high BMI as risk factors for dry eye.**

Fagehi R, El-Hiti GA, Almojalli A, et al. Assessment of tear film parameters in smokers and subjects with a high body mass index. Optom Vis Sci. February 23, 2022. [Epub ahead of print].

■ In a study on 1,038 keratoconus patients, **several socioeconomic factors were found to be associated with more severe disease** as well as with corneal transplantation. **Patients on Medicaid were more likely to have severe keratoconus**, while Medicare and Medicaid recipients were **more likely to require transplantation** than commercially insured patients. **Progression was also significantly more common in men than in women.**

Ahmad TR, Kong AW, Turner ML, et al. Socioeconomic correlates of keratoconus severity and progression. Cornea. February 19, 2022. [Epub ahead of print].

■ **An ortho-K lens design with a smaller back optical zone diameter might yield a faster myopic reduction and a smaller aspheric treatment zone.** Researchers recently found that using polynomial function in modeling relative corneal refractive power change yielded reasonably good fitting of curves. It reserved as much topographical data as possible compared with the previous methods.

Zhang Z, Chen Z, Zhou J, et al. The effect of lens design on corneal power distribution in orthokeratology. Optom Vis Sci. March 12, 2022. [Epub ahead of print].

Epithelial Maps Can Alter Refractive Surgery Evaluations

Screening patients for corneal refractive surgery candidacy remains challenging because it is critical to identify subtle ectatic disease before dramatic changes occur. It also remains largely interpretive and therefore subjective because none of these metrics have proven to be equivalent to or better than expert interpretation of corneal images. Researchers at the Cole Eye Institute in Cleveland have found that using epithelial mapping as part of screening is impactful and can benefit refractive surgical practices.

The study evaluated 100 consecutive patients who presented for refractive surgery screening. Two masked examiners performed a screening based on Scheimpflug tomography, clinical data and patient history and then independently decided on eligibility for LASIK, PRK and SMILE. The examiners were then shown patients' epithelial thickness maps derived from OCT. Afterwards, the researchers determined the percentage of screenings that changed upon evaluating the epithelial thickness maps, with regard to candidacy for surgery, as well as the ranking of surgical procedures from most to least favorable.

When incorporated into the preoperative evaluation, epithelial thickness maps resulted in ruling in slightly more patients for corneal refractive surgery. Candidacy for corneal refractive surgery changed in 16% of patients after evaluation of the epithelial thickness maps, with 10% of patients screened

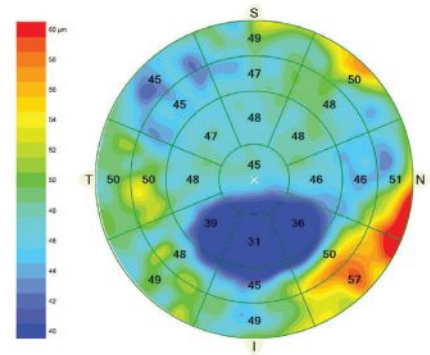


Photo: Carl Zeiss Meditec

Using epithelial maps in pre-op evaluations may indicate a greater number of candidates for refractive surgery.

in and 6% screened out. Surgery of choice changed for 16% of patients, and the ranking of surgical procedures from most to least favorable changed for 25% of patients. The study noted that 11% of patients gained eligibility for LASIK, while 8% lost eligibility for LASIK. The researchers noted no significant difference between the evaluations of the two examiners.

“While these results reflect the surgical decision-making thought processes of the two examiners and are therefore subjective, the almost identical outcomes obtained underscore the significance of the results of the study despite its inherent subjectivity,” the researchers noted in their paper. “We hope our work stimulates future studies conducted with numerous masked reviewers based on our preliminary findings regarding the utility of epithelial maps in our refractive surgery practice.”

Asroui L, Dupps WJ, Randleman JB. Determining the utility of epithelial thickness mapping in refractive surgery evaluations. Am J Ophthalmol. March 2, 2022. [Epub ahead of print].

Lid Margin Score Helps Detect Undiagnosed MGD

Diagnosing meibomian gland dysfunction (MGD) is often a challenge, and while meibography can provide evidence of gland dropout, this approach is not always an option for many clinics. Therefore, researchers sought to determine which clinical ocular marker is most associated with meibomian area loss. Their secondary objective was to identify correlations with confocal microscopy imaging of the lid margin.

This observational, cross-sectional clinical study included 100 participants between the ages of 18 to 65. The researchers conducted a number of measurements of the right eye and its upper eyelid, including noninvasive tear breakup time, bulbar and limbal redness scores, blepharitis score, lipid layer thickness and number of parallel conjunctival folds, as well as tear osmolarity, corneal fluorescein staining, phenol red thread test, lid margin score, meibography and *in vivo* confocal microscopy. Participants also completed the Ocular Surface Disease Index questionnaire.

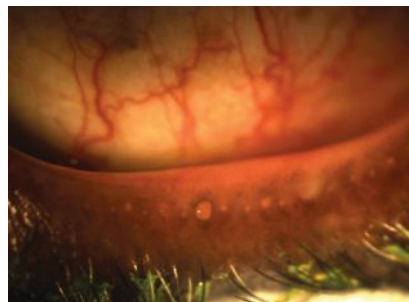
The study authors observed significant correlations between meibomian area and lid margin score as well as between meibomian tortuosity and lid signs of blepharitis.

“The overall lid margin score was the only test significantly correlated with the meibomian area, as well as the most related ocular testing measure to the degree of gland dropout,” the study authors wrote in their paper. “The lid margin score was smaller when the meibomian area was greater; thus, the higher the meiboscore, the less the meibomian area evident with meibography. This indicates that a healthier lid margin condition was associated with healthier meibomian glands and vice versa.”

They reported that a lid margin score of 1.70 or greater detected meibomian area loss with a sensitivity of 0.58 and a specificity of 0.86. Additionally, they found that there were significant associations between meibomian area and orifice area at a 30mm depth.

Summarizing their findings, the authors noted, “The lid margin score was most related to early meibomian area loss, and its assessment could assist in the early detection of undiagnosed MGD. A lid margin score of 1.70 [or greater] was considered abnormal. There is only a weak association between low-magnification meibography and high-magnification confocal microscopy imaging of the gland orifice area.”

Zhou N, Edwards K, Colorado LH, et al. Lid margin score is the strongest predictor of meibomian area loss. *Cornea*. March 5, 2022. [Epub ahead of print].



Lid margin score is a valuable ocular parameter to help detect MGD in patients with few or no other visible signs of the condition.

EDITORIAL STAFF

EDITOR-IN-CHIEF

Jack Persico jpersico@jobson.com

SENIOR EDITOR

Julie Shannon jshannon@jobson.com

SENIOR ASSOCIATE EDITOR

Catherine Manthorp cmanthorp@jobson.com

SENIOR ASSOCIATE EDITOR

Mark De Leon mdeleon@jobson.com

ASSOCIATE EDITOR

Leanne Spiegler lspiegler@jobson.com

CLINICAL EDITOR

Joseph P. Shovlin, OD jpshovlin@gmail.com

ASSOCIATE CLINICAL EDITOR

Christine W. Sindt, OD christine-sindt@uiowa.edu

SENIOR ART DIRECTOR

Jared Araujo jaraujo@jhihealth.com

AD PRODUCTION MANAGER

Farrah Aponte faponte@jobson.com

BUSINESS STAFF

PUBLISHER

Michael Hoster mhoster@jobson.com

SENIOR MANAGER, STRATEGIC ACCOUNTS

Michele Barrett mbarrett@jobson.com

REGIONAL SALES MANAGER

Jon Dardine jdardine@jobson.com

EXECUTIVE STAFF

CEO, INFORMATION SERVICES GROUP

Marc Ferrara mferrara@jhihealth.com

SENIOR VICE PRESIDENT, OPERATIONS

Jeff Levitz jlevitz@jhihealth.com

SENIOR VICE PRESIDENT, HUMAN RESOURCES

Tammy Garcia tgarcia@jhihealth.com

VICE PRESIDENT, CREATIVE SERVICES & PRODUCTION

Monica Tettamanzi mtettamanzi@jhihealth.com

VICE PRESIDENT, CIRCULATION

Jared Sonners jsonners@jhihealth.com

CORPORATE PRODUCTION MANAGER

John Caggiano jcaggiano@jhihealth.com

EDITORIAL REVIEW BOARD

James V. Aquavella, MD

Edward S. Bennett, OD

Aaron Bronner, OD

Brian Chou, OD

Kenneth Daniels, OD

S. Barry Eiden, OD

Desmond Fonn, Dip Optom, MOptom

Robert M. Grohe, OD

Susan Gromacki, OD

Patricia Keech, OD

Bruce Koffler, MD

Pete Kollbaum, OD, PhD

Jeffrey Charles Krohn, OD

Jerry Legerton, OD

Kelly Nichols, OD

Robert Ryan, OD

Jack Schaeffer, OD

Charles B. Slonim, MD

Kirk Smick, OD

Mary Jo Stiegemeier, OD

Loretta B. Szczołka, OD

Michael A. Ward, FCLSA

Barry M. Weiner, OD

Barry Weissman, OD



Scleral Lens News

NEW! SynergEyes VS™ 3 Innovations:

1

Multifocal

Front Surface
Progressive Center Distance
Design

2

Aberration Control

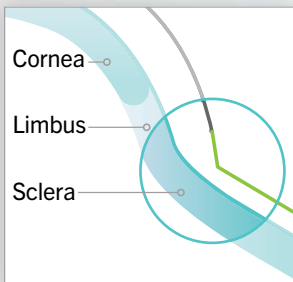
Helps address lens-induced
aberrations for consistent power
throughout optical zone

3

Limbal Clearance Factor

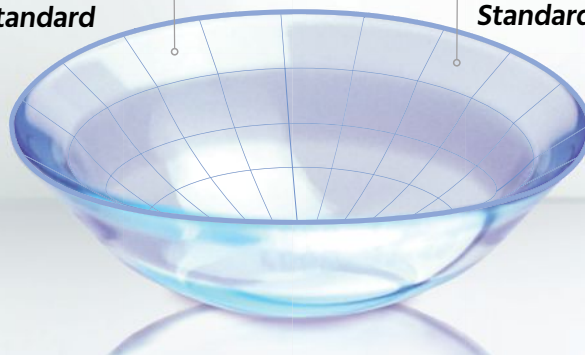
Broadens the area of
limbal clearance;
beneficial for larger HVIDs

SynergEyes VS™ is an innovative scleral lens with a distinctive bi-tangential periphery and linear landing zones that fits the true shape of the sclera. Designed to accommodate a wide variety of corneal conditions, each parameter may be adjusted independently, without affecting other parameters.



Linear landing zones follow the straight anatomy of the para-limbal sclera

**Linear Scleral
Landing Zone:
Standard**



**Toric
Periphery:
Standard**

**100%
TORIC
PERIPHERY**

Standard toric peripheral system aligns with the toricity of the sclera

SynergEyes VS™ All Inclusive Pricing

- Linear Landing Zones • Toric Peripheries • Aberration Control¹ • Limbal Clearance Factor
- 90-day Guaranteed Fit • Unlimited Exchanges Provided and Shipped Free of Charge²
- No Need to Return Opened Lenses for Credit

SynergEyes.com/Professional
877.733.2012 option 5

1. Aberration Control is standard on Multifocal and an option on Single Vision; price is all inclusive.
2. Unlimited free exchanges and associated shipping during 90-day fitting period.
SynergEyes VS™ available in US only.



contents

Review of Cornea & Contact Lenses | March/April 2022



Cornea post-RK performed with 42 incisions.
See page 34.

departments

3 News Review

Epithelial Maps Can Alter Refractive Surgery Evaluations; Lid Margin Score Helps Detect Undiagnosed MGD

8 My Perspective

The Power of Presbyopia Drops
By Joseph P. Shovlin, OD

10 The GP Experts

Behold the Benefits of Bitoric Lenses
By Lindsay A. Sicks, OD,
and William Skoog, OD

12 Fitting Challenges

Troubleshooting Hybrid Lenses
By Tiffany Andrzejewski, OD, Marcus R. Noyes, OD, and John D. Gelles, OD

32 Corneal Consult

To Culture or Not to Culture?
By Suzanne Sherman, OD

34 The Big Picture

The Unkindest Cut
By Christine W. Sindt, OD

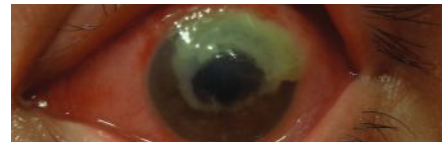
features

14

Fighting Mail Order Contact Lenses

Although steps have been made to combat online sellers, this is still an ongoing challenge that continues to impact optometric practices.

By Catlin Nalley, Contributing Editor

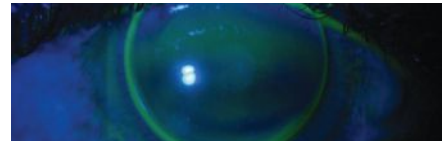


18

An Evidence-based Approach to Gas Permeable Lenses

The CLEAR study offers ODs a comprehensive review of current literature.

By Catlin Nalley, Contributing Editor

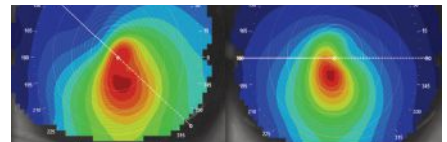


22

Using Topography to Guide Your CL Fits

Learn the maps and images that can best visualize any issues prior to placement or troubleshooting.

By Shalu Pal, OD



28

Make Contact Lens Discomfort Extinct

Manage expectations and follow the steps below to reduce or eliminate this bothersome condition.

By Milton Hom, OD





Using Photrexa[®] Viscous (riboflavin 5'-phosphate in 20% dextran ophthalmic solution), Photrexa[®] (riboflavin 5'-phosphate ophthalmic solution), and the KXL[®] system, the iLink[™] corneal cross-linking procedure from Glaukos is the only FDA-approved therapeutic treatment for patients with progressive keratoconus and corneal ectasia following refractive surgery.*1



GET THERE IN TIME

When you see patients with signs of keratoconus, don't hesitate. Refer them for iLink[™] — the only FDA-approved cross-linking procedure that slows or halts disease progression and is eligible for commercial insurance coverage with over 95% of commercially covered lives.

Connect with an
iLink[™] expert today.
Visit iLinkExpert.com

INDICATIONS

Photrexa[®] Viscous (riboflavin 5'-phosphate in 20% dextran ophthalmic solution) and Photrexa[®] (riboflavin 5'-phosphate ophthalmic solution) are indicated for use with the KXL system in corneal collagen cross-linking for the treatment of progressive keratoconus and corneal ectasia following refractive surgery. Corneal collagen cross-linking should not be performed on pregnant women.

IMPORTANT SAFETY INFORMATION

Ulcerative keratitis can occur. Patients should be monitored for resolution of epithelial defects.

The most common ocular adverse reaction was corneal opacity (haze). Other ocular side effects include punctate keratitis, corneal striae, dry eye, corneal epithelium defect, eye pain, light sensitivity, reduced visual acuity, and blurred vision.

These are not all of the side effects of the corneal collagen cross-linking treatment. For more information, go to www.livingwithkeratoconus.com to obtain the FDA-approved product labeling.

You are encouraged to report all side effects to the FDA. Visit www.fda.gov/medwatch, or call 1-800-FDA-1088.

*Photrexa[®] Viscous and Photrexa[®] are manufactured for Avedro. The KXL[®] system is manufactured by Avedro. Avedro is a Glaukos company.

REFERENCE: 1. Photrexa [package insert]. Waltham, MA: Glaukos, Inc.; 2016.

MA-02164A
PM-US-0427

iLink[™] is a trademark of Glaukos Corporation. Photrexa[®], Photrexa[®] Viscous, and the KXL[®] system are registered trademarks of Avedro, a Glaukos company. All rights reserved. ©2022



GLAUKOS



The Power of Presbyopia Drops

Examine the pros and cons of available and forthcoming options.

The first drop for presbyopia, Vuity (pilocarpine hydrochloride, Allergan), has recently gained FDA approval and has received much attention. It provides a pharmaceutical option beyond spectacles, contact lenses and surgery. The new drug is now readily available and easy to administer with fast onset and sufficient duration for most (about six hours). Even though this product has only been used for just a few months, reports have been positive. As with any newly approved product, time will tell just how well it will be embraced by patients and providers.

How might these products help contact lens wearers? Is there a place for those with early presbyopic symptoms? How about patients past their mid-40s who require some add power to see well at both distance and near? What major effect(s) do these products have on lens optics, since they work by making the pupil smaller? Only time and experience will help answer these questions.

WHERE WE'RE AT

Remember that lens wear results in a greater stimulus to accommodate than spectacles, which then requires an earlier need for help at near. I think it's safe to assume there might be some benefit in using drops for presbyopia in early presbyopic lens wearers, even prior to or in lieu of relying on one-eye undercorrection or low-add powered lenses.

Any synergy when using multifocal contact lenses with presbyopic drops might be possible with low-add powered contact lenses so not to affect distance acuity. Higher add powers (mid-high) require lens designs that

add negative spherical aberrations (distanced defocus) to extend the depth of focus.¹⁻⁴ Unfortunately, this increases the blur circle, thereby affecting distance acuity, and smaller pupils reduce retinal illumination, lowering contrast sensitivity.^{3,5}

In addition to some variations in pupil size effects in using these products, there may be somewhat different responses depending on specific multifocal/bifocal designs (simultaneous vs. alternating) worn. Some designs are pupil dependent while others have less overall effect on optics based on pupil size.^{2,5}

The drawbacks in using these drops with contact lenses are its durability and minimal amplitude effect. The newly approved Vuity provides about 1.25D to 1.50D of amplitude for a relatively short period of time. Some clinicians are asking patients to use the drops more than once daily (off-label).

OTHER CHOICES

The pipeline is replete with options to help presbyopes. Many manufacturers are using a cholinergic muscarinic agonist such as pilocarpine. I am aware of at least six other compounds in clinical trials that produce miosis and should aid in managing presbyopia. Most are in the Phase III FDA pre-market approval process. Lenz Therapeutics is studying the use of aceclidine (miotic) and Visus Therapeutics is using a combination carbachol/brimonidine for a possible dual/synergistic action.

Novartis has a unique product that uses a lipoic acid/choline ester compound and may be effective in enhancing accommodation along with affecting depth of focus. It

reduces dihydrolipoic acid within the lens fibers, which causes hydrolysis of the disulfide protein bonds and restores lens elasticity.

I do have some reservations in patients who might use pilocarpine for years prior to cataract surgery and may not get adequate dilation for their cataract removal. Warn patients, on initial use, about a “dimming effect” and that they should avoid using this drop in poor lighting conditions such as driving at night.


Of course, there have been exceedingly rare adverse events such as iris cysts, angle widening resulting in angle closure (often used to treat angle closure glaucoma but paradoxical in spherophakia patients), accommodative spasm and retinal detachment in myopes (not often reported with low concentrations). Careful instruction for patients to discontinue miotics prior to dilation will be required.

We'll see if these new options for presbyopia are game-changers. Patients will know early on whether Vuity makes sense for them. Overall, the response has been favorable for those who are properly screened and have had an adequate education on how to best use the drop. [rcccl](#)

1. Papadatou E, DelAguila-Carrasco A, Esteve-Taboada, et al. Objective assessment of the effect of pupil size upon the power distribution of multifocal contact lenses. *Int J Ophthalmol*. 2017;10(1):103-8.
2. Baker K, Merchea M. Impact of pupil diameter on multifocal contact lens vision. *Optom Vis Sci*. 2018; E-abstract 3022263.
3. De Leon M. Multifocal optics explored. *Rev Cornea Contact Lenses*. 2020;157(2):18-21.
4. Monsalvez-Romin D, Gonzalez-Mejome JM, Esteve-Taboada JJ, et al: Light distortion of soft multifocal contact lenses with different pupil size and shape. *Cont Lens Anterior Eye*. 2020;43(2):130-6.
5. Kurt Moody, OD, Johnson & Johnson. Personal communication. February 15, 2022.

REGISTER NOW!

Register for an upcoming CE conference
from Review Education Group



**EAST COAST
OPTOMETRIC GLAUCOMA
SYMPOSIUM**

MAY 6–7, 2022

GRAND HYATT | WASHINGTON, DC

EARN UP TO 12 CE CREDITS* | Register at www.reviewedu.com/ogseast



 **Intrepid** PRESENTS

**Innovations and Implementations
in Practice**

JUNE 10–11, 2022

RENAISSANCE NEWPORT BEACH | NEWPORT BEACH, CALIFORNIA

EARN UP TO 14 CE CREDITS* | Register at www.reviewedu.com/ies

For more upcoming events, visit
www.reviewedu.com/events



Behold the Benefits of Bitoric Lenses

Optimized base curves and a custom optic zone diameter provide superior vision.

A 43-year-old female presented with blurry vision through her habitual glasses. A previous GP lens wearer, she had self-discontinued as she felt glasses met her visual needs better and were easier to use. Her entering distance visual acuity with glasses was 20/30-1 OD and 20/30 OS. Her new refraction was OD -10.00-5.50x005 and OS -10.25-5.25x176. Entrance testing and slit-lamp exam were within normal limits.

Corneal tomography was obtained to rule out corneal ectasia due to the high ametropia and astigmatism. The scans revealed limbus-to-limbus, WTR astigmatism in each eye with no signs of ectasia (*Figure 1*). Simulated K results were OD: 41.6/45.6@090 and OS: 42.2/45.5@078. Pupil size in bright illumination was 4.0mm OD, OS.

CONSIDER GP LENSES

Since the patient was a previous corneal GP wearer and astigmatism is a common indication for GP lenses, we proceeded with an empirical GP lens fit. We evaluated the corneal

astigmatism amount and location. When there is little peripheral corneal toricity, one may be able to fit the patient into a spherical or aspheric design (especially with low amounts of astigmatism). This patient had high WTR corneal astigmatism (OD 4.00D and OS 3.30D) that was limbus-to-limbus in nature. Thus, a bitoric corneal GP design will provide the best lens-cornea fitting relationship and minimize rotation (as there is a large amount of toricity).²

Bitoric and back toric lenses are most successful when the keratometric axis differs from the spectacle cylinder axis by less than 15°; this was indeed the case for this patient.¹ Topography maps can be useful not only for evaluation of astigmatism but also to look for a large sagittal height differential (more than 30µm) or a large eccentricity differential (>0.20e), either of which may signal the need for a toric lens design.³

The majority of corneal astigmatism occurs with the steeper curve in the vertical meridian (with-the-rule). If fit with a spherical corneal GP, there will typically be heavy bearing along the flatter (horizontal) meridian. As a result, poor centration, physical discomfort and poor vision are likely.⁴

Typically, the lower limit for a well-stabilized toric lens is 2.00 to 2.50D of corneal astigmatism.⁴ When designing a lens, the toricity of the base curve will ideally be at least two-thirds of the full amount of corneal toricity (it does not always need to be equal). Without this amount of toricity matching, there can be induced over-refraction, resulting in

reduced best-corrected visual acuity (BCVA).

The initial lens parameters were configured for this patient using the Mandell-Moore Bitoric Lens Guide. Because she was returning to lens wear after a long hiatus and since the upper lid was positioned below the upper limbus, our goal was a lid-attached fit. Because of this goal and the high minus lens power necessary due to her refraction, we chose a 9.6mm OAD lens. This resulted in an initial optic zone size of 8.2mm (as determined by the lab). The initial lens order was OD BC 8.16/7.53, power -9.00/-12.25 and OS BC 8.04/7.54, power -9.12/-13.00. The peripheral curves were spherical and the edge thickness was optimized to 0.10mm by the laboratory.

At dispensing, the patient's BCVA through the new bitoric lenses improved to 20/25+ OD and OS (compared with 20/30 in spectacles). Both lenses were lid attached and sitting slightly superiorly. Each demonstrated ideal apical alignment, adequate mid-peripheral bearing and acceptable edge lift, similar to what is seen with a well-fit spherical lens on a spherical cornea (*Figure 2*). The flat meridian marking on both lenses was stable (*i.e.*, no lens rotation and therefore no induced astigmatism).

At the next visit two weeks later, she was happy with her vision overall, but noticed glare and halos when driving at night. Acuity through the lenses was 20/25 OD and OS. An over-refraction of +0.50DS OU improved vision to 20/20- in each eye. The fit and fluorescein pattern were identical to the dispensing visit, with slight superior decentration and a stable lens marking (*Figure 3*).

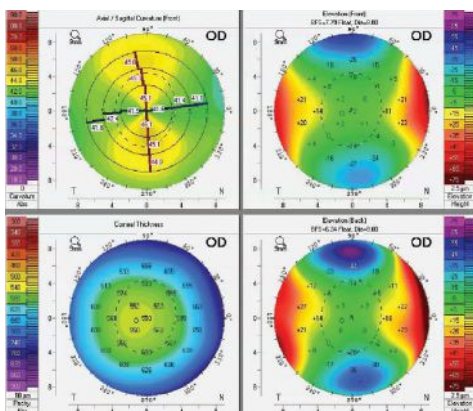


Fig. 1. Maps show regular WTR astigmatism OD. The OS had a similar appearance.

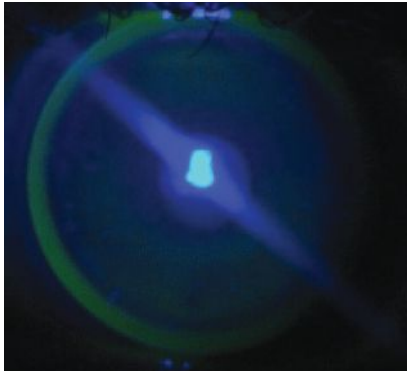
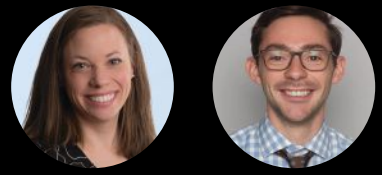


Fig. 2. A well-fit bitoric lens on an astigmatic cornea demonstrates an appropriate fit with central alignment, mid-peripheral bearing and adequate edge lift.

The glare and haloes were exacerbated by the lid-attached fit causing superior decentration and her increased pupil size in dim illumination.

Ideally, the optic zone diameter (OZD) should be greater than the pupil size in dim light to prevent flare symptoms. Additionally, when contact lenses are decentered, the peripheral curves can enter the visual axis, causing flare symptoms.¹ To combat the impact of these factors, the optic zone size was increased in each eye from 8.2mm to 8.4mm and the over-refraction was incorporated. The patient was happy with her vision and comfort from these new lenses and appreciated the resolution of the haloes and glare.

Another GP lens adjustment that would reduce the glare/flare in this case would be to incorporate peripheral curve toricity. When a spherical secondary curve is applied to a toric base curve lens, the result is an oval optic zone, which can induce flare symptoms. Other options to assist with centration would include steepening the base curve, increasing

the lens center thickness or further thinning the lens edge.

PERFECT THE BITORIC FIT

In patients with $\geq 2.50D$ of corneal astigmatism, a bitoric or back toric GP lens should always be considered. On highly toric corneas, toric lenses provide better stability and centration compared to spherical GP lenses. Bitoric lenses have both a toric back and toric front surface (whereas a back toric would only have a toric back surface), thereby correcting for any residual astigmatism present.

The base curve and power in each meridian can be determined by many methods, including using a standard fit factor (*e.g.*, Mandell-Moore or Remba) or a low toric simulation. Alternatively, diagnostic fitting is streamlined by using a spherical power effect bitoric lens fitting set.

The Mandell-Moore Bitoric Lens Guide is an empirical fitting strategy that uses keratometry measurements and refraction to determine the appropriate GP lens power and base curve radius in each meridian.¹ This method produces comparable fitting success to that seen with diagnostic fitting of bitoric lenses.¹ The lens is fit 0.25D flatter than the flat keratometry reading in one meridian and 0.75D flatter than the steep keratometry reading in the opposite meridian. Fitting flatter in the steep meridian allows for tear exchange, and that flatter edge allows for lid attachment and added stabilization.

OZD ADJUSTMENTS

Ideally, a GP's OZD should be as large as possible to facilitate centration and minimize glare. The OZD typically encompasses 65% to 80%

of the overall diameter of the lens.¹ The initial OZD for this patient was 8.2mm based on the 9.6mm OAD. Due to the glare and haloes, OZD was further increased to 8.4mm with resolution. Making such changes can affect the overall lens fit. Thus, one should flatten the base curve by 0.25D for every 0.5mm OZD increase.¹ Other cautions with a larger OZD include limited lateral lens movement and the potential for corneal desiccation, as the lens does not move as much over the periphery.⁵

Consider bitoric GPs in patients with high corneal and refractive astigmatism. Watch the lens fit for centration and stability and don't be afraid to consider fit and/or OZD changes to alleviate glare. [INCL](#)

1. Bennett ES, Henry VA. Clinical manual of contact lenses. 3rd ed. Lippincott Williams & Wilkins. 2019;336-44.
2. Hom MM, Bruce AS. Manual of contact lens prescribing and fitting. Elsevier Health Sciences. 2006.
3. Lampa M, Fujimoto MJ, Caroline PJ. Topography and contemporary corneal GP lens fitting. Continuing Education Lecture. Amer Acad Optom. 2020.
4. Phillips AJ, Speedwell L. Toric contact lens fitting. Contact lenses. 5th ed. Butterworth-Heinemann. 2006.
5. Bennett ES, Weissman BA. Clinical contact lens practice. 2nd ed. Lippincott Williams & Wilkins. 2005.

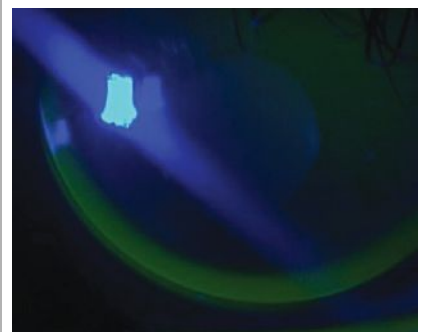


Fig. 3. Bitorics often have markings to denote the flat meridian (see approximately nine o'clock). This can help determine if the lens is stable or if vision fluctuations are being caused by unwanted lens rotation.

Troubleshooting Hybrid Lenses

A guide to working through the common problem of adherence with this modality.

Hybrid lenses have a unique contact lens design that is made up of a gas permeable (GP) center with a soft contact lens “skirt” attached. Many of us who fit hybrid lenses have run into the problem of lens adherence, sometimes so severe that patients cannot remove the lens. Lens adherence, although it generally does not go unmentioned by the patient, can cause corneal staining, conjunctival injection, rebound conjunctival hyperemia after removal and, in the late stages if not addressed, corneal scarring and neovascularization.

Adherence is typically caused by three things: (1) a lens that is applied too forcefully, (2) a lens with a GP portion that is too steep or (3) a lens with a soft skirt that is too steep (though this is much less common). As an example, when the base curve (BC) of a GP is too steep, the lens no longer aligns with the central cornea and its weight distribution shifts toward the edge. Mitigating this is as simple as flattening the BC.

Adherence can be simple to troubleshoot if you know what to look for during the exam and teach your patients proper lens application and removal. Here’s where to start.

BACKGROUND

There are two main types of hybrids: those for normal corneas and those for irregular ones. Troubleshooting looks different for the two designs in regard to flattening the GP portion of the lens. With the normal cornea design, the goal—similar to corneal GPs—is to align with the cornea. The irregular cornea design is intended to vault the cornea with the goal of clearing it by approximately 100µm to 150µm at the time of the initial fitting and ~50µm within several hours of wear.

The weight of the lens is shared between the GP on the midperipheral cornea and the skirt, with 70% to 80% of support in the soft skirt and 20% to 30% in the inner landing zone of the GP portion (*Figure 1*). If the balance varies too much, then lens adherence can result (*Figure 2*).

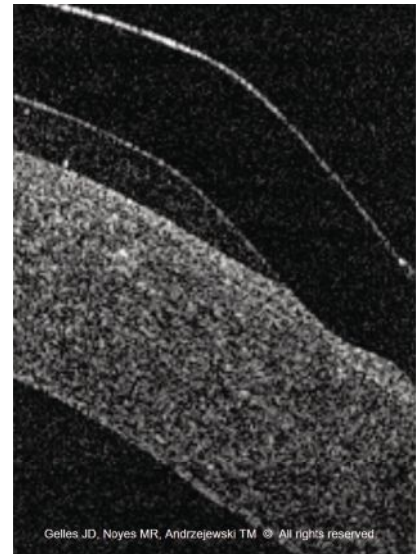


Fig. 2. OCT of a hybrid with inner landing zone bearing leading to lens adherence, as the support of the lens is more toward the edge of the GP vs. the skirt.

ASSESSMENT

There are several ways to identify lens adherence, the first being patient history. Patients experiencing issues will report difficulty removing the lens at the end of the day or increasing discomfort with longer wear times.

The second is slit lamp exam. With lens wear, there will be no movement and potential inferior displacement. Evaluation upon removal will typically show evidence of epithelial disruption on the cornea in the junction where the GP and the soft skirt meet (*Figure 3*).

As the tear exchange is much slower with hybrids than corneal GPs, it doesn’t make sense to apply fluorescein over the lens. However, it’s imperative that the lens is removed and fluorescein is instilled afterward to monitor for any staining.

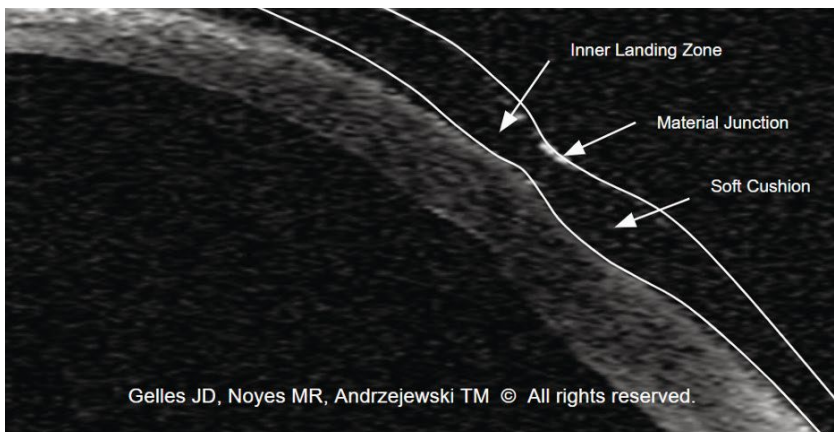


Fig. 1. OCT of an ideal hybrid fitting relationship to avoid lens adherence.



Central staining is always an issue of the BC being too flat or the sagittal depth/vault being too low. Midperipheral staining, on the other hand, can be either a BC, sagittal depth or skirt issue. To determine where the problem lies, the lens should be reapplied with fluorescein in the bowl to check the pattern with gentle application by the practitioner to rule out whether the patient applied the lens too forcefully.

The fluorescein pattern should exhibit central clearance in the GP portion of the lens, a light halo of thinning at the inner landing zone (the border between the GP edge and the soft skirt) and bearing in the skirt outside the GP junction. Reapplying a diagnostic lens with 100µm less vault can confirm there is not excessive vault if heavy central bearing is present; if clearance is present, no matter how thin it is, then the patient's lens has too much sagittal depth.

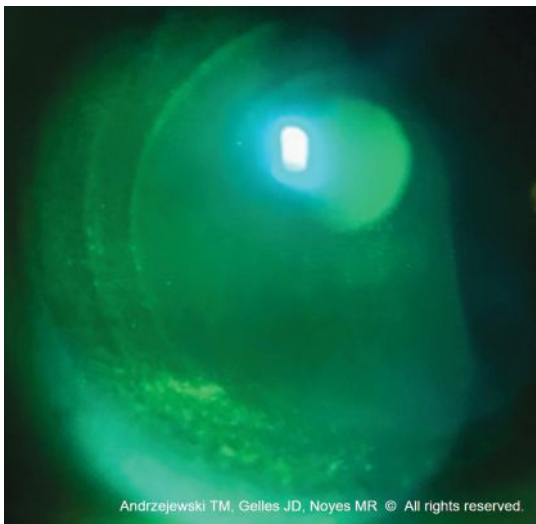


Fig. 3. Midperipheral corneal staining, indicated by the seal-off around the GP edge of the hybrid.

PROBLEM-SOLVING

For the normal cornea design, clearance can be solved by flattening the BC by at least 0.1mm. For the irregular cornea design, if there's central clearance, decrease the vault 100µm until bearing is observed. If there's light bearing, add 50µm to the final lens upon ordering, but if there's heavy bearing, add 100µm.

After the vault is confirmed to be acceptable, the next option is to steepen the skirt if bearing in the inner landing zone still remains. Be careful to not fit the skirt too steep because the second-generation irregular cornea design has a silicone hydrogel skirt, which temporarily lifts the GP junction off the cornea before the lens settles and allows the edge of the GP to dig into the cornea after it has been on the eye for a couple of hours (*Figure 4*).

In some cases, a hybrid lens may not be the right choice. The cornea may have a markedly displaced apex inferiorly, be too irregular or have too much eccentricity to accommodate the lens shape, in which case alternative lens designs exist for you to achieve success.

TAKEAWAYS

Hybrid lenses have a unique design that can allow for fitting advantages, specifically when it comes to irregular corneas. Technology such as OCT imaging can aid with particularly troublesome fits, but much of the troubleshooting is observable simply by slit

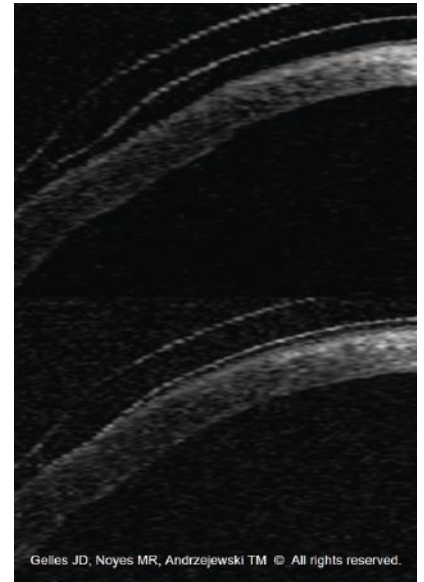


Fig. 4. OCT of the lens on the eye with a skirt that's too steep at dispense (top). OCT post-dispense shows the lens has settled too much and now bears into the cornea (bottom).

lamp observation and fluorescein dye. Lastly, ensuring proper patient adherence and insertion/removal techniques is paramount for a successful fit. Commit these fit tips to memory and you'll be well on your way toward becoming an expert specialty lens practitioner, hybrid lenses included. **RCCL**

Dr. Andrzejewski practices at Chicago Cornea Consultants and serves as an adjunct assistant professor of optometry at the Illinois College Optometry as well as the Chicago College of Optometry. Her clinical work is dedicated exclusively to specialty contact lenses and surgical comanagement. She is associated with Bausch + Lomb Specialty Vision Products, Blanchard, Eaglet, Ocular Therapeutix and SynergEyes.

FIGHTING MAIL ORDER CONTACT LENSES

Although steps have been made to combat online sellers, this is still an ongoing challenge that continues to impact optometric practices.

By Catlin Nalley, Contributing Editor

In recent years, we have seen a growing number of health care-related websites and apps have opened the door for self-diagnosis and treatment, often giving the general public the false perception that they can forgo visiting a medical professional. In an era where convenience and cost tend to be given more weight than quality care, this trend has accelerated, especially since the pandemic and a further shift away from in-person services.


For optometric practice, this perfect storm exacerbated an already significant challenge: online contact lens sellers. During the COVID-19 shutdown, these companies saw a massive influx of consumer interest. 1-800 CONTACTS, for example, reported a 100% year-over-year increase in new and returning customers. Additionally, the company's ExpressExam app had a 200% usage increase and its Rx Reader app had a 700% increase in monthly active users.¹

During this time, other online sellers also ramped up the promotion of their prescription renewal services, using their ability to duplicate old prescriptions to bypass the doctor.¹ Now, these retailers are appealing to the general public's desire for convenience by not only marketing these services but also encouraging consumers to skip the in-office eye exam altogether.



"This is a war of truth vs. profits," says Jeffrey Sonsino, OD, of Nashville. "Online retailers funded by private equity companies are simply trying to make a dollar off of contact lens patients with no regard whatsoever for their health and safety." Dr. Sonsino says in their marketing, they take doctors out of the equation when it comes to safeguarding patients' health

and discourage in-person exams that can prevent vision loss from improperly fit lenses, instead offering non-FDA approved online vision tests. "It's simply inexcusable and an example of a corporate interest for profit with blatant disregard for the safeguards that keep patients healthy."

Optometrists have been calling attention to the abuses of these companies for years, highlighting the threat their predatory practices pose to patient safety. It can be frustrating to witness the blatant undermining of not only the patient-doctor relationship, but also the critical role ODs play in eye care.

1-800 CONTACTS
Sponsored ·  LIKE PAGE

Why subject yourself to having air puffed in your eye just to renew your contacts Rx?

 +  = 

WWW.1800CONTACTS.COM
Try an online vision exam
You can skip the dilation, too

LEARN MORE

This is an example of a Facebook advertisement used by 1-800 CONTACTS to promote the company's online contact lens prescription renewal platform.

However, as technology continues to improve and expand, so will the market for online vision correction. And so, optometrists must be prepared to address this issue head-on to protect both their practices and the patients they serve.

WHERE THE ISSUE STANDS

As the contact lens market continues to evolve, so does the legislative and regulatory landscape. The Fairness to Contact Lens Consumers Act and the subsequent Contact Lens Rule imposed responsibilities on both prescribers and sellers of contact lenses. While optometrists have complied, based on the few complaints to date, the same cannot be said for most contact lens sellers.²

See Something? Say Something

A crucial component of ongoing efforts to contend with the abusive behavior of online contact lens sellers depends on individual ODs shedding light on issues they come across in practice. For instance, if you have a patient come in who is dealing with complications that are a direct result of these behaviors, take the time to report the problem. This helps advocacy groups collect the necessary data and ensures these sellers can be held accountable. Simply follow the steps below:

- Visit the MedWatch webpage: www.fda.gov/safety/medwatch-fda-safety-information-and-adverse-event-reporting-program
- Click 'Report a Problem'
- Click 'Begin Report as Health Practitioner'
- Populate the report categories
- Review and submit data

In 2020, the Federal Trade Commission (FTC) revised the rule to include the following requirements:³

- Ask patients to acknowledge receipt of the contact lens prescription by signing a separate document.
- Ask patients to sign a prescriber-retained copy of the prescription that includes a statement confirming patient receipt.
- Include a statement confirming the patient received the prescription on the exam sales receipt and ask that they sign a copy.
- Provide the patient with a digital copy of the prescription and retain evidence that it was sent, received or made accessible.

These changes—which place additional burdens on prescribers without addressing the ongoing issues surrounding direct-to-consumer contact lens sellers—went into effect one year ago, despite opposition from the optometric profession.

While these developments can be frustrating—and efforts to change them continue—progress has been seen in recent months. Amid growing concerns that regulatory oversight may be lacking, a group of US Congress members called for a federal review of direct-to-consumer prescription medical device practices.⁴

Additionally, on Jan. 28, 2022—just weeks after the Government Accountability Office accepted this Congressional call to review federal

Aveo Chat Transcript with Andrew [REDACTED]

Chat started on 05 Oct 2018, 07:37 PM (GMT+0)

(07:37:43) *** Andrew [REDACTED] joined the chat ***
 (07:37:43) Andrew [REDACTED]: Can my Optometrist fit me for these lenses? I'm in Nashville, TN.
 (07:37:46) *** Kimberly joined the chat ***
 (07:38:29) Kimberly: Thank you for reaching out to Aveo, my name is Kimberly.
 (07:40:47) Kimberly: Hi Andrew! Your doctor would need to request a fitting kit from us before they would be able to fit you for our lenses. We do provide an online vision test that is often cheaper than having your doctor fit you for contacts and you will see that option when placing your order. You can also just submit your current contact rx and we will attempt verification using that!
 (07:42:53) Andrew [REDACTED]: So you you would be able to substitute my current prescription? I have Accuvue 1-Day Moist
 (07:43:36) Kimberly: Some doctors don't mind allowing substitutions so we always like to check first before having you take an unnecessary step like an additional vision test or fitting!
 (07:43:59) Kimberly: Just make sure to include correct contact information for your doctor when you place your order and we'll take care of the rest!
 (07:45:10) Kimberly: If your doctor denies our request to verify your prescription or there is any other issues we would reach out to you by email.
 (07:45:34) Andrew [REDACTED]: Should I ask my Doctor if they are ok with the substitution first?
 (07:45:48) Kimberly: That's really not necessary!
 (07:47:04) Kimberly: You can place your order and we will use the information you provide to contact your doctor. If there is any issues we will place the order on hold while we let you know what additional steps are needed, such as a new fitting or the option to take our vision test online.
 (07:50:16) Andrew [REDACTED]: I'd rather you reached out first if that's ok. I've run into issues like this before. His email address is optique@optiquenashville.com
 (07:51:00) Kimberly: We can't reach out to your doctor without an order being placed but if you would like to you can reach out to him.

NAME Andrew [REDACTED]
 EMAIL [REDACTED]
 PHONE [REDACTED]
 LOCATION Knoxville, United States
 URL <https://aveovision.com/our-contacts/>
 DEPARTMENT — SERVED BY — RATING Good COMMENT —

Read this transcript of an interaction between a patient and direct-to-consumer contact lens company Aveo.

FIGHTING MAIL ORDER CONTACT LENSES

regulations—Hubble Contacts received a \$3.5 million penalty from the Department of Justice and FTC for fraudulent business practices and repeated violations of the Fairness to Contact Lens Consumers Act, the Contact Lens Rule and the FTC Act.⁵

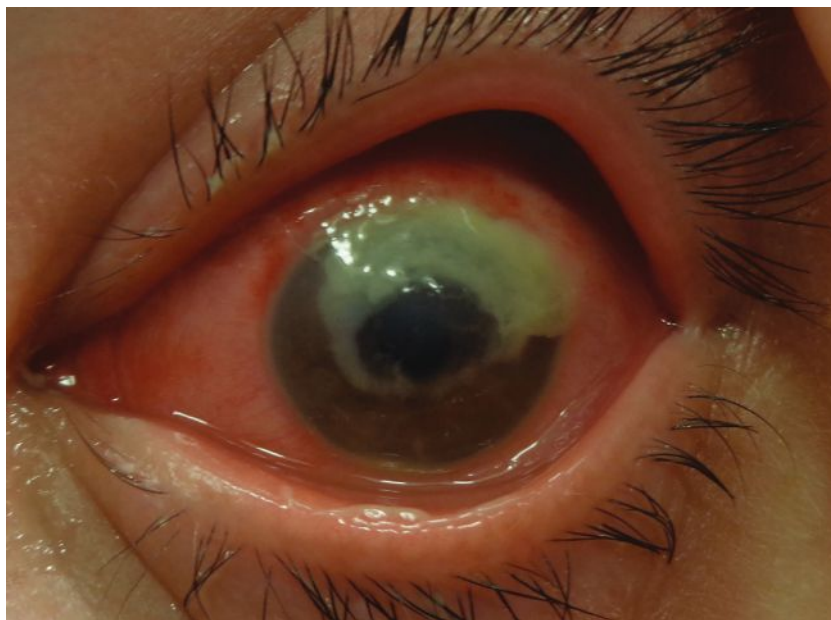
Dr. Sonsino applauds the FTC for this action, while noting that it remains to be seen how closely they will enforce Hubble's flawed business model of not requiring a prescription. "I would like to see the FTC impose the same fines and sanctions against online resellers of contact lenses who are just as guilty of exploiting passive verification rules," he adds.

"This settlement marks an increased enforcement of current regulations, and it is our hope that the FTC will continue to do so equitably and correctly," notes Clarke Newman, OD, of Dallas, while emphasizing the importance of these efforts for patient safety. "Enforcement of these regulations is imperative and, as optometrists, we need to continue to comply, despite our concerns. We as a profession may not agree with every aspect of the rule, but it is important to try and support it, while also advocating for continued change."

ADVOCACY EFFORTS

The prioritization of convenience and lower costs, coupled with the power of online advertising and misinformation, can make connecting with patients a difficult and sometimes frustrating experience. However, elevating the patient-doctor relationship is crucial, especially when others in the industry are actively trying to minimize its value.

This can be accomplished by not only building strong relationships with your patients and community, but also through the support of advocacy for the optometry profession



This patient suffered a corneal perforation due to a *Pseudomonas* ulcer from ordering contact lenses online without doctor oversight.

as a whole. Leading the charge is the American Optometric Association (AOA), whose ongoing efforts seek to ensure the fair treatment of optometrists as well as the safety of their patients.

Supporting the AOA and other organizations is one way ODs can lend their voice to the cause, suggests Dr. Newman. "In addition to complying with the current laws, optometrists can also help make a difference in ongoing efforts to address the issue of online contact lens sellers and related legislation."

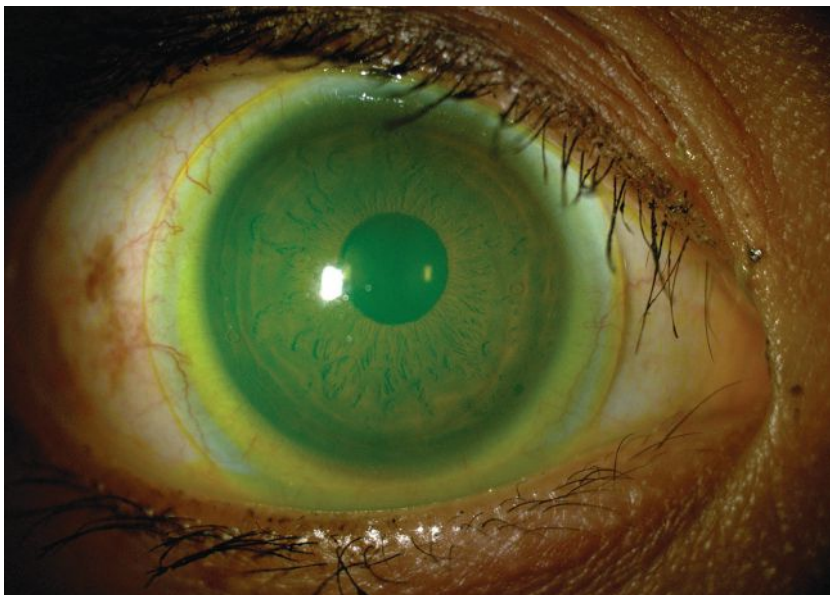
This includes the Contact Lens Rule Modernization Act, introduced to the Senate in September 2020, which is backed by the AOA as well as the Health Care Alliance for Patient Safety, which was founded in 2018 to advocate for patient safety and protect the doctor-patient relationship. This bill seeks to eliminate contact lens prescription verification robocalls as well as the FTC's recent revisions that require prescribers to get signed acknowledgment forms confirming patients received their contact lens prescriptions.^{6,7}

"Our goal is to support this bill and try to get it passed because it will greatly improve the processing and further curtail some of the abuses of online sellers," Dr. Newman notes, while underscoring the importance of individual ODs participating in this effort.

Legislative and regulatory work is bolstered when optometrists share what they are witnessing firsthand in clinical practice, according to Andrea P. Thau, OD, AOA past president, who advises ODs to report any issues they observe directly to the AOA. "If a doctor believes a retailer is not adhering to patient safety laws, it is vital that they report it," she says. "When advocacy groups are speaking with regulators, specific examples help them wrap their heads around what is happening and the true scope of the problem."

STRATEGIES FOR ODs

Contending with online sellers remains a challenge for optometrists; however, there are ways to tackle these issues in clinical practice. It be-



A specialty lens, such as this mini-scleral, may be a good option for your patient with high corneal astigmatism—and one only you can prescribe.

gins, according to San Diego's Brian Chou, OD, by recognizing that they cannot compete strictly on price.

"Our core competency is the service we provide," he explains. "There is no way that online retailers who use a remote model can compete in this space when it comes to quality eye care, clinical decision making and human connection."

Emphasizing your expertise can be as simple as changing the language used for the services you provide, suggests Dr. Chou. For instance, instead of "contact lens fitting," use the phrase "contact lens evaluation and prescribing" to better convey the value you provide to your patients. It is also important, he notes, to charge an appropriate fee for your time that reflects your worth as an optometric professional.

Take the time to educate your patients, Dr. Sonsino says. "When you are performing tests in the office, explaining every one you perform in front of the patient assigns a value to your service," he says. "When your patients don't understand what you are doing and you don't explain it, they won't have

an accurate understanding of what that service is worth.

"When you're looking at blood vessels in the slit lamp, take the time to say, 'I'm looking at these blood vessels to see how they're responding to your contact lens wear, and if we see vessels growing where they shouldn't be, we will change your contact lens material,'" Dr. Sonsino elaborates. "That simple statement shows the patient that you're looking for something that is going to keep them safe."

"It is important to reinforce to the patient that eyeglasses and contact lenses are medical devices that come with associated benefits and risks, and you might not receive the same quality from online retailers," adds Dr. Thau. "We also emphasize the need for comprehensive eye exams to ensure that they not only receive the right contact lenses, but also for their overall health and well-being."

Other ancillary strategies ODs can employ to offer more convenience and cost savings to their patients include subscription services and manufacturer rebates. Additionally, most manufacturers offer free ship-

ping when a patient orders a yearly supply. Dr. Thau's practice takes it one step further by offering replacement diagnostic or trial lenses when needed.

For example, if a patient is short a few lenses prior to their comprehensive eye exam, they will help bridge the gap. Or, if they need to change the prescription or fit before the year is out, Dr. Thau and her practice will exchange any sealed boxes at no charge.

"Going the extra mile for your patients can have a significant impact," she says. "It's our mission as doctors of optometry to protect, preserve, enhance and rehabilitate vision and we take that challenge very seriously."

Seeing patients suffer due to companies who don't have their health, safety and best interests in mind, and with the sole intention to make money, is exceptionally upsetting, Dr. Thau notes.

"I encourage every OD to find a way to be actively involved in this fight for both our patients and the profession," she concludes. **RECL**

1. Chou B. How COVID-19 is reshaping optometry. *Rev Optom.* 2020;157(10):38.
2. Shovlin J. The FTC's One-Two Punch. *Rev Cornea & Contact Lenses.* 2020;157(4):6.
3. Federal Trade Commission. FTC Announces Final Amendments to the Agency's Contact Lens Rule. www.ftc.gov/news-events/news/press-releases/2020/06/ftc-announces-final-amendments-agencys-contact-lens-rule. 2020. Accessed March 23, 2022.
4. American Optometric Association. U.S. House, consumer groups mull federal action against DTC contact lens sales schemes. 2021. www.aoa.org/news/advocacy/federal-advocacy/us-house-consumer-groups-mull-federal-action-against-dtc-contact-lens-sales-schemes?ss=y. Accessed March 23, 2022.
5. American Optometric Association. Hubble Contacts slapped with \$3.5 million penalties, restrictions and supervision. 2022. www.aoa.org/news/advocacy/federal-advocacy/hubble-contacts-slapped-with-35-million-penalties-restrictions-and-supervision?ss=y. Accessed March 23, 2022.
6. American Optometric Association. Contact Lens Rule Modernization Act introduced in the U.S. Senate. 2020. www.aoa.org/news/advocacy/federal-advocacy/contact-lens-rule-modernization-act-introduced-in-the-us-senate?ss=y. Accessed March 23, 2022.
7. S.4613 - Contact Lens Rule Modernization Act. www.congress.gov/bills/116th-congress/senate-bill/4613/. Accessed March 23, 2022.

AN EVIDENCE-BASED APPROACH TO GAS PERMEABLE LENSES

The CLEAR study offers ODs a comprehensive review of current literature.

By Catlin Nalley, Contributing Editor

Offering optimal visual acuity and contrast sensitivity, as well as a lower risk of complications, gas permeable (GP) lenses are an effective option for many patients, particularly those with high corneal astigmatism. Evidence also suggests this modality is better tolerated among patients with dry eye compared with soft contact lenses.¹ However, only about 10% of contact lens wearers use these lenses.¹ This discrepancy is thought to be a result of a combination of challenges, including the initial discomfort associated with rigid lenses and the time it takes to successfully fit and manage patients who must deal with the adaptation period.

“GP lenses should be a key component of any contact lens practice, especially for those who offer specialty contact lenses and manage presbyopia and irregular corneal surfaces,” notes Joseph Shovlin, OD, of Northeastern Eye Institute in Scranton, PA. “You just can’t satisfy most patients with soft lens options when the cornea is severely distorted.”

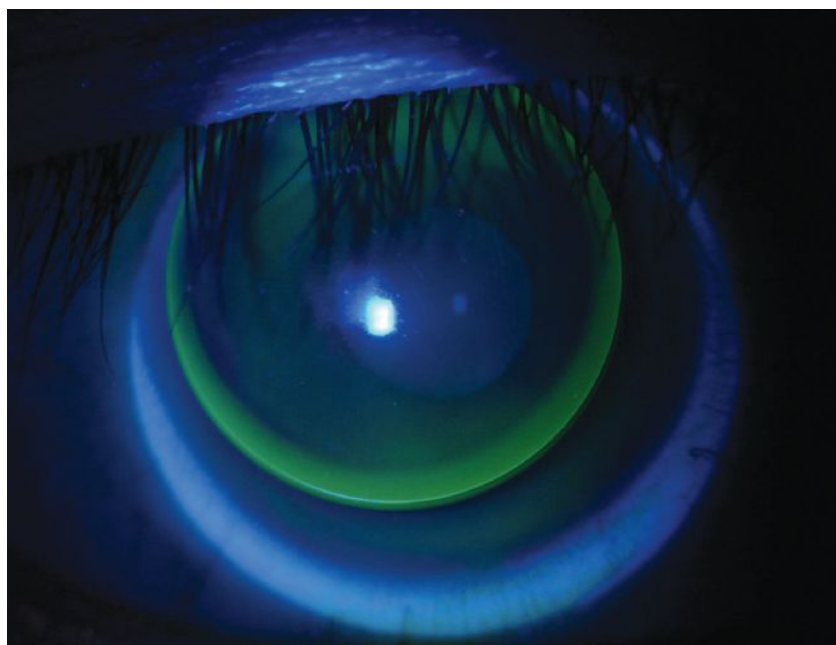


Photo: Lindsay Sticks, OD

The available literature on GPs is extensive, and CLEAR aims to consolidate it all.

Dr. Shovlin urges optometrists to recognize that they do have the time and knowledge to fit these lenses. “Yes, they are more challenging most of the time and do often require additional chair time, but clinicians are adequately educated to fit GP lenses and will find it incredibly rewarding,” he

adds. He emphasizes the variety of resources available to ODs to help them get started, including tutorials and guides.

Given the plethora of research available regarding contact lenses, the British Contact Lens Association (BCLA) gathered more than 100 multidisciplinary

experts to review and summarize the current literature in the Contact Lens Evidence-based Academic Reports (CLEAR). In a series of 10 articles, CLEAR covers topics focusing on contact lens materials, designs, optics, medical uses, evidence-based practices and future technologies.¹

“BCLA CLEAR is both an impressive compendium and a comprehensive review on all aspects of lens wear with complete discussions on pre-fit considerations and managing contact lens wearers over time,” says Dr. Shovlin. “For example, it helps in making clinical decisions using appropriate evidence ranging from who the most appropriate candidates for assorted types of lens wear are and how we best care for these patients once they start wearing lenses in order to minimize complications and avoid eventual dropouts.”

In this article, we will delve into CLEAR, highlighting key takeaways while also discussing how ODs can use the information and strategies detailed in the report to up their management of GP lenses, or rigid corneal lenses—the terminology recommended by the authors of CLEAR.¹

CLINICAL PEARLS

Taking an evidence-based approach to rigid corneal lenses is crucial to success for both ODs and their patients because it incorporates not only the best research and scientific evidence from the literature, but also—in theory—the patient’s values,

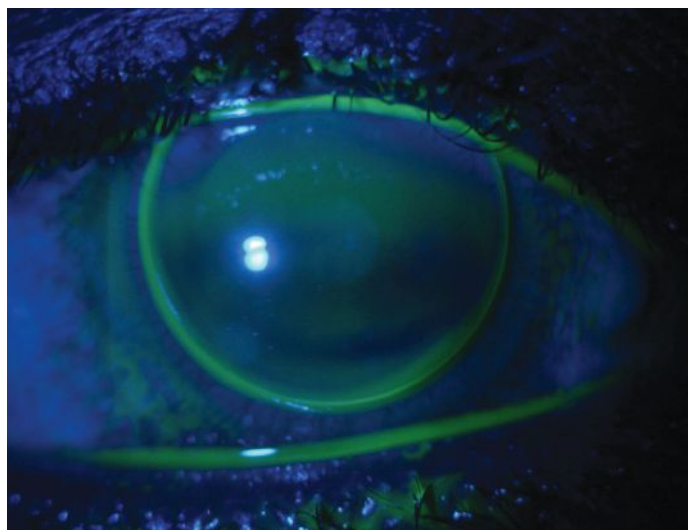


Photo: Lindsay Sicks, OD

The report details how to determine whether a patient is an ideal GP candidate.

preferences and needs, along with the clinician’s judgment, expertise and experience, explains Lindsay Sicks, OD, of the Illinois College of Optometry.

“This report is rich in content for GPs and sclerals,” she notes. “It’s a comprehensive review of the best strategies and things to think about in terms of case history, anterior segment evaluation, contact lens selection (with ortho-K, scleral lenses and medical use of lenses covered in separate reports), lens fit evaluation, prescribing/dispensing practice and aftercare advice.”

Successful contact lens fitting begins by recognizing the multitude of factors that can impact it, including patient age, thyroid disease, smoking status and medication use. Always discuss family ocular history, since it can inform management of myopia, keratoconus, corneal dystrophies and diabetes—all of which can have an effect on contact lens wear, says Dr. Sicks.

“Eyelid eversion is a necessary component of not only initial fitting but also the aftercare pro-

cess,” she adds, while discussing the key takeaways from the report. “It’s important to avoid iatrogenic staining when everting the lid, and studies have shown a special evertor made of silicone rubber is superior to even our fingers for lid eversion as more of the lid is exposed. Another important factor is instilling NaFl, as the grading of palpebral roughness is significantly

higher when assessing with NaFl and blue light vs. just white light.”

Another key component of contact lens fitting is a thorough examination of the anterior eye. “Ocular/anterior segment photography allows for objective grading of digital images, which has the potential to decrease the variability of subjective ratings,” explains Dr. Sicks. “It can also be employed for patient education to help explain ocular changes to patients and keep them fully informed.”

When it comes to rigid corneal and scleral lens fitting, fluorescein dye allows for visualization of the tear film. Also, it penetrates the corneal epithelium to help visualize epithelial disruption, according to the authors of the report. “If excess fluorescein is instilled, the stimulated molecules collide, reducing the fluorescence; hence, the recommended technique is to place a drop of saline onto the paper strip, then shake the strip to remove the excess liquid,” they wrote. They also explained that the strip should be applied flat and at the temporal canthus to avoid damage to the tissues under observation.

AN EVIDENCE-BASED APPROACH TO GAS PERMEABLE LENSES

The CLEAR report provides evidence to help ODs better determine if soft or rigid contact lenses are the right choice for their patient, depending on health conditions, past treatments/surgeries and medications. For instance, the study authors report strong evidence supporting the use of rigid corneal or reverse geometry lenses when corneal irregularities are present in patients post-refractive surgery.

A thorough, systematic approach to rigid corneal lens fitting is outlined by the authors as follows:¹

1. Comfort: 0 (extreme discomfort) to 10 (no lens sensation)
2. Coverage: +2 to -2 (based on size relative to the horizontal visible iris diameter)
3. Centration: L (crosses limbus)/P (crosses dim pupil)/C (contained within limbus)
4. Movement inter-blink: +2/>2mm to -2/<0.5mm
5. NaFl pattern with the lens centered: +2 steep to -2 flat
6. Edge width: +2/>2mm to -2/ not visible

While properly fitting rigid corneal lenses is important, ODs also have to take the time to help set their patients up for success once they leave their office. This should include adaptation advice prior to dispensing the lenses, according to the CLEAR report.

Rigid corneal lenses are more often associated with poorer initial comfort and longer adaptation times; ODs need to identify strategies to meet this challenge. Anesthetic use during rigid lens fitting appointments can improve initial comfort as well as reduce dropouts and anxiety; however, the CLEAR authors report that a survey of UK eyecare providers showed that less than 1.5% used anesthetic regularly and less than

one-third considered it a clinically acceptable approach.¹

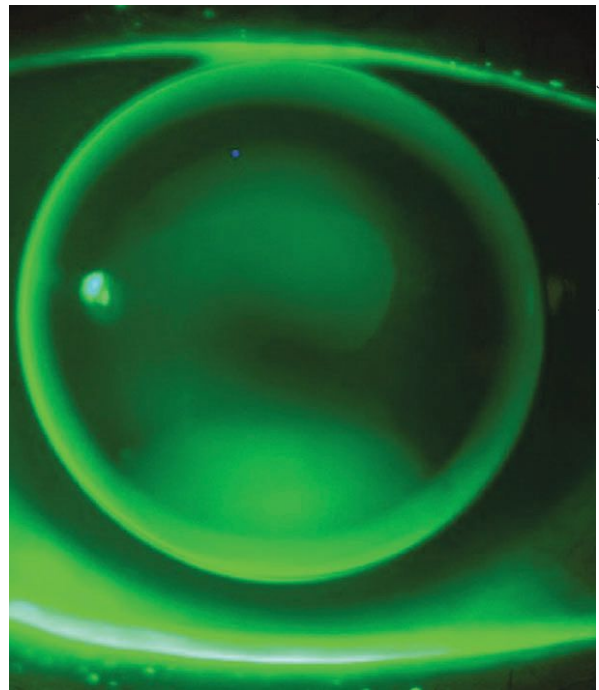
Providing a comprehensive patient education, including a discussion on modifiable risk factors, can make a significant difference when it comes to successful compliance. This includes information on hand-washing, sleeping in lenses, solution use, replacement interval, case cleaning, rubbing and rinsing, use of tap water and annual exams.

“It’s always important to realize there are modifiable factors and non-modifiable factors that ultimately affect lens wear success,” notes Dr. Shovlin. “We have to live and deal with the non-modifiable factors, such as lid anatomy/characteristics and corneal features, to name a few. We can at least attempt to alter modifiable factors in order to maximize comfort and vision.”

IMPLEMENT THE EVIDENCE

Fitting and managing rigid corneal lenses in practice is often a challenge, but using an evidence-based approach can help optometrists lay the foundation for overall success. This includes maintaining a strong understanding of current literature, while also recognizing what seems to work the best for your individual practice and patients.

Staff members also play a key role in the ongoing success and optimization of GP lenses in prac-



The report covers soft vs. rigid corneal lenses and the efficacy of each in different patients.

tice, especially during the aftercare process, according to Dr. Sicks, who urges optometrists to use their team to ensure all the necessary information is gathered so no issues or concerns are missed during follow-up appointments and exams.

“Equally important is the mindset of the optometrist. Success depends not only on the skills of the practitioner, as well as the lens material and design, but also on their attitude and how information is being presented to the patient,” Dr. Sicks concludes. “We have to make sure we are considering these lenses for the right patients. There are definitely individuals who could benefit from GP lenses, and by offering this option, we are providing the highest level of care possible to our patients.” **RECL**

1. Wolffsohn JS, Dumbleton K, Huntjens B, et al. CLEAR—evidence-based contact lens practice. *Cont Lens Anterior Eye*. 2021;44(2):368-97.

Photo: Tiffany Andziewski, OD, and John Gelles, OD

USING TOPOGRAPHY TO GUIDE YOUR CL FITS

Learn the maps and images that can best visualize any issues prior to placement or troubleshooting.

By Shalu Pal, OD

For many eyecare providers, corneal topography is never given a thought. To be a contact lens fitter, I had to have a corneal topographer—a good one! My practice would not be complete without it. The first new piece of equipment I purchased was a mighty, small placido disc topographer. Technology has improved by leaps and bounds since those early days, as has the role that these devices can play.

Topography platforms today incorporate software that expands the technology's capabilities to include design assistance for custom gas permeable (GP) lenses, myopia management platforms, higher-order aberration assessment, meibography, anterior segment cameras and dry eye suites.

Let's discuss the types of images we collect, the most important measurements to consider as well as how to put the data to use in contact lens fitting.

REFLECTION VS. PROJECTION

There are two categories of topographer: placido disc (reflection)-based and elevation (projection)-based.



A Topcon Myah in use. The device combines axial length, dry eye testing, meibography and corneal topography in a single machine.

Reflection-based topographers project a series of rings on the cornea. The image of the reflected rings on the tear film is captured, the distance between the rings is measured and the slope is calculated, from which the height is extrapolated. This is the most widely and commonly used type of topographer. When rings are close together, it indicates that there is a high rate of change in curvature in that area.

Rings that are further apart have a slow rate of change. Small-cone

systems collect more data points and are more accurate than large-cone placido disc systems. Both iterations depend on alignment during capture and a robust ocular surface to capture a complete ring set image. If the patient is off-axis or the cornea is dry, the data collected and extrapolated will be inaccurate.^{1,2}

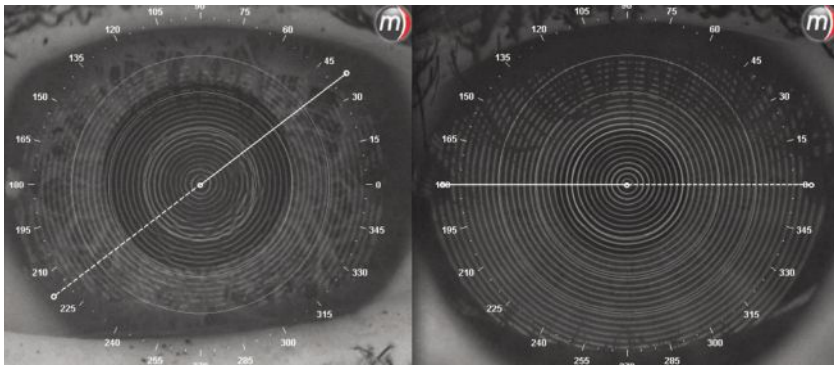
Examples of these topographers include the Medmont E300 and Meridia, the Oculus Keratograph and the Zeiss Atlas.

Elevation-based topographers evaluate specific points on the cornea and measure the height of the cornea at those points. Highly irregular corneas and distorted surfaces can be analyzed. These topographers image through the cornea, using off-axis light to

ABOUT THE AUTHOR



Dr. Pal runs a group practice in Toronto specializing in specialty contact lenses, myopia management and ocular aesthetics. She is a Fellow for the American Academy of Optometry, Scleral Lens Education Society and British Contact Lens Association. She is a consultant for Allergan, Alcon, Bausch + Lomb, CooperVision, Johnson & Johnson Vision Care and Menicon, as well as a facilitator of the CooperVision STAPLE lens fitting workshops.



At left, a comparison of an eye with a poor ocular surface due to dry eyes. The mires are incomplete and distorted. At right, clean ocular surface with no dryness present.

provide details of both the front and the back surfaces of the cornea.

The analysis of the posterior cornea is a key difference between placido disc- and elevation-based topographers, as it allows for earlier detection of ectatic changes than was previously possible. This technology also allows for global pachymetry calculations, axial length, anterior vault and surgical measurements for LASIK and cataract extractions.³ Examples of elevation-based topographers are the Oculus Pentacam and the Bausch + Lomb Orbscan.

IMAGE CAPTURE

The only way to get a great topographic map with accurate data is to take a good image. In order to do that, a patient must be comfortable, properly aligned within the instrument and looking in a direction that allows for proper alignment of the mires onto the cornea. A good ocular surface is helpful as well.¹ The use of preservative-free saline on a dry eye will help clear up distorted mires, if present.

TOPOGRAPHIC MAPS

There are many ways to visualize the data collected from a topographer. A few of the most common

and useful maps include the axial map, the elevation map and the tangential map.

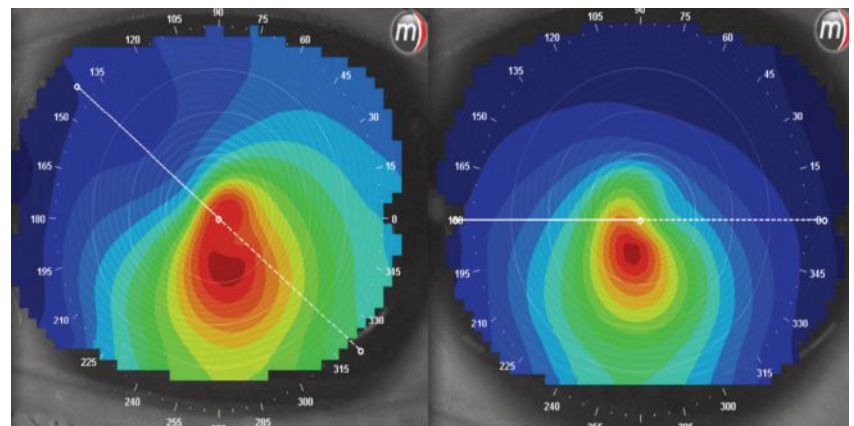
The *axial map* shows the corneal curvature in diopters; as such, think of it as a representation of how the refractive power is distributed across the corneal surface. The reference point for these maps is the central axis, from which changes in curvatures are measured.⁴ Red indicates a high rate of change in curvature, whereas blue denotes a slow rate of change in curvature. The center of this map—closest to the central axis—is more detailed and accurate than the edges of these maps. The data at the edges of the map are averaged and extrapolated to create a

smooth image for us to view—the “airbrushed map,” if you will. The downside to this extrapolation is that it yields a map that misses important blips and blemishes, which can be critical for assessing true corneal shape.⁵

Despite this, axial maps continue to be the most used map by practitioners. My clinical experience has guided me to use these maps to determine the base curve of soft and GP lenses using the most detailed central curvature data.

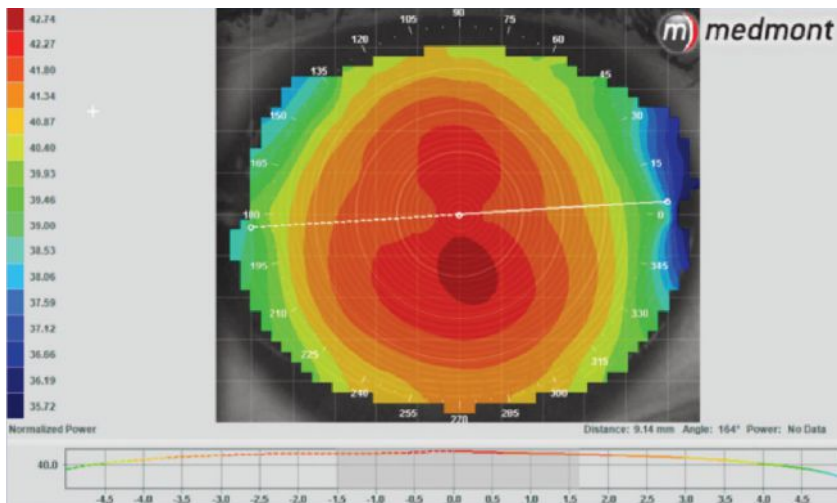
The *elevation maps* are created based on a reference surface that is placed on the eye, like a spherical GP would be placed on the eye. The heights are measured above and below the reference sphere; red above and blue below. These maps are best used for regular corneas to determine the starting spherical GP to place on the eye and for toric corneas to determine if a sphere, aspheric or toric lens is needed.⁶

Elevation should not be confused with the other two maps; this map gives a sense of how high or low the cornea is (often distinct from how steep or flat). As such, elevation maps can often be the most helpful in visualizing how

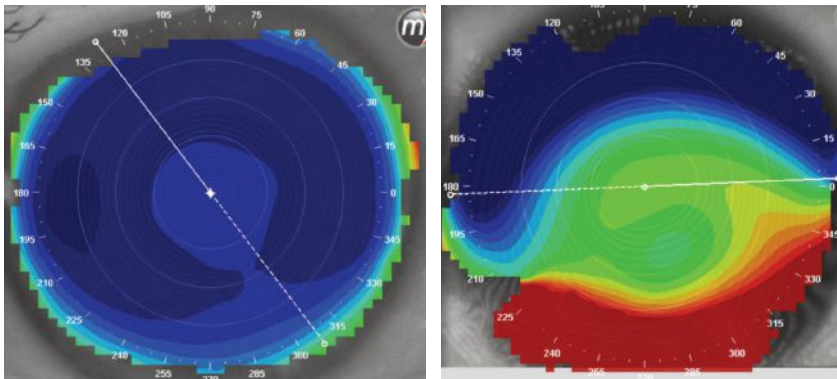


At left, a patient is looking off center when this image was taken. The right images were taken while looking straight ahead. The patterns are very different between the two.

USING TOPOGRAPHY TO GUIDE YOUR CL FITS



Axial map of a normal cornea.



Elevation maps of two different patients. Both have a reference sphere, from which the maps were created. The patient on the left has a very uniform elevation and was successfully fit with a spherical GP. The patient on the right has a very irregular elevation pattern and, with the scar in the inferior cornea, could only be fit with a very customized scleral lens. Nothing would stay on the eye without falling off.

a GP lens may actually fit on the eye (with higher areas likely to touch, lower areas likely to pool and everything else somewhere in between).

These maps are also helpful with irregular corneas to determine if a GP lens would work or if a scleral lens would be the better choice. As a rule of thumb: if the steepest elevation compared with the flattest elevation shows a difference of greater than 300 μ m, then a scleral lens is likely to be most successful. Placing a GP lens on such a cornea with a large elevation difference is comparable

to trying to balance a teeter-totter. The fit will be poor and the patient uncomfortable and unhappy.

The *tangential map*, known as the true map, in contrast to the other two, does not rely on a reference point, central axis or reference curvature. There is no airbrushing of the data, and true corneal shape can be appreciated; red represents steep curvatures, while blue represents true flat curves. This is the most sensitive of maps and allows for the greatest accuracy of data at the periphery.⁴ As such, these maps are critical in understanding the

true shape of the cornea, the true size of a cone, the location of a scar or pinguecula, the fitting of orthokeratology (ortho-K) lenses that require peripheral fitting evaluation, determining the apex of the cornea and monitoring corneal conditions and irregularities for change over time. This is a high-yield map and should be the go-to for getting an accurate understanding of corneal shape and monitoring.

CORNEAL SHAPE

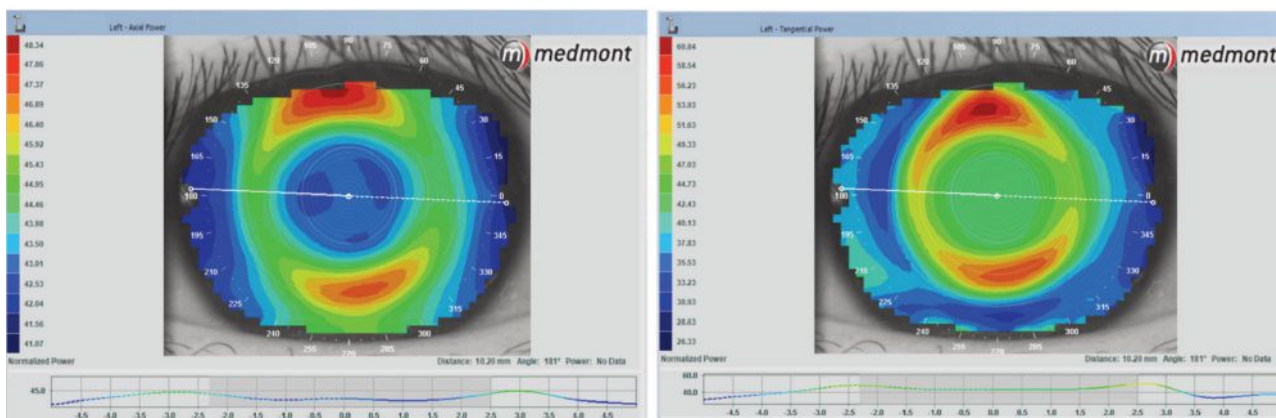
The beautiful thing about topographers is that we can learn so much about the shape of the cornea before we start a contact lens fitting. Eccentricity and the shape factor are two values that can help us better understand the change in curvature of the cornea from the center to the edge.

Eccentricity (E value) is the rate of flattening from the center of the cornea towards the edge. Normal corneas have an E value that ranges between 0.4 to 0.6.⁷ To visually understand E values a little better, look at *Table 1*.⁷

A prolate cornea is steep in the center and flattens outwardly toward the limbus. Prolate can be used to describe a normal cornea or even an ectatic cornea, such as nipple cone keratoconus and keratoglobus. Keratoconic eyes are just very highly prolate. A prolate cornea can be well described by an E value.

Oblate corneas are flat in the center and steepen towards the edge of the cornea.^{8,9} A patient who has undergone LASIK, post-keratoplasty, post-ortho-K lens wear, as well as some pellucid marginal degeneration cases are all examples of oblate corneas. Soft contact lenses are designed for prolate corneas.

When you place a soft contact



The left image is an axial map of an ortho-K patient with a great fit, great vision and much happiness. The right image shows the tangential map, which defines the edges of the cornea and shows a complete ring of treatment around the central treatment zone. The tangential map gives us a clear, complete picture of what is going on with this ortho-K fit.

lens on an oblate cornea, the optic zone of the lens may compress towards the globe with each blink, causing vision to fluctuate. Understanding this anomalous shape before starting a contact lens fitting allows you to select a contact lens modality best suited for success on these irregularly-shaped surfaces.

Shape factor is another way to describe the rate of flattening of the cornea outwards from the center; the difference is that it can be used to describe both prolate and oblate corneas. There are several different methods that can be used to calculate the shape factor, each having their own reference point. A reference sphere can have a shape factor of either zero or one depending on which calculation method is used. A shape factor below sphere reference value would describe an oblate eye, and above would describe a prolate eye. Knowing the calculation method—and, more important, the

reference point for your topographer—is important to understand how to interpret the shape factor.

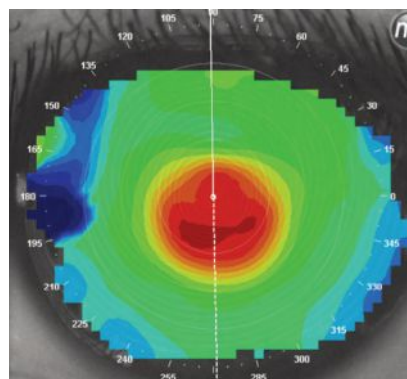
Using the various indicators of corneal shape can help understand the cornea and assist in lens design. This data demonstrates that the majority of corneas are flatter nasally, which can cause soft lenses to decenter towards the nose. We also know that GP lenses tend to center over the steepest apex of the cornea. Knowing where the steepest apex is allows us to better predict if a lens will decenter. Using these tools to predict the performance of our various lens designs on-eye has been a time-saving approach in my clinic.

FITTING SOFT LENSES

Truthfully, when fitting soft contact lenses (spheres, torics or multifocals), we don't often think of using topography to assist in our fitting process. We typically have one diameter and one base curve per lens design and are high-

ly successful with them. Ordering a specialty lens is rarely indicated for soft lenses based on a fitting issue and more frequently needed based on power availability. When there are two base curve options, we generally use our autorefractor K readings and choose one. When on the eye, if the lenses are found to be either too steep or too flat on the eye, then we switch to the other base curve option if the direction of change correlates with the available second base curve option or we try a different brand entirely.

We have been spoiled by the wonderful lens technology available to us; the soft lenses of today have been engineered to work well on the vast majority of our

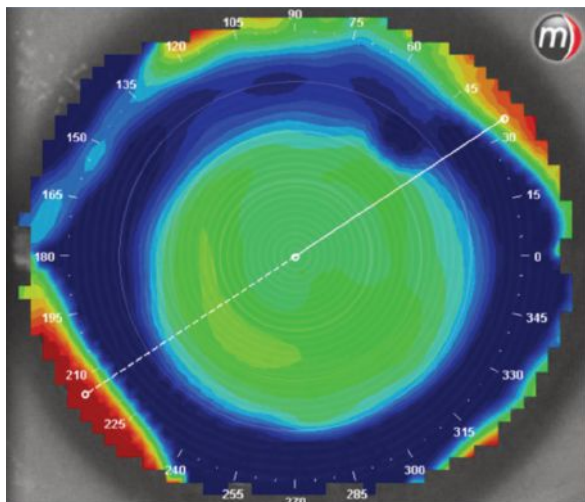


A central cone that signals a highly prolate cornea.

Table 1. Relating Corneal Shape to E Values

Shape	E Value
Sphere	0
Ellipses	0-1
Parabolas	>1
Hyperbolas	<1

USING TOPOGRAPHY TO GUIDE YOUR CL FITS



A patient with normal corneas who overwore their soft one-day disposable lenses caused a compression right on their peripheral cornea, as seen on a tangential map.

patients and often with the first lens we try. If the fit is not successful, our topographers now play a larger role in helping troubleshoot why we are not getting the predictable and ultimately highly successful outcomes we have come to expect with these lenses.

Despite the ease in fitting soft lenses, the argument can be made that topographies should be used to establish a baseline before every contact lens fit. Soft contact lenses can cause corneal compression or corneal edema if fit too tight, if on eyes with tight lids or if over-worn.¹⁰ Using baseline measurements for comparison, we can monitor the cornea as the fitting progresses to look out for these issues. If vision decreases, topographies compared with baseline images can show change over time, ruling out or revealing corneal changes.

ASTIGMATISM

Perhaps the most familiar use of these tools is for

establishing magnitude of astigmatism. Keratometers and autorefractors provide central K readings, which guide us as to whether our patients have corneal astigmatism. Topographers take this a step further and outline exactly the type, shape and magnitude of this astigmatism. Regular vs. irregular, with-the-rule or against-, central or limbus-to-limbus

are all distinctions a topographer can provide.

When I think of with-the-rule astigmatism, I think of a face stretched horizontally. The flat meridian or least power is along the horizontal and the steep more minus power is along the ver-

tical. This form of astigmatism is more common. The opposite depiction is true for against-the-rule astigmatism. Picture a vertically stretched long face. The flat meridian is along the vertical and the steep meridian along the horizontal.

Toric soft lenses are stabilized to fit these astigmatic corneas. Stabilization techniques vary from brand to brand but all are designed with a combination of thick and thin zones to best center or orient the lens on-eye. Optimizing the design to the type and distribution of astigmatism can help troubleshoot to minimize rotation, decentration and excessive movement.

SOFT MULTIFOCAL LENS FITTING

Baseline topographies can also help us understand if the corneal and visual axes are aligned. The size of the pupil and lens centration are critically important

to multifocal lens performance.^{11,12} If a lens is decentered, the best optics of the lens will not be in the center of the pupil or on the visual axis. If our line of sight and geometric center of the cornea do not line up, then there is a natural decentration inherent in the eye. You can determine this with your topographer; if you ask a patient to look straight ahead and your mires on not centered on the cornea, you know that natural alignment is off.

You can fix this for imaging by asking the patient to look either right or left to better center the mires on the cornea, but when this happens we know that the center of the cornea and the



Regardless of which technology we choose to use, corneal topographers are more than just colorful maps of our patient's eyes. They provide a wealth of information and have a wide variety of applications.

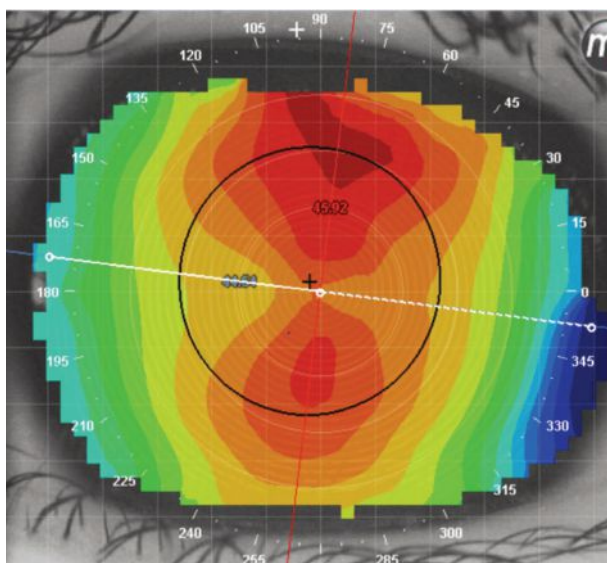
visual axis are not in line with one another. When patients do not perform well with multifocal contact lenses, this may be the reason. Knowing that a patient is naturally visually decentered before you start a multifocal fit may impact your decision to move forward with the fit, to set realistic expectations of the visual potential or on the complexity of the fit, which may require more of your time.

Another little trick that you can use with multifocal lenses is to take a topographical scan of the lens on-eye. The tangential map will show the power distribution of the lens on-eye. You can identify if the optic zone of the lens is centered over the pupil as desired.

SOFTWARE-GUIDED LENS FITTING

There are many different programs that are starting to become available that allow you to fit GP and scleral contact lenses. Profilmetry describes scleral lens topographers—*e.g.*, the Eaglet Eye Surface Profiler, Oculus Pentacam, sMap 3D (Visionary Optics)—that are designed to help practitioners with choosing the first lens to start your scleral lens fitting.

There are software programs available that will help you visualize and design a fit of a gas permeable lens. This software is built into topographers, one of the first being the Medmont. You can see what the fluorescein pattern would like for specific lens on the eye, modify parameters and see how those changes would impact your fit—all before you order a lens.



This patient has astigmatism. It is a regular form that stretches from limbus to limbus and is with-the-rule.

Other programs that also do this include the EyeSpace and Wave contact lens programs.

TAKEAWAYS

The art of fitting contact lenses stems from a relationship between the contact lens and the cornea. With all the advanced lens technologies available to us, it seems considering corneal shape has largely gone by the wayside in soft lens fitting. Even the best soft lenses fail us on occasion, and our topographers can often save the day with an explanation of why. Having baseline topographies helps us identify fits that may be more challenging. Knowing this from the start of a fit will allow you to properly educate your patient and set realistic expectations of the process that lies ahead. When you take a few minutes to do these steps before a fit begins, you can increase the success of your fits, reduce frustration and speed up your decision-making process.

Ultimately, an understanding of corneal shape remains a valuable

tool in optimizing the soft lens experience for our more challenging patients and in monitoring their success over time, and topographers will continue to be beloved and worthwhile investments in a contact lens practice. **RCCL**

1. Kojima R. Validating corneal topography maps. CL Spectrum. July 1, 2007. www.clspectrum.com/issues/2007/july-2007/validating-corneal-topography-maps. Accessed March 17, 2022.
2. Erdélyi B, Csákány B, Németh J. Spontaneous alterations of the corneal topographic pattern. J Cataract Refract Surg. 2005;5(31):973-8.
3. Muller-Breitenkamp U, Hockwin O. Scheimpflug photography in clinical ophthalmology. a review. Ophthalmic Res. 1992;24 Suppl 1(0030-3747):47-54.
4. Lebow K. Learning the intricacies of axial and tangential maps. CL Spectrum. September 1, 1999. www.clspectrum.com/issues/1999/september-1999/learning-the-intricacies-of-axial-and-tangential-m. Accessed March 17, 2022.
5. Klein SA. Corneal topography reconstruction algorithm that avoids the skew ray ambiguity. Optom Vis Sci. 1997;74(11):945-62.
6. Dehghani C. The elevation map best fit sphere as starting point for gas permeable contact lens fitting. Presented at AAO Meeting 2012. November 2012. www.aaopt.org/detail/knowledge-base-article/elevation-map-best-fit-sphere-starting-point-gas-permeable-contact-lens-fitting. Accessed March 17, 2022.
7. Hansen D. Evaluating the eye with corneal topography. CL Spectrum. August 1, 2003. www.clspectrum.com/issues/2003/august-2003/evaluating-the-eye-with-corneal-topography. Accessed March 17, 2022.
8. Lebow K. Are all aspheric contact lenses created equal? CL Spectrum. February 1, 1999. www.clspectrum.com/issues/1999/february-1999/are-all-aspheric-contact-lenses-created-equal. Accessed March 17, 2022.
9. Scholz K, Messner A, Eppig T, et al. Topography-based assessment of anterior corneal curvature and asphericity as a function of age, sex, and refractive status. J Cataract Refract Surg. 2009;35(6):1046-54.
10. Cook GW, Benton MG, Akerly W, et al. Structural variation and its potential impact on genome instability: Novel discoveries in the EGFR landscape by long-read sequencing. PLOS One. 2020;15(1):ee0226340
11. Papatadou E, Del Águila-Carrasco AJ, Esteve-Taboada JJ, et al. Objective assessment of the effect of pupil size upon the power distribution of multifocal contact lenses. Int J Ophthalmol. 2017;10(1):103-8.
12. Fedtke C, Ehrmann K, Thomas V, et al. Association between multifocal soft contact lens decentration and visual performance. Clin Optom (Auckl). 2016;8:57-69.

MAKE CONTACT LENS DISCOMFORT EXTINCT

Manage expectations and follow the steps below to reduce or eliminate this bothersome condition.

By Milton Hom, OD

My eyes are dry with these lenses.” I remember hearing about contact lens discomfort (CLD) for the first time as a novice optometry student. That was decades ago, and just yesterday I heard it again, and again and again.

With so many contact lens options available today, there’s no reason anyone should be experiencing discomfort. For too long, we’ve sort of accepted it as a cost of doing business, so to speak, for contact lens wear. What are the factors that influence this and ideally prevent it?

Believe it or not, CLD *can* be controlled. Just like fitting contact lens multifocals, it’s manageable if you can manage expectations. I’ll be honest—some patients will never be comfortable with their contact lenses. Their expectations are too high, no matter what you do. But, those with reasonable expectations can be made reasonably comfortable most of the time.

THE COMFORT ZONE

Years ago, I wrote about the comfort zone. Imagine your patients coming in with a comfort gauge on their forehead. Now, we know

that the needle isn’t always in the same position 24/7, as it varies and changes. All kinds of factors can make that needle move. Why? Because the tear film is dynamic; it is never the same all the time. It’s the same for contact lens comfort; it will change along with the tear film. Whatever impacts the tear film impacts the contact lens. What we try to do is keep the patient in the comfort zone as long as we can.

How do we accomplish this? Well, our treatment strategies fall into two distinct categories: lens-based and disease-based. These categories will help you organize your thinking when new treatments become available, just as it helped me build my own algorithm for CLD.

The TFOS International Workshop on Contact Lens Discomfort led by Jason Nichols, OD, is great compilation of peer-reviewed knowledge that goes into detail about the progression of contact lens dropout. The patient first goes to lens awareness, followed by reduced comfortable wearing time, reduced total wearing time, temporary discontinuation of wear, ending in permanent discontinuation of lens wear (drop out.)

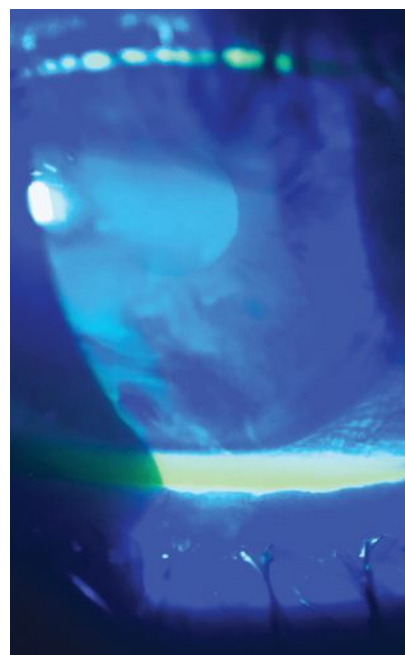


Photo: Christopher Kuc, OD

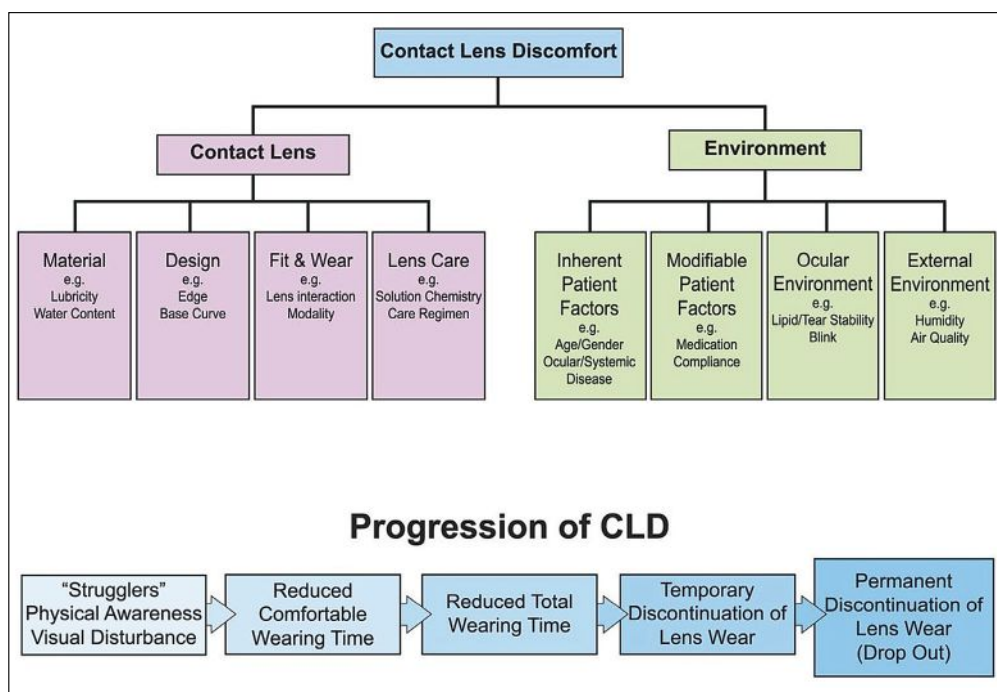
Reduction in tear break-up time is easily assessed and has direct correlation to CLD.

ABOUT THE AUTHOR



Dr. Hom is an internationally recognized expert and researcher in therapeutics, dry eye, contact lenses, allergy and glaucoma. He has written four books and published over 200 papers and peer-reviewed abstracts. He does research support for AbbVie, Allergan, Novartis, Vyluma and Surface Pharmaceuticals.

Much of the treatment portion is devoted to lens-based treatments. In fact, most of the contact lens education today covers lens-based treatments. The yearly survey on contact lens dryness, also piloted by Dr. Nichols, gives a window into the current thinking by our peers. Again, the survey points to most of the treatments performed being lens-based and, when you talk to contact lens manufacturers, many of their suggestions for treatments are lens-based.



Classification of contact lens discomfort as described in the TFOS International Workshop on Contact Lens Discomfort.

LENS-BASED TREATMENTS

The survey's reigning treatment champion for as many years as I can remember is daily disposable lenses; increase comfort by decreasing lens replacement time. Does it work? For many patients, yes. The disadvantages are more lenses, more costs and more plastic, but in terms of comfort, they work. Just like everything else, they don't work for everyone—every seasoned clinician most likely has a failure story. We need to consider the cause of dryness, water content, type of lens material and many other factors.

The next treatment on the popular list is rewetters—personally, I love them. Artificial tears are the backbone of dry eye treatment and the modern day rewetters are re-versions of artificial tears. There is so much technology in artificial tears; it's mind-blowing when you think about it. An artificial tear inventor once told me these products are so sophisticated, he wouldn't

be surprised if they would be a formidable challenge to some of the dry eye drugs on the market today.

To make things clear, I'm talking about the new rewetters, not the old ones. In the past, they were multipurpose solutions just put into a smaller bottle, like chemical disinfectants used as rewetter drops—I run from those.

My first choice of rewetters have sodium hyaluronate acid (HA) in them. HA is almost a miracle component for rewetters and artificial tears in general. In simple terms, HA is a large molecule with long chains. When the patient blinks, rather than being washed out like thicker drops, the HA chains line up, lay themselves down and remain in the eye. They seem to have longer residence time on the ocular surface, and longer residence time means longer retention of benefit—which means more time in the comfort zone.

Recently I had a patient who said her rewetters didn't work

very well (she was using a generic re-versioned MPS one). She loved the sample I gave her (with HA) but couldn't remember the name and got the other one. After I feigned disappointment, I told her I'm just glad she came back to ask.

DISEASE-BASED TREATMENTS

This is the idea is to use treatments for the ocular surface for discomfort. Like I mentioned earlier, discomfort is tied to tear film, and if the tear film is inadequate, discomfort usually follows. Fortify the tear film and you will move the comfort gauge. Basically, the way to fortify is to use conventional dry eye treatments.

I look at dry eye in terms of triggers, which come from the environment. Dry eye correlates with weather: high temperature, low humidity and high pollen counts. Does it impact the tear film and discomfort? Of course. I practice in Southern California and we say that we don't have winter any more. It

MAKE CONTACT LENS DISCOMFORT EXTINGUISH

seems like pollen surrounds us all year round.

In general, dry eyes make allergies worse; allergies make dry eye worse. So, what to do? I prescribe antihistamine drops for all my CLD patients BID before application and after lens removal every day. This is my first-line treatment, but if more help is needed, I add on other viable treatments: dry eye medications such as cyclosporine or lifitegrast, and steroids like loteprednol and meibomian gland treatments.

My philosophy is to use treatments from both categories: lens-based and disease based-treatments. The more severe the condition, the more treatments from both categories. Mild cases may take just one treatment; severe treatments require more. I find that using both categories optimizes outcomes greatly.

LID WIPER EPITHELIOPATHY

Donald Korb and colleagues first described lid wiper epitheliopathy (LWE) decades ago. They were able to connect it to contact lens dryness and it was actually a new objective sign of CLD. I bring this up because most of the way we detect discomfort is based on what the patient tells us—subjective symptoms. The comfort gauge is essentially a subjective sign. Having an objective sign such as LWE helps with our diagnosis, but it goes beyond that. We can also use objective signs to monitor progress. Lots of time, there is a disconnect between signs and symptoms, especially in ocular surface disease. Many times, the patient feels they are not progressing, but in actuality, they are. Monitoring progress with more than just symptoms can be valuable in keeping the patient motivated and helps to manage expectations.

Does anything help LWE? Originally, prescribing steroids was recommended; they work well, but



Photo: Don Korb, OD

On a scale from zero to four, LWE in this patient is quite severe at a grade three.

they are not without pitfalls such as pressure spikes. Most steroid courses are usually no more than two to four weeks, leaving out maintenance therapy. Recently, rewetter drops have been shown to reduce LWE. Again, another reason why I love HA and rewetters. They reduce LWE, relieve symptoms, are easily available because there is no need for a prescription and are a reasonable cost—what's not to love?

CHANGING SOLUTIONS

Just a few years out of optometry school I attended a lecture by Pat Caroline, who stated, “solutions are the guilty until proven innocent.” Little did I realize his words explained the reason why one of the most popular treatments for CLD works even today. That treatment is changing solutions.

HYDROGEN PEROXIDE

Does anyone remember the original term for MPS? Chemical disinfection—yes, chemicals in the solution are used to kill bacteria and other microbial organisms. These are the same chemicals we soak lenses in and put into the eye. Now, over the years, the chemicals have become infinitely better; they disinfect and are much more mild to the eye. Remember, though, that they are still chemicals and irritate, cause dryness, redness and

discomfort. The incidence is much, much less than before, but there are still patients who are sensitive. This is where peroxide-based solutions come into play. Many times changing to peroxide works wonders, if you know the proper situation when to prescribe it.

I find that peroxide works best when the patient experiences reduced comfortable wearing time, which is early in the progression of CLD. Switching to peroxide successes diminishes as the discomfort becomes more severe. For instance, I have had little success switching to peroxide when the patient is undergoing temporary discontinuation of lens wear or has already dropped out. The patient, unfortunately, is too far gone for peroxide to save the day. For me, peroxide is invaluable, especially when you know when to use it.

CHANGING LENS MATERIALS

This is another strategy to reduce or eliminate CLD. There are many newer materials that are designed to address discomfort—non-silicone hydrogel, those that have superior retention of water and others that have great surface attributes. If you like monthly replacement, changing materials is a viable option, but which materials to use and when? I have not figured this one out yet; all I know is one material does not

TFOS International Workshop on Contact Lens Discomfort: Executive Summary

An 18-month workshop included 79 experts, who were assigned with taking an evidence-based approach at evaluating contact lens discomfort. Below are the eight subcommittees and the experts' evaluation:

Definition and Classification

They defined contact lens discomfort as “a condition characterized by episodic or persistent adverse ocular sensations related to lens wear, either with or without visual disturbance, resulting from reduced compatibility between the contact lens and the ocular environment, which can lead to decreased wearing time and discontinuation of contact lens wear.”

Epidemiology

While the etiology of CL discomfort is yet to be determined, the authors explain that use of symptoms as an outcome measure is appropriate because it relates directly to the patients' experience and the motivation to seek and use treatment, regardless of the presence of signs. Symptoms can be assessed with questionnaires, including the Contact Lens Dry Eye Questionnaire.

Contact Lens Materials, Design and Care

While the design of contact lenses influence their ability to fit the ocular surface properly, which is influential in terms of overall performance—especially with soft and rigid contact lenses—its overall association with contact lens discomfort is not clear. The authors note that the size, shape and contour of lens edges appear to be some of the most important factors of contact lens comfort.

Neurobiology of Discomfort and Pain

Changes in corneal sensitivity with contact lens wear have been reported widely, but the underlying mechanism is not known and the outcomes of studies may be dependent on the type of instrument used to test sensitivity, the authors note.

One hypothesis is the possibility of mechanical stimulation of the nociceptors in the lid wiper region of the eyelids. Stimulation of subacute inflammation of the ocular surface during lens wear may occur, and nerves can respond to the production of a variety of inflammatory mediators, including cytokines and arachidonic acid metabolites, the authors explained.

Contact Lens Interactions with the Ocular Surface & Adnexa

The subcommittee identified dozens of ocular surface tissue alterations that may occur as a result of lens wear. “While many of these

result in pain (*i.e.*, microbial keratitis), it was determined that such obvious pathologic complications were not the remit of this exercise and that the subcommittee would consider only potential tissue alterations that were associated with contact lens discomfort and not pain that remained upon removal of the lens,” they concluded.

Contact Lens Interactions with the Tear Film

Experts found that decreased tear film stability, increased tear evaporation, reduced tear film turnover and tear ferning are associated with contact lens discomfort. Further evidence is needed, they said, to support the associations between tear volume, surface tension, osmolarity, pH and ocular surface temperature and contact lens discomfort.

Trial Design and Outcomes

Certain factors from clinical trials had been associated with contact lens discomfort, including lid wiper epitheliopathy, tear film stability/volume and lid parallel conjunctival folds. “Although no single outcome parameter of contact lenses was found to be validated fully, it was concluded that the Contact Lens Dry Eye Questionnaire currently was the most appropriate subjective outcome for contact lens discomfort,” the authors concluded.

Management and Therapy

A history of the discomfort and the general status of the patient is a critical step in the management process, followed by noncontact lens causes (autoimmune diseases, eyelid diseases), changing lens material, fitting with steeper base curves, and using artificial tears and wetting agents may help improve contact lens discomfort.

The paper concludes by emphasizing how important it is that the process of prevention and management of contact lens discomfort starts early, even before the onset of symptoms, to improve the long-term prognosis of successful, safe and comfortable contact lens wear.

1. Nichols JJ, Willcox M D.P., Bron AJ, et al. The TFOS international workshop on contact lens discomfort: executive summary. *Inv Ophthalmol Vis Sci.* 2013;54:TFOS7-13.

work for everyone. What I try to do is have different materials from different manufacturers available. Almost like fitting multifocals, just don't have one manufacturer available; I recommend having multiple fitting sets.

It's funny: when I speak on this topic, I always get different responses. It reminds what someone said about pizza in New York. If you have 40 New Yorkers in a room and ask, “What's the best pizza?” you'll get 40 different answers.

Sometimes, you will get instant success treating CLD. Other times, it is a long journey that can feel like a roller coaster to patients. No matter what happens, managing expectations at the outset will greatly increase your chances for success. **RCCL**

To Culture or Not to Culture?

Let's break down how to properly diagnose and treat corneal ulcers.

An 88-year-old female presented for an emergency visit complaining of irritation to her right eye. Her uncorrected acuity was 20/25 OD and 20/25 OS, and she refused intraocular pressure readings. Ocular history was notable for macular drusen in both eyes. Clinical exam revealed trichiasis in the right lower lid with one distinct lash causing irritation to the inferior nasal cornea OD. She had an incomplete blink and conjunctival injection OD. An inferior nasal corneal ulcer with a 1mm x 3mm stromal infiltrate OD was present (*Figure 1*).

On the initial visit, epilation of the lower right lid lash in question was performed and well-tolerated. A corneal scraping on an agar plate was performed (*Figure 2*). She was started on moxifloxacin and asked to follow-up in four days.

Within 24 hours, the patient called complaining of pain and worsening of vision and came back to the office. She reported not using moxifloxacin due to burning after instillation. At this visit, results from the culture returned with growth of *Moraxella catarrhalis* beta-lactamase, which slightly altered the treatment plan. The patient was told to continue moxifloxacin and start polymyxin B/trimethoprim Q1h while awake and erythromycin ophthalmic to be used at night.

At one-week follow-up, she slowly improved but her vision was still 20/25. The infiltrate further consolidated; however, keratic precipitates were seen and a grade one anterior chamber reaction was present. Due to this change, prednisolone was added to the regimen twice a day,

and at the next visit it was increased to four times a day as the keratic precipitates had not resolved.

CORNEAL ULCERS

Around 30,000 cases of microbial keratitis occur annually in the United States, with the majority being bacterial in origin.^{1,2} Having a plan for how to handle them can be sight-saving for patients.

Signs may include epithelial defects overlying a single stromal infiltrate, indistinct infiltrate edges, corneal edema with white cell infiltration of nearby stroma, an anterior chamber reaction and hypopyon often located in the inferior cornea.²⁻⁷ Symptoms can include pain, photophobia, decreased vision, redness and discharge.^{2,7-9}

Once you have made your clinical observation and the differential diagnosis of a bacterial ulcer is under consideration, an even more focused patient history must be obtained. It is imperative to remember the risk factors for bacterial corneal ulcers, including contact lens wear, ocular surface disease, acute corneal trauma and corneal surgery.³ At this point, the decision of whether to culture or not will need to be made,



Fig. 1. Patient at initial presentation with a corneal ulcer and one distinct lash (trichiasis).

which is multifactorial. If you are in a situation that does not give you the ability to culture, the choice of whether to send it out before starting antibiotics becomes urgent.

WHEN TO CULTURE

As published by the American Academy of Ophthalmology, the Bacterial Keratitis Preferred Practice Pattern guidelines state that smears or cultures of infectious corneal ulcers are recommended when any of the following circumstances are present: ulcer >2mm and centrally located, significant stromal melting, unresponsive to empiric antibiotic therapy, characteristics suggestive of amoebic, mycobacterial or fungal infection or a history of corneal surgery.⁷

Even though this patient did not meet any of the criteria, I cultured her for the following reasons: (1) she is an elderly patient who was very difficult to get to come in for an exam, (2) it appeared as though this ulcer had been present for an extended amount of time, (3) she had an incomplete blink causing chronic exposure and (4) I have easily accessible culturing and smear materials at my office.

TREATMENT

First-line therapy for infectious ulcers traditionally involves the use of empiric treatment with extended-spectrum topical antibiotics, such as fluoroquinolones.^{2,4,8-10} As of now, there is no agreed-upon treatment regimen—ciprofloxacin 0.3%, levofloxacin 1.5% and ofloxacin 0.3% are all FDA-approved to treat bacterial keratitis.⁹ If the ulcer is sight-threatening, accompanied by

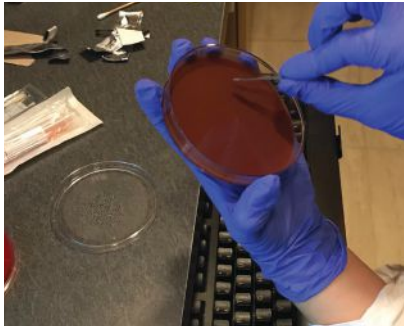


Fig. 2. Blood agar culture done with a blade.

a hypopyon and/or deep stromal involvement, fortified topical antibiotics are beneficial.

In this case, we started with moxifloxacin. The positive result of *Moraxella* did alter our treatment and we were able to make this decision faster instead of waiting for a recalcitrant ulcer. The most common causes of bacterial keratitis are *Haemophilus influenzae*, *Streptococcus pneumoniae*, *Staphylococcus aureus* and *Staphylococcus epidermidis*.^{11,12} *Moraxella*, a gram-negative rod, is not as common. This positive culture led us to add polymyxin B/trimethoprim, an antibiotic drug that is active against a wide variety of gram-positive and gram-negative ophthalmic pathogens. Specifically, polymyxin B is an excellent bactericidal against most gram-negative bacterial species.¹³

STEROIDS

The goal of using steroids is to diminish tissue damage from the inflammatory response and reduce stromal melt, neovascularization and scarring. Its use is debated because steroid therapy may delay epithelial healing, leading to stromal thinning and melt.^{2,8,10} The Steroids

for Corneal Ulcers Trial studies have compared clinical outcomes in bacterial keratitis treated with antibiotics and steroids vs. solo antibiotics and found no significant adverse effects when using steroids; some ulcers experienced better visual outcomes at three months.^{2,14} These studies also found that timing and dosage are important. Patients who started steroids after only two or three days of antibiotic use experienced better visual outcomes, and patients who weren't started on steroids until later had the same or worse acuity.^{2,14,15}

In our case, steroids were not prescribed initially due to the ulcer location, which was not visually threatening. However, the subsequent presence of keratic precipitates and an anterior chamber reaction altered our treatment regimen, which may ultimately have prevented scarring.

Luckily, the patient gradually improved over a month (*Figure 3*). The stromal infiltrate continued to consolidate and we considered debriding the infiltrate. This method would be used if improvement had stagnated. Fortunately, she continued to have gradual improvement with the antibiotic and steroid drops.



Fig. 3. Confirmed bacterial corneal ulcer one month after treatment was initiated. Seen here is a condensed and dried up infiltrate.

Whether you see these cases every week or only rarely, you should consider bacterial keratitis in your differential for corneal ulcers. Imaging the ulcer is a great first step in monitoring. Remember that proper identification of the etiology is essential in accurate management. Knowing and understanding the use of adjunctive diagnostic evaluation and treatment—such as culture, fortified antibiotics and steroids—can play an important role in improving visual outcomes. **RCCL**

1. Palioura S, Henry CR, Amescua G, Alfonso EC. Role of steroids in the treatment of bacterial keratitis. *Clin Ophthalmol*. 2016;10:179-86.
2. Sherman S, Cherny C. Keeping up with keratitis. *Rev Optom*. 2021;158(4):62.
3. Bourcier T, Thomas F, Borderie V, et al. Bacterial keratitis: predisposing factors, clinical and microbiological review of 300 cases. *Br J Ophthalmol*. 2003;87(7):834-8.
4. Dalmon C, Porco TC, Lietman TM, et al. The clinical differentiation of bacterial and fungal keratitis: a photographic survey. *Invest Ophthalmol Vis Sci*. 2012;53(4):1787-91.
5. Mascarenhas J, Lalitha P, Prajna NV, et al. Acanthamoeba, fungal and bacterial keratitis: a comparison of risk factors and clinical features. *Am J Ophthalmol*. 2014;157(1):56-62.
6. Thomas PA, Leck AK, Myatt M. Characteristic clinical features as an aid to the diagnosis of suppurative keratitis caused by filamentous fungi. *Br J Ophthalmol*. 2005;89(12):1554-8.
7. Lin A, Rhee MK, Akpek EK, et al. Bacterial keratitis preferred practice pattern. *Ophthalmology*. 2019;126(1):P1-55.
8. Ni N, Srinivasan M, McLeod SD, et al. Use of adjunctive topical corticosteroids in bacterial keratitis. *Curr Opin Ophthalmol*. 2016;27(4):353-7.
9. Moshirfar M, Hopping GC, Vaidyanathan U, et al. Biological staining and culturing in infectious keratitis: controversy in clinical utility. *Med Hypothesis Discov Innov Ophthalmol*. 2019;8(3):145-51.
10. Austin A, Lietman T, Rose-Nussbaumer J. Update on the management of infectious keratitis. *Ophthalmology*. 2017;124(11):1678-89.
11. Teweldemedhin M, Gebreyesus H, Atsbaha AH, et al. Bacterial profile of ocular infections: a systematic review. *BMC Ophthalmology*. 2017;17:212.
12. Shuja F, Sherman S. Smart strategies on using antibiotics to treat corneal infections. *Rev Cornea Contact Lenses*. 2019;156(6):18.
13. Melton R, Thomas R. Topical antibiotics. The clinical guide to ophthalmic drugs. *Rev Optom*. 2009;796(8).
14. Srinivasan M, Mascarenhas J, Rajaraman R, et al. Corticosteroids for bacterial keratitis: the steroids for corneal ulcers trial (SCUT). *Arch Ophthalmol*. 2012;130(2):143-50.
15. Ray KJ, Srinivasan M, Mascarenhas J, et al. Early addition of topical corticosteroids in the treatment of bacterial keratitis. *JAMA Ophthalmol*. 2014;132(6):737-41.



The Unkindest Cut

A case of longstanding visual fluctuation from overzealous RK surgery decades prior.

A 72-year-old white female, presenting for a cataract evaluation, was subsequently referred for a scleral lens evaluation due to fluctuating vision. She was told by her previous doctor that nothing could be done about her vision, so she has lived for many decades with poor vision and without seeking care. She recently had been experiencing greater swings in her vision and thought perhaps cataract surgery would help.

She presented with visual acuities of OD 20/60 and OS 20/40. Slit lamp examination revealed 42 linear radial incisions in each eye, with ferrous staining in the central optic zone. She had mild, non-surgical cataracts. A trial of scleral lenses yielded 20/25 vision in each eye. No historical refractive data was available.

Radial keratometry, a popular refractive procedure throughout the 1980s and early 1990s, was effective in flattening the cornea through a series of radial incisions into the stromal bed. The number of cuts (typically eight) and their depth (typically 80% to 90%) affected the resultant power. By the early 2000s, it was supplanted by the more predictable laser refractive procedures.

We have dealt with numerous complications in the decades following the RK boom, including dry eye, biomechanical instability at the incision points (leading to unstable irregular astigmatism), progressive localized corneal flattening or steepening with resultant hyperopic or myopic refractive shifts, increased higher-order aberrations, incisional infections, epithelial down-growth and even globe rupture.

Many RK patients are now at an age where cataracts are a concern.

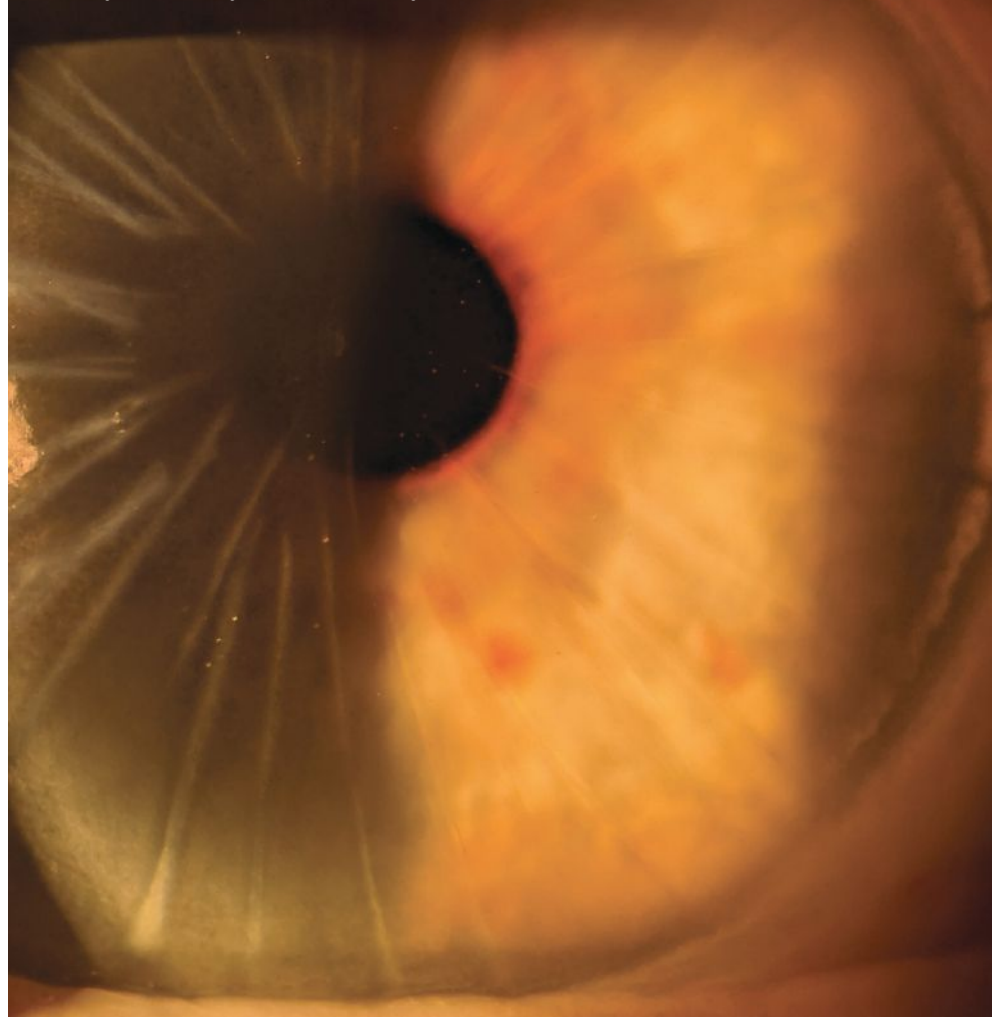
Outcome predictability is highly variable. Cataract surgery increases the risk of incision dehiscence and refractive instability. There are also case reports of collagen crosslinking exacerbating the wound instability, with the hypothesis that crosslinking does not reach deep into the incision, resulting in changes to, rather than stabilizing of, the existing scars.

As in this case, refraction is difficult and often shifts the aberrations without increasing overall visual acuity. This is frustrating for both patient and doctor. Patients are often referred for contact lens fitting prior to surgery, since surgical outcomes are so highly variable. Most often,

scleral lenses are used for post-RK corneas because the extreme flatness and irregular astigmatism may be difficult to fit with a corneal lens. While the cornea may continue to fluctuate under a scleral, the lacrimal lens will neutralize surface irregularity and provide stable vision. GP lenses tend to decenter; piggybacking is recommended for better centration and to avoid bearing on elevations.

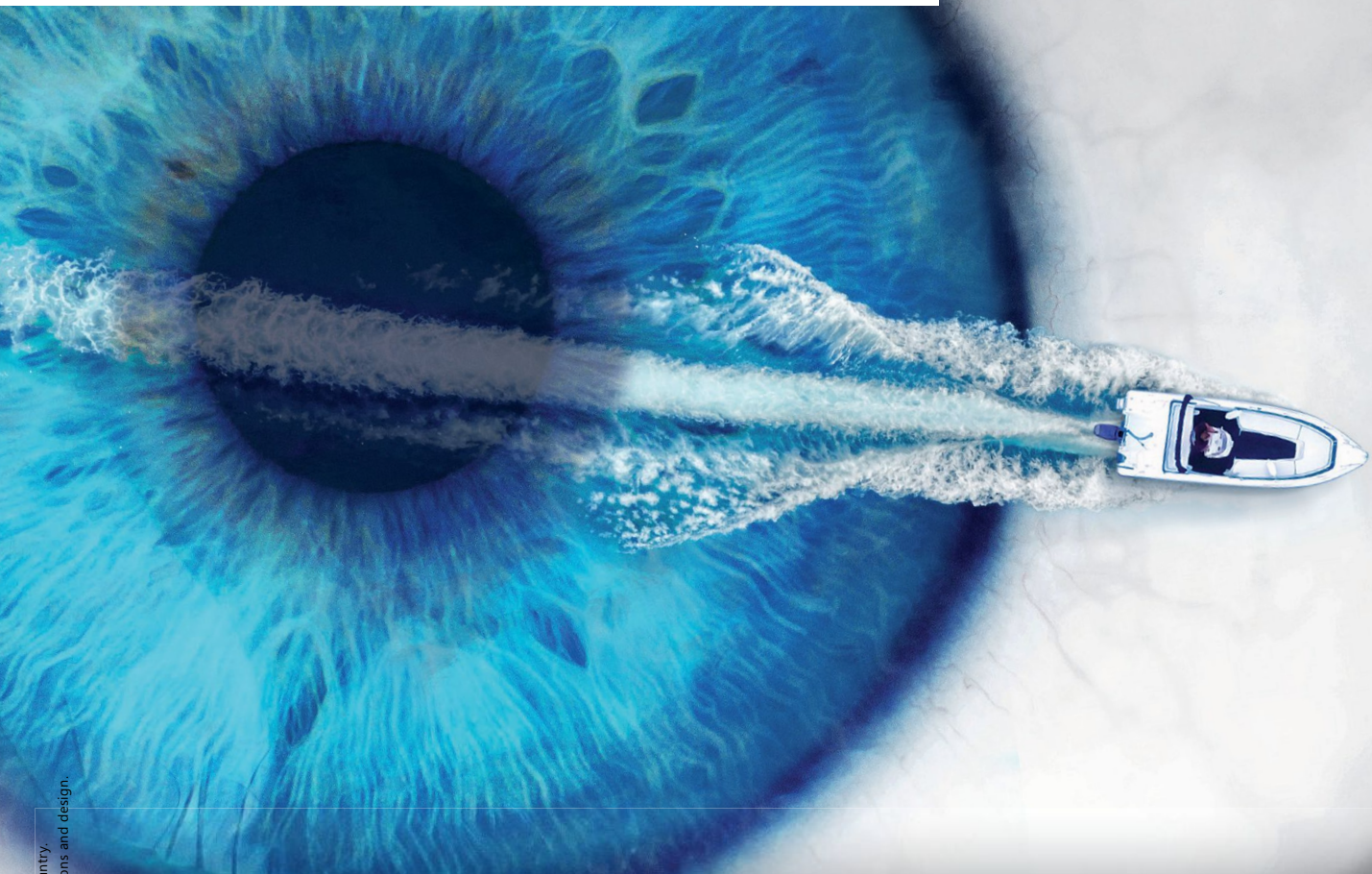
This patient chose to continue without visual correction and to use reading glasses as necessary. She had habituated to her visual world and preferred not to hassle with contact lenses, since her original goal was to be correction-free. [KCCU](#)

Photo by Marcus Noyes, OD, University of Iowa



Cornea Scleral Profile Scan for Pentacam®

Beyond the Cornea!



The availability of products and features may vary by country. OCULUS reserves the right to change product specifications and design.



Pentacam® CSP Report – A new level of accuracy

Measure beyond past boundaries when fitting scleral lenses. The CSP Report creates 250 images within the measuring process. The tear film independent measurement with automatic release allows coverage up to 18 mm with the same fixing point.

Visit www.pentacam.com to learn more

Toll free 888-519-5375



ads@oculususa.com www.oculususa.com



70th
anniversary
1951-2021



Miru 1day UpSide

silicone hydrogel contact lenses
with **Smart Touch™** technology

A new generation of silicone hydrogel material
balanced for health and comfort incorporating
a unique combination of **high oxygen** and **ultra
low modulus**.

SMART TOUCH™

Miru 1day UpSide contact lenses are always
the right way up and ready to wear, thanks to
Smart Touch™ technology.

Multifocal now available

Miru
1day UpSide

Miru
1day UpSide

Find us on:    

www.meniconamerica.com