RCCL®
REVIEW OF CORNEA & CONTACT LENSES

SEPTEMBER 2014

Controlling MYOPIA, Changing Lives

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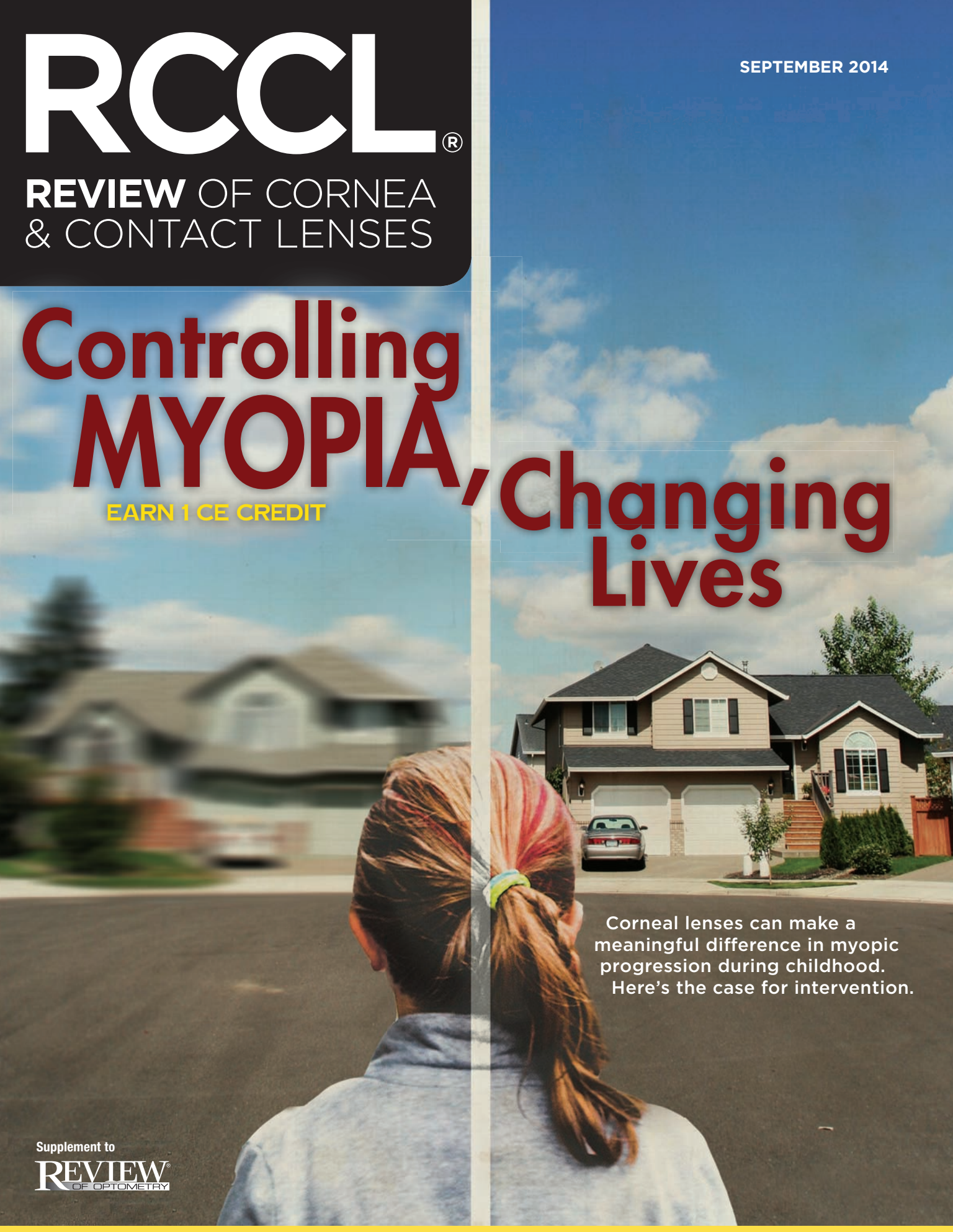

Corneal lenses can make a meaningful difference in myopic progression during childhood. Here's the case for intervention.

Supplement to REVIEW OF OPTOMETRY

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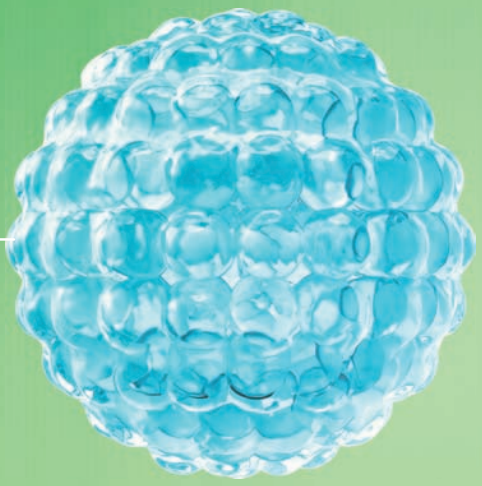

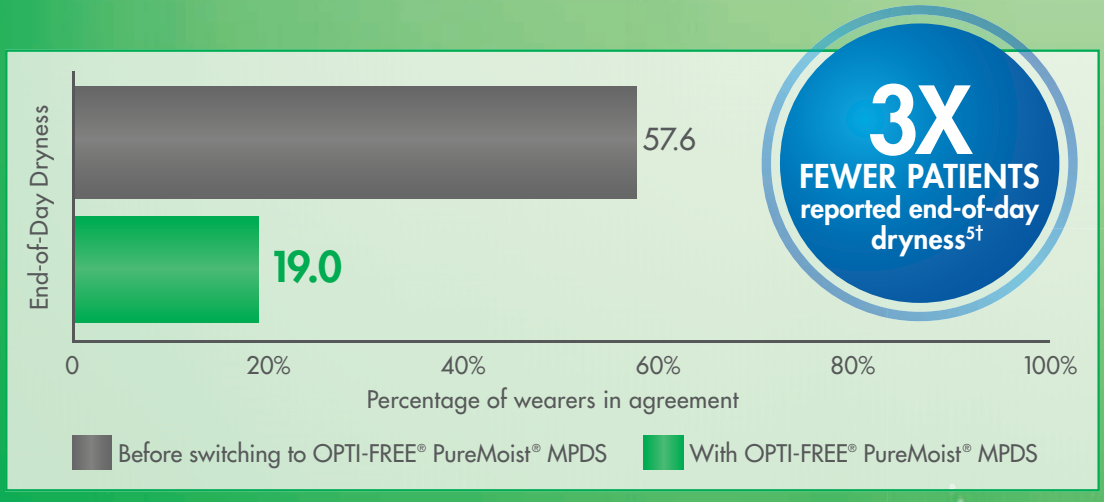

3X FEWER PATIENTS reported end-of-day dryness[5†]

†Based on a global survey of 10,611 contact lens wearers who tried OPTI-FREE® PureMoist® for two weeks.

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References: 1. Campbell R, Kame G, Leach N, et al. Clinical benefits of a new multipurpose disinfecting solution in silicone hydrogel and soft contact lens users. *Eye & Contact Lens.* 2012;38(2):93-101. **2.** Alcon data on file, 2011. **3.** Lally J, Ketelson H, Borazjani R, et al. A new lens care solution provide moisture and comfort with today's contact lenses. *Optician.* 2011;241:42-46. **4.** Davis J, Ketelson HA, Shows A, Meadows DL, A lens care solution designed for wetting silicone hydrogel materials. ARVO Meeting Abstracts. 2012;38(2):93-101. **5.** Lemp J, Kern JR. Results from global survey of contact lens-wearer satisfaction with OPTI-FREE® PureMoist® MPDS. *Clinical Optometry.* 2013:5 39-46.

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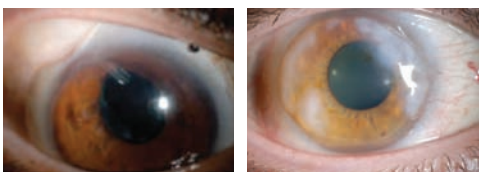

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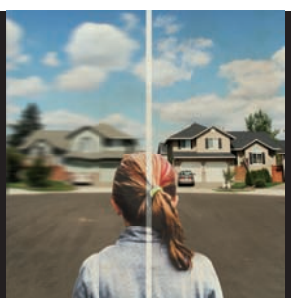

CE — Controlling Myopia, Changing Lives
Corneal lenses can make a meaningful difference in myopic progression during childhood. Here's the case for intervention.
By Richard L. Anderson, OD, Thomas Aller, OD, and Jeffrey J. Walline, OD, PhD

IN BRIEF

• A prospective study of 237 dry eye patients conducted at four sites found that **matrix metalloproteinase-9** (MM9) level, identified using the **InflammaDry test**, correlated with **dry eye status**. Results were compared to clinical assessment using tear break-up, Schirmer testing, corneal staining and the Ocular Surface Disease Index. The study was published in the August 2014 issue of *Cornea.*

• A **new resource** is available for clinicians seeking guidance with scleral lens fitting. Created by Michigan College of Optometry's Vision Research Institute, the **Scleral Lens Fit Scales** demonstrate how to accurately estimate the amount of vaulting (clearance) under the posterior surface of a scleral lens by comparing the tear layer thickness to the center thickness of the lens. Additionally, optic sections demonstrate the tear thickness underneath the lens both centrally and at the limbal area, and various edge clearances are also shown.

The 8.5" x 11" card can be downloaded for use or sent via US mail free of charge (courtesy of the **Bausch + Lomb Boston Custom Lab Channel**) by contacting CraigNorman@ferris.edu.

• In August, **CooperVision** completed its **acquisition of Sauflon Pharmaceuticals** for approximately $1.2 billion. The deal will expand Cooper's contact lens product portfolio, particularly in daily disposable options.

Cooper also recently launched an e-commerce service called **LensFerry**, which allows contact lens wearers to order replacement lenses (from any manufacturer) online for home delivery. The prescribing practice receives the sales revenue "as if the lenses had been ordered in-office," CooperVision says. More info is available at www.lensferry.com.

Type 2 Diabetes Linked to Worse Keratoconus

Patients with type 2 diabetes may be more likely to also have keratoconus, and cases of the corneal disease in patients with type 2 diabetes may be more severe, according to a study published in the August 2014 issue of *Cornea*.

In the first of two substudies, researchers compared the existence of type 1 and type 2 diabetes in patients with and without keratoconus; the second substudy examined the severity of keratoconus in affected patients with and without diabetes. In both studies, patients were separated into several age groups, including one encompassing ages 20-40 for comparison to earlier research conducted in 2000.

In the first substudy, 1,377 patients with keratoconus were identified through a computerized electronic health records search, while 4,131 control patients without keratoconus were selected using a random number generator. Each keratoconus-affected patient was matched to three control patients by sex and age.

The researchers found that while the number of patients with type 1 diabetes in the keratoconus-affected group and the keratoconus-free control group did not differ significantly, the amount of patients with type 2 diabetes in each group did. In particular, patients with keratoconus between the ages of 25-44 and 45-64 were more inclined to have type 2 diabetes than those without the degenerative eye disorder in the same age ranges.

The researchers also correlated the presence of type 2 diabetes with the severity of keratoconus, finding in the second substudy that patients with type 2 diabetes were more likely to also have more severe keratoconus.

These findings differ from the 2000 study, which reported that the presence of type 2 diabetes was in fact lower in keratoconus-affected patients. A second referenced study in 2006 did not find any correlation in patients with keratoconus vs. those without, and also suggested that diabetes was associated with less severe keratoconus.

The researchers acknowledged the sample could be skewed because patients attending a specialty eye clinic may be more likely to have cataracts and glaucoma, which correlate with diabetes. In addition, selecting controls from these patients could be problematic because diabetes patients more frequently undergo regular screening than the general population and could thus be overrepresented. However, say the researchers, based on these assumptions in each case, the presence of diabetes would be higher in the control group, contrary to the results.

Studies investigating whether more severe diabetes could be linked to stabilization of keratoconus, as well as the effect of regulated hyperglycemia on keratoconus, are welcome, the authors conclude.

Kosker M, Suri K, Hammersmith KM, Nassef AH, Nagra PK, Rapuano CJ. Another look at the association beween diabetes and keratoconus. Cornea. 2014 Aug;33(8):774-9.

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JMI

Positive Data on Sodium Hyaluronate 0.18% for DED

Under the clinical settings of the Dry Eye Workshop treatment guideline for mild dry eye disease (DED), researchers performed an analysis of 60 patients with DED to evaluate the efficacy of hypotonic sodium hyaluronate (SH) 0.18% solution eye drops.

They treated patients with Level 1 DED with either isotonic SH 0.1% (Group 1) or hypotonic SH 0.18% eye drops (Group 2); Level 2 DED patients received fluorometholone 0.1%, cyclosporine 0.05% plus either isotonic SH 0.1% (Group 3) or hypotonic SH 0.18% eye drops (Group 4). Tear film break-up time (TBUT), Schirmer test, corneal staining with fluorescein and ocular surface disease index (OSDI) score were recorded at baseline, one month and three months following treatment.

The researchers published their results in the September 2014 issue of *Cornea*. In Group 2, they found that TBUT at three months ($p=0.03$) and corneal staining scores at one and three months ($p\leq0.03$) were significantly improved after the treatment compared with baseline scores, whereas they noted that these parameters were not changed during the follow-up period in Group 1. In Groups 3 and 4, they reported that TBUT and corneal staining scores at one and three months, and OSDI score and Schirmer's test results at three months following the treatment showed significant improvements compared with the baseline score ($p<0.05$). Additionally, Group 4 patients showed an extended TBUT and an improved corneal staining score ($p\leq0.01$) at three months and after treatment, compared with the values of Group 3.

The researchers concluded that hypotonic SH 0.18% seemed effective in improving tear film stability and ocular surface integrity compared with isotonic SH 0.1% eye drops in patients with mild DED.

Lee HS, Ji YS, Yoon KC. Efficacy of hypotonic 0.18% sodium hyaluronate eye drops in patients with dry eye disease. Cornea. 2014 Sept;33(9):946-51.

Another Rx Dry Eye Agent Studied

Kala Pharmaceuticals recently initiated a Phase II trial of loteprednol etabonate mucus penetrating particle (LE-MPP) program, KPI-121, to investigate the safety and efficacy of low-dose LE-MPP in patients with dry eye disease. The company aims to enroll about 150 patients in up to 10 US centers in the double-masked, randomized, controlled trial (KPI-121-C-002), which will compare its nanotechnology-based LE-MPP 0.25% to vehicle, dosed QID in subjects who have a clinical diagnosis of dry eye.

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By Joseph P. Shovlin, OD

Under the Microscope

Your clinical decisions and any professional involvement with industry are about to receive unprecedented scrutiny.

The lazy, hazy days of summer 2014 masked a tumult of changes behind the scenes affecting the regulation of health care. As fall approaches, be on guard for a storm cloud ahead: a new level of scrutiny for health care providers is quickly approaching Have these programs resulted in too much bureaucracy? Let's take a close look at what's ahead.

THE SUNSHINE ACT—WHAT IS IT?

The Physician Payment Sunshine Act aims to enhance patient safety by requiring disclosure of certain financial relationships between pharmaceutical manufacturers and health care providers. Most notably, the Act requires manufacturers of drugs, devices, and biological and medical supplies to track and report all financial relationships with physicians and teaching hospitals.

Recent headlines would lead us to believe the Sunshine Act is a new development. Actually, it has been around for some time. Passed in 1976, it is one of the Freedom of Information Acts, designed to increase transparency of financial relationships between health care providers and pharmaceutical manufacturers, thereby ideally enhancing patient safety.[1,2] Although originally introduced as an independent piece of legislation in 2007 by Senator Chuck Grassley (R-IO), the law in its current form was included in an amendment to the Patient Protection and Affordable Care Act.

You may not yet be aware of many of the changes coming from the Sunshine Act. Pharmaceutical and medical device companies recently began tracking their interactions with physicians and reporting to the Centers for Medicaid and Medicare Services (CMS) any financial payments made; CMS will display all the information reported on its public database, planned to go live in September 2014.[2]

Doctors can dispute 2013 data until Dec. 31, 2014 by logging onto CMS.gov and review/correct any reporting of personal financial transactions with industry. Unfortunately, it will not be corrected in the public database until 2015.[1] Please review your postings. The website has had its problems, crashing on occasion. Sound familiar?

MEANINGFUL USE/EHR INCENTIVE PROGRAMS

Another area of potential for added scrutiny is CMS's "meaningful use" program. As part of the American Recovery and Reinvestment Act of 2009, meaningful use is defined by CMS as "using electronic health records (EHR) technology for improved care coordination, to maintain privacy, engage patients, and improve quality, efficiency and reduce health care errors."[3] The objectives have evolved and are being rolled out in three separate stages: MU1—data capture and sharing; MU2—advance clinical processes; MU3—improved outcomes.[3]

Our practice started MU2 upgrades this summer. Just when we were beginning to feel comfortable with MU1 EHR hierarchy, an added level of MU2 complexity has hit us hard.[1] These additional measures assure a slower patient flow (we are asking many more questions), additional staff time and expense, more time at the computer and less time with the patient. One of our docs recently bemoaned that he spends 90% of his time on the computer and 10% examining his patients. Although the goal is to improve patient care, I'm not sure how the current circumstances will yield such an outcome.

CMS will likely glean additional patient and practice information with a full range of potential ramifications and, yes, more scrutiny of our practices. Specifically, I expect the abundance of clinical data collected will lead CMS to wonder:

(1) Are we asking the "right" questions in their opinion, based on their goals?

(2) Exactly how much time are we spending with each patient?

(3) Does all the above justify the level of coding charged?

I suppose more scrutiny on all fronts is the new norm. I welcome closer scrutiny in areas where better patient care is the end result or when services are enhanced, but I do not enjoy the added level of surveillance that makes us feel like we are under the microscope, and determines how we should practice on a day-to-day basis.

Stay tuned for the weather report on the Sunshine Act and MU2 as it unfolds in daily practice. Stormy or sunny—who knows? RCCL

1.en.wikipedia.org/wiki/Physician_Payments_Sunshine_Act

2.www.kevinmd.com/blog/2013/04/physician-payment-sunshine-act-ready.html

3.www.healthit.gov/providers-professionals/meaningful-use-definition-objective

THIS IS WHY 4 out of 5 patients agree their lenses feel like new.[1]

The scientifically proven formula of CLEAR CARE® Solution deeply cleans, then neutralizes, to create a gentle saline similar to natural tears. The result is pure comfort and is why CLEAR CARE® has the most loyal patients of any lens care brand.[2]

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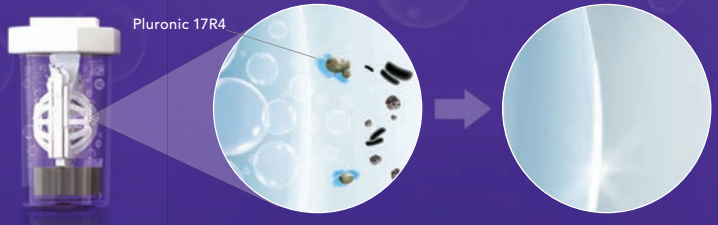

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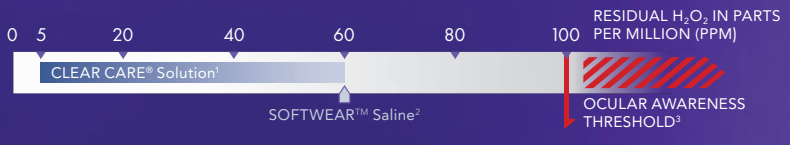

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References: 1. A market research study conducted amongst 107 US contact lens wearers representative of CLEAR CARE® purchasers in the United States, 2007. 2. Based on third party industry report 52 weeks ending 12/29/12; Alcon data on file. 3. Alcon data on file, 2009. 4. SOFTWEAR™ Saline package insert. 5. Paugh, Jerry R, et al. Ocular response to hydrogen peroxide. *American Journal of Optometry & Physiological Optics*: 1988; 65:2,91–98.

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A Fresh Look at Lens Cleaning

New FDA contact lens solution testing procedures introduced earlier this year aim to improve user safety. Will CMC play a role?

With any product—but especially a medical device—safety is the linchpin of success, as it builds the trust and confidence needed for both doctors and patients to give their assent. The FDA is revising its contact lens solution testing procedures in the wake of the solution recalls of the mid-2000s and new lens material development, particularly silicone hydrogels. Current guidelines cover the following five topics:

(1) *lens compatibility*—does the solution alter the parameters of the lens?

(2) *cleaning efficacy*, determined through the use of Critical Micelle Concentration (CMC)

(3) *microbial testing*, with the use of predetermined microbes

(4) *toxicology testing*, to determine cytotoxicity, systemic toxicity and ocular irritation

(5) *clinical testing*, with a minimum of 60 subjects over a period of one month

In June 2014, we discussed lens compatibility, where the chief issue is how lens materials affect the uptake and release patterns of solution components. This month, we will look at cleaning efficacy.

KEEPING IT CLEAN

Contact lens cleaning is done with a *surfactant* (more fully, a *surface-active agent*), a bipolar molecule comprised of both hydrophobic and hydrophilic ends. These polar ends interact with debris or the lens surface and the aqueous tear film, respectively.

In surfactant-based cleaning products, the hydrophobic ends cluster around debris on the lens to form small clusters known as *micelles*. The free hydrophilic ends then react with water to help remove the micelles from the lens surface, simultaneously cleaning and moisturizing the contact lens. This process is very similar to what happens when we wash our hands with soap. The molecular weight of the surfactant chain, block copolymer size, solvent composition and temperature affect how tightly it will bind to the lens surface and how micelles are formed. The strength of the bond will determine how long the surfactant will remain on the lens, thus affecting wettability.

The *critical micelle concentration* (CMC) refers to the concentration above which micelles form and all additional surfactants added to the system form micelles. In effect, CMC can be considered a measure of surfactant efficacy. For example, a lower CMC indicates that less surfactant is needed to saturate interfaces and form micelles.

Concentrations of surfactants higher than the CMC are needed to achieve micelle formation; in so doing, they provide a reservoir of additional surfactant molecules to form micelles. These micelles solubilize and disperse soils, leading to detergency. CMC values provide a valuable guideline for comparing surfactant detergency.

The major chemical disinfectants in lens care products on the market are biguanides (primarily polyhexyl-methyl-biguanide, or PHMB), polyquaterium-1 (Polyquad) and peroxide. While hydrogen peroxide is an effective disinfectant, it is not a surfactant; such agents are added to the system to help with cleaning and wettability.

PHMB is a cationic disinfectant that has antimicrobial efficacy against both gram-negative and gram-positive bacteria, as well as some effect against *Acanthamoeba*.[1] It works using the electrostatic interaction of cationic sites of PHMB with anionic sites of the bacterial cell membrane, causing the agent to bind to the cell membrane. These interactions result in the disturbance of the membrane structure and the leakage of intracellular components, thus destabilizing the organism.

Polyquad is a cationic surfactant larger in size than PHMB. Polyquad also affects the phospholipid membrane but, because of its molecular size, has a reduced uptake and release pattern in contact lenses and cases.[2] Uptake and release patterns of surfactant disinfectants affect corneal staining patterns and comfort responses during lens wear.

It was previously believed that CMC is a critical parameter for surfactants to be useful as cleaners. It is uncertain at this time, however, if the FDA plans to use this information or if any changes will be made to the next cleansing protocol. RCCL

1. Imayasu M1, Uno T, Ohashi Y, Cavanagh HD. Effects of multipurpose contact lens care solutions on the adhesiveness of Acanthamoeba to corneal epithelial cells. Eye Contact Lens. 2009 Sep;35(5):246-50. doi: 10.1097/ICL.0b013e3181b4d152.

2. Willcox MD1, Phillips B, Ozkan J, Jalbert I, Meagher L, Gengenbach T, Holden B, Papas E. Interactions of lens care with silicone hydrogel lenses and effect on comfort. Optom Vis Sci. 2010 Nov;87(11):839-46. doi: 10.1097/OPX.0b013e3181f3e2fc.

Seeing the world through a different lens

Technological advancements in a frequent replacement lens to match the changing visual demands of a digital age

By Jill Saxon, OD

We are all witness to the relentless progress of today's digital world, with nearly annual upgrades of the digital devices we use on a daily basis. Such advancements come with unprecedented visual and physical demands, and require contact lenses that can help address those needs. Yet, over much of the last decade, we've seen relatively little progress in the design and materials of frequent replacement silicone hydrogel lenses, which continue to be the primary refractive option for the majority of contact lens wearers in the US. Many current contact lens wearers struggle with discomfort particularly by the end of the day, perhaps underscored by a dropout rate still cited as high as 24%.[1]

I'd like to share with you a recent innovation, Bausch + Lomb ULTRA® contact lenses with MoistureSeal® technology. This novel material has the highest Dk/t and lowest modulus among the leading silicone hydrogel lenses, and is highly wettable for extraordinary comfort.

Up until now, a rule of thumb has been that an increase in Dk required an increase in silicone content which resulted in an increase in the modulus. The Bausch + Lomb ULTRA® lens, however, utilizes a proprietary combination of silicone molecules, allowing higher oxygen transmissibility, but with its unique blend of silicones, maintains a low modulus compared to leading silicone hydrogel lenses. The net result of these new developments is a lens with high oxygen transmissibility, and low modulus.

The addition of the wetting agent, Polyvinylpyrrolidone (PVP), in an earlier generation silicone hydrogel lens helped establish an unprecedented level of patient comfort. In fact, most of us believed that a new benchmark for comfort had been established. Through its proprietary MoistureSeal® technology, Bausch + Lomb ULTRA® contact lenses contain 4 times as much PVP as the leading silicone hydrogel lens for high water content and surface wettability.[2] These attributes help provide exceptional patient comfort both on initial insertion and at the end of the day.

How are these characteristics borne out by patient experience? Recently, I fit a 17-year-old male patient getting ready to go to college. He believed he had been doing relatively well in the leading two-week planned replacement lens for the last 6 years, until he was questioned more specifically about his cycle of discomfort and vision. Like many patients, he had a tendency to wear the lenses beyond the recommended 2-week replacement schedule. I recommended refitting to Bausch + Lomb ULTRA® contact lenses to help improve both his comfort and compliance. He was initially skeptical because he perceived his original lens was very comfortable but immediately noticed a "wow" factor on lens insertion. At a follow-up visit, the patient reported that end of day comfort and dryness symptoms were significantly improved.

Another patient was a 46-year-old woman with whom I've had limited success fitting in most other frequent replacement lenses. She has significant contact lens dryness symptoms, and has only been marginally successful in even a daily disposable lens. In the 5 years that she has been a patient I had not been able to find a frequent replacement lens that she could wear for more than a very short period of time. She agreed to try the Bausch + Lomb ULTRA® lens and immediately remarked on its comfort: "Wow!" she said, "I have never not felt a lens in my eye." On follow-up she reported being able to wear the lenses for a full 12 hours with virtually the same comfort at the beginning of the day as at the end.

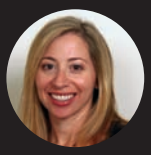
In my practice I prescribe the Bausch + Lomb ULTRA® lens to virtually all of my frequent replacement contact lens patients. This lens has been able to offer my patients unsurpassed comfort and vision. With its combination of unique physical properties—high oxygen transmissibility, low modulus, high water content, and aspheric optics—the Bausch + Lomb ULTRA® lens is able to deliver best in class performance.* ■

*Among leading silicone hydrogel lenses

REFERENCES: 1. Richdale K, Sinnott LT, Skadahl E, Nichols JJ. Frequency of and factors associated with contact lens dissatisfaction and discontinuation. Cornea. Feb 2007;26(2):168-174. 2. Nichols WF, Hoteling AJ, Harmon P, Salvati III L. Quantitative Analysis of Bulk and Extractable PVP Incorporated in Silicone Hydrogel Contact Lenses using APCI HR/AM-SIM Mass Spectrometry. Proc. 62nd ASMS Conf. Mass Spectrom. Allied Topics 2014; Baltimore.

US/ZUS/14/0130

By Elyse L. Chaglasian, OD, and Tammy Than, MS, OD



New Drugs You May Have Missed

Even if you aren't prescribing these to your patients, others may be. Here's an overview.

While 2014 might not be notable for the launch of very many new pharmaceutical agents within the purview of clinic-based eye care, numerous FDA approvals have occurred this year that may be used by other providers who are caring for our patients. Though it may not be important for generalists to understand the specific prescribing details, a working knowledge of these agents will be valuable as we begin to encounter patients who have been managed with them.

THE CATARACT PATIENT

Two new drugs available for intraoperative use during cataract surgery seek to improve outcomes in the immediate postoperative period.

• ***ReSure Sealant*** (Ocular Therapeutix), which received FDA approval in January 2014, is indicated for intraoperative management of clear corneal incisions (≤3.5mm) that demonstrate leakage in adult patients. A temporarily dry ocular surface must be achievable to use this sealant.

ReSure Sealant is an *in situ* formed hydrogel that is mixed just before use. Its package consists of a diluent solution used to mix lyophilized polyethylene glycol (PEG) and trilysine acetate. There is a transient visualization aid (FDC Blue #1) combined with the acetate to help with placement of the hydrogel in the wound. Thus, patients allergic to this colorant (FDC Blue #1) should not be managed with ReSure Sealant.

Upon mixing, the liquid will begin to solidify via a crosslinking reaction, forming a hydrogel within 20 seconds. The hydrogel is applied to the corneal incision using a foam-tipped applicator, resulting in adherence to the ocular tissue surfaces. The sealant will remain present on the corneal incision for approximately one to three days, at which time the hydrogel will soften, detach and slough off into the tears. In a clinical trial of 304 patients who received ReSure Sealant, 31.3% of the participants still had sealant present at day three and only 2.6% had the compound present at day seven.[1]

The only clinical trial for which data are available was sponsored by Ocular Therapeutix. In this 488-patient study, those who underwent uncomplicated clear corneal incision cataract extraction and demonstrated wound leaks were randomized to have the wound sealed either with ReSure or with sutures. ReSure Sealant demonstrated superiority over sutures by preventing wound leaks in 95.9% of patients, compared to 65.9% of patients in the suture group. There was no significant difference in the amount of corneal edema or in the amount of surgically induced astigmatism between the two groups.[1,2] This sealant has not been studied for use prophylactically on corneal incisions that do not demonstrate intraoperative leakage.

• ***Omidria*** (Omeros), approved on May 30, 2014, is another agent intended for use during cataract surgery. It is used to maintain pupil size (by inhibiting intraoperative miosis) and to reduce postoperative ocular pain. The agent is a combination of phenylephrine 1% and ketorolac 0.3% that must be diluted with ophthalmic irrigation solution; it is to used as needed during surgery. Phenylephrine acts a mydriatic agent through its α-1 adrenergic agonist activity. Ketorolac is a nonsteroidal anti-inflammatory that lowers the prostaglandin concentration, reducing pain and preventing surgically-induced miosis.

Phase III studies demonstrated that mydriasis was maintained throughout the cataract surgery in Omidria-treated subjects compared to placebo-treated eyes. After cortical clean-up, 96% of the Omidria eyes had a pupil diameter of at least 6mm while only 77% of the placebo group maintained that level of mydriasis. Pain at the 10-12 hour postoperative evaluation was significantly less in the Omidria-treated subjects compared to placebo.[3] This drug is FDA pregnancy category C and should be used with caution in patients with hypertension and a history of NSAID sensitivities.

ANTI-INFECTIVES

Two new systemic antibiotics have been recently approved and, while not likely to be used routinely for our patients, it is comforting to know that new agents are available for serious or life-threatening infections.

• ***Sivextro*** (tedizolid phosphate, Cubist Pharmaceuticals) is approved for the treatment of acute skin infections caused by certain susceptible bacteria, including MRSA and various *Streptococcus* species. Approval for this new antimicrobial was obtained on June

20, 2014. Sivextro is a prodrug that in the presence of phosphatases is converted to tedizolid. Its antimicrobial activity derives from tedizolid's binding for the 50S subunit of bacterial ribosome, thereby inhibiting protein synthesis.

Sivextro may be administered orally or intravenously. The oral dose is 200mg daily for six days. Sivextro is approved only for patients 18 years or older and is FDA pregnancy category C.[4]

• ***Dalvance*** (dalbavancin, Durata Therapeutics), approved on May 23, 2014, is the newest cell wall synthesis inhibitor. It is indicated for acute bacterial skin infections caused by various strains of *Staphylococcus* and *Streptococcus*. The route of Dalvance is intravenous administration. The drug is approved for adults only and is FDA pregnancy category C.[5]

ALLERGY MEDS

The FDA approved three allergen immunotherapy agents in April 2014. Each contains at a least one allergen extract:

• ***Ragwitek*** (Merck) contains pollen extract from short ragweed.[6]

• ***Grastek*** (Merck) contains extract from Timothy grass.[7]

• ***Oralair*** (Greer Labs) is a mixed allergen extract of five different pollens: Sweet Vernal, Orchard, Perennial Rye, Timothy and Kentucky Blue Grass.[8]

These drugs are all approved for the treatment of pollen-induced allergic rhinitis with or without conjunctivitis, as confirmed by a positive skin test or in vitro testing for pollen-specific IgE antibodies for the allergen extract being used.

The exact mechanism of allergen immunotherapy is not known. Ragwitek, Grastek and Oralair are all sublingual tablets to be used in adults. The first dose should be administered in-office by a practitioner experienced in management of local allergic reactions. The patient should be observed closely for 30 to 45 minutes to rule out a severe allergic reaction. If tolerated, the patient then self-administers one tablet daily. Treatment should begin at least three months before the expected onset of the particular pollen season and continued throughout. In clinical trials, all three agents reduced nasal and ocular symptoms compared to placebo.[6-8]

DIABETIC CONTROL

Afrezza (MannKind Corporation) was approved on June 27, 2014 as a novel route of delivering short-acting insulin. Afrezza is inhaled insulin to be used at the beginning of each meal or within 20 minutes of beginning a meal. Peak insulin levels occur within 12 to 15 minutes of inhalation and decline to baseline after approximately three hours. Afrezza is to be used in conjunction with long-acting insulin. It is contraindicated during periods of hypoglycemia, insulin hypersensitivity and in patients with chronic lung disease. It is estimated that approximately 8.3% of the US population has diabetes and this new, convenient route of regulating glycemic control is high impact.[9,10] Tables are available to convert traditional injectable insulin doses to Afrezza, which is available in four- and eight-unit single-use cartridges for oral inhalation.

SLEEP-WAKE DISORDER

Hetlioz (tasimelteon, Vanda Pharmaceuticals), approved earlier this year, is the only FDA-approved drug indicated for the treatment of non-24-hour sleep-wake disorder, a chronic disruption of a person's circadian rhythms that is thought to affect up to 70% of patients who are totally blind.[11]

Hetlioz is a melatonin receptor agonist. These melatonin receptors are thought to be involved in the control of circadian rhythms. Hetlioz is dosed 20mg daily before bedtime. Efficacy and safety in pediatric patients has not been studied. It is FDA pregnancy category C.[12] RCCL

1.www.fda.gov/medicaldevices/productsandmedicalprocedures/deviceapprovalsandclearances/recently-approveddevices/ucm381099.htm accessed 8/1/2014.

2. Kim T, Levenson J, Tyson, F. Randomized Controlled Study of an Ocular Sealant to Prevent Wound Leak After Cataract Surgery. Poster presented at: American Academy of Ophthalmology Annual Meeting. 2013 Nov 16-19; New Orleans, LA.

3. www.accessdata.fda.gov/drugsatfda_docs/label/2014/205388s000lbl.pdf accessed 7/30/2014.

4. www.accessdata.fda.gov/drugsatfda_docs/label/2014/205435s000lbl.pdf accessed 8/1/2014.

5. www.accessdata.fda.gov/drugsatfda_docs/label/2014/021883s000lbl.pdf accessed 8/1/2014.

6. www.fda.gov/downloads/BiologicsBloodVaccines/Allergenics/UCM393600.pdf accessed 8/1/2014.

7. www.fda.gov/downloads/BiologicsBloodVaccines/Allergenics/UCM393184.pdf accessed 7/30/2014.

8. www.fda.gov/downloads/BiologicsBloodVaccines/Allergenics/UCM391580.pdf accessed 8/1/2014.

9. www.accessdata.fda.gov/drugsatfda_docs/label/2014/022472lbl.pdf accessed 7/30/2014.

10. Traynor K. Inhaled insulin product approved. Am J Health Syst Pharm. 2014 Aug 1;71(5):1238.

11. Dhillon S, Clarke M. Tasimelteon: first global pproval. Drugs. 2014 Mar;74(4):505-11.

12. www.accessdata.fda.gov/drugsatfda_docs/label/2014/205677s000lbledt.pdf accessed 8/1/2014.

BLEPHARO-INDUCED OSD: No Match for Scleral Lenses

Real-life cases offer proof that this modality can relieve symptoms of ocular dryness.

By Melissa Barnett, OD

Scleral contact lenses have changed the lives of many of my patients, enabling them to see clearly while wearing a comfortable lens option. We are so fortunate to have several scleral lens designs (including front surface toric lenses for residual astigmatism, toric peripheral curves for eyes with great-than-average scleral toricity, reverse geometry and multifocal) available to us.[1,2]

These lenses are a fantastic choice for patients who have irregular corneas and glaucoma, and even more so if ocular surface disease (OSD) compromises the ocular surface in such patients. In fact, I have used them for many years on individuals with lid-induced OSD (*Figure 1*) and I would like to share a few clinical pearls for fitting scleral lenses in such instances. The lenses and designs mentioned are just a few of many possible solutions that practitioners have available today.

CASE 1: BANDAGE BE GONE!

A 74-year-old Caucasian male was referred to me by a corneal specialist for a contact lens fitting of the right eye. He complained of dryness in the morning and wore a soft bandage contact lens extended wear OD. Past history included an eyelid tumor OD; status post resection with lagophthalmos and corneal exposure. Corneal scarring was present OD and pseudophakia was present OU.

A scleral lens to manage the ocular surface and provide improved vision was discussed with the patient. If he was not successful with scleral lenses, the plan was to perform a penetrating keratoplasty OD. Even after a penetrating keratoplasty, a contact lens would be indicated to treat the ocular surface; a tarsarrophy would be the last resource, if needed.

- ***The exam.*** The patient's medical history was significant for diabetes. Systemic medications included aspirin, glyburide, metformin, multivitamin and omega-3 fish oil. Visual acuity without correction was 20/400 OD (improved to 20/100 with pinhole) and 20/20 -2 OS. Manifest refraction of -2.25+3.25 x 070 OD provided 20/100. Simulated keratometry readings with topography OD: 48.49 @ 013 / 39.20 @ 103. Irregular astigmatism was present OD.

Examination revealed ocular rosacea OU and a notch in the right upper eyelid with an absence of a portion of the eyelid from

ABOUT THE AUTHOR

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the eyelid resection. I also noted a stable punctal plug on the right lower eyelid, as well as a corneal scar extending from 11:00 to 5:00 with extension into the visual axis and neovascularization from 11:00 to 5:00 extending into the visual axis OD. I observed no epithelial defect. The anterior chamber was deep and quiet, and intraocular pressures (IOPs) were normal OU. Moreover, the posterior chamber intraocular lens (IOL) OU were stable and the optic nerve, macula and peripheral retina were all within normal limits.

• ***The fit.*** Once I was able to remove the bandage contact lens for the right eye without any complications, I fit a scleral contact lens to treat his ocular surface and irregular astigmatism.

Based on corneal topography measurements and visual ocular shape, the initial diagnostic lens selected was an Accu Lens Maxim scleral lens in Boston XO2 material (Bausch + Lomb) with a 16.5mm diameter. Lens parameters were OD 45.00D base curve (BC), 16.5-mm overall diameter (OAD), 9.50mm optical zone diameter (OZD), -4.00D power, sag 4.88. excessive central and peripheral vault was present with this lens.

The next diagnostic lens was OD 41.00D BC, 16.5mm OAD, 9.50mm OZD, plano power, sag 4.63. This lens had 100µm excessive vault centrally with peripheral blanching 360 degrees. Based off of the second diagnostic lens, lens parameters were OD 40.50D BC, 16.5mm OAD, 9.50mm OZD, +3.25D power, sag 4.55 flatter peripheral curves. The scleral lens fitting was successful, with good initial fit, vision and comfort and the patient had no trouble with insertion and removal.

• ***The result.*** Best-corrected visual acuity (BCVA) OD was 20/40-2. At the scleral lens dispensing and training appointment, the patient reported good vision and comfort with the lens. His visual acuity remained stable at 20/40-2, and he completed the insertion and removal training.

I advised him to discontinue the soft bandage contact lens (both day and night), but informed him to restart nighttime bandage contact lens wear if any dryness or irritation occurred during the day. I also prescribed lubricant ointment to be used at nighttime. No antibiotics were prescribed.

Two weeks later at the follow-up visit, the patient reported good vision and improved comfort with the scleral lens worn during the day. He was not using the bandage contact lens at night and had no complaints of dry eyes either day or night. The patient's BCVA remained at 20/40-2 OD with no over-refraction.

At the time of the examination, he had been wearing the lens for five hours, but on average reported wearing the lens for up to 14 hours. He was using Clear Care (Alcon) and non-preserved sodium chloride 0.9% inhalation solutions.

Scleral lens fit of the right eye demonstrated good central apical clearance. I noted less clearance present nasal and temporal; however, the lens vaulted the entire cornea. Mild peripheral blanching was present in the nasal quadrant only from 2 o'clock to 4 o'clock associated with a nasal pinguecula. Conjunctival blanching may be due to a landing that is too flat or too steep. If blanching is under the entire area of the scleral lens, the landing may need to be increased by increasing the lens diameter. If blanching is under the scleral lens edge, it may cause conjunctival staining and hypertrophy over time. A notch could be considered; however, because the pinguecula was mild, it was not indicated. I did not observe any tear debris.

Upon removal of the lens, the eyelid appeared unchanged and the cornea demonstrated trace inferior punctate epithelial keratopathy without microcystic edema in either eye. I saw no evidence of a conjunctival impression ring, so I instructed the patient to continue scleral lens wear during the day using the same solutions. He also continued to use the lubricant ointment in the evening without a bandage contact lens.

Six months later, he is still successfully wearing his scleral lens. He continues to have some mild blanching nasally and still follows the same wearing schedule.

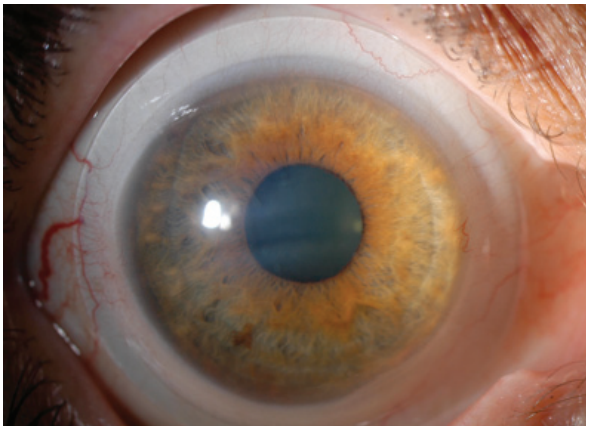

Fig. 1. Scleral lens used in ocular surface disease.

CASE 2: MOVE OVER, EYE DROPS

A 58-year-old Caucasian female presented with a history of dry eye. Her eyes were particularly

dry status post blepharoplasty for the upper and lower eyelids OU. She complained of red, burning, tearing and photophobic eyes since her surgery, which may have been a result of over-correction of the upper eyelid; however, no evidence of lagopthalmos was present in either eye. Her ocular history was also significant for posterior subcapsular cataract OD, and she previously wore soft lenses (both daily and two-week replacement). Ocular meds included topical cyclosporine 0.05% one to two times a day and bottled artificial tears one to two times a day; however, she noted no improvement with the eye drops.

• ***The exam.*** The patient's medical history was significant for recurrent herpes simplex virus keratitis. Medications taken were estradiol, progesterone and Valtrex. Visual acuity with glasses was 20/25+1 OD (improved to 20/20+1 with pinhole) and 20/40-2 OS (improved to 20/25+1 with pinhole). Manifest refraction of -10.25+1.00 x 160 OD enabled 20/20-2. Manifest refraction of -8.50+0.75 x 091 in the left eye enabled 20/20-2. Simulated keratometry readings with topography read OD: 42.35 / 065 / 42.24 /155, OS: 42.72 / 098 / 41.82 / 008. Additionally, irregular astigmatism was present OD and regular astigmatism was present OS. Quality of tears was poor and TBUT was two seconds OD.

Slit-lamp examination revealed 1+ meibomian gland dysfunction OU. No evidence of lagophthalmos was present in either eye. Conjunctival staining (2+), chemosis (1+) and reduced tear meniscus were also present OU. I observed corneal staining OU; however, the right eye was worse than the left. Tear break-up time (TBUT) was two seconds OD and four seconds OS. IOP was normal in both eyes. I also noted trace nuclear sclerosis OU. The patient's right eye had a posterior subcapsular cataract. Her optic nerves and maculae were normal OU.

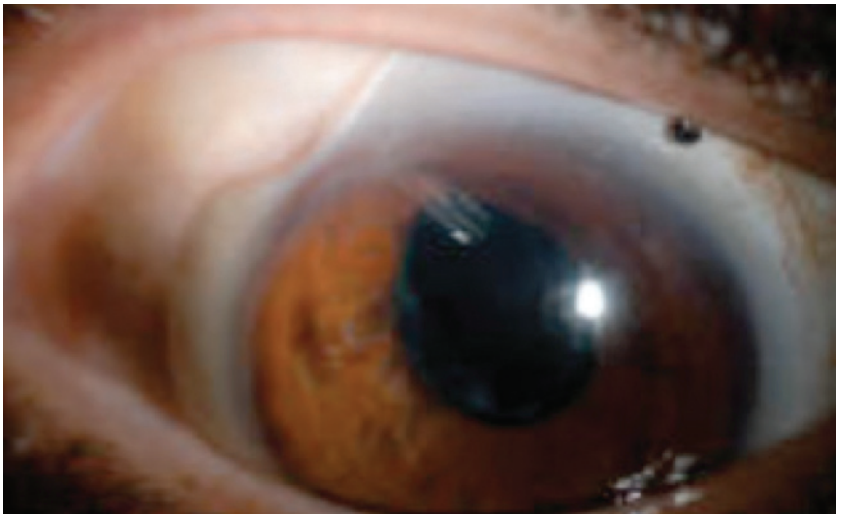

Fig 2. A superotemporal notch was made in this patient's scleral lens to avoid contact with a Baerveldt glaucoma implant.

• ***The fit.*** To rehabilitate the ocular surface, the initial lenses selected were a 16.5mm diameter lens with a 4.63 sagittal depth.[3] I fit the patient with Accu Lens Maxim scleral lenses in Boston XO2 material with a 16.5-mm diameter OU. Lens parameters were: OD 41.00D BC, 16.5mm OAD, 9.50mm OZD, -8.00D power, sag 4.63 and OS 41.00D BC, 16.5mm OAD, 9.5mm OZD, –6.50D power, sag 4.63.

• ***The result.*** Visual acuity in each eye was 20/20-1. An over-refraction of +0.25 was present OD; no over-refraction was present OS. Binocular vision without over-refraction was 20/15. Both lenses exhibited good central apical clearance. Less clearance was present superonasally; however, each lens cleared the cornea. The lenses fit well peripherally without blanching and there was no evidence of tear debris or surface debris on either lens.

The patient noticed "tremendous improvement" in her ocular dryness. Thanks to the scleral lenses, she no longer experienced dry eye symptoms while wearing her lenses; without lenses, she still requires artificial tears every 15 minutes during waking hours. She was happy with the vision and comfort the lenses provided. She required no artificial tears while wearing the lenses, but continued to use non-preserved artificial tears and cyclosporine 0.05% BID when not wearing them.

Fortunately, neither mucin debris nor lens surface debris under the lens was present, both of which are common in patients with OSD. Thus, it is important to inform patients of this problem before beginning the fit. Chamber debris is mucous build-up in the reservoir behind lens and tends to be more common in lenses ≥18mm due to a larger fluid reservoir and slower fluid turnover. If mucous debris is present, the lens diameter can be reduced. Patients may also remove the lens and manually clean or rinse and reinsert it one to two times during the day to reduce mu-

cin debris. If possible, reducing lens clearance can reduce mucin debris.

Another tip is to use an artificial tear with increased viscosity (such as Celluvisc, Allergan) with the application of a scleral lens. It is also possible to loosen the peripheral curves to increase fluid exchange or tighten peripheral curves to reduce excessive fluid exchange. If complaints of debris are noted only in the morning, the eye may be soaked with an eye cup before applying lenses, but be sure to convey to patients the importance of disinfecting the cup after use. It is imperative to treat the underlying eyelid disease.

To treat front surface debris, suggest that patients change hand soap to a contact lens or acne treatment hand soap. It is important that hand soap does not contain lotion. Verify that patients are applying make-up *after* scleral lens insertion. Also, on-eye surface cleaning with a saline-moistened cotton swab or eye shadow applicator is beneficial in removing front surface debris. The lens could also potentially be plasma treated once again. Increased lubrication over the lens throughout the day may also decrease or eliminate debris. Changing to a peroxide-based cleaner and adding enzymatic cleaner is also beneficial. In this case, cyclosporine was used to treat meibomian gland dysfunction.

CASE 3: TIME FOR A LENS UPGRADE

A 58-year-old Hispanic female was referred for a contact lens examination. She was experiencing irritated eyes with her current hybrid contact lens and had reverted back to a soft lens for the left eye. She complained of poor vision, especially at distance when driving at night. She also reported double vision when reclining, but not in straight-ahead gaze.

• ***The exam.*** The patient's medical history was significant for diabetes, hypertension, hypothyroidism and sleep apnea. Systemic medications included insulin, metformin, glimepiride, lisinopril, hydrochlorothiazide, levothyroxine and escitalopram. In addition to glaucoma, her ocular history was significant for dry eye OU. Ocular medications were Alphagan (Allergan) and Cosopt (Merck) BID OD. She had a stable IOL in her right eye and a cataract in her left eye. Primary open-angle glaucoma was present in both eyes.

Of note, she had undergone a Baerveldt glaucoma implant six months prior to this examination. Following the glaucoma implant, she developed a right hypertropia and alternating exotropia. This is not uncommon, as persistent restrictive strabismus may occur with glaucoma drainage implants due to scarring between the rectus and oblique muscles.[4]

Entering vision OD was 20/50+2 without correction and OS was 20/50-2 with a soft contact lens. Anterior segment examination revealed a stable glaucoma drainage device implant located superotemporally in the right eye with a bleb over the plate. The tube was well covered and visible in the anterior chamber. Both eyes exhibited corneal staining (1+ inferior punctate epithelial keratopathy). The posterior chamber IOL was stable OD and mild nuclear and cortical sclerosis was present OS. The patient's IOPs were 25mm Hg OD and 21mm Hg OS at 1:57pm. Optic nerve examination revealed vertical elongation of the disc with peripapillary atrophy. My-opic degeneration of both the macula and periphery was present OU.

• ***The fit.*** My recommended treatment included nonpreserved artificial tears, frequent breaks when reading and using a computer, good water intake and daily omega-3 fatty acid intake. Due to elevated IOP OD, I had her schedule an appointment with the glaucoma surgeon.

I discussed medical management and other options with the patient, and fit her with Maxim (Accu Lens) scleral lenses in Boston XO2 material. Lens parameters were OD 46.00D BC, 15.0mm OAD, 8.00mm OZD, +0.50D power, sag 4.35, 4mm notch (to insert superotemporally) and OS 46.00D BC, 15.4mm OAD, 8.0mm OZD, –13.00D power, sag 4.46 (intermediate/near).

I targeted the right lens for distance and the left lens for intermediate/near to eliminate diplopia. I also had a superior temporal notch made in the right scleral lens to avoid the Baerveldt glaucoma implant (*Figure 2*). Putting a notch in a scleral lens may sound complicated, but it is not. First, measure the size (both height and width) of the conjunctival abnormality using a slit beam. Then, measure the height and width of the conjunctival abnormality while the scleral lens is on the eye and mark the scleral lens with a Sharpie or surgical skin marker while its is on the eye. Next, measure the tracing on the lens after removing it from the eye. Finally, call your laboratory consultant to discuss the plan and send the lens to the laboratory.

• ***The result.*** Visual acuity at distance was 20/30 OD, 20/30+2 OS and 20/25-2 OU. Additionally, the patient had good computer and near vision, with J1+ OS and J1+ OD at near. She reported incredible comfort with the scleral lenses, both of which fit well with good

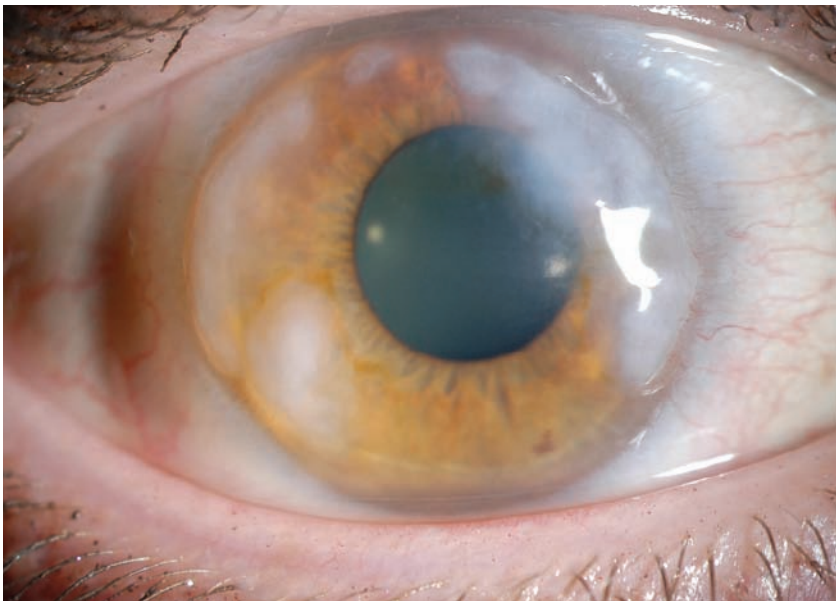

Fig 3. Elevated Salzmann's nodules.

central apical clearance and good peripheral alignment. I noted no blanching in either eye, and the scleral lens notch was correctly positioned superior temporal in the right eye and did not touch the glaucoma implant. The patient was able to wear the lenses for 15 hours each day. IOPs checked multiple times during a three-month period ranged from 16mm Hg to 18mm Hg in each eye.

CASE 4: SALZMANN WHO?

A 41-year-old Caucasian female was referred by a corneal specialist for a contact lens fitting. She had a history of Salzmann's nodular degeneration in both eyes and presented with blurry vision for distance with glasses. She previously tried soft and gas permeable (GP) contact lenses, but vision was not acceptable with soft lenses and she was intolerant to GP lenses. Consequently, she hadn't worn contact lenses for the last five years. In addition to Salzmann's nodular degeneration, dry eyes were present OU. Ocular medications included nonpreserved artificial tears as needed, fluorometholone 1% and ketorolac 0.5% daily OU.

• ***The exam.*** There was no significant medical history, and the patient was not taking any systemic medications. Visual acuity with glasses was 20/30-2 OD and 20/40 OS. Manifest refraction of -6.75+6.25x123 OD enabled 20/30-2 and manifest refraction of -8.50+6.25 x 059 OS enabled 20/20-2. Simulated keratometry readings with topography read OD: 34.90 / 117 / 25.40 /027 and OS: 42.56 / 066 / 30.74 / 156. Irregular astigmatism was present OU.

Slit lamp examination revealed 1+ meibomian gland dysfunction OU. Mild hyperemia was present OD and the patient's conjunctiva was white and quiet OS. Scattered elevated Salzmann's nodules were present from 12 o'clock to 4 o'clock and 7 o'clock to 12 o'clock OD, and elevated Salzmann's peripheral nodules were also present OS (*Figure 3*). In addition, I noted an iron line in the mid-periphery OS, but saw no staining in either eye. IOP, optic nerves and maculae were normal OU.

• ***The fit.*** To improve vision and rehabilitate the ocular surface, the initial lenses selected were Jupiter GP scleral lenses (Essilor) in Optimum Extra (Contamac) with an 18.2mm diameter. Lens parameters were: OD 44.00D BC, 17.6mm OAD, 9.0mm OZD, -7.75D power and OS 44.25D BC, 18.2mm OAD, 9.0mm OZD, -6.50D power. Visual acuity OD was 20/20-2 and 20/20+2 OS. Good central and peripheral clearance was present in each eye. The lenses cleared the nodules in both eyes.

The patient noticed tremendous improvement with ocular dryness and denied any sensitivity to light. She also reported that her eyes were no longer watery and that vision was improved with very good comfort in each eye. The lenses were stable for three years, after which the right lens began to chafe the cornea superotemporally at 2 o'clock, causing scleral lens intolerance. I referred the patient back to the corneal specialist to consider removal of Salzmann's nodules in the right eye. Scleral lens wear was discontinued and superficial keratectomy performed at 2 o'clock and 7 o'clock in the right eye.

After four months, she returned for a scleral lens refit. New simulated K readings with Pentacam (Oculus) were OD: 32.20 / 40.1 / 42.20 / 130.1, OS: 27.1 / 138.2 / 46.1 / 48.2. High irregular astigmatism was present OU.

• ***The refit.*** The initial lenses selected were Alden Optical's mini-scleral, fully vaulting lens, Zenlens, available in prolate and oblate designs. I chose an oblate design in Boston XO2 material with a 16.0mm diameter. Lens parameters were: OD 37.5DBC,

16.0mm OAD, 9.0mm OZD, -1.00D power, 4.700 sag and OS 37.5DBC, 16.0mm OAD, 9.0mm OZD, +0.50D power, 4.700 sag. Visual acuity OD was 20/20 and 20/20+1 OS. Good central and peripheral vault was present in each. Most importantly, an even fluorescein pattern was present OU and all peripheral nodules were cleared.

• ***The result.*** So far, the patient has been wearing the lenses for four months and reports good vision and comfort with the lenses. She is able to wear them 12 hours per day and uses a +1.25D spectacle prescription over the lenses for near. At the last visit, I ordered a new left lens with the same parameters as above and a +1.75D power for monovision.

TAKE-HOME TIPS

With these cases in mind, let's consider what fitting pearls we may glean from the experience. A history of glaucoma surgery—including trabeculectomy, shunt, stent or glaucoma implant—may complicate the fitting of scleral contact lenses because the conjunctiva may be elevated or uneven in the area in which the procedure was performed. Furthermore, excessive pressure or rubbing over tube shunts or valves may compromise IOP and lead to conjunctival and/or tube erosion, which can increase the risk of further complications such as endophthalmitis.

A notch, or an advanced periphery design such as an EyePrint-Pro prosthetic scleral cover shell (EyePrint Prosthetics) or a PROSE (prosthetic replacement of the ocular surface system) device, can be created in the scleral lens to avoid both pressure on the conjunctiva and contact with the surgical area.

My approach to lens selection depends on multiple factors. For a new fit, I evaluate the corneal abnormality, eye shape, aperture and Pentacam or topography results, then decide on the diameter and lens design. For a refit, I choose a lens that will solve the problem of the current fit. For example, there is less sagittal depth with Maxim lenses than Jupiter lenses. In addition, the Zenlens Oblate design can be used to vault the peripheral cornea. It is also useful for other corneal abnormalities such as post-lasik corneal ectasia.

With sclerals, it is possible to fit inside of conjunctival abnormalities by decreasing the lens diameter or to fit over abnormalities by increasing the lens diameter. Alternatively, it is possible to go around the abnormality by putting a notch in the lens. The notch should never be cut into the optic zone or air will get suck in under the lens.

In cases of glaucoma surgeries or implants, it may be beneficial to avoid the abnormality altogether and to create a notch in the scleral lens. Scleral lens notches are also advantageous when other types of conjunctival abnormality (e.g., an elevated pinguecula or conjunctival cyst) are present.

Finally, when inserting a scleral contact lens, it is important to place it on the eye with the correct orientation. Be sure to inform the staff person who is training the patient on scleral lens application and removal—as well as the patient—about the need for proper lens orientation. RCCL

1. Pecego M, et al. Jupiter scleral lenses: the UC Davis Eye Center experience. Eye Contact Lens. 2012 May;38(3):179-82.

2. Visser ES, et al. Modern scleral lenses. Part I: Clinical features. Eye Contact Lens 2007;33(1):13-20.

3. Alipour F, et al. Use of mini scleral contact lenses in moderate to severe dry eye. Cont Lens Anterior Eye. 2012 Dec;35(6):272-6.

4. Schwartz KS, et al. Glaucoma drainage implants: a critical comparison of types. Curr Opin Ophthalmol. 2006 Apr;17(2):181-9.

"Real-world" Strategies for Improving Contact Lens Compliance

Give your patients the "green light" for better care!

By Danielle M. Robertson, OD, PhD

During a recent contact lens examination, I asked my patient for information regarding her current contact lens prescription. She happily handed me a box of daily disposables that had expired four years earlier. There were still lenses remaining. As a patient, she was excited at the money she had saved by stretching out her prescription over this extended time period. As a clinician, I instantly imagined everything that could have gone wrong.

Unfortunately, this scenario is an all too familiar one. Despite the introduction of products such as daily disposable lenses and "all in one" multipurpose solutions, compliance remains a metaphorical elephant in the room. Historically, compliance with contact lens wear has been estimated to range from 40% to 70% among adult wearers.[1] These rates of noncompliance are likely greatly underestimated due to the methodology used to ascertain actual compliance. In support of this argument, recent studies in the US and abroad suggest that optimal compliance with practitioner recommended daily lens wear is closer to 1% for all soft lens wearers.[2,3]

Several factors have been proposed as contributors to noncompliance. These include cost, regimen complexity, frequency and duration of use, and the nature of the condition.[4] The last of these, which includes asymptomatic lens wear, can fuel patient misconceptions regarding the safe wear and care of contact lenses. While patient education and attitudes are paramount in achieving compliant contact lens use, successful patient education continues to fall short and truly effective strategies to change behavior appear to be non-existent.

COMPLIANCE WITH LENS WEAR AND CARE REGIMENS

Noncompliance has been shown to occur with most, if not all, steps involved with lens wear and care regimens. Evaluation of adherence to standard of care contact lens practices indicates that the average lens wearer only performs 50% or fewer of the steps correctly.[3] This includes complying with recommended lens replacement frequencies, sleeping in lenses prescribed for daily wear, inappropriate use of cleaning and disinfection solutions, failing to rub and rinse lenses, and poor hand and lens case hygiene.

Frequent replacement lenses account for the majority of the soft lens market. Amongst all frequent replacement modalities, two-week disposable lenses have consistently been shown to carry the highest rate of noncompliance, with an average wearing period 2.6x longer than the recommended replacement

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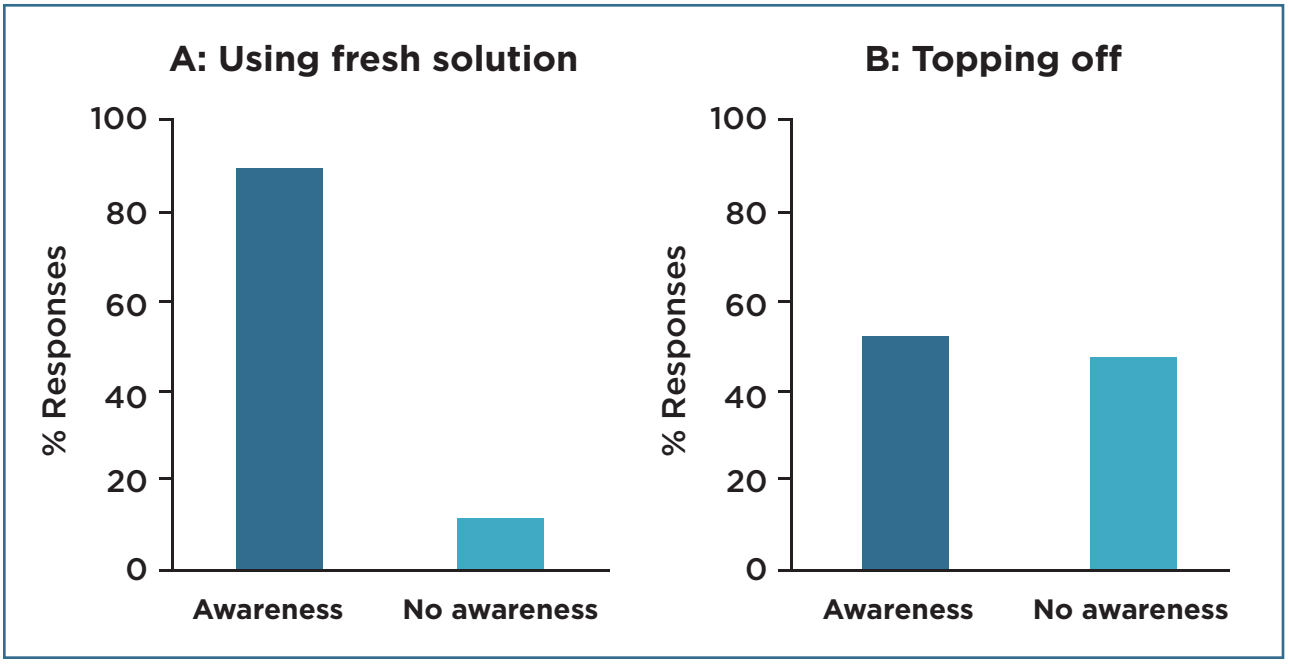

Fig. 1. Solution IQ. Respondents correctly identified the need to use fresh solution daily (A), but demonstrated reduced awareness of risk with topping off (B). *Adapted from Robertson et al.*[3]

frequency.[5] For many, cost is the primary concern. Not surprisingly, stretching lenses to reduce cost is a major contributor driving this noncompliant behavior.

However, a recent study of 1,000 lens wearers in Japan indicates that patient misconceptions about lens safety also play a role. In this study, more than 60% of lens wearers cited "no harm in extending the duration of use" as the most common reason for noncompliance with recommended replacement schedules.[6] But is noncompliance with lens replacement schedules a risk factor for lens-related complications? Work by Dumbleton and colleagues indicate that it is. In their study of 501 contact lens wearers, they reported that the rate of contact lens-related adverse events was higher for patients who wore their lenses for longer than the recommended replacement interval and for those who failed to rub and rinse their lenses during cleaning.[5]

While daily disposable lenses that eliminate the need for care solutions and lens storage cases have the highest rate of replacement frequency compliance, they do not eliminate risk completely. Epidemiological studies from the UK have confirmed that inappropriate use of this modality can result in severe corneal infection and suggest that the incidence may be the same, if not higher, than with other frequent replacement modalities.[7]

In addition to replacing lenses at prescribed intervals, correct use of care solutions and exposure to water remain problematic. Following the 2006 outbreak of *Fusarium* keratitis, solution re-use or "topping off" was identified as a risk factor for lens-related microbial keratitis.[8] A survey of established lens wearers in the Dallas-Fort Worth area also identified topping off solutions in the lens case as a key area where patient education is lacking (*Figure 1*).[3]

In this study, approximately 90% of established lens wearers correctly recognized the importance of using fresh cleaning solution daily and, more importantly, reported routinely using fresh solution. The disappointing and unsettling finding, however, was that half of the lens wearers queried failed to understand the need for discarding the used solution already present in the lens case, prior to adding new. Re-using old solution creates a one-two punch—both lowering disinfection efficacy and providing a moist environment that fosters growth of the case's microbial inhabitants.

Since the first reported case of *Acanthamoeba* keratitis (AK) in South Texas in the 1970s, water exposure during contact lens wear remains a major risk factor for infection. Although water exposure to soft lenses during wear from swimming and showering is more common than not, and many

patients use tap water to rinse their lens cases on a routine basis, the overall incidence of lens-related AK remains low at around one to 33 cases per million contact lens wearers per year in developed countries. This low incidence may account in part for the lack of patient knowledge of the risks associated with water and their subsequent behaviors (*Table 1*).[3] This represents an important area for patient education by eye care practitioners for both soft and rigid lens wearers. While *Acanthamoeba* infections are infrequent among this latter group, they can and do occur, and the consequences are dire.[9]

DON'T FORGET THE LENS CASE

Contact lens storage cases serve as a reservoir for infectious microorganisms. Contributors to the high bacterial load include failure to replace the lens case on a routine basis and inadequate hygiene practices. In a study of over 700 lens wearers in the US, Hickson-Curran and colleagues reported a median cleaning frequency of two to three times per week, with one third of patients cleaning their lens case monthly or less often.[10] Cleaning of the lens case with water has also been associated with higher rates of gram-negative contamination.[11]

Microbial contamination of the lens case often results in biofilm formation, the encasement of bacteria within a protective extracellular polysaccharide matrix. Currently available contact lens care solutions have limited efficacy against bacterial biofilms formed on lens surfaces and in lens cases.[12,13] These heavy biofilms require mechanical removal, either through rubbing and rinsing or tissue wiping, to effectively remove them and facilitate disinfection.[14]

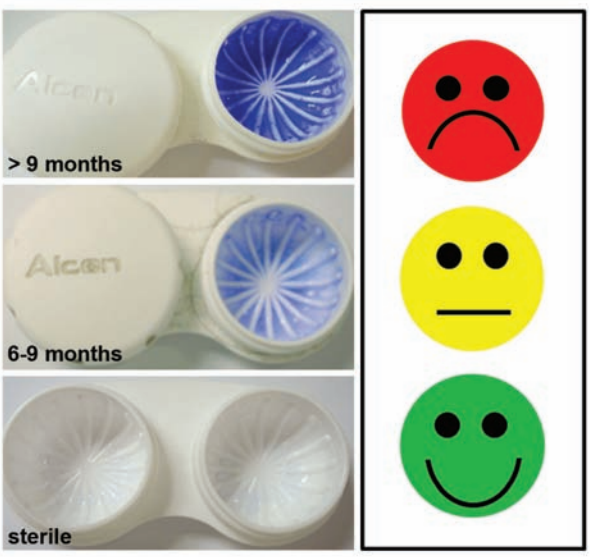

Fig. 2. Crystal violet staining of lens storage cases. Staining of cases was evident as early as six months. Cases older than nine months showed dramatic increases in staining intensity. ***Adapted from Burnham et al.*[15]**

One of the biggest challenges eye care practitioners face when trying to promote cleaning and replacement of the lens storage case is the absence of visual signs of contamination. This buildup can be readily visualized by staining with crystal violet, a histologic stain that labels protein and DNA, the primary constituents of cellular debris. As shown in *Figure 2*, staining of lens storage cases collected across our university campus showed an increase in crystal violet staining that paralleled the age of the lens case.[15] When compared against sterile, unused cases, lens cases older than six months all demonstrated some level of staining. The phenomenon was further increased after one year of use.

Using the stoplight approach demonstrated in *Figure 2*, we can categorize levels of contamination as viewed by crystal violet, making it readily visible for patients and offering an ideal interventional strategy for eye care practitioners to address lens case cleaning and replacement.

TELL PATIENTS: COMPLIANCE MATTERS

Proposed strategies to enhance patient compliance have included the use of both verbal and written instructions, the use of visual aids such as photographs to reinforce proper instruction, and repetition and frequent monitoring of compliance at annual and aftercare exams.[16] Effective hand washing techniques should be reinforced at all visits. Regularly spaced self-review exercises on appropriate lens handling techniques have been shown to enhance lens case hygiene; however, this strategy had little effect on other aspects of lens care.[17]

Examination of lens case contaminants in a population of lens wearers participating in clinical research also has confirmed that patient education results in an improvement in lens case hygiene and is more effective when presented in written form as opposed to verbal instructions.[11] Whether these changes persist long term and result in true behavioral modification requires further investigation.

Unfortunately, education alone isn't likely to exert a measurable change in patient attitudes and behavior with their contact lens wear and care practices. It is well

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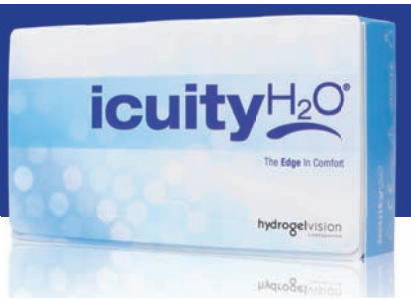

Table 1. Behaviors Associated With Water Exposure

BEHAVIOR	PERCENT OF RESPONDENTS
Shower while wearing lenses	86%
Clean their lens case with tap water	52%
Clean their lenses with tap wayer	8%
Swim/water sports wearing lenses	66%

Source: Adapted from Robertson et al.[3]

established that the majority of lens wearers exhibit noncompliant behaviors. As with other medical practices, awareness of risk factors associated with contact lens wear is not a major deterrent to poor behavior.[3]

Interventional approaches may be more effective. In his review of patient education and compliance, McMonnies advises that the optimal time to review wear and care procedures is during an exam for a red eye or when a patient complains of persistent irritation or discomfort during lens wear.[18] He argues that a patient whom is symptomatic and receives an explanation for those symptoms may be more motivated to enhance their compliance. In support of an interventional approach, we found that patients were more likely to report replacing their lens case if they had experienced a prior contact lens-related complication.[1]

McMonnies also advocates the use of practice newsletters and group emails. Along these lines, emails or text messages may serve as a useful adjunct to remind patients to replace their lenses or their lens storage case. The implementation of newly designed blister packs (such as the Magic 1-day Menicon Flat Pack) as a countermeasure to poor hand hygiene may be beneficial in reducing the introduction of bacterial contaminants to the eye.[19] However, even these would require a strict level of compliance with removal of the lens from the blister pack followed by direct insertion into the eye as further lens manipulation by hand would override any beneficial effect.

Another potentially useful strategy to promote good behavioral patterns is the use of a subscription membership system, where members pay an annual fee and receive a continuous supply of lenses throughout the year, as needed.[20] The effectiveness of a subscription-based system, as recently evaluated in the Japanese market, has been shown by an increase in lens replacement frequency by members when compared to non-members and a corresponding reduction in the rate of non-severe ocular complications associated with lens wear.

As the indications for contact lenses continue to expand with the development of new designs and technologies, so too will the need for increased compliance with contact lens wear and care regimens. While some areas of lens care may benefit from increased education, new innovative strategies geared towards modification of attitudes, perceptions and behaviors to enhance compliance are needed. RCCL

1. Bui TH, Cavanagh HD, Robertson DM. Patient compliance during contact lens wear: perceptions, awareness, and behavior. Eye Contact Lens 2010;36:334-339.

2. Morgan PB. Contact lens compliance and reducing the risk of keratitis. Optician 2007:20-25.

3. Robertson DM, Cavanagh HD. Non-compliance with contact lens wear and care practices: a comparative analysis. Optom Vis Sci 2011;88:1402-1408.

4. Donshik PC, Ehlers WH, Anderson LD, Suchecki JK. Strategies to better engage, educate, and empower patient compliance and safe lens wear: compliance: what we know, what we do not know, and what we need to know. Eye Contact Lens 2007;33:430-433.

5. Dumbleton KA, Woods CA, Jones LW, Fonn D. The relationship between compliance with lens replacement and contact lens-related problems in silicone hydrogel wearers. Cont Lens Anterior Eye 2011;34:216-222.

6. Ichijima H, Shimamoto S, Ariwaka Y, Muraki K, Cavanagh HD. Compliance study of contact lens wearers in Japan, part 1: internet survey of actual circumstances of lens use. Eye Contact Lens 2014;40:169-174.

7. Dart JKG, Radford CF, Misassian D, Verma S, Stapleton F. Risk factors for microbial keratitis with contemporary contact lenses: a case-control study. Ophthalmology 2008;115:1647-1654.

8. Levy B, Heiler D, Norton S. Report on testing from an investigation of Fusarium keratitis in contact lens wearers. Eye Contact Lens 2006;32:256-261.

9. Robertson DM, McCulley JP, Cavanagh HD. Severe acanthamoeba keratitis after overnight orthokeratology. Eye Contact Lens 2007;33:121-123.

10. Hickson-Curran S, Chalmers RL, Riley C. Patient attitudes and behavior regarding hygiene and replacement of soft contact lenses and storage cases. Cont Lens Anterior Eye 2011 Jan 10;34:207-215.

11. Tilia D, Lazon de la Jara P, Zhu H, Naduvilath TJ, Holden BA. The effect of compliance on contact lens case contamination. Optom Vis Sci 2014;91:262-271.

12. Wu YT, Zhu H, Willcox M, Stapleton F. Removal of biofilm from contact lens storage cases. Invest Ophthalmol Vis Sci 2010;51:6329-6333.

13. Szczotka-Flynn LB, Imamura Y, Chandra J, Yu C, Mukherjee PK, Pearlman E, Ghannoum MA. Increased resistance of contact lens-related bacterial biofilms to antimicrobial activity of soft contact lens care solutions. Cornea 2009;28:918-926.

14. Wu YT, Zhu H, Willcox M, Stapleton F. The effectiveness of various cleaning regimens and current guidelines in contact lens case biofilm removal. Invest Ophthalmol Vis Sci 2011 April 7;52:5287-5292.

15. Burnham GW, Cavanagh HD, Robertson DM. The impact of cellular debris on Pseudomonas aeruginosa adherence to silicone hydrogel contact lenses and contact lens storage cases. Eye Contact Lens 2012;38:7-15.

16. McMonnies CW. Improving patient education and attitudes toward compliance with instructions for contact lens use. Cont Lens Anterior Eye 2011;34:241-248.

17. Yung AM, Boost MV, Cho P, Yap M. The effect of a compliance enhancement strategy (self-review) on the level of lens care compliance and contamination of contact lenses and lens care accessories. Clin Exp Optom 2007;90:190-202.

18. McMonnies CW. Improving contact lens compliance by explaining the benefits of compliant procedures. Cont Lens Anterior Eye 2011;34:249-252.

19. Nomachi M, Sakanishi K, Ichijima H, Cavanagh HD. Evaluation of diminished microbial contamination in handling of a novel daily disposable flat pack contact lens. Eye Contact Lens 2013;39:234-238.

20. Ichijima H, Shimamoto S, Ariwaka Y, Sakata H, Cavanagh HD. Innovations to improve patient compliance. Contact Lens Association of Ophthalmology 2014;Annual meeting:abstract.

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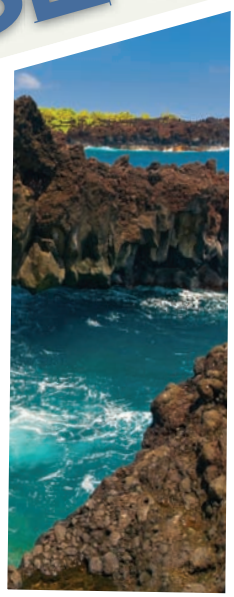

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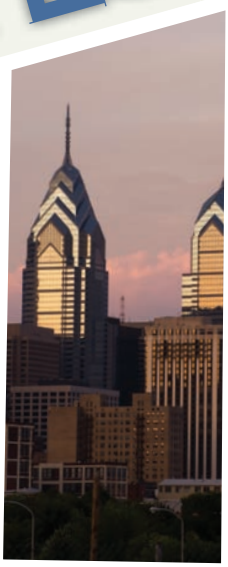

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CONTROLLING MYOPIA, Changing Lives

By Richard L. Anderson, OD, Thomas Aller, OD, and Jeffrey J. Walline, OD, PhD

Myopia is currently receiving greater attention in eye care for at least three reasons. First, its prevalence has been increasing.[1-3] Second, myopia can be considered a "dose-dependent" risk factor for many sight threatening ocular diseases.[4,5] Finally, better clinical tools to slow myopic progression have recently become available.[4-17] Instead of treating most myopia as merely an inconvenience to the patient, these clinical tools allow practitioners to reduce its sight-threatening adverse effects and quality of life by providing treatment options to actually slow myopic progression instead of merely compensating for the changing refractive error or, in extreme situations, actually making myopia worse.

In the United States, myopia's prevalence rate has increased from 25% to 42% from 1971 to 2004.[3] Worldwide, the highest rates are found in Asian populations, approaching 96% in one study population of Taiwanese medical students.[18] Significant increases have occurred within just one generation, which implies that our environment has a significant effect on myopic development, even if there is an underlying genetic component.

Myopia less severe than -6.00D is often termed physiological myopia and has historically been perceived merely as a nuisance to the patient. However, Flitcroft recently showed that myopia is a dose-dependent risk factor for many ocular complications, such as glaucoma, myopic maculopathy, cataract and retinal detachment. Levels of myopia in the physiological range show a risk of cataract and glaucoma comparable to that of stroke from untreated hypertension.[19] Myopia was shown to be a risk factor for retinal detachment and myopic maculopathy "far in excess of any identified population risk factor for cardiovascular disease."[19] There is no logical reason to define a cut-off point for when myopia transitions from physiological to pathological. Clearly, it is unwise to consider even low levels of myopia as merely an inconvenience to the patient.

Research has given practitioners several options for curbing myopic progression. Since myopia has no clearly defined "safe" level as risk factor for ocular disease, it would be wise to consider options other than a mere compensation of refractive error using conventional spectacles or contact lenses. These options have been reviewed elsewhere with the most significant being the use of anti-muscarinic agents (atropine, pirenzepine), multifocal style contact lenses and orthokeratology.[20,21] Other methods have either been found to have limited to no clinical usefulness, such as progressive addition lenses,[22-24] bifocals[25-27] and rigid gas permeable lenses.[28,29] Under-

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Dr. Anderson has been in private practice for 34 years, He is the head of the Myopia Control committee of the American Academy of Orthokeratology and Myopia Control (AAOMC).

Corneal lenses can make a meaningful difference in myopic progression during childhood. Here's the case for intervention.

correction of refractive error was also reported to either have no effect or even increase the rate of myopic progression.[30,31]

TREATMENT OPTIONS

The three main treatment options for myopia control at this time are atropine, soft multifocal contact lenses and orthokeratology. The specific mechanisms of treatment effect for each and their effect on individual patients remain the subject of research.

• ***Atropine.*** This agent has a long history of usage to slow myopia.[32] Recent reports show that atropine in dosages as low as 0.01% has a clinically meaningful ability to slow myopia without significant mydriasis or cycloplegia,[10] and the effect persists after discontinuation of the treatment.[11] An increasing number of doctors are adding it to their myopia treatment regimen even though it is only available in low dosages through a compounding pharmacy.

• ***Soft multifocal contact lenses.*** Bifocal contact lenses have several potential advantages over spectacle bifocal lenses that make them worth considering as myopia control treatments. Most soft bifocal contact lenses are either aspheric and/or concentric and work under the principle of "simultaneous vision"—thus, their add power is available to the user with any viewing angle and very large areas of plus power can be presented to the retina with good acceptance.

The earliest report of a myopia control effect with bifocal contact lenses was a conference poster in which a retrospective study reported dramatic reductions in myopia progression in children and adults when switched to bifocal contact lenses.[36] Later, a prospective, randomized, case-control study of a pair of identical twins reported that while the twin assigned to wear single vision soft contact lenses almost doubled her initial level of myopia in the first year, the sibling wearing a bifocal contact lens had a slight reduction in myopia in the first year.[33]

A one-year randomized, controlled clinical trial compared the myopia progression rate in children and adolescents with progressing myopia and eso fixation disparity at near when wearing single vision or bifocal contact lenses. As reported in a symposium abstract, myopia progressed at -0.75D/year in the single vision group; in the bifocal group, myopia progressed at -0.10D/year, based on cycloplegic subjective refraction.[34]

A one-year study found 50% slower myopia progression in children with center distance bifocal contact lenses compared to a historical control group of single vision soft lens wearers.[16] A four-year randomized, controlled study comparing myopia progression rates with test lenses with center distance and peripheral plus power to single vision contacts of the same material found about 40% less myopia progression with the test lens. Notably, this reduction in progression was found throughout

Release Date: September 2014
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the four-year span of the study.[14,37] A two-year double blind, randomized trial of 221 Chinese children wearing a multifocal lens design with alternating concentric rings of full power and an add of +2.50D showed a 36% slowing of myopia.[38] Multiple other studies are ongoing throughout the world with bifocal soft lenses and other anti-myopia designs.

Bifocal contact lenses have been prescribed specifically to reduce esophoria or eso fixation disparity at near, resulting in myopia progression dropping by 80% to 90% relative to single vision contact lenses.[39,40] Patients with insufficient fusional reserves to compensate for esophoria at near will usually exhibit a fixation disparity, and they may compensate by relaxing their accommodation, resulting in a higher lag.[35] By reducing or eliminating the near eso fixation disparity, bifocal contact lenses may both improve near vision comfort through reduction of esophoria and may reduce the accommodative lag through reducing the need to relax accommodation.

• ***Orthokeratology treatment.*** Overnight orthokeratology was first touted to slow the progression of myopia by Reim and colleagues.[39] Since then, case reports,[40] controlled trials[9,13,15,17,41,42] and randomized clinical trials[8,12,43] have all shown the myopia control effects of orthokeratology.

The initial orthokeratology myopia control evidence was a case series that included 253 eyes examined after one year and 164 eyes examined after three years. Calculating the change from baseline refraction after three months of orthokeratology contact lens wear and including an adjustment for any change in base curve, the average myopia progression experienced during the first year was -0.06D and -0.31D over three years.[38] There weren't any control subjects included in this report, but that rate of progression is significantly lower than the expected -0.50D to -0.75D per year progression reported for several control groups.[24,27,29,44]

Two trials using historical control groups reported similar findings, even though one was conducted in Hong Kong[13] and one in the United States.[17] Vitreous chamber growth is highly related to myopia progression, and it is not affected by corneal flattening secondary to orthokeratology.[27] The study in Hong Kong found a 52% slower vitreous chamber growth while the United States study found 41% slower vitreous chamber elongation. These two studies provided the first evidence that orthokeratology may slow the growth of the eye, which leads to slowed myopia progression.

Non-randomized trials with concurrent control groups were subsequently reported by Santodomingo-Rubido,[15] Kakita,[42] Chen[9] and Hiraoka.[41] These studies reported that eye growth slowed by 30% to 52% with overnight orthokeratology contact lens wear. The study by Hiraoka and colleagues followed subjects for five years and indicated that the eyes with orthokeratology contact lenses progressed more slowly than the eyes wearing single vision spectacles for three years. Many trials find that the myopia control treatment is no longer effective after the first year,[24,45] so this is very important.

The first randomized clinical trial was reported by Swarbrick, who conducted a contralateral control trial (randomly assigned one eye of a subject to wear an alignment fitted gas permeable lens and the other eye to wear an orthokeratology lens). Although these findings have not been published in a peer-review journal, data reported at meetings indicated complete eradication of myopia progression over a six-month period.[43]

Longer term randomized clinical trials also showed significant slowing of eye growth. A study of six- to 10-year-old children with less than 4.00D myopia reported a 43% slowing of eye growth over two years,[12] and a study of eight- to 11-year-old children with 5.00D or more myopia reported a 63% slowing of myopia progression when children underwent 4.00D of orthokeratology treatment and wore single vision spectacles to treat the remainder of the myopia.[8]

Both randomized clinical trials, in addition to several other studies, indicate a role for orthokeratology in myopia control. On average, orthokeratology seems to slow the growth of the eye by a little over 40%, which is similar to the slowing of myopia progression reported for soft bifocal contact lenses[7,14,16,33,46] and slightly less than atropine.[10,11,45,47-49] We can tell our patients that, on average, orthokeratology slows myopia progression by about 40% and that children are capable of wearing and caring for the lenses.[8,12,50,51]

STRATEGIES

Myopia treatment is not yet a protocol but rather a treatment that needs to be developed from a thorough understanding of a patient's history, lifestyle, goals and personality. There is no one best answer. Parents are a key part of the decision about which treatment options will be accepted.

Myopia onset usually begins between ages six and nine[52,53] and

progresses rapidly at the beginning, slowing gradually with age.[54,55] Early treatment is vital if lifetime benefits are to be achieved. It may be beneficial to treat a pre-myopic child that is both rapidly losing their hyperopia at a young age and has highly myopic parents.

While corneal reshaping is FDA approved up to -6.00D of myopia and is effective for moderate levels of astigmatism, it may offer less myopia control efficacy at the lowest levels of myopia.[56] Some authors dispute whether or not the initial level of myopia is a significant factor in how successfully orthokeratology is able to control myopic progression.[12,42] Various orthokeratology lens manufacturers have new designs to address this issue, although resultant studies have yet to be published.

Anti-myopia strategies should be employed as soon as myopia onsets, or perhaps even before onset in a case of rapidly reducing hyperopia in a family prone to myopia. The most effective strategy should be attempted first in order to produce the greatest effect during the time that myopia would be progressing rapidly.

Because the ability to slow myopia with corneal reshaping seems to correlate with the initial level of myopia, practitioners should consider using bifocal contact lenses preferentially in patients with low initial myopia (-3.00D or less). Soft bifocal lenses may also be best for high myopia (-6.00D or more), high WTR astigmatism and low or moderate levels of oblique and ATR astigmatism.

Low-dose atropine (0.02%) may be considered in patients unable or unwilling to wear contact lenses. Although no studies have been published on combination therapy, there is the possibility that combining low-dose atropine with multifocal soft lenses or orthokeratology may have a greater effect than either lens treatment alone.

IN PURSUIT OF A PROTOCOL

The Myopia Protocol Committee of the American Academy of Orthokeratology and Myopia Control (AAOMC)—formerly the Orthokeratology Academy of America (OAA)—has the goal of creating a protocol that will redefine how myopia is treated. The nine-member committee of optometrists and ophthalmologists is comprised of researchers, optometry school faculty, consultants, patent holders and clinicians who have published a sizable portion of the current literature on myopia. One heads the first optometry school myopia control clinic. Many are involved in current research to further determine the mechanisms of myopia progression and what tools can be developed to customize treatment options for specific patients.

At the present time, the scientific evidence is not sufficiently advanced to create a true myopia treatment protocol. However, recent randomized clinical trials and other research efforts have identified treatment options that make consensus guidelines a valid clinical tool. Using orthokeratology, multifocal soft lenses and/or low-dose atropine, a practitioner should be able to reduce the progression of myopia by at least 40% on average. Not using such tools—in other words, ignoring the research—means patients will progress nearly twice as fast as those being treated.

The progress in the last 10 years has been nothing short of astounding. Tools are being developed to reduce myopic progression and thereby reduce the incidence of many ocular diseases that are made much worse when eyes become myopic. Although the OAA was originally organized to further the practice of orthokeratology, its mission recently expanded with the realization that most members were successfully using ortho-k to slow myopia. The inclusion of all other scientifically valid tools to do so will benefit the most patients.

Over the last few years, the AAOMC has been instrumental in forming the International Academy of Orthokeratology (IAO) composed of additional sections around the world. Currently, the other sections are the European Academy of Orthokeratology (EurOK), the International Academy of Orthokeratology Asia (IAOA), the Orthokeratology Society of Oceana (OSO) and the Asociación Latinoamericana de Ortoqueratologia (ALO). Each has its own independent board of directors and a general membership. They have local meetings and educational seminars and conduct fellowship testing. They all operate under the umbrella of the IAO and fellowships (FIAO) are awarded after case presentations and oral and written exams.

TIME TO ACT

It is our belief that practitioners should stop accepting myopia progression as normal or at worst an inconvenience to the patient. Myopia is a highly significant risk factor for ocular health, in addition to its negative effects on lifestyle. It is time to use the tools we have available to actually treat myopia as a progressive disease, same as we do with numerous other conditions. RCCL

1. Bar Dayan Y, et al. The changing prevalence of myopia in young adults: a 13-year series of population-based prevalence surveys. Invest Ophthalmol Vis Sci, 2005. 46(8):2760-5.

2. Fan DS, et al. Change in vision disorders among Hong Kong preschoolers in 10 years. Clin Experiment Ophthalmol, 2011. 39(5):398-403.

3. Vitale S, Sperduto RD, Ferris FL. 3rd, Increased prevalence of myopia in the United States between 1971-1972 and 1999-2004. Arch Ophthalmol, 2009. 127(12):1632-9.

4. Eye Disease Case-Control Study Group, Risk factors for idiopathic rhegmatogenous retinal detachment. Am J Epidemiol, 1993. 137(7):749-57.

5. Saw SM, et al. Myopia and associated pathological complications. Ophthalmic Physiol Opt, 2005. 25(5):381-91.

6. Aller T, Wildsoet C. Results of a one-year prospective clinical trial (CONTROL) of the use of bifocal soft contact lenses to control myopia progression. Ophthalmic and Physiological Optics, 2006. 26(Suppl 1):8-9.

7. Anstice NS, Phillips JR. Effect of dual-focus soft contact lens wear on axial myopia progression in children. Ophthalmology, 2011. 118(6):1152-61.

8. Charm J, Cho P. High Myopia-Partial Reduction Ortho-k: A 2-Year Randomized Study. Optom Vis Sci, 2013. 90(6):530-9.

9. Chen C, Cheung SW, Cho P. Myopia control using toric orthokeratology (TO-SEE study). Invest Ophthalmol Vis Sci, 2013. 54(10):6510-7.

10. Chia A, et al. Atropine for the treatment of childhood myopia: safety and efficacy of 0.5%, 0.1%, and 0.01% doses (Atropine for the Treatment of Myopia 2). Ophthalmology, 2012. 119(2):347-54.

11. Chia A, et al. Atropine for the treatment of childhood myopia: changes after stopping atropine 0.01%, 0.1% and 0.5%. Am J Ophthalmol, 2014. 157(2):451-457 e1.

12. Cho P, Cheung SW. Retardation of Myopia in Orthokeratology (ROMIO) Study: A 2-Year Randomized Clinical Trial. Invest Ophthalmol Vis Sci, 2012. 53(11):7077-85.

13. Cho P, Cheung SW, Edwards M. The longitudinal orthokeratology research in children (LORIC) in Hong Kong: a pilot study on refractive changes and myopic control. Curr Eye Res, 2005. 30(1):71-80.

14. Sankaridurg P., et al. Decrease in rate of myopia progression with a contact lens designed to reduce relative peripheral hyperopia: one-year results. Invest Ophthalmol Vis Sci, 2011. 52(13):9362-7.

15. Santodomingo-Rubido J, et al. Myopia Control with Orthokeratology Contact Lenses in Spain (MCOS): Refractive and Biometric Changes. Invest Ophthalmol Vis Sci, 2012.

16. Walline JJ, et al. Multifocal contact lens myopia control. Optom Vis Sci, 2013. 90(11):1207-14.

17. Walline JJ, Jones LA, Sinnott LT. Corneal reshaping and myopia progression. Br J Ophthalmol, 2009. 93(9):1181-5.

18. Lin LL, et al. Changes in ocular refraction and its components among medical students--a 5-year longitudinal study. Optom Vis Sci, 1996. 73(7):495-8.

19. Flitcroft DI. The complex interactions of retinal, optical and environmental factors in myopia aetiology. Prog Retin Eye Res, 2012. 31(6):622-60.

20. Cooper J, Schulman E, Jamal N. Current status on the development and treatment of myopia. Optometry, 2012. 83(5):179-199.

21. Walline JJ, et al. Interventions to slow progression of myopia in children. Cochrane Database Syst Rev, 2011(12):CD004916.

22. Berntsen DA, et al. A randomized trial using progressive addition lenses to evaluate theories of myopia progression in children with a high lag of accommodation. Invest Ophthalmol Vis Sci, 2012. 53(2):640-9.

23. Correction of Myopia Evaluation Trial 2 Study Group for the Pediatric Eye Disease Investigator Group, Progressive-addition lenses versus single-vision lenses for slowing progression of myopia in children with high accommodative lag and near esophoria. Invest Ophthalmol Vis Sci, 2011. 52(5):2749-57.

24. Gwiazda J, et al. A randomized clinical trial of progressive addition lenses versus single vision lenses on the progression of myopia in children. Invest Ophthalmol Vis Sci, 2003. 44(4):1492-500.

25. Cheng D, et al. Effect of bifocal and prismatic bifocal spectacles on myopia progression in children: three-year results of a randomized clinical trial. JAMA Ophthalmol, 2014. 132(3):258-64.

26. Grosvenor T, et al. Houston Myopia Control Study: a randomized clinical trial. Part II. Final report by the patient care team. Am J Optom Physiol Opt, 1987. 64(7):482-98.

27. Fulk GW, Cyert LA, Parker DE. A randomized trial of the effect of single-vision vs. bifocal lenses on myopia progression in children with esophoria. Optom Vis Sci, 2000. 77(8):395-401.

28. Katz J, et al. A randomized trial of rigid gas permeable contact lenses to reduce progression of children's myopia. Am J Ophthalmol, 2003. 136(1):82-90.

29. Walline JJ, et al. A randomized trial of the effects of rigid contact lenses on myopia progression. Arch Ophthalmol, 2004. 122(12):1760-6.

30. Adler D, Millodot M. The possible effect of undercorrection on myopic progression in children. Clin Exp Optom, 2006. 89(5):315-21.

31. Chung K, Mohidin N, O'Leary DJ. Undercorrection of myopia enhances rather than inhibits myopia progression. Vision Res, 2002. 42(22):2555-9.

32. Song YY, et al. Atropine in ameliorating the progression of myopia in children with mild to moderate myopia: a meta-analysis of controlled clinical trials. J Ocul Pharmacol Ther, 2011. 27(4):361-8.

33. Aller TA, Wildsoet C. Bifocal soft contact lenses as a possible myopia control treatment: a case report involving identical twins. Clin Exp Optom, 2008. 91(4):394-9.

34. Aller TA, Wildsoet CF. Results of a one-year prospective clinical trial (CONTROL) of the use of bifocal soft contact lenses to control myopia progression. in International Myopia Conference. 2006. Singapore: Ophthal Physiol Opt.

35. Griffin JR, Grisham JD. Binocular Anomalies: Diagnosis and Vision Therapy. 3rd ed. 1995: Butterworth-Heinemann.

36. Aller TA, Grisham JD. Myopia progression control using bifocal contact lenses in American Academy of Optometry. 2000. Orlando, FL: Optom Vis Sci.

37. Holden BA, et al. Decreasing peripheral hyperopia with distance centre relatively plus powered periphery contact lenses reduced the rate of progress of myopia: a 5 year Vision CRC study., in ARVO. 2012, Poster 6300.

38. Lam CS, Tang WC, Tse DY, et al. Defocus Incorporated Soft Contact (DISC) lens slows myopia progression in Hong Kong Chinese schoolchildren: a 2-year randomised clinical trial. Br J Ophthalmol 2014;98:40-5.

39. Reim TR, Lund M, Wu R. Orthokeratology and adolescent myopia control. Contact Lens Spectrum, 2003. 18(3):40-2.

40. Cheung SW, Cho P, Fan D. Asymmetrical increase in axial length in the two eyes of a monocular orthokeratology patient. Optom Vis Sci, 2004. 81(9):653-6.

41. Hiraoka T, et al. Long-term effect of overnight orthokeratology on axial length elongation in childhood myopia: a 5-year follow-up study. Invest Ophthalmol Vis Sci, 2012. 53(7):3913-9.

42. Kakita T, Hiraoka T, Oshika T. Influence of overnight orthokeratology on axial elongation in childhood myopia. Invest Ophthalmol Vis Sci, 2011. 52(5):2170-4.

43. Swarbrick H, et al. Overnight orthokeratology lens wear slows axial eye growth in myopic children. IOVS, 2010. 51:E-abstract 1721.

44. Walline JJ, et al. A randomized trial of the effect of soft contact lenses on myopia progression in children. Invest Ophthalmol Vis Sci, 2008. 49(11):4702-6.

45. Chua WH, et al. Atropine for the treatment of childhood myopia. Ophthalmology, 2006. 113(12):2285-91.

46. Lam CS, et al. Defocus Incorporated Soft Contact (DISC) lens slows myopia progression in Hong Kong Chinese schoolchildren: a 2-year randomised clinical trial. Br J Ophthalmol, 2014. 98(1):40-5.

47. Lee JJ, et al. Prevention of myopia progression with 0.05% atropine solution. J Ocul Pharmacol Ther, 2006. 22(1):41-6.

48. Wu PC, Yang YH, Fang PC. The long-term results of using low-concentration atropine eye drops for controlling myopia progression in schoolchildren. J Ocul Pharmacol Ther, 2011. 27(5):461-6.

49. Yen MY, et al. Comparison of the effect of atropine and cyclopentolate on myopia. Ann Ophthalmol, 1989. 21(5):180-2, 187.

50. Fan L, et al. Clinical study of orthokeratology in young myopic adolescents. Int Contact Lens Clin, 1999. 26(5):113-116.

51. Walline JJ, Rah MJ, Jones LA. The Children's Overnight Orthokeratology Investigation (COOKI) pilot study. Optom Vis Sci, 2004. 81(6):407-13.

52. Gonzalez Blanco F, Sanz Fernandez JC, Munoz Sanz MA Axial length, corneal radius, and age of myopia onset. Optom Vis Sci, 2008. 85(2):89-96.

53. Mutti DO, et al. Refractive error, axial length, and relative peripheral refractive error before and after the onset of myopia. Invest Ophthalmol Vis Sci, 2007. 48(6):2510-9.

54. Goss DA. Cessation age of childhood myopia progression. Ophthalmic Physiol Opt, 1987. 7(2):195-7.

55. Thorn F, Gwiazda J, Held R. Myopia progression is specified by a double exponential growth function. Optom Vis Sci, 2005. 82(4):286-97.

56. Smith EL, 3rd. Optical treatment strategies to slow myopia progression: effects of the visual extent of the optical treatment zone. Exp Eye Res, 2013. 114:77-88.

CE TEST

1. On average, orthokeratology slows the progression of myopia by about:
a. 0%
b. 20%
c. 40%
d. 60%

2. An average amount of myopia progression expected for single vision spectacle or contact lens wearers presented as control groups is:
a. less than -0.25D per year
b. -0.50D to -0.75D per year
c. -1.00D to -1.25D per year
d. -1.50D to -1.75D per year

3. In general, how does orthokeratology myopia control compare with soft bifocal contact lenses and atropine?
a. About the same as soft bifocal contact lenses and slightly worse than atropine
b. About the same as atropine and slightly worse than soft bifocal contact lenses
c. About the same as soft bifocal contact lenses and slightly better than atropine
d. Better than soft bifocal contact lenses and about the same as atropine

4. Myopia is a risk factor for ocular diseases such as retinal detachment and glaucoma:
a. only when pathological, generally recognized as over -6.00D
b. at all levels of myopia in a dose-dependent manner
c. but not for cataracts
d. both B and C

5. The following are the best treatment options to slow myopic progression:
a. atropine, multifocal spectacles, orthokeratology
b. undercorrection, atropine, orthokeratology
c. RGP contacts, vision training, undercorrection
d. atropine, soft bifocal contacts, orthokeratology

6. The use of atropine to slow myopic progression:
a. is clinically effective at very low concentrations, e.g., 0.01%
b. has not been proven
c. is never used due to mydriasis and cycloplegia side effects
d. only works at 1% concentrations

7. Bifocal contact lenses used to slow myopic progression:
a. only work when the patient has an eso fixation disparity
b. have been shown to slow myopia 36% to 90%, depending on the study design
c. show a rebound phenomenon, so that the effect is lost when lens wear stops
d. have a high dropout rate due to lens intolerance

8. Bifocal contact lenses used to treat eso fixation disparity
a. have no effect on myopic progression
b. reduce myopic progression more than for those without eso fixation disparity
c. don't work because children still accommodate through the distance portion
d. increase the rate of myopic progression

9. Combining atropine with either bifocal contact lenses or orthokeratology:
a. is not proven to have any additional benefit over either lens treatment alone
b. may be beneficial
c. should not be tried because the drug is not well tolerated, even in low dosages
d. both A and B

10. Orthokeratology slows myopic progression:
a. in some studies but not in any randomized clinical trials
b. but its action is all corneal, unrelated to vitreous chamber growth
c. but is only effective for about the first year
d. and children can wear and take care of the lenses

Examination Answer Sheet

Valid for credit through September 1, 2017

This exam can be taken online at www.reviewofcontactlenses.com.
Upon passing the exam, you can view your results immediately.
You can also view your test history at any time from the website.

Controlling Myopia, Changing Lives

Directions: Select one answer for each question in the exam and completely darken the appropriate circle. A minimum score of 70% is required to earn credit.

Mail to: Jobson - Optometric CE, PO Box 488, Canal Street Station, New York, NY 10013

Payment: Remit $20 with this exam. Make check payable to Jobson Medical Information LLC.

COPE approval for 1 hour of CE credit is pending for this course.

This course is joint-sponsored by the Pennsylvania College of Optometry

There is an eight-to-10 week processing time for this exam.

1. Ⓐ Ⓑ Ⓒ Ⓓ
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10. Ⓐ Ⓑ Ⓒ Ⓓ

1 = Excellent 2 = Very Good 3 = Good 4 = Fair 5 = Poor

Rate the effectiveness of how well the activity:

11. Met the goal statement: ① ② ③ ④ ⑤
12. Related to your practice needs: ① ② ③ ④ ⑤
13. Will help you improve patient care: ① ② ③ ④ ⑤
14. Avoided commercial bias/influence: ① ② ③ ④ ⑤
15. How would you rate the overall quality of the material presented? ① ② ③ ④ ⑤
16. Your knowledge of the subject was increased:
◯ Greatly ◯ Somewhat ◯ Little
17. The difficulty of the course was:
◯ Complex ◯ Appropriate ◯ Basic

How long did it take to complete this course?

Comments on this course:

Suggested topics for future CE articles:

Please retain a copy for your records. Please print clearly.

You must choose and complete one of the following three identifier types:

① SS # ___ - ___ - ____

Last 4 digits of your SS # and date of birth

② ____ - ____

State Code and License #: (Example: NY12345678)

③ ____

First Name

Last Name

Email

The following is your: ☐ Home Address ☐ Business Address

Business Name

Address

City State

ZIP

Telephone #

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By submitting this answer sheet, I certify that I have read the lesson in its entirety and completed the self-assessment exam personally based on the material presented. I have not obtained the answers to this exam by any fraudulent or improper means.

Signature _____ Date _____

Lesson 110590 RO-RCCL-0914

Say Hi to Hybrids!

If you haven't heard about or used hybrid lenses, you may want to consider exploring this option for certain well-selected patients.

What are hybrid contact lenses? These lenses consist of a rigid gas permeable lens (GP) surrounded by a soft lens skirt (*Figure 1*). In theory, they should provide the vision of a GP lens with the comfort of a soft lens. Hybrid lenses correct for corneal astigmatism without a prism ballast system. Several types of hybrids are available, including multifocal designs.

If you determine a patient is a good candidate for hybrid lenses, you can perform a trial lens fitting in the office, or order empirically using keratometry values and refraction. To order a multifocal hybrid empirically, you will also need to know eye dominance and add power.

CANDIDATE SELECTION

Who is a good candidate for hybrid lenses? The many likely patient profiles include:

- Patients with regular corneal astigmatism.
- Patients complaining of lens rotation or fluctuating vision with soft toric lenses.
- Patients interested in GP lenses, but concerned about the comfort.
- Presbyopic patients with astigmatism.
- Soft multifocal patients looking for better vision.
- Irregular cornea patients looking to try other contact lens options.

PROS AND CONS

Of course, every patient has specific needs and goals that affect the choice of lens design. What are the pros and cons of hybrids?

Fig 1. Hybrid lens: GP center and soft skirt.

• ***Advantages of hybrid lenses:*** Hybrid lenses are great for patients with astigmatism, as the GP lens is able to mask most, if not all, of the corneal astigmatism. Hybrid multifocal designs give patients the option to reduce their dependency on glasses. Since hybrid lenses are created from exact keratometry values and glasses prescription, the patient's vision is likely to be crisp and the comfort should be good.

Another great value to hybrids is that the lenses are not available at discounted contact lens suppliers or online. This means that the patient must purchase the lenses from your office and keeps patient retention high. The price of conventional hybrid lenses is very comparable to soft multifocals or GP multifocals, so patients do not get "sticker shock" when outlining the costs associated with hybrid lenses. Something unique that SynergEyes offers ECPs is a chair-side tool that explains the benefits of hybrid lenses and how they compare to traditional soft contact lenses.

A fabulous resource that SynergEyes offers is something called the Duette hotline. This is a phone line that patients or practitioners can call 24 hours a day, seven days a week. It is a great resource for patients that may be having problems such as with lens insertion and removal. Letting patients know that there is always someone to help them, in case the need arises, gives anxious patients some relief. Patients who are on the fence about trying a new lens modality may find comfort in the fact that there is always someone to help them if necessary.

• ***Disadvantages of hybrid lenses:*** Hybrid lenses do not correct for lenticular astigmatism; keep this in mind when comparing keratometry/topography values with the patient's spectacle refraction. If there is significant residual astigmatism (> 0.50 D), you may want to reconsider. As for pricing, if you choose to pursue a diagnostic fitting in office, this will require more chair time and the fitting fees will generally need to reflect this.

Hybrid lens wearers will need proper training with insertion, removal and lens care. This new modality is easy for some and difficult for others. If your patient is unwilling to learn about a new lens modality, a hybrid lens may not be the best option. Hybrid lenses have the possibility of flattening the cornea over time, even if the contact lens fit is perfect in the beginning (see case report).

CASE REPORT

NW, a 25-year-old female, presented for a comprehensive eye exam and contact lens fit. She complained of occasional lens rotation OS, which caused intermittent blurry vision. She was currently wearing standard soft toric contact lenses.

Manifest refraction was -4.00 -1.25x180 OD (20/20), -4.00 -1.75x160 (20/20). After trialing two additional soft toric lens options over the course of three weeks, the problem persisted. At this point, I decided to try Duette HD on the OS. Topography showed 45.5@067 and 43.9@157 (*Figure 2*). I felt this patient was an excellent candidate because all her astigmatism was corneal and her complaint of lens rotation should be solved with a hybrid lens. Using the online calculator, I ordered for the left eye: Duette HD 7.7 BC / -4.00 / 8.4 skirt curve.

Upon dispensing, the lens was centered and moved about 0.5mm with blink. The base curve and prescription were correct, as per the fitting guide. Her vision was 20/20 through the lens. She felt the lens comfort was good, even though she described a very mild foreign body sensation. She was trained with insertion, removal, and lens care.

NW presented for a one-week follow up and was very excited about the comfort and the vision of the lens. She was still seeing 20/20 with no over-refraction. With the lens removed, there was no corneal staining and all ocular structures were healthy and normal. She then returned for a one-month follow up and no issues with her hybrid lens. Once again, the lens was removed and there were no corneal defects an all ocular health was normal.

NW presented back to the clinic about four months after her dispensing visit complaining of blurred vision again OS. Her vision was 20/50 with the hybrid lens. The lens fit appeared to be unchanged and there were no major scratches or deposits on the lens.

With the lens removed, there was mild SPK centrally and also around the GP/soft junction of the lens. Topography was taken and a change in the pattern of astigmatism was seen (*Figure 3*). In response to this change in her corneal shape, the prescription was changed. Her manifest refraction without the lens for the OS was -4.50 -0.50 x 165 (20/20). At this time, she was re-fit into another lens modality. Six months after the new modality, her corneal shape remains very stable to her original topography (*Figure 4*).

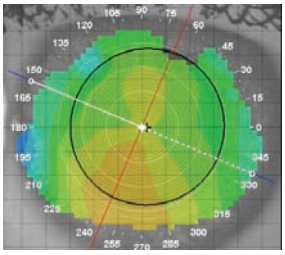


Fig. 2. NW topography before Duette.

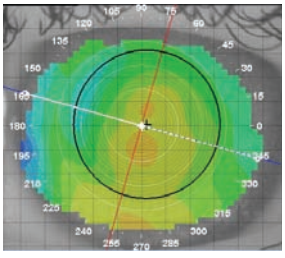


Fig. 3. NW topography showing flattening after wearing Duette.

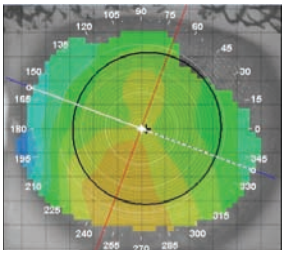


Fig. 4. NW topography after discontinuing Duettte (appears similar to her original topography).

PRACTICE POINTERS

Hybrid contact lenses do work well for many patients, but be careful of potential flattening or altering of corneal shape as outlined in this case report. Frequent monitoring of the patient may be necessary to recheck their vision and eye health. In my personal experience, hybrid lenses have been a huge value to my practice; they satisfy many patients when other lens modalities fail. The optics for their multifocals have proven to be great for patients who may have failed in other multifocals. In other cases, patients do not adapt to the comfort or their vision is still not up to their standards.

I think hybrid lenses are worth having in every practice, because that patient who has failed in every other design may love their vision in a hybrid lens. Since their pricing is competitive with custom toric lenses, hybrid lenses may be the first lens of choice for many practitioners or patients with normal corneal astigmatism.

If you are nervous or skeptical, try ordering empirically and think of it as a "custom diagnostic lens." This lens may work right off the bat, or may need minor tweaking to achieve the best possible fit and vision. In either case, many patients are very happy with the comfort and vision of the lens, so why not be that doctor who is seen as using cutting edge technology? RCCL

By Mile Brujic, OD, and Jason Miller, OD, MBA

Color Me Impressed

Reignite your contact lens practice by offering a new way to improve patients' appearance and you'll motivate them to stay with lens wear.

The advancements in contact lens technology over the past 20 years have been tremendous in terms of ocular health, visual performance and ease of prescribing by the eye care professional. We can customize the contact lens wearing experience to the patient's ocular status and lifestyle needs, improve vision, achieve a competitive edge and increase patient loyalty all at the same time. New technologies and applications of contact lenses improve patients' vision and self-image every day.

The colored or cosmetic contact lens category has been reinvigorated with the launch of a new option. Alcon's Air Optix Colors was recently introduced with a new palette of colors and the same the lotrafilcon B material we're familiar with in other applications. By confidently offering our patients colored contact lenses, we give them the opportunity to enjoy the benefits of changing their appearance by simply altering their eye color—as often as they like.

Renewed interest in this category may offer new growth opportunities for your contact lens practice, and could help to retain some who might otherwise drop out. With proper marketing strategies, offering these contact lenses can even create a "niche" that garners word of mouth in your community.

Fig. 1. A front office staff member at EyeCare Professionals of Powell before (top) and after (bottom) insertion of color contact lenses.

MAKE THE OFFER

Some patients may prefer one specific color; others may prefer to alternate between a variety of colors. Still others may be interested in eye color change only on special occasions while otherwise remaining in their existing lenses.

As this category had fallen dormant in recent years, many patients have not been offered them in the past and likely won't realize that they are candidates for this option. With options available for patients with both light and dark irides, nearly any patient can enjoy the benefits of these lenses.

Additionally, a recent study found lotrafilcon B and lotrafilcon B color are nearly identical materials in terms of technical attributes.[1] This means that existing lotrafilcon B wearers do not require a refit to wear lotrafilcon B color lenses.

The variety of colors and designs available for colored contact lenses in 2014 are better able to meet your patients' comfort and appearance expectations. In the past, patients

sometimes considered these lenses more a novelty than a genuine medical device, and compliance tended to be even below the usual levels. Make sure to discuss the importance of compliance and not to share these lenses with anyone unless they are properly fit.

SIHY COLORS

Silicone hydrogel materials have improved corneal health enough that many wearers have corneal presentations indistinguishable from non-lens wearing patients. Increased oxygen levels limit the amount of chronic limbal inflammation. Certainly, there are many other factors that lead to successful contact lens wear, such as deposition likelihood, movement, modality and wettability. The Air Optix Colors are the initial SiHy color option on the market. This provides an opportunity to offer cosmetic enhancement along with the oxygen permeability available in a silicone hydrogel lens.

Start by fitting a staff member (*Figure 1*), preferably someone whose job entails a high amount of patient interaction.

SOCIAL MEDIA OPPORTUNITY

Earlier phases of popularity for this modality missed out on a huge driver of patient interest: social media. Today's millennials, however, live in an era of omnipresent interaction—with friends, family and complete strangers.

Colored lenses offer a perfect opportunity for you to market your practice through social media. Encourage patients to post before and after photos on their favorite social media outlets right from your office! It'll promote cosmetic lenses specifically and your practice as a whole (*Figure 2*).

The initial post will generate visibility on social media and, when using a hashtag (#) and a key phrase, it becomes a searchable field accessible by all users of the platform. The exposure could be exponential.

INDIVIDUALIZE THE SELECTION PROCESS

Allow interested patients to try on the color lenses on one eye and compare to their current eye color or against another colored lens. They do not have to purchase them on that day and may call back to order them on a later date, but set the stage by making the offer. Allow them—and even encourage them—to take pictures and share with their family and friends. This is instant marketing for your practice.

Be careful, though: there are some unique concerns associated with using cosmetic contact lenses compared to other lenses. Make sure to discuss proper care for these lenses, as they may end up sitting in solution for extended periods of time. This can be of concern if the patient is using peroxide solution, as the peroxide will break down over time. Patients need to be encouraged to clean and disinfect before wearing the lenses again after an extended period of storage. Additionally, focus on stressing the replacement schedule and how often to change lenses after opening the package, whether or not they were worn on a daily basis.

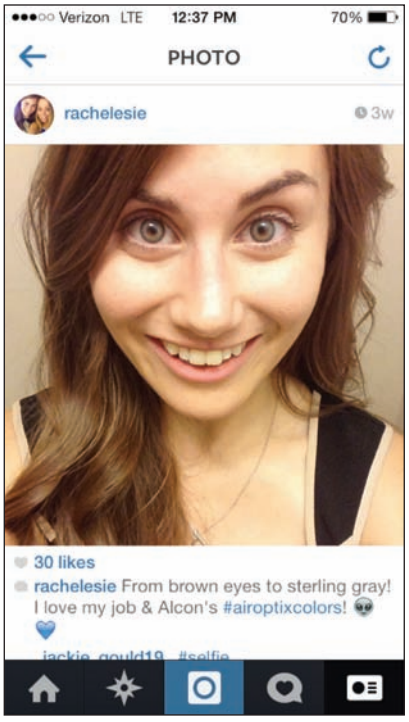


Fig. 2. A post on Instagram or other social media may create "likes." Make sure patients use a hashtag. This adds a searchable phrase, expanding access to the photo.

We are fortunate to practice in a time of great innovation in contact lenses. However, it's also important to keep in mind the variety of lenses available to us. With the plethora of options out there, mixing some traditional technology with the newest lens options will help keep your practice healthy and growing. Our contact lens department needs the attention. Consider breathing some new life in the color contact lens market by reintroducing them to your patients. RCCL

1. Miller, J. Fitting Success of a New Color Silicone Hydrogel Contact Lens in Lotrafilcon B Clear Sphere Wearers. Poster presented at Optometry's Meeting, 2014, June.

By Gary Gerber, OD

It's All Greek to Me

Don't go in expecting patients to be dissatisfied. Expect them to be amazed! And they will be.

I recently vacationed in Greece and noticed something very different in the restaurants (besides the great food) regarding how they checked up on their customers. In the US, a few minutes after your food is delivered, your server will return to ask, "How is everything?" When you have finished eating, they usually pick up the dirty dishes and ask if you'd like to see the dessert menu. Some servers with more outgoing personalities may add, "Oh, I see you really enjoyed your dinner!"

Greeks do things slightly differently, and those differences—while seemingly small—have a lot to do with culture and attitudes regarding how they run their restaurants.

"PRESCRIBE AND **COMMUNICATE WITH CONFIDENCE,** NOT CAUTION."

In Greece, there was no interim question, "How is everything?" during the meal. Instead, at the close of dinner, they approach the table for the *first* time since your food was first brought out, and if *anything* was left on your plate, they are visibly concerned. The automatic assumption is that you weren't happy. You *must* be a member of the "clean plate club" or you'll hear, "What was wrong? Didn't you like it?" They are shocked if you don't eat your entire meal. Even if you respond with a genuine, "It was delicious! I just couldn't finish all of it," they'll persist. "Are you sure?" they'll ask. "Is there something you aren't telling me?" They are genuinely concerned and on a conscious mission to ensure you were 100% satisfied with your meal.

THE LESSONS FOR US?

First, they are most likely omitting the interim "check in" visit because they are *extremely* confident you are satisfied with the service and quality, and don't want to disturb your dining experience. It is assumed that the meal will be great. That's because they take a lot of pride in every aspect of its preparation and are laser focused on your satisfaction. You might say there is a bit of culinary arrogance to this, but that is not the case. Rather, they are conditioned to believe this is so by one patron after another being happy with their meals. So, when someone leaves something on their plate—a potential sign of unhappiness—they are distraught.

We, of course, are clinically obligated to provide the requisite follow up care after contact lenses are dispensed (analogous to seeing how customers are doing with their meal). In all but very extreme cases, we can't neglect this visit. But, in straightforward cases, when we believe there is a very high likelihood of patient success (as opposed to a first-time keratoconic fit, for example) we should approach these visits with a *very* high degree of confidence and self-assuredness.

So, instead of starting the conversation with, "Are your lenses are OK?" or, "How are your contact lenses?" we can intimate something like, "Aren't they awesome?" or, "Was I right? Isn't it so much easier playing tennis with contact lenses instead of glasses?" You should liberally use professionally and courteously applied optometric arrogance, just like the experienced chef would.

Next, when patients are *not* happy, it *should* be a surprise! After all (again, for straightforward, non-pathology cases), you should be surprised when a new -2.25D OU healthy-eyed wearer complains about their vision. "What? Really? You're having trouble seeing road signs? That's terrible and is very unusual, but of course we'll fix it right away!"

Just like the lean diners who choose not to finish their meal, the surprise expressed by you will be seen as genuine—if it is! And patients will pick up on your immediate desire to make them happy, and all the perhaps over-the-top commitment to fixing their problems you will demonstrate.

Prescribe and communicate with confidence, not caution. This isn't about over-promising and possibly under-delivering. It's about confidently communicating expectations—and using that confidence to build your practice. RCCL

Discover Biotrue® ONEday Lenses

Made from HyperGel™, a bio-inspired material designed to work like the eye

Meets
oxygen level the open eye needs[1]

Matches
water content of the cornea – 78%[2]

Mimics
lipid layer of the tear film[3]

Recommend comfortable vision throughout the day with **Biotrue ONEday** and **Biotrue ONEday** for Presbyopia.

For more information, call **1-800-828-9030,** contact your Sales Representative or visit **biotrue.com**

REFERENCES: 1. Brennan NA. A Model of Oxygen Flux Through Contact Lenses, Cornea 20(1):104-108, 2001. **2.** Bergmanson J. Clinical Ocular Anatomy and Physiology. 14th ed. Houston, Texas: Texas Eye Research and Technology Center; 2007. **3.** Twenty-two subjects participated in a randomized, double-masked, contralateral eye study to evaluate water loss of Biotrue® ONEday, 1-Day ACUVUE MOIST, and 1-Day ACUVUE TruEye. After 4, 8, 12, and 16 hours of wear, lenses were removed and immediately weighed (wet weight). The lenses were then completely dried and reweighed (dry weight). The percent water loss was then calculated for each lens from the wet and dry weights.

BAUSCH + LOMB
See better. Live better.

Introducing the most breathable color contact lens available[1]*

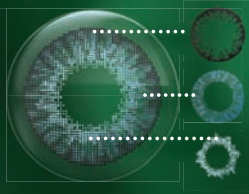
AIR OPTIX® COLORS
contact lenses

THIS IS WHY
the **first color silicone hydrogel** contact lens sets a new standard.

UNIQUE PLASMA SURFACE + 3-IN-1 COLOR TECHNOLOGY

PLASMA SURFACE TECHNOLOGY
Offers superior wettability[2]** and provides deposit resistance for consistent comfort from day 1 to day 30[3†]

+



OUTER RING
defines the iris

PRIMARY COLOR
transforms the eye color

INNER RING
brightens and adds depth

Before

After

Carmen enhanced her look with Sterling Gray.

To learn more talk to your Alcon sales representative or visit MYALCON.COM

9 colors available with or without vision correction.

PERFORMANCE DRIVEN BY SCIENCE™

*High Oxygen Transmissible Lenses: Dk/t = 138 @ -3.00D.
**Compared to ACUVUE^ ADVANCE^, ACUVUE^ OASYS^, PureVision^, Biofinity^ and Avaira^ contact lenses.
†Lotrafilcon B contact lenses tested include AIR OPTIX® AQUA, AIR OPTIX® AQUA Multifocal and AIR OPTIX® for Astigmatism contact lenses.
^Trademarks are the property of their respective owners.

Important information for AIR OPTIX® COLORS (lotrafilcon B) contact lenses: For daily wear only for near/farsightedness. Contact lenses, even if worn for cosmetic reasons, are prescription medical devices that must only be worn under the prescription, direction, and supervision of an eye care professional. Serious eye health problems may occur as a result of sharing contact lenses. Although rare, serious eye problems can develop while wearing contact lenses. Side effects like discomfort, mild burning, or stinging may occur. To help avoid these problems, patients must follow the wear and replacement schedule and the lens care instructions provided by their eye doctor.

References: 1. Based on ratio of lens oxygen transmissibilities; Alcon data on file, 2013. **2.** Based on in vitro measurement of contact angles of unworn lenses; significance demonstrated at 0.05 level. Alcon data on file, 2009. **3.** Eiden SB, Davis R, Bergenske P. Prospective study of lotrafilcon B lenses comparing 2 versus 4 weeks of wear for objective and subjective measures of health, comfort, and vision. *Eye & Contact Lens.* 2013;39(4):290-294.

See product instructions for complete wear, care and safety information.

Rx only

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