Earn 2 CE Credits: Controlling Diabetes with Oral Agents, **p. 57**

REVIEW® OF OPTOMETRY

August 15, 2016

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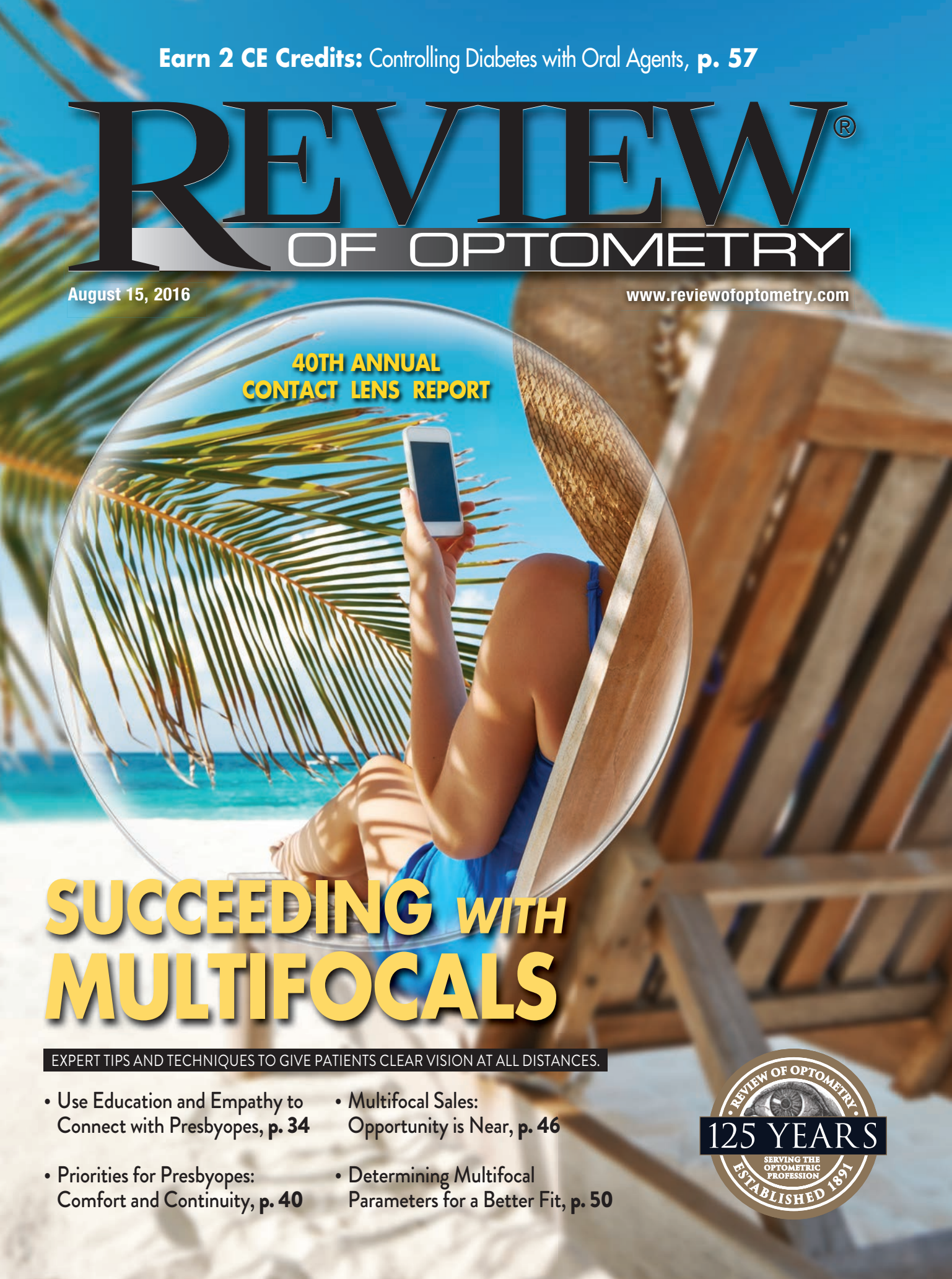

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** Based on *in vitro* data. Clinical studies have not been done directly linking differences in lysozyme profile with specific clinical benefits.

* UV-blocking percentages are based on an average across the wavelength spectrum.

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‡ **WARNING:** UV-absorbing contact lenses are NOT substitutes for protective UV-absorbing eyewear such as UV-absorbing goggles or sunglasses because they do not completely cover the eye and surrounding area. You should continue to use UV-absorbing eyewear as directed. NOTE: Long-term exposure to UV radiation is one of the risk factors associated with cataracts. Exposure is based on a number of factors such as environmental conditions (altitude, geography, cloud cover) and personal factors (extent and nature of outdoor activities). UV-blocking contact lenses help provide protection against harmful UV radiation. However, clinical studies have not been done to demonstrate that wearing UV-blocking contact lenses reduces the risk of developing cataracts or other eye disorders. Consult your eye care practitioner for more information.

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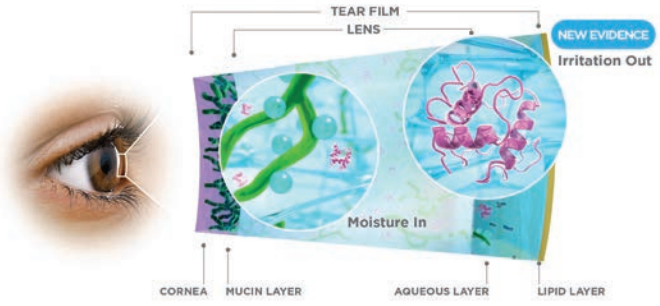

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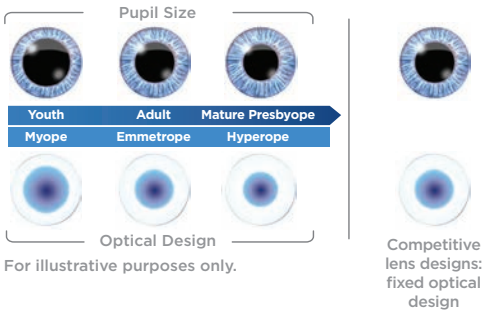

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Reference: 1. Suwala M, Glasier MA, Subbaraman LN, et al. Quantity and conformation of lysozyme deposited on conventional and silicone hydrogel contact lens materials using an in vitro model. *Eye Contact Lens.* 2007;33(3):138-143.

VOL. 153 NO. 8 ■ AUGUST 15, 2016

IN THE NEWS

Humira (adalimumab, AbbVie) recently received FDA approval for the treatment of **non-infectious intermediate, posterior and panuveitis**. The FDA approval is based on results from two Phase III studies, which demonstrate that adult patients with active and controlled non-infectious intermediate, posterior and panuveitis treated with Humira had a significantly lower risk for treatment failure compared with placebo.

A new study, reported in *PLOS Computational Biology*, might lead to **better treatment options for diabetic retinopathy**. Researchers combined data on optometry patients' eyes with advanced computational methods to create a **virtual tissue model of diabetes** in the eye—illustrating how a small protein in the eye causes vision loss and blindness in people with diabetes.

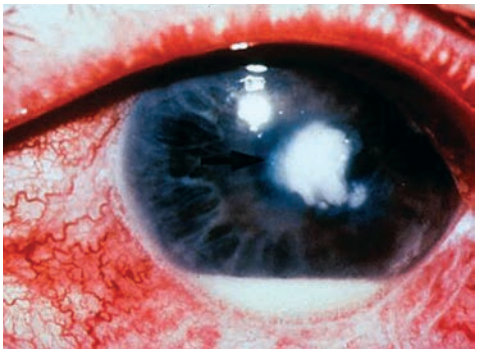
A recent proof-of-concept study published in *Cornea* found that **Descemet stripping** allowed **rejuvenation of surrounding tissue**, without the need for a corneal transplant. Six months after the operation, 77% of the treated eyes had clear corneas and eight had 20/20 vision or better. Three eyes did not respond and required a standard cornea transplant.

A study recently published in the *American Journal of Transplantation* found that **female corneal transplant patients did better** if they got their new corneas from **female donors**—but there was no gender difference in failure rates for men receiving women's tissue. With **Fuchs' endothelial dystrophy**, researchers found that women's transplants were 40% less likely to fail if they received a woman's cornea instead of a man's.

A Look Behind Contact Lens Bacteria

Knowing the proteins responsible for cellular compromise may lead to new therapies.

By Adrienne Taron, Associate Editor



Microbial keratitis due to contact lens wear.

While eye infections caused by bacteria are common—especially among contact lens wearers—until now there has been limited understanding of the nature of the bacteria to blame and the specifics of the damage it causes.

Recent research sheds light on the nature of common bacterial contaminants of contact lenses and cases. The study, presented at the American Society for Microbiology Microbe research meeting, discovered a new means by which bacteria can induce significant morphological changes in human cells. This newly discovered mechanism causes the formation of bubble-like structures (blebs) that ultimately are toxic to cells.

Among bacteria observed were *Proteus mirabilis* and *Serratia marcescens*. Using molecular genetics, the researchers discovered a regulatory protein, GumB, and a secreted protein, ShIA, to be responsible for bleb formation. Blocking these proteins will hopefully prevent infections related to inflammation and tissue damage.

Now, "greater understanding will help provide insights into better preventative mechanisms to avoid inflammation and infection of the ocular surface," says Mile Brujic, OD, of Premier Vision Group in Ohio. "We know that the ocular surface is remarkably resistant to both inflammation and infections and a relatively small number of patients wearing contacts, even in the face of non-compliance, will truly develop an infectious insult to the eye."

"Ultimately, this will be critical in the eye care practice that promotes wellness through healthy comfortable lens wear," Dr. Brujic adds. "Having a better understanding of this through mechanisms previously unknown will help in developing more targeted treatments when infections have resulted in ocular surface compromise." Researchers hope these outcomes will foster the development of new therapies to alleviate inflammation associated with these often severe infections.

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Joint Program Teaches the Business of Optometry

Optometry students with an eye for business can pursue an MBA degree along with their Doctor of Optometry degree at the University of Alabama at Birmingham (UAB).

The University's new dual program, accepting applicants for 2017, is designed to provide the training and education necessary to better understand the business side of optometry. Courses focus on accounting and finance, economics, marketing, operations, supply chain management, information technology and business strategy—most with a health care focus. The program also includes health-specific professional development sessions.

"Some of the greatest challenges in health care today are both scientific and business-related," said Eric Jack, PhD, dean of UAB's Collat School of Business, in a press release. "Combining a business degree with an optometry degree can help future health care leaders learn to manage through rapid change and traverse the uncertainties of management with flexibility. An MBA education provides our optometry school graduates not only more job options, but also the ability to be active participants in shaping the future of health care."

The program begins with business classes the summer before optometry school and integrates courses during the four years. It adds only one semester of coursework to the traditional length of optometry school, and students finish both degrees simultaneously.

"We're proud that UAB is offering the first joint OD/MBA program in the country, and we believe program graduates will be well-equipped to pursue careers with both clinical and administrative responsibilities—adding to an existing practice or starting their own practice," said Kelly K. Nichols, OD, MPH, PhD, dean of UAB's School of Optometry, in a press release. "Students in this dual-degree program will learn how to use innovation and strategic thinking to solve health care problems through fluency in the languages of optometry and business, which will put them on the fast track to career advancement and the betterment of patient care."

Shonesy K. Nation's first joint OD/MBA degree program opens at UAB. UAB News. www.uab.edu/news/student-experience/item/7440.

Vision Care Changes with Routine Exams

Even in asymptomatic patients, comprehensive eye examinations result in a significant number of eye care management changes, a recent study out of the University of Waterloo found.

In fact, 58% of asymptomatic patients who visited the researchers' eye clinic during a one-year period had at least one significant change on routine eye exam.

"In terms of pathology, I do believe that the routine exam produces early pathological findings that have great benefit to society," Bill Potter, OD, says. "They reduce overall cost of care […] and help the individual to function optimally for a longer period of time."

Photo: Gina M. Wesley, OD, MS

But there are glaring flaws in the way information is presented in this study, according to Dr. Potter. Namely, the open-endedness of the term "significant change"—which the study defined as a change in prescription, diagnosis of a new eye condition, or a change in overall patient management.

"I give a lot more weight to the health-assuring aspect of routine care," Dr. Potter says. "We diagnose early glaucoma, cataract and macular degeneration quite often. Perhaps even more importantly, we talk about health habits such as not smoking, eating green and yellow vegetables and wearing sunglasses outdoors."

Irving EL, Harris JD, Machan CM, et al. Value of routine eye examinations in asymptomatic patients. Optom Vis Sci. 2016;93(7):660.

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*Compared to Clear Care.

References: 1. Data on file.

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Crosslinking Approved for Corneal Ectasia Treatment

Avedro's corneal collagen crosslinking has an expanded scope with the recent FDA approval for Photrexa Viscous, Photrexa and the KXL system to treat corneal ectasia following refractive surgery. This marks the system's second indication. In April, it received approval for the treatment of keratoconus (*see our coverage at* www.reviewofoptometry.com/article/ro0516-news-review) and still remains the first and only approved corneal collagen crosslinking in the United States.

FDA approval was based on Avedro's NDA submission, which incorporates data from three prospective, randomized, parallel-group, open-label, placebo-controlled, 12-month trials. Study 1 included 58 patients with progressive keratoconus and 49 patients with corneal ectasia following refractive surgery; Study 2 enrolled 147 patients with progressive keratoconus; and Study 3 included 120 patients with corneal ectasia following refractive surgery.

"At month 12, the CXL-treated eyes in corneal ectasia patients had an average Kmax reduction of 1.0 diopter in Study 1 and 0.5 diopter in Study 3, while the sham eyes had an average increase of 1.0 diopter in Study 1 and 0.5 diopter in Study 3; the treatment difference between the CXL and sham groups was: -2.0 (-3.0, -1.1) diopters in Study 1 and -1.1 (-1.9, -0.3) diopters in Study 3," a company press release said.

Walt Whitley, OD, MBA, director of optometric services at Virginia Eye Consultants, whose practice was involved with these studies, says this approval provides an exciting new treatment option optometrists can offer patients. "We understand the progressive nature of keratoconus and ectasia and the negative impact on our patients' vision," Dr. Whitley says. "Passive management of keratoconus with contact lenses only is no longer an option, and we cannot allow our patients to continuously progress and worsen without doing something about it."

The new treatment option will impact clinical practice and comanagement strategies for ODs, Dr. Whitley says. "One additional step prior to referring patients for keratoconus (or any other corneal surgery or procedure) will be aggressive treatment of ocular surface disease. There are numerous treatment options that are available from artificial tears, nutraceuticals, anti-inflammatories, punctal occlusion, etc., and the most recent addition to our dry eye armamentarium, lifitegrast. By doing so, we can optimize the corneal topography which will provide more accurate measurements pre/post procedure."

"Education will be key to let our patients know about their condition, what the procedure entails, expectations after the procedure and the importance of follow-up care to monitor changes within the cornea, which can progressively flatten for up to six years," Dr. Whitley says.

Avedro receives additional indication for Photrexa Viscous, Photrexa and the KXL system for the treatment of corneal ectasia following refractive surgery. Avedro press release. http://avedro.com/en-us/press-releases.

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BUSINESS OFFICES
11 Campus Blvd., Suite 100
Newtown Square, PA 19073

CEO, INFORMATION SERVICES GROUP
Marc Ferrara
(212) 274-7062 • mferrara@jobson.com

PUBLISHER
James Henne
(610) 492-1017 • jhenne@jobson.com

REGIONAL SALES MANAGER
Michele Barrett
(610) 492-1014 • mbarrett@jobson.com

REGIONAL SALES MANAGER
Michael Hoster
(610) 492-1028 • mhoster@jobson.com

VICE PRESIDENT, OPERATIONS
Casey Foster
(610) 492-1007 • cfoster@jobson.com

VICE PRESIDENT, CLINICAL CONTENT
Paul M. Karpecki, OD, FAAO
pkarpecki@jobson.com

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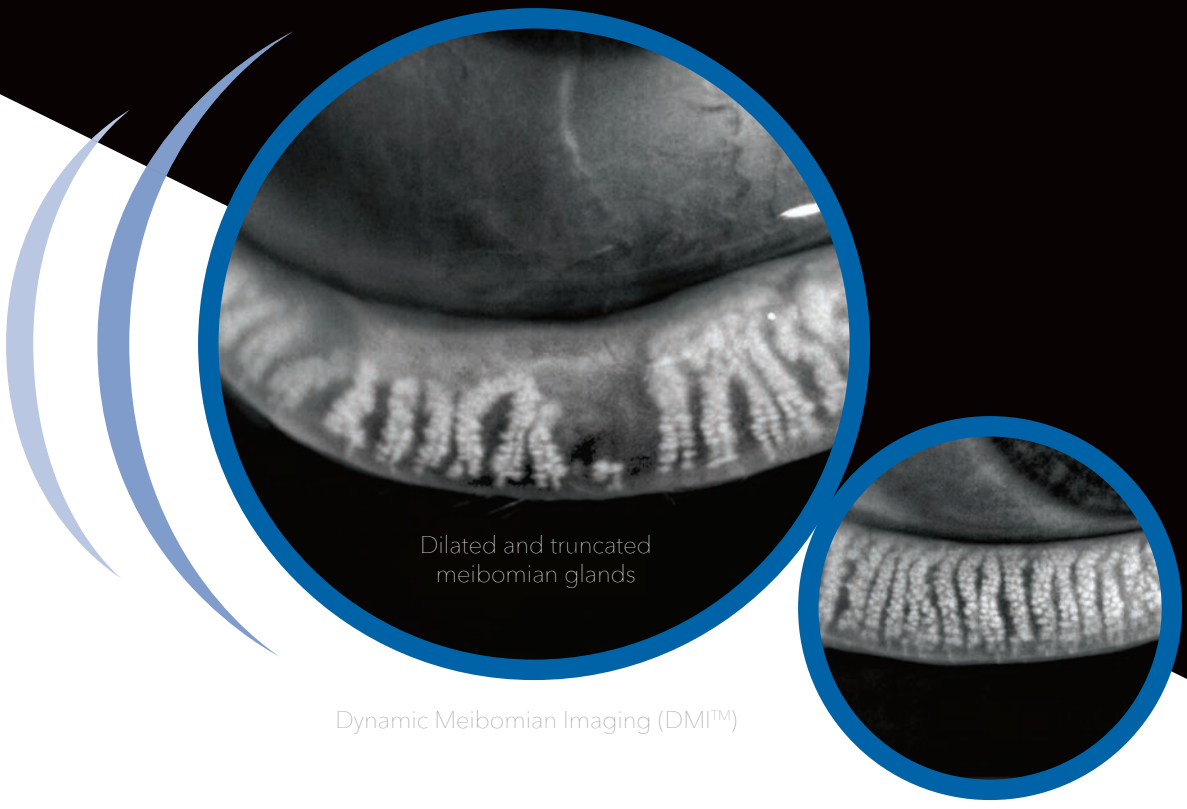

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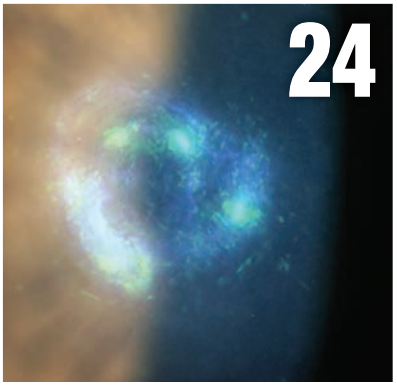

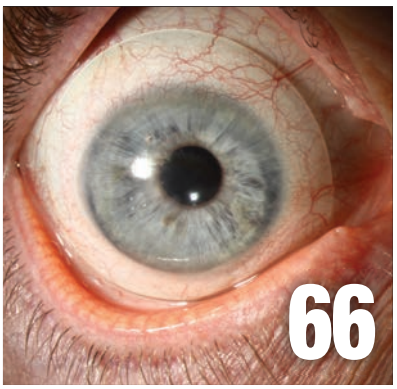

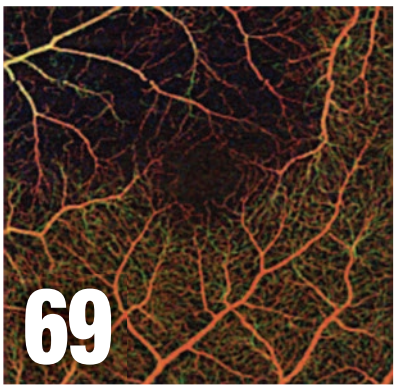

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The safety of lifitegrast was evaluated in 5 clinical studies. 1401 patients received at least one dose of lifitegrast (1287 of which received Xiidra). The most common adverse reactions (5-25%) were instillation site irritation, dysgeusia, and reduced visual acuity.

iN

Xiidra is the only prescription eye drop FDA-approved to treat both the signs and symptoms of Dry Eye Disease

Indication

Xiidra™ (lifitegrast ophthalmic solution) 5% is indicated for the treatment of signs and symptoms of dry eye disease (DED).

Important Safety Information

In clinical trials, the most common adverse reactions reported in 5-25% of patients were instillation site irritation, dysgeusia and reduced visual acuity. Other adverse reactions reported in 1% to 5% of the patients were blurred vision, conjunctival hyperemia, eye irritation, headache, increased lacrimation, eye discharge, eye discomfort, eye pruritus and sinusitis.

To avoid the potential for eye injury or contamination of the solution, patients should not touch the tip of the single-use container to their eye or to any surface.

Contact lenses should be removed prior to the administration of Xiidra and may be reinserted 15 minutes following administration.

Safety and efficacy in pediatric patients below the age of 17 years have not been established.

For additional safety information, see accompanying Brief Summary of Safety Information on the following page and Full Prescribing Information on Xiidra-ECP.com.

Shire

xiidra™ (lifitegrast ophthalmic solution) 5%

Rx Only

BRIEF SUMMARY:
Consult the Full Prescribing Information for complete product information.

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Xiidra™ (lifitegrast ophthalmic solution) 5% is indicated for the treatment of the signs and symptoms of dry eye disease (DED).

DOSAGE AND ADMINISTRATION
Instill one drop of Xiidra twice daily (approximately 12 hours apart) into each eye using a single use container. Discard the single use container immediately after using in each eye. Contact lenses should be removed prior to the administration of Xiidra and may be reinserted 15 minutes following administration.

ADVERSE REACTIONS
Clinical Trials Experience
Because clinical studies are conducted under widely varying conditions, adverse reaction rates observed in clinical studies of a drug cannot be directly compared to rates in the clinical trials of another drug and may not reflect the rates observed in practice. In five clinical studies of dry eye disease conducted with lifitegrast ophthalmic solution, 1401 patients received at least 1 dose of lifitegrast (1287 of which received lifitegrast 5%). The majority of patients (84%) had ≤3 months of treatment exposure. 170 patients were exposed to lifitegrast for approximately 12 months. The majority of the treated patients were female (77%). The most common adverse reactions reported in 5-25 % of patients were instillation site irritation, dysgeusia and reduced visual acuity. Other adverse reactions reported in 1% to 5% of the patients were blurred vision, conjunctival hyperemia, eye irritation, headache, increased lacrimation, eye discharge, eye discomfort, eye pruritus and sinusitis.

USE IN SPECIFIC POPULATIONS
Pregnancy
There are no available data on Xiidra use in pregnant women to inform any drug associated risks. Intravenous (IV) administration of lifitegrast to pregnant rats, from pre-mating through gestation day 17, did not produce teratogenicity at clinically relevant systemic exposures. Intravenous administration of lifitegrast to pregnant rabbits during organogenesis produced an increased incidence of omphalocele at the lowest dose tested, 3 mg/kg/day (400-fold the human plasma exposure at the recommended human ophthalmic dose [RHOD], based on the area under the curve [AUC] level). Since human systemic exposure to lifitegrast following ocular administration of Xiidra at the RHOD is low, the applicability of animal findings to the risk of Xiidra use in humans during pregnancy is unclear.

Animal Data
Lifitegrast administered daily by intravenous (IV) injection to rats, from pre-mating through gestation day 17, caused an increase in mean preimplantation loss and an increased incidence of several minor skeletal anomalies at 30 mg /kg /day, representing 5,400-fold the human plasma exposure at the RHOD of Xiidra, based on AUC. No teratogenicity was observed in the rat at 10 mg /kg /day (460-fold the human plasma exposure at the RHOD, based on AUC). In the rabbit, an increased incidence of omphalocele was observed at the lowest dose tested, 3 mg /kg /day (400-fold the human plasma exposure at the RHOD, based on AUC), when administered by IV injection daily from gestation days 7 through 19. A fetal No Observed Adverse Effect Level (NOAEL) was not identified in the rabbit.

Lactation
There are no data on the presence of lifitegrast in human milk, the effects on the breastfed infant, or the effects on milk production. However, systemic exposure to lifitegrast from ocular administration is low. The developmental and health benefits of breastfeeding should be considered, along with the mother's clinical need for Xiidra and any potential adverse effects on the breastfed child from Xiidra.

Pediatric Use
Safety and efficacy in pediatric patients below the age of 17 years have not been established.

Geriatric Use
No overall differences in safety or effectiveness have been observed between elderly and younger adult patients.

NONCLINICAL TOXICOLOGY
Carcinogenesis, Mutagenesis, Impairment of Fertility
Carcinogenesis: Animal studies have not been conducted to determine the carcinogenic potential of lifitegrast. *Mutagenesis:* Lifitegrast was not mutagenic in the *in vitro* Ames assay. Lifitegrast was not clastogenic in the *in vivo* mouse micronucleus assay. In an *in vitro* chromosomal aberration assay using mammalian cells (Chinese hamster ovary cells), lifitegrast was positive at the highest concentration tested, without metabolic activation. *Impairment of fertility:* Lifitegrast administered at intravenous (IV) doses of up to 30 mg/kg/day (5400-fold the human plasma exposure at the recommended human ophthalmic dose (RHOD) of lifitegrast ophthalmic solution, 5%) had no effect on fertility and reproductive performance in male and female treated rats.

Shire

Manufactured for: Shire US Inc., 300 Shire Way, Lexington, MA 02421.

For more information, go to www.Xiidra.com or call 1-800-828-2088.

US Patents: 8367701; 9353088; 7314938; 7745460; 7790743; 7928122; 9216174; 8168655; 8084047; 8592450; 9085553 and pending patent applications.
Last Modified: 07/2016 S13681

REVIEW OF OPTOMETRY

PRINTED IN USA

FOUNDING EDITOR, FREDERICK BOGER
1891-1913

EDITORIAL OFFICES
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EDITOR-IN-CHIEF • JACK PERSICO
(610) 492-1006 • JPERSICO@JOBSON.COM

SENIOR EDITOR • BILL KEKEVIAN
(610) 492-1003 • BKEKEVIAN@JOBSON.COM

SENIOR ASSOCIATE EDITOR • REBECCA HEPP
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SENIOR ASSOCIATE EDITOR • ALIZA BECKER
(610) 492-1043 • ABECKER@JOBSON.COM

ASSOCIATE EDITOR • MICHAEL RIVIELLO
(610) 492-1021 • MRIVIELLO@JOBSON.COM

ASSOCIATE EDITOR • ADRIENNE TARON
(610) 492-1005 • ATARON@JOBSON.COM

SPECIAL PROJECTS EDITOR • JILL HOFFMAN
(610) 492-1037 • JHOFFMAN@JOBSON.COM

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Outlook

By Jack Persico, Editor-in-Chief

Second Chances

Your practice should be filled with multifocal patients by now. Take heart: it still can be.

One thing that struck me while working on our special 125th anniversary issue—published last month—is just how pivotal optometrists were in the development of contact lenses. There's an entire story about it in that issue ("Contact Lenses: A Perfect Fit for Optometry," July 2016). Decades of achievement came at the hands of ODs.

Optometrists were integral to the process of developing the materials, designs and fitting principles that made contact lenses a reality. They started contact lens-themed conferences, as well as study groups to educate each other. When problems arose—and they did quite often in the early days—ODs got to work figuring out the causes and devising a path forward. Discomfort, lens flexure, hypoxia and edema, CLARE, GPC, ulcers and infiltrates, solution reactions—all these setbacks, and more, were essentially conquered by optometrists. Hardly anything was too tough to tackle.

Except multifocals. Only 2% of optometrists perform more than two multifocal fits per week, according to one industry study.

Are the designs at fault? The doctors who are successful with multifocals say no, they're better than ever and easy to use if you follow the fitting guidelines.

Are patients disinterested? Again, the answer is no. Surveys and anecdotal experiences find that presbyopes welcome an alternative that would give them better vision and a younger appearance than they have with the dreaded reading glasses.

Are the economics of multifocal lens prescribing a turn-off? I'll bet many ODs continue to think so, but the doctors who set fees commensurate with their expertise and the value of the service provided do great with these lenses. Fitting multifocals brings in recurring revenue, boosts referrals and creates one more driver of patient loyalty.

But still the perception problem persists, and multifocals languish.

It's because of this disconnect between perception and reality that we devoted our 40th annual contact lens report to multifocals. We asked ODs who have made this modality a marquee item in their practices for their best tips and insights. In a series packed with good advice, two quotes bear repeating:

"I think we are reactionary when it comes to our presbyopes," said Mile Brujic, OD, in the practice-building article on p. 46. "We often feel that if we make a recommendation or offer a solution, and the patient says, 'No, I'm not interested,' we should simply stop offering it to all our other patients unless a patient comes in and specifically asks for it."

In the same article, Julie DeKinder, OD, said that she encourages patients to let her do a trial fit "by telling them they really have nothing to lose. If the multifocal works, that is great for them." If not, "they can always go back to their current modality." Invest a little chair time and see if it doesn't start to pay off, she advises. Even those who pass on it will appreciate the opportunity to try. And as the saying goes, you miss 100% of the shots you don't take. ■

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When *Isn't* it Allergy Season?

You know it's in full force when a patient recommends *you* take OTC ketotifen drops BID OU. **By Montgomery Vickers, OD**

In my home state of West Virginia, we have mold when it's damp, grass when it's dry, trees and ragweed—you pretty much know the enemy so you can premedicate yourself into a post nasal drip stupor all year. In my new state, Texas, there is nothing to block the wind, so every time someone cleans their hacienda in Juarez, we all get sick in Dallas.

Treating the Crazies

Patients who don't just live with their allergies (I mean, it's not a kidney stone, it's a sneeze), watch TV commercials and spend billions of dollars on stuff. I totally understand. You put a pretty, sniffly girl in a garden with her cat and basket of posies and I'd buy, too.

The patients who actually show up at your office want you to (a) make recommendations to make their allergies go away forever and (b) agree with them when they tell you why your recommendations won't work because of something they read online. They probably like their funky eyes because it gives them something to talk about with their tennis friends.

This makes it tricky to treat them. Oh, we know that a good antihistamine/mast cell inhibitor, sometimes combined with nasal sprays or pills, taken on an ongoing basis, will get rid of 90% of their symptoms, but they've heard of that stuff. The secret is to throw them off their game by assessing what their game is before you spout the cookbook plan. Here are some examples:

1. Ask if they have ever had tofu hot wings. If so, you know they'll only listen if you recommend something natural and groovy such as herbal teas and watermelon enemas. (Don't knock it 'til you've tried it.)

2. Ask if they went deer hunting recently. They'll spend the next 15 minutes telling you about their Bigfoot sightings and forget why they came; but they'll still tell their friends what a great doctor you are.

3. Ask who they are voting for. If they like her, prescribe saline rinses to wipe out their allergies' hard drives. If they like him, tell them to quit whining and just deal with it.

4. Ask what eye drops they have tried. If none, hand them a tear sample. If they've tried a bunch and none were worth a hoot, tell them the story of my band's drummer who told me, "You know, after I got divorced for the fourth time, I started thinking 'Maybe it's me.'"

5. Ask if they have a cat. Prescribe yogurt … for the cat. I'm serious. You'll see.

6. Ask if anyone has ever swabbed their eyelids. If not, rinse a sterile swab with sterile saline, double evert the lid and wipe it thoroughly with the sterile swab. Don't worry about their allergies—they'll never come back.

7. Ask if they smoke. If so, tell them to quit. If they won't, encourage them by saying, "Good news! You'll probably die before the allergies cause any permanent damage!"

8. Ask if they want to get well fast or slow. If fast, hit them with a steroid and they'll call you a genius. If slow, refer back to #6.

I used to be allergic to, well, pretty much everything. I couldn't drink cow's milk or orange juice (well, maybe orange juice a few times in college, but we called it a Screwdriver). I couldn't mow the grass—that actually bothered my sweating, angry brother, but not me, inside watching TV. I couldn't have a dog inside the house, but the six we had outside were fine.

All this allergy talk has me kinda itchy. I'm heading out to get yogurt for the cat and see if anyone has a watermelon. ■

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THE VALUE PROPOSITION: CLINICAL LAB TESTING IN OPTOMETRIC PRACTICE

By John Rumpakis, OD, MBA, and Paul Karpecki, OD

Like doctors in almost every other sector of health care, today's optometrists face significant challenges. For example, we are increasingly affected by health care reform, vertical integration, changes in patient benefit structure, third-party plan participation, increasing overhead costs, and more. All of these impact our traditional revenue streams. Yet even in the face of these hurdles, we strive to deliver improved clinical services. The evolution of point-of-care laboratory testing has been instrumental in our ability to do this.

In many ways, point-of-care testing helps us to overcome fiscal challenges while simultaneously elevating the standard of care. As such, diagnostics like TearLab osmolarity testing, are quickly gaining traction in the average optometric practice and are weaving their way into daily clinical regimens.

In part 3 of this series on how osmolarity testing can benefit your contact lens practice, we will discuss how the clinical value of TearLab testing offers a hidden revenue stream that extends far beyond direct reimbursement.

CONSIDER THE CLINICAL VALUE

The majority of the point-of-care testing that's currently performed in eye care practice is related to the anterior segment. Within this segment, the largest area of potential is ocular surface disease. Dry eye affects nearly 30 million Americans, including 50% of all contact lens wearers.[1-5] Furthermore, research suggests that if we were to rely on symptoms to diagnose dry eye, this would produce a missed or incorrect diagnosis more than 40% of the time.[6-8]

Without question, there is an opportunity here to improve care as well as quality of life for contact lens wearers. Despite a 20-year parade of contact lens improvements, dropout rates have not fallen. About 16% of contact lens wearers drop out every year.[9-11] As we discussed in the first two installments of this series, osmolarity testing can be a catalyst for meaningful change in this regard.

Osmolarity testing allows us to determine objectively and quantitatively the quality of the tear film in dry eye and the severity level of the condition, offer appropriate treatment as needed, determine the likelihood of imminent contact lens dropout, and fit patients in lenses based on clinical variables instead of monetary ones that are based on a patient's knee-jerk decision to select the least expensive available lens. This alternative, proactive approach sets the patient up for success and, in so doing, helps strengthen your practice.

WHERE TO START

Like many of the tests that are performed at the point of care, to perform and bill for TearLab osmolarity testing, your office will need a CLIA waiver license. By definition, CLIA stands for Clinical Lab Improvement Amendments. This means that your office will need to be designated as a CLIA-approved laboratory, and one of the doctors must be designated and approved as a clinical lab director. To begin this simple process, you'll need to apply through CMS to get your CLIA certification.[12] The cost is only $150 for two years.[13]

You may have heard the argument that point-of-care testing isn't worthwhile because the reimbursements aren't substantial. This is only half true. Indeed, point-of-care testing is rarely a huge profit center from the myopic perspective of direct reimbursement, although reimbursement more than

FIGURE 1

Number of annual patients	3,100
Percent of patients who wear CLs	34%
Number of contact lens patients	1,054
Average annual value of a contact lens patient	$275
Average contact lens dropout rate	16%
Average number of contact lens dropouts	169
Annual economic value of your contact lens patients	$46,376
Lifetime economic potential of eliminating your contact lens dropouts	$2,086,920

covers the cost of the disposables. However, tests like TearLab are financially rewarding when they help you maintain and grow your contact lens practice by providing accurate clinical assessment at the point of care. Consider the benefits of knowing whether a patient has a healthy and stable tear film so you can choose the most suitable lenses and treatment to help that patient maintain healthy, comfortable wear. Osmolarity testing also helps you manage dry eye more efficiently because, even though symptoms are usually the last thing to improve, improvement in osmolarity scores offers piece of mind that the patient is on the right path.

It's also important to clarify that, in terms of growing the contact lens segment of your practice, success with the TearLab test is not dependent upon whether you perform testing on the same day as the primary visit or if you bring the patient back for a dry eye evaluation. In either case, the advantage stems from the value of the data itself and what that data enables you to achieve clinically in terms of outcomes in your contact lens patient population.

THE HIDDEN PROFIT CENTER

The direct reimbursement for TearLab osmolarity testing is a modest $22.50 per test/per eye—or $45 per patient since two eyes must be tested—according to the 2016 CLIA Medicare Fee Schedule.[14] Commercial payers pay slightly less. But consider what this test allows you to achieve in terms of patient care. If this test leads you to properly diagnose ocular surface disease and prevent contact lens dropout, the economic return potential is significant. In addition, there is revenue upside in dry eye treatments such as omega-3 supplements, MGD treatments, punctal plugs, etc.

Consider that the mean annual value of a single contact lens patient is about $275. Assuming your practice has a 16% dropout rate—which is low compared to data in many studies—you could be missing out on millions of dollars in revenue over the course of about 45 years (*see Figure 1*).[15] And most importantly, you would allow patients who want to wear contact lenses to remain in them.

Figure 1 shows a lifetime impact of contact lens dropout of more than $2 million. For the sake of argument, let's look at these figures even more conservatively. Since the prevalence of abnormal osmolarity is 62%, at least 50% of dropout should be due to dry eye disease. This would still provide an impressive lifetime value of $1 million. And this does not account for any additional revenue that you would generate treating this dry eye population.

Osmolarity testing allows you to get ahead of dry eye in your contact lens wearers and enables you to justify your clinical decision-making in a way that patients can easily understand. This may mean the patient needs treatment or it may mean the patient would benefit from a higher-end contact lens. In either case, you are staying in front of the problem instead of falling victim to its consequence.

Also, consider that losing a contact lens patient not only costs you the material revenue stream, in many cases you also incur the "replacement cost" of bringing in a new patient to replace the one who has sought out a solution from another provider.

When clinical tools like the TearLab test help you keep patients comfortable and happy in their lenses, they are of tremendous value—in every respect.

CHANGE FOR THE BETTER

They say that necessity is the mother of invention. That certainly rings true regarding the role of TearLab testing in contact lens practice. Instead of allowing changes in health care to take the wind out of our sails, we ought to anticipate change, embrace it, and direct it to help deliver better clinical outcomes and stronger bottom lines.

HOW TO CODE FOR THE TEARLAB OSMOLARITY TEST

CPT coding for TearLab is straightforward:

CPT 83861: Microfluidic analysis utilizing an integrated collection and analysis device, tear osmolarity.

If I were testing both eyes and coding for it, this is what the claim form would look like:

- *83861-QW-RT* (paired with appropriate ICD-10, coded for laterality)
- *83861-QW-LT* (paired with appropriate ICD-10, coded for laterality)

Clinical lab tests can be performed and billed for on the same day as any office visit, including a vision visit, whether a 992XX or 920XX code, so you don't have to reschedule the patient to perform the tests or to get reimbursed for the tests.

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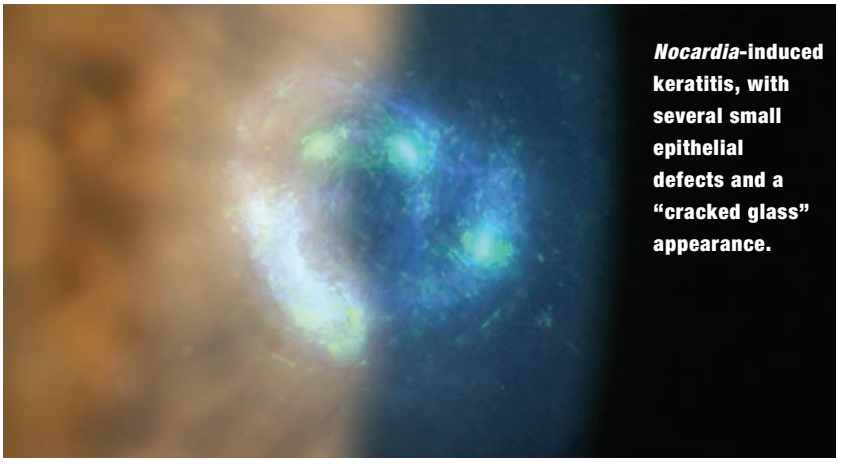
WHY TEARLAB?

TearLab osmolarity testing is one of the few tests we have to confirm dry eye. It's also the most predictive test for dry eye. It provides scientific, objective proof and reasoning for our contact lens recommendations. It can be performed on patients while they are wearing their lenses, and it requires fewer than 30 seconds from test to result.

Combating Bacterial Keratitis

You can neutralize these sight-threatening infections with prompt diagnosis and aggressive therapy. **By Scott G. Hauswirth, OD, and Richard Mangan, OD**

Patients with infectious keratitis typically present urgently with sudden onset of pain, photophobia and redness. The degree of discomfort and light sensitivity may make examination challenging, and more aggressive presentations may result in permanent corneal scarring, loss of vision or even the loss of the globe. All this is enough to unsettle even a seasoned practitioner. However, with enough knowledge and careful attention to the details in presentation, successful treatment and preservation of the patient's vision can be achieved in the majority of cases.



***Nocardia*-induced keratitis, with several small epithelial defects and a "cracked glass" appearance.**

Epidemiology

Infectious keratitis occurs in approximately 20 to 50 per 100,000 people in the United States.[1] The risk of infectious keratitis is increased following any compromise to the corneal epithelium. Principal risks include contact lens wear, trauma and ocular surface disease.[2,3] Among contact lens wearers, the primary risk is overnight wear, with secondary risk coming from poor contact lens hygiene.[4] As most contact lens wearers and ocular surface disease patients are under an optometrist's care, we must be on the lookout for infectious keratitis and develop the skills to manage it.

Clinical Presentation

Although the number of organisms capable of causing infectious keratitis is quite high, only a handful of organisms are responsible for the majority of infections. The most common bacteria present in bacterial keratitis are the gram-positive organisms of *Staphylococcus* and *Streptococcus*, which are components of the normal flora of the eyelids in adults.[5] *Staphylococcus* species are typically listed amongst the most pervasive organisms cultured in episodes of keratitis and are the most common pathogen causing keratitis following cataract surgery, LASIK and PRK.[6-9] Both *Staphylococcus* and *Streptococcus* infections are characteristically identified by a dense, round to oval, focal white infiltrate with clear margins. Although differences exist in virulence, *Staphylococcus* ulcerations will grow gradually over two to three days. More aggressive growth is possible, especially in cases with underlying immune compromise. Relatively speaking, *Streptococcus* organisms are more virulent and may expand quickly, over one to two days.

Pseudomonas is a gram-negative organism commonly associated with contact lens wear and has a more aggressive presentation than its gram-positive counterparts. Its classic presentation is an ulcer with a gray, necrotic appearance in the cornea extending out well beyond the site of excavation to involve nearly the entire cornea. Anterior chamber reaction and hypopyon are more common, and a ring infiltrate or perineural involvement may be noted.[10,11] In conjunction with the increased size and depth of the infiltrate, thinning of the corneal tissue may occur quite rapidly, and *Pseudomonas* infections result in melting and perforation more frequently than gram-positive organisms.[10] Perforation of the cornea may occur in as few as 24 hours following infection.[12]

Atypical mycobacteria, such as *Nocardia* and actinomyces, represent a smaller subset of bacterial ulcer patients. The ulcer associated with mycobacterial infection appears as a minimally excavated,

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REFERENCES: 1. Data on file. Bausch & Lomb Incorporated. Rochester, NY; 2013. **2.** Data on file. Bausch & Lomb Incorporated. Rochester, NY; 2015. **3.** Thirty-nine ECPs (from 10 countries) refitted 422 existing soft contact lens wearing presbyopes into PureVision®2 Presbyopia lenses. Patients returned for follow-up visits after 1-2 weeks. ECP assessment of lens performance including ease of fit, and patient satisfaction with lenses in real-world conditions, were measured using a 6-point agreement survey.

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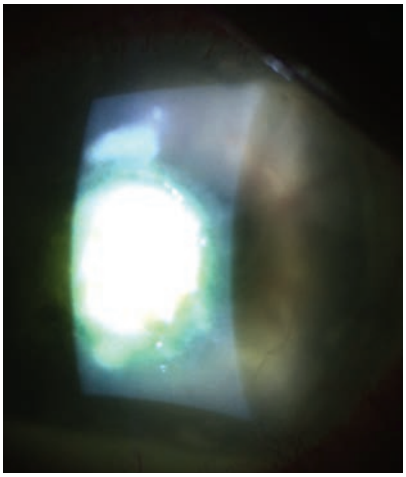
focal lesion, which develops adjacent lesions, similar to the satellite lesions seen in fungal keratitis. Distinction can be made on the relatively clean appearance of the borders of the infiltrates, as opposed to the feathery edges seen in fungal infections. In addition, the appearance of the cornea immediately surrounding the lesion may have a "ground glass" or "cracked glass" appearance. These ulcers typically are slower to develop and may gradually worsen over a period of several days to weeks.[13] They are also more difficult to treat, often requiring multiple medications and several weeks to months of treatment to completely eradicate.

Culturing

Without culturing the ulcer, the identity of the bacteria can only be assumed. However, in today's optometric practice, culturing may be performed relatively easily. Culturing should be performed with ulcers that are central, large (greater than 2mm), deep, do not show improvement with treatment, or exhibit features associated with mycobacterial, fungal or amoebic organisms.[14] The first step is to establish a relationship with a microbiology reference laboratory, often located within a hospital setting. Materials needed for culturing are becoming increasingly efficient, with the advent of single-swab kits, which may be kept at room temperature for transport to the laboratory.

Treatment

In clinical practice, treatment decisions are generally empirical in nature, using broad-spectrum antibiotic therapy.[15] A meta-analysis of randomized and nonrandomized studies comparing empirical treatment that use fluoroquinolones with combination therapy and fortified antibiotics shows essentially equivalent outcomes.[16]



A dense, round-to-oval, focal white infiltrate with clear margins is characteristic of *Streptococcus* infections like the one seen here.

Besivance (besifloxacin, Bausch + Lomb) is a chlorinated fluoroquinolone approved in the United States for bacterial conjunctivitis. It has no oral equivalent for systemic use. It has a low resistance profile, has demonstrated efficacy against gram-positive, gram-negative and anaerobic bacteria, and has been used as an adjunctive agent in mycobacteria infection.[17,18] No single antibiotic provides complete coverage against all types of bacteria, so carefully monitor patients after initiation of treatment.

Empirical treatment for central or severe corneal ulcers may be performed as follows. First, a loading dose of one drop is administered every five to 15 minutes for the first 30 to 60 minutes.[19] Afterwards, topical antibiotic drops are administered once every 30 to 60 minutes around the clock, with reevaluation the following day.[19] The dosing may be decreased in cases of less severity to match the clinical picture.[19]

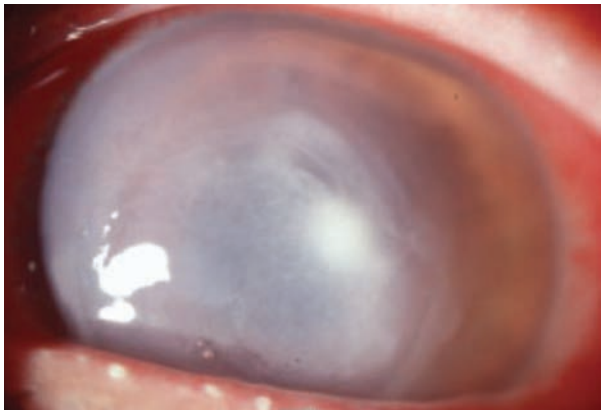
This dosing should be continued until the lesion shows clinical improvement, and tapered down as the keratitis resolves. No clinical benefit has been shown in tapering topical antibiotics below three to four times per day.

If the patient does not improve within 48 hours, the treatment regimen should be modified. The lack of improvement may be a result of resistance to the chosen antibiotic. In this case, culturing should be performed. As with all cases of severe infection, referral to a corneal specialist should be made in cases of impending perforation, or in cases where the keratitis is progressive or unresponsive to treatment.

The Antibiotic Resistance Monitoring in Ocular Microorganisms (ARMOR) study published data based on more than 3,200 isolates over a five-year period. The findings indicate that methicillin-resistant organisms were noted in 42.2% of *S. aureus* isolates and 49.7% of coagulase-negative *Staphylococcus* isolates.[20] More importantly, the methicillin-resistant organisms also showed high likelihood of being resistant to fluoroquinolones, aminoglycosides and macrolides, and multidrug resistance to at least three other drug classes was present in 86.8% of MRSA isolates, potentially making treatment much more difficult. Interestingly, incidence of MRSA did not increase over the five-year period.[20]

In Optometry's Wheelhouse

Thanks to available knowledge regarding typical presentation patterns of these bacteria and advances in culturing techniques, successful management of bacterial keratitis is well within optometry's set of capabilities, giving ODs yet another way to serve patients in the fight against potentially vision-threatening conditions. ■



The classic presentation of *Pseudomonas*, as seen here, involves an ulcer with a gray, necrotic appearance extending out well beyond the site of excavation to involve nearly the entire cornea.

Dr. Hauswirth is a consultant/speaker for Allergan, Bausch + Lomb, Biotissue and Shire Pharmaceuticals.

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Say Hii to Xiidra

The first new DED drug in more than 13 years is finally here. How does it work and what are the potential implications for optometry? **By Paul M. Karpecki, OD**

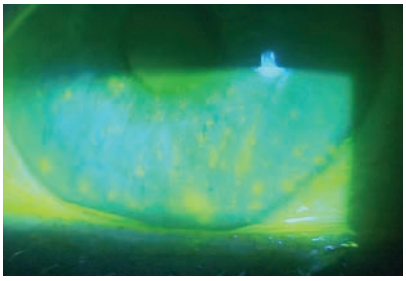
Studies estimate more than 30 million patients suffer from dry eye disease (DED) in the United States alone, but less than one million are receiving medical treatment.[1,2] This is a huge population—estimated to be more than 10 times that of other common conditions such as glaucoma—in need of awareness, diagnosis and treatment.[3] Most patients believe dry eyes and contact lens discomfort are normal parts of aging and don't mention them to their doctors. This disconnect may leave millions of patients untreated or left to progress to advanced levels before they begin treatment, making it difficult and frustrating to manage.

In mid-July, the FDA finally approved a new drug for the treatment of signs and symptoms of DED: Xiidra (lifitegrast ophthalmic solution 5%, Shire Pharmaceuticals). It is the first in a new class of drugs known as lymphocyte function-associated antigen-1 (LFA-1) antagonists.

Welcome Xiidra

Xiidra is a preservative-free solution of lifitegrast 5% ophthalmic solution that comes in individual vials and is dosed BID.

The drug went though four separate multicenter, prospective, placebo-controlled, randomized, double-masked FDA clinical trials involving more than 1,000 subjects ranging in age from 19 to 97 with a predominance of female patients,



A new treatment option for DED could mean more patients find relief.

at about 75%.[4] Both the active drug and placebo were administered BID for 84 days, and safety and efficacy were determined between the groups. The study results revealed that the groups using Xiidra had a statistically significant clinical improvement in signs (corneal staining) and symptoms (eye dryness) compared with placebo. In the OPUS-3 study on symptoms of eye dryness, which involved 355 patients on Xiidra and 356 on placebo, Xiidra had a highly statistical improvement compared with placebo at day 84 ($p=0.0007$), day 42 ($p<0.0001$) and at 14 days after initiating therapy ($p<0.0001$).

For each study, patients were excluded who had: contraindications or hypersensitivity to the investigational product; previous lifitegrast treatment use; a disorder causing immunodeficiency; history of LASIK or similar surgery within 12 months; topical ophthalmic nonsteroidal anti-inflammatory agent use; topical ophthalmic cyclosporine and systemic steroid use; and those who were pregnant or nursing.

During the one-year safety study, however, after day 14, study participants were allowed to use artificial tears (≤4 times daily, as needed), contact lenses (daily disposable lenses only), topical ophthalmic/nasal antihistamines/mast cell stabilizers and steroids (loteprednol only).

Safety was based on ocular and nonocular treatment-emergent adverse events. Adverse events were assessed for severity (mild, moderate, severe) and relation to the investigational drug (not related, possibly related, probably related). The most common (>5%) ocular finding associated with Xiidra was burning, and the most common (>5%) nonocular finding was dysgeusia, or a change in taste sensation. Most adverse events were reported as being mild to moderate in severity and transient.

Mechanism of Action

Studies have associated DED with inflammation involving the conjunctiva and lacrimal glands, and the mechanism of this process is becoming better known through more recent research.[5,6] When the tear film is altered or hyperosmolar tears are present, the ocular surface over-expresses a ligand known as intercellular adhesion molecule-1 (ICAM-1).[7] These fingerlike projections on the epithelium and endothelium have binding sites for T-lymphocytes. The specific binding occurs via the LFA-1 integrin.

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LFA-1 is on the migrating T-lymphocyte and binds to ICAM-1. The interaction of LFA-1 and ICAM-1 is not only important for T-cell adhesion, but also migration, proliferation and cytokine release at sites of inflammation such as the conjunctiva or lacrimal glands.[8-11] Once LFA-1 binds to ICAM-1, recruitment takes place, allowing the T-lymphocyte to enter. An antigen-presenting cell with the same binding mechanism activates the inflammatory cascade, resulting in release of cytokines and further expression of ICAM-1.[12] Given this cascade of inflammation in dry eye patients, LFA-1/ICAM-1 blocking is a logical target for treatment.

Specifically, lifitegrast is a small molecule integrin antagonist that blocks binding of ICAM-1 to LFA-1 on the T-cell surface, inhibiting T-cell recruitment and activation associated with DED inflammation.[13-15]

Clinical Application

I was involved in three separate lifitegrast studies, and I still have DED patients who return regularly stating that their eyes felt better while in the study than at any other time. Given the rapid onset of effect (14 days is more rapid than any other drug studied to date for DED) and good safety profile, I expect this medication will further aid in treating the more than 30 million DED sufferers still in need of diagnosis and treatment.

Once we have access to this new therapeutic agent, we will better understand how to use Xiidra in the treatment of signs and symptoms of dry eye disease.

Why Xiidra?

DED is the most common disease optometry will manage—now and in the foreseeable future. A new therapeutic agent in our armamentarium is extremely

Top 5 Questions on Using Xiidra in Practice

Q: How quickly does Xiidra's clinical efficacy manifest?
A: Symptoms improved significantly within two weeks.

Q: What criteria should we use to gauge successful response to therapy?
A: You should first see improvement in osmolarity, then early symptoms and signs—but it depends on the severity of DED. Patients with milder DED will see symptoms improve sooner than patients with more severe dry eye disease.

Q: Should a treatment-naïve patient be started on Xiidra instead of over-the-counter artificial tears?
A: Yes. Artificial tears serve only a palliative role. To treat the underlying inflammation associated with DED, we should begin with Xiidra or Restasis (cyclosporine, Allergan).

valuable and exciting. Xiidra's FDA approval and subsequent marketing will increase the awareness of dry eye as a significant, debilitating, chronic and progressive disease. With a better understanding of dry eye, more patients will present to doctors who will be prepared to use advanced diagnostics, such as osmolarity testing, to make the diagnosis. Finally, it will provide us with another therapeutic option for patients suffering from DED that involves the key inflammatory mechanisms. We will have access to a drug designed to effectively manage the signs and symptoms of dry eye that has a rapid onset and a good safety profile. ■

Dr. Karpecki is a consultant/advisor to Shire Pharmaceuticals, TearLab, Allergan and Bausch + Lomb.

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Q: If a patient is maintained well on Restasis, would there be any benefit from switching the patient to Xiidra?
A: We don't know for sure, unless they are still symptomatic. But if they are maintained well, then probably not. We'll learn more as we treat more patients.

Q: Is there a potential synergistic effect with Restasis that might suggest a benefit of dual therapy?
A: There could be; Xiidra affects activation, recruitment and downstream inflammation, while Restasis has overlap but primarily prevents migrating T-cells. So, once controlled with Restasis, there may not be a need. But early in the condition the two may be very additive, or Xiidra may be used alone to gain control of the disease. There is still a lot to learn from early patient experiences.

Look Beneath the Lens

Distinguishing between refractive error and ocular compromise is the key to CL—and billing—success. **By John Rumpakis, OD, MBA, Clinical Coding Editor**

The contact lens practice is a mainstay within optometry today—nearly 34% of the average optometrist's revenue is derived from contact lens services and materials.[1,2] Much of our continuing education courses are devoted to properly fitting them and avoiding dropout. Millions of dollars are spent by industry to bring new polymers to the market.

Mistaken Identity

Despite this significant investment, why then does the typical practice still experience 16% of its contact lens patients dropping out of CL wear in their first year?[1,2] Is it the type of contact lens polymer? The solution? The modality? Perhaps the better question is this: Does the CL wearer suffer from compromised ocular physiology and the OD isn't properly evaluating the patient prior to the fit or refit of the lenses?

Far too often, we make the mistake of thinking it's the contact lens, when in fact it is the ocular surface infrastructure creating the environment for successful CL wear. In the case of the contact lens patient with end-of-day discomfort, for instance, we should first investigate the ocular surface rather than simply switch solutions, modalities or polymers.

It's On the Ocular Surface

Why discuss this in a coding column? Because misidentifying these fundamental issues puts many on the wrong path, leading further from properly identifying the clinical issues, creating the proper medical record and, ultimately, coding and billing for the appropriate procedures and conditions.

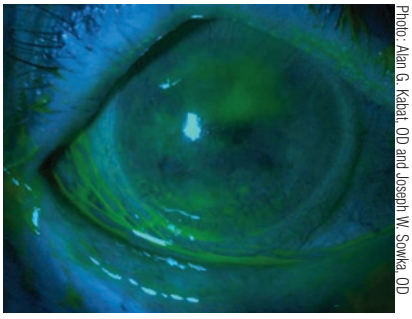

Photo: Alan G. Kabat, OD and Joseph W. Sowka, OD

Identifying ocular disease, such as dry eye, is necessary to ensure CL success.

Generally, people associate contact lenses with refractive benefits through a managed vision care carrier because they provide coverage for refractive diseases and their prescriptive solutions. However, evaluating the problematic CL wearer has nothing to do with refractive disease—it has to do with ocular diseases such as dry eye and ocular allergy. Evaluating for ocular disease clearly creates a significantly different medical record. Using the appropriate office visit codes, either 920XX or 992XX, creates higher reimbursement for managing the episode of care due to the condition's chronicity. That also means you would either collect copays or patients have to pay out of pocket to meet their deductible; but you are providing a different level of service, and your record must reflect that.

The Eye First, CLs Second

Regardless of who is financially responsible, it is your clinical duty to properly diagnose and treat both refractive and ocular disease. Unlike with refractive disease, assessing the structural and functional integrity of the ocular surface is a legitimate medical encounter. More importantly, you are evaluating the functional patency of the eye and ocular surface prior to determining the refractive solution for the patient. If the patient's ocular surface is compromised in any way, simply changing the contact lens or the solution may only be alleviating the symptom, not truly addressing the problem.

My point is simple: don't take the path of least resistance with your contact lens patients. It's far too tempting not to explain their medical benefits, not to understand which level of 992XX code you performed, not to do the appropriate diagnostic testing to determine the underlying clinical condition, not to understand the ICD-10 system—but it doesn't pay. So, don't give in to temptation. Do the very best job you can, and that means performing a workup to better understand the ocular surface, and thus discover the underlying cause of the patient's problems. By doing so, you will benefit from the consistent and correct application of medical eye care guidelines, creating happy patients and a better bottom line. ■

Send questions and comments to ROcodingconnection@gmail.com.

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Use Education and Empathy to Connect with Presbyopes

Focusing on visual system changes and setting realistic expectations can empower patients to succeed in multifocal lenses. By Shalu Pal, OD

For those of us who specialize in contact lenses, our primary goal is improving our techniques to increase both patient satisfaction and our own success rate. But defining success in terms of a lens fit—especially considering that both you and the patient contribute different factors—can be challenging. How successful are we as practitioners when fitting our patients with soft multifocal contact lenses, and do we really give them what they are expecting?

While a student at the Southern California College of Optometry, a mentor of mine, Harue Marsden, OD, taught me the importance of patient education and, more importantly, the value of patient understanding. This article discusses options for improving patient comprehension of how multifocal lenses work, which may ease the fitting and wearing experience as well as prevent patients from dropping out of contact lens wear entirely. As always, the primary goal is to reduce frustration, increase satisfaction and elevate the practice's multifocal contact lens success rate.

Take a Step Back

At the heart of the matter is presbyopia. More patients than ever are dealing with loss of accommodation: approximately one-third of current patients are presbyopic, with 2.3 billion presbyopes worldwide expected to surface by the year 2020—135 million of whom will be in the United States.[1]

As such, many of us likely mention age in some way in our discussion of presbyopia with our patients. However, we should consider a different culprit. Although standard practice is to refract the patient to 20 feet away, this generation of presbyopes spends a large amount of time in front of monitors, laptops, tablets, e-readers and cell phones, which are less than two feet in front of them. A 2015 report by the Vision Council on digital eyestrain noted that more than 90% of American adults use digital devices for at least two hours per day, with close to 30% of individuals using digital devices for more than nine hours each day.[2] Our visual world is much closer to us than in the past.

The human visual accommodative and convergence systems are relied on more than they ever have been before; thus, the rate of population entry into the presbyopic category, a condition in which the ability to focus up close declines over time, is increasing significantly. Anecdotally, patients seem to arrive at my clinic at a much earlier age than the previous decade, asking about asking about near assistance and support. The industry as a whole is catering to these pre-presbyopic patients with exercises, visual breaks and ophthalmic tools that push plus power up close. Thus, we should consider digital devices to be a primary source of early-onset presbyopia, in addition to age and chance.

Use of multifocal contact lenses in children to help slow the rate of

myopia progression continues to be investigated by researchers and applied in clinical practice—yet another opportunity to help patients in need.

Education: The Right Approach

Generally, presbyopia occurs between the ages of 30 and 65 with the loss of the ability to accommodate by 2.5D, or a change of 10 units over the course of 35 years if broken into 0.25D steps. Using this unit system can be beneficial when explaining the process of loss of the focusing system to patients and can help you pinpoint where they are in the process—specifically, how much more change they have ahead of them. Doing so may eliminate concerns of frequent lens prescription changes they may require.

For the most part, presbyopic patients are in denial and do not want to be informed that age is the reason for their visual changes. We can overcome this resistance by highlighting computer focusing trends, explaining the system of 10 units of change and initiating the conversation sooner with each patient. With this approach, many will be less frustrated or upset. For example, if a patient presents to the clinic with a +1.50D add, they have more than likely lost six units of their accommodate muscle energy and are running with only 40% of their initial ability. This patient would require six units of add/magnification support to return them to their full potential. This explanation helps patients understand where they are in the process and how much muscle they have lost, enabling them to track their own rate of change.

The system of 10 units can also be used to clarify how a pair of progressive lenses is a linear system while a soft multifocal contact lens is typically designed in a circular pattern. Explaining the differences in glasses and contact lens designs is key to clarifying how these products work and understanding which one is right for the patient.

Most importantly, early patient education is key to achieving greater fitting success using either progressive ophthalmic lenses or soft multifocal contact lenses. Patients with a lower add amount typically have an easier time adapting to soft multifocal lenses as compared with more mature presbyopic patients.

Fitting Step-by-Step

This step-by-step guide is designed to work with all lens designs:

1. Obtain an accurate refraction value. This is the foundation upon which much of the contact lens fitting process is based. Don't over-minus and don't over-plus the reading, as this can lead to inaccurate focusing later. Additionally, try to minimize the difference between distance and near viewing to reduce the add demand required, which will reduce the amount of adaptation required and likely increase your success rate. A patient with less than 1D of cylinder may be easier to fit than those with higher cylinder prescriptions.

2. Determine the patient's dominant eye. This is necessary for choosing lenses and will help during troubleshooting. Sensory dominance testing in which you evaluate the binocular response to plus over each eye, in my opinion, is a better indicator of how the patient will likely respond to simultaneous vision compared with the sight dominance testing process that incorporates hand motions to form a triangle to evaluate for alignment.

3. Check the patient for any ocular surface issues such as dry eye prior to fitting them with contact lenses. Though comfort is less of an issue today due to new developments in technology, this will ensure other factors are not hindering contact lens success.

4. Select the lens modality you think will work best for the patient, regardless of price. Then, incorporate the vertexed spherical equivalent of the spectacle refraction, together with the corresponding lens manufacturer's fitting guide, to choose the initial contact lenses for the patient.

5. Apply the lenses to the patient's ocular surface and let them settle. Direct the patient to look at frames, read a magazine or survey the office. The more time patients have to do this, the better the contact lenses will settle and improve accuracy in your vision assessment.

6. Evaluate the fit once you feel enough time has passed. Look for indications that the lenses are centered, aligning the optics of the lens with the center of the pupil and line of sight. When evaluating the patient's vision in their new lenses, keep the lights on and test binocular vision in both distance and near ranges. Additionally, use real-world test methods, such as cell phone screens, watches, magazines and pill bottles to further evaluate the lenses. Success is achieved only when all initial complaints have been satisfied. In the case of a chart, set 20/40 as the goal and express excitement if the patient is able to pass this line. A chart on the wall with no instructions to the patient has an automatic implied expectation that the bottom line is success.

7. Troubleshoot. If there are any problems, perform a binocular distance over-refraction, regardless of the complaint. Use loose lenses to push plus power in the distance, but do not change the add power. Changing the add power is a large shift in the design of the lens and should only be considered once small distance changes to the spherical component have been made. However, if changing the spherical component does not ultimately solve the patient's problems, refer to the fitting guide for directions on making proper adjustments to the add power based on the patient's complaints. If there are still issues remaining at this point, consider the possibility of an incorrect refraction, the need for a different lens or the lens is fit optically off-center. Evaluating monocular vision at this point may help in troubleshooting refractive errors.

Soft Multifocal Lens Designs

Broadly speaking, there are two multifocal lens designs: translating and simultaneous vision. Translating designs, which resemble traditional bifocal and trifocal ophthalmic lenses, are for the most part found in gas permeable contact lenses. These provide crisp vision and are suitable for higher add demands. They are, however, more complex to fit and require greater patient adaptation as they must train themselves to use downgaze for the add power.

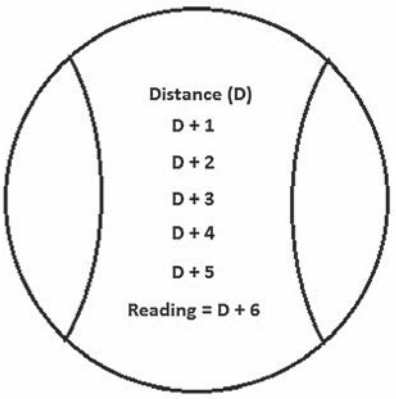
Simultaneous vision is the process through which multiple powers are presented to the eye at the same time. The patient's visual system then chooses which prescription to focus through in order to see the image in question at the selected distance, while ignoring the other prescriptions. There are two forms of simultaneous vision—concentric and aspheric—although many lenses involve a combination of concentric and aspheric designs.

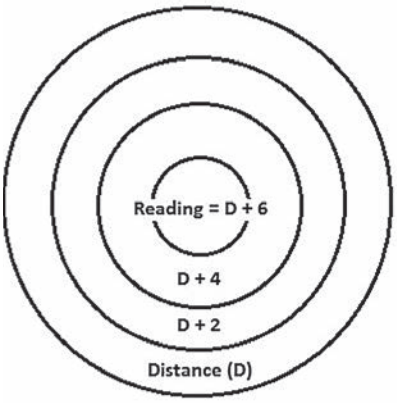
Explaining to patients the complexity of the visual system and how simultaneous vision lenses work can help them better understand the design and also the reasons why 100% crispness of vision is not always feasible, particularly in low-light conditions. It can also help patients understand why a certain lens may not be the right fit for them. Two patients with the same prescription and the same daily visual tasks might wear different multifocal lenses because they process certain lens designs in different ways. Thorough patient education also helps to alleviate any blame the patient may place on you or the lens design for perceived inadequacies.

Introducing Soft Multifocal Lenses to The Patient

There are several steps to consider when introducing patients to soft multifocal contact lenses. First and foremost, you can gauge patients' awareness and level of interest with either paper or electronic signage in your reception room and dispensary, as well as questions on your intake form. For a more active approach, direct staff members to inform patients about the lenses during the registration process, pre-testing session or at checkout following the appointment. The most important discussion, however, comes directly from you via a recommendation, which can be as simple as a new product update or a more targeted presentation of the available options.

Regardless, when introducing the concept of multifocal contact lenses, it is key to first explain presbyopia and its effect on visual demands. From there, relay the available advancements in technology and multifocal options and, if they express interest, continue by describing the pros and cons of the lenses and their designs, the fitting process, follow-up timeline, issues or complications they may experience during adaptation to the lens and, lastly, the cost. Providing patients with an understanding of the entire process helps them accept the fitting fee.





Progressive lenses, above, usually have a linear design, while multifocal contact lenses use a circular design, below.

Fitting time. At my practice, we find that it can take about two and a half visits on average to fit a soft multifocal lens properly; the exact timeframe will depend on the amount of add power needed and the patient's adaptability. To avoid patient frustration, always make them aware of this fact so they can plan accordingly. Communicating clearly about the protracted nature of the fitting process also helps to justify the fitting fee in their minds.

During each visit, patients should expect to devote ample in-office time to trial lens wear so that perceptual adaptation can take place before assessing visual performance. Although there is no set length of time for this, we find 20 to 30 minutes may be adequate, during which patients can test their lenses using various viewing materials around the office. If patients object to the fitting delay, inform them that this time allows their visual system to adapt to the lens, after which their concerns are more easily addressed. A small change in power can alter the distribution of the pattern on the lens surface, changing how their eyes react to the design. Thus, it is important to give them time to adapt in the office so they do not walk away with improperly powered lenses.

Patient adaptation to multifocality continues following exposure to real-life visual demands beyond the office setting, and patients need to

be prepped to anticipate this and advised to withhold judgment for several days after the initial fitting. We schedule a one-week follow-up appointment to reassess the fit and visual performance of the lens after they have had time to neuroadapt.

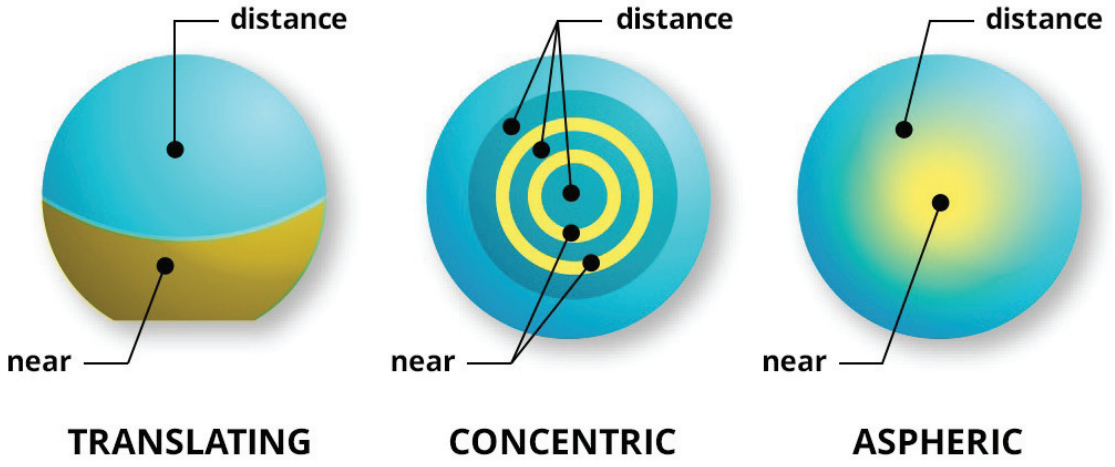
Fitting limitations. When discussing limitations with the patient, mention the design of simultaneous vision lenses and the importance of adequate light. The pupil is a dynamic system, while soft multifocal lenses are not; a simple explanation regarding how dilation works can prevent many patients from expressing frustration— when attempting to read a small menu in a poorly lit restaurant, for example. Under-promising and over-delivering is the best strategy, which can be done by being realistic, not necessarily negative.

Fitting fees. You should feel confident charging an appropriate fee for your education, years of experience, expertise and time. As experts, we deserve to be paid for both our knowledge and time. Arrange a mutually agreed-upon course of action prior to the contact lens fitting so both you and the patient understands what is expected of each other. Having a back-up plan in the event the lens fit does not work is also a good idea: this may include modified monovision, monovision or distance contact lenses with glasses placed over top for reading purposes.

Refining and Rethinking

If patients do not adapt well to multifocal wear, don't give up just yet. The abundance of designs on the market today offers alternatives that are worth exploring with a properly motivated patient. The patient may fail in one multifocal design concept and yet do just fine with a different approach. Again, make sure the patient is prepped at the outset about this potential setback and your contingency plans.

Should the patient find the next lens also poorly suited to their needs, we consider modified monovision before abandoning multifocal wear entirely. This approach has no exact



Explaining how each lens works will help patients understand the difference and ensure successful contact lens wear.

guidelines and is more of a trial-and-error approach when the patient's prescriptions do not follow the usual guidelines and principles. Examples include emmetropic patients who view even a plano lens as a distraction, early presbyopes who may not need two multifocal lenses initially and astigmatic patients.

Fitting emmetropes with one multifocal lens in the non-dominant eye is an easy entry into presbyopia, but the latter two types of patients are slightly harder to manage. In the case of early presbyopes, even the presence of two low lenses may provide too much add power; instead, place a single vision lens in the dominant eye and a multifocal in the non-dominant eye. Patients who have astigmatism higher than 1D may have difficulties using spherical lenses. For these patients, place a toric lens in one eye and a multifocal lens in the other to provide distance clarity and near support. Those who have high levels of astigmatism in both eyes unable to be masked with a spherical lens should consider soft toric multifocal, hybrid, gas permeable or scleral contact lenses.

If the monovision contact lens approach fails due to a lack of intermediate vision or if the range of vision between near and distance becomes too vast for adaptation, placing a multifocal in the non-dominant eye can assist with the patient's intermediate vision. You must get creative to help these patients, and perhaps consider options such as using low add powers in the dominant eye and higher add powers in the non-dominant eye to prevent blur from two high aspheric lenses. Unfortunately, switching monovision patients to multifocal lenses is not easy, as they enjoy good distance and near clarity. The best strategy, when possible, is to avoid monovision as the initial choice entirely.

The End of a Fit

With so many factors in play during a multifocal lens fitting, it can be challenging to know when the patient is fit in the best possible option. The end of a fitting comes when there are no other means to adjust the lenses. Patients who are content with their vision may continue to provide feedback until you ask them to stop; thus, it is acceptable to inform a patient that you have reached the best level of vision possible with the lenses they are in. Remember, you guide and control the process and can decide when to stop taking further action.

Above all, however, you can achieve higher rates of success with multifocal contact lens fittings when patients are properly educated on both the affected visual structures and the fitting process. Including them on the journey helps them remain involved with their eye care decisions, ensuring you are both on the same page with the same goals in mind. A comprehensive approach based on effective communication builds stronger relationships between you and your multifocal lens patients. ■

Dr. Pal runs a specialty contact lens and dry eye practice in Toronto. She is the vice chair of the AOA Contact Lens and Cornea Section Council, a member of the Women's Advisory Board for Alcon and a speaker for Allergan's dry eye faculty in Canada. She is consultant for Allergan, Alcon, Bausch + Lomb, CooperVision, Johnson & Johnson Vision Care and Menicon, as well as a facilitator of the STAPLE lens fitting workshops.

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PEER • REVIEWED • PRA • ARTICLE

Priorities for Presbyopes:
Maintain Comfort and Continuity

Patients are highly motivated to succeed. Don't let them go home disappointed.

By Pamela A. Lowe, OD

Most optometrists know very well that the members of the baby boom generation, and now even Generation X, who present to our offices have made near vision correction a priority. They feel the effects of accommodative loss every day—and they don't like it. Our practices are filled with patients seeking, or at least amenable to, intervention. By the year 2020, 135 million Americans will be presbyopic.[1] That's a whopping 42% of the population.

What might be less well known, however, is that younger patients who are also current contact lens wearers but not yet presbyopic are just as committed to staying in contact lenses. The high rate of contact lens dropout doesn't represent a loss of motivation—just an increase in frustration, in part due to issues with comfort, convenience and vision clarity.[2] Given an option better suited to their visual and anatomic status, they would be elated to remain in contact lenses. Market research indicates that the number of patients who wear contact lenses peaks around those who are age 30 to 34, and then starts to dramatically decrease as these individuals enter their fourth decade of life *(Figure 1)*. As their circumstances change, perhaps their lens modalities and care regimens should as well.

In short, our existing contact lens wearers don't want to give them up, and presbyopes want to regain the visual function they have lost. These forces conspire to create an enormous opportunity for optometrists.

Surprisingly, of the approximately 40,000 optometrists in the United States, only 700 are fitting more than two multifocal contact lens patients per week—less than 2% total.[3] With this large disconnect in adequately fulfilling the needs of the presbyopic patient, we need to ask ourselves: why do most of us shy away from proactively fitting multifocal lenses? Is it because of prior failures, increased chair time or preconceived assumptions about price sensitivity? Let's dive into the nuts and bolts of what might hold us back, and discuss options for how we can overcome these obstacles.

Source: Alcon

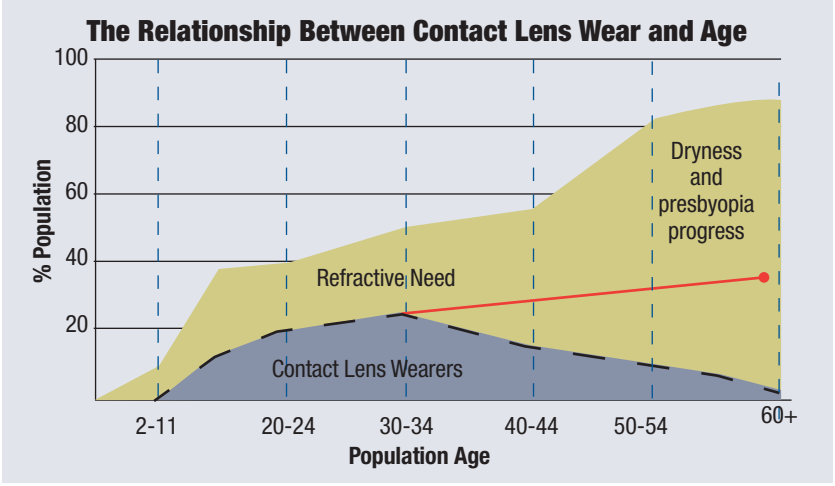

Fig. 1. Contact lens wear begins to decline in conjunction with an increase in age, starting around age 30. The red line shows a projection of the potential lens-wearing population if dropouts could be eliminated.

An Expansion in Design

Available multifocal lens designs have historically fallen short of meeting either patient or doctor expectations. Early distance-centered lens designs failed to provide patients with adequate near acuity, while efforts to improve these lenses with the inclusion of multiple zones (i.e., concentric designs alternating distance and near) offered improved near vision but also distorted distance images, leaving patient satisfaction low. Additionally, available designs remained limited to select parameters while lens costs continued to run high, forcing many practitioners to return to more tried-and-true monovision fits as they enabled patients to function as efficiently as possible.

Fortunately, innovations made in the last decade in both designs and extended parameters have dramatically improved visual performance, providing us with better options with which to satisfy presbyopic lens wearers. Near-centered designs now overwhelmingly prevail, offering better near acuity, while peripheral distance zones typically now include smoother transitions.

These designs mimic the eye's natural pupil function of miosis during accommodation to reduce interference with distance correction during reading; as such, when a patient wearing these lenses looks at a distance and their pupils widen, they receive adequate distance optics, allowing for less aberrations. The general increase in patient satisfaction—even the hard-to-fit emmetropic individuals can succeed with these lens designs—and the sheer number of presbyopes who are currently candidates for these lenses together has pushed the industry to continue with innovation in this lens category, offering wider parameters (in most cases +6.00 to -10.00 in 0.25 steps) and more materials than ever before in new aspheric designs. This portfolio helps to improve visual quality, comfort and convenience of wear, enabling more individuals then ever to enjoy these lenses, including those who might otherwise have worn glasses.

As an example, take this recent case seen at my practice: a 53-year-old female presented complaining of a change in near vision. She is in excellent general health and is not taking any medications other than nutritional supplements, but she has been a progressive spectacle wearer for the past four years. Though she reports that she does not mind the use of spectacles, she does point out that she is very active and involved in multiple sports and outdoor activities, which may not be the best place for spectacle wear.

Her presenting uncorrected vision is 20/15 at distance and 20/60 at near with K readings of 42.50/42.50 OD and 42.25@030/42.50@120 OS and refraction values of +0.25-0.50x095 OD, +0.75-0.50x083 OS +2.00 add OU. Additionally, her slit lamp results indicated a reduced TBUT of eight seconds OD, six seconds OS and a grade 1 OD and grade 2 OS papillary response. Retinal exam findings were unremarkable OU.

She reported attempted use of soft contact lenses in the past (both in monthly and daily modalities) but ultimately had problems of unsuccessful comfort and fluctuating vision. The patient noted that along with not being able to read clearly through those lenses, she had also often developed redness and irritation after just one hour of lens wear. A daily disposable aspheric multifocal lens with BC 8.5, diam: 14.1, plano/med add OD, +0.25/med add OS; 20/20+ OU at distance; and 20/30 OU at near parameters was given to the patient at this point, with some fluctuations noted at near vision. Following the fitting process, a fit-guide recommendation and over-refraction data indicated that addition of a +0.25 OU did not blur distance vision and also enhanced her near vision to 20/30+ and decreased the fluctuations. The final lens dispensed to this patient was +0.25/med OD and +0.50/med OS, and she returned for follow-up at a later date reporting satisfaction with lens comfort and her new ability to experience a full day of wear without discomfort.

Chair Time

The historical failure of multifocal lenses has caused many practitioners to also believe that multifocal lens designs are complicated to fit and will significantly increase chair time to the point where it is not profitable. However, this scenario overstates the necessary time commitment. In reality, newer multifocal lens designs can achieve fitting success in less chair time than older designs. Though newer, better fitting guidelines are mostly responsible for this streamlining, it's likely that eye care practitioners are also shedding old habits developed when fitting older designs. Much like any advancement in technology—be it cars, electronics, computers or medical devices—part of the product's success is continued efforts to understand and incorporate it into daily life. As such, we must step back and familiarize ourselves with the optics of today's multifocal lenses and have faith in the manufacturer's guidelines.

However, the adjustments that a patient may need to enhance their vision are unique to the characteristics of both the individual and the lens they are wearing and must be approached with a trial-and-error mindset. Following the manufacturer's fitting guidelines means that, for the most part, today's multifocal fitting process should not take more than two patient visits; yet, this is not always the case. Take this patient example:

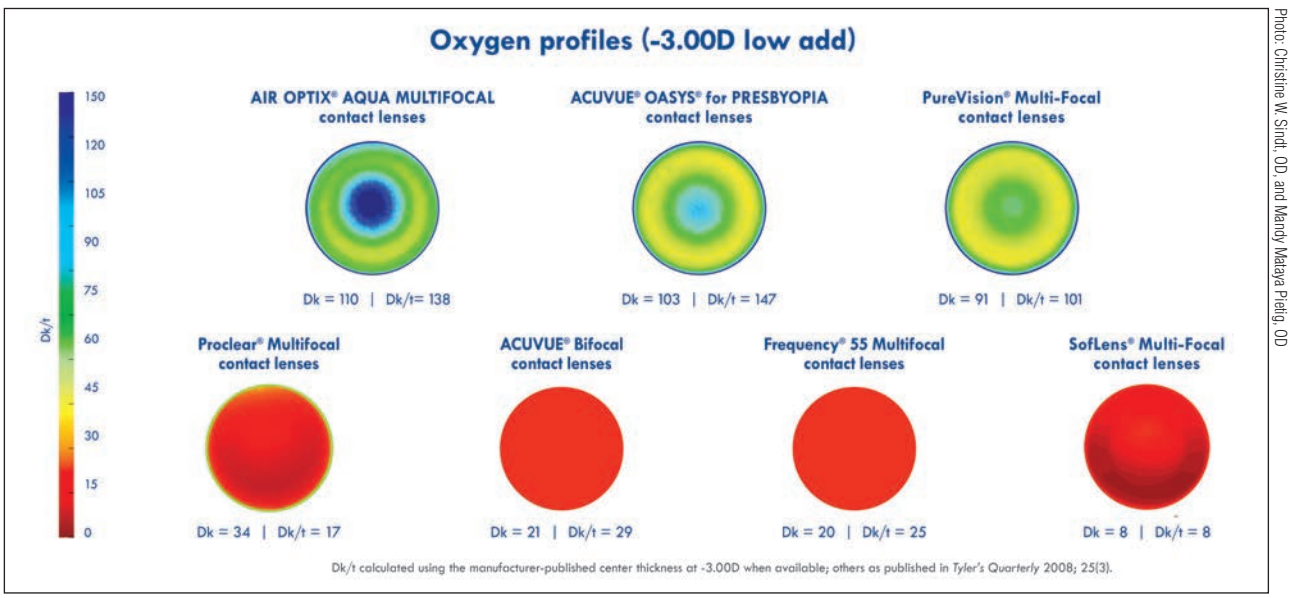

Photo: Christine W. Sindt, OD, and Mandy Mataya Pietig, OD

Fig. 2. Oxygen transmissibility may be another factor in the determination of which multifocal lens to fit a patient with, as risk of dry eye may be a concern. Here are the oxygen profiles of several soft multifocal lenses on the market.

A 45-year-old female with a long history of successful gas permeable contact lens wear since her teenage years presented to the office with a complaint of decreased near vision with her single vision GP lenses. Vision with the lenses in question was 20/20 OU at distance and 20/40 OU at near. Her health history was negative, with no medications other than a multivitamin being taken, and her spherical GP lens fit appeared healthy with distance over-refraction recorded at plano in both eyes. Further examination revealed K readings of 41.75@021/42.50@111 OD and 41:50@167/42.25@077 OS and refraction values of -4.00, +1.00 add OU. The patient's slit lamp and retinal examinations were both unremarkable OU.

The patient reported that she experienced high near demands while reading documents on the computer screen and expressed the desire not to sacrifice her distance vision or wear glasses over her GP lenses. She was refit into an aspheric GP lens design; however, upon return for follow-up, she reported the presence of shadows. Her distance vision and overall lens fit appeared adequate upon examination, but her near vision was reduced. The same lenses were ordered for a second time following a consultation with the GP lens lab, albeit this time with inclusion of a larger optic zone to improve the quality of the patient's near vision. Parameters were BC 8.00, OAD 9.6, OZ 8.5, -4.50 with a +1.50 add OU; 20/30 OD, 20/25 OS and OU at distance; and 20/40 OU at near.

When questioned regarding the second pair of lenses, the patient said that she was content with her distance vision, but frustrated with her near ability. Wishing to improve her near vision and alleviate the continuing symptoms of shadow appearance, she was switched to a translating GP lens design with BC 8.10, OAD 9.5, Seg Ht 3.9 with a +1.00 add OU; 20/20 OU at distance; and 20/40 OU at near parameters. She reported achieving excellent distance acuity with the new translating lenses and also remarked that the shadows were gone, though now she had to move her head around to see clearly, which was leading to headaches at times.

Ultimately, the patient was moved to a monthly disposable silicone multifocal lens design, despite her history of successful GP lens wear. The new lenses were a three-zone aspheric design with parameters BC 8.5, Diam. 14.2, -4.00 Low Add OU; 20/20 OU at distance and 20/25 OU at near. The patient expressed resolution of all problems with wear of these lenses, as well as excellent distance vision and much-improved near acuity.

Table 1. Multifocal Soft Contact Lenses on the Market**

Multifocal Lens Name	Manufacturer	Material	Diameter (mm) / $H_2$0%	BC	DK / CT / OZ (mm)
Concise*	ABB Optical	Polymacon C	14.5 / 38%	8.4, 8.6	
Concise MTO*	ABB Optical	Polymacon C	13.0 to 16.0 in 0.10 steps / 38%	7.8 to 10.0 in 0.10 steps	
Definitive MTO*	ABB Optical	Efrofilcon A	13.5 to 15.5 in 0.10 steps / 74%	7.5 to 9.6 in 0.30 steps	
Definitive*	ABB Optical	Efrofilcon A	14.2, 14.5 / 74%	8.3, 8.6, 8.9	
Ocu-Flex-53*	ABB Optical	Ocufilcon B	14.5 / 53%	8.4, 8.6	18.0 / varies / 1.9, 2.18
Air Optix Aqua	Alcon	Lotrafilcon B	14.2 / 33%	8.6	110, 138 @ -3.00D / 0.08 mm @ -3.00D/
Focus Dailies Progressives	Alcon	Nelfilcon A	13.8 / 69%	8.6	0.10 @ -3.00D
Dailies AquaComfort Plus	Alcon	Nelfilcon A	14.0 / 69%	8.7	26.0 / 0.10 (-3.00) / varies
Dailies Total1 Multifocal	Alcon	Delefilcon A	14.1 / 33%	8.5	156 @ -3.00D / 0.09
Astera	Alden Optical	Hioxifilcon D	10.0 to 16.0 (14.5 std.) / 54%	6.5 to 9.7 (8.3, 8.6, 8.9 std.)	21. / 0.1 / 8.0
Intelliwave Quarterly Replacement*	Art Optical Contact Lens	Efrofilcon A	74%	MTO	60 / varies / 8.4
Intelliwave Semi-Annual Replacement*	Art Optical Contact Lens	Acofilcon A, Hioxifilcon B	48%, 49%	MTO	16 / varies / 8.4
Biotrue OneDay for Presbyopia	Bausch + Lomb	Nesofilcon A	14.2 / 78%	8.6	42 @ -300D / 0.10mm @ -3.00D / 9.0mm @ -3.00 D
PureVision 2 for Presbyopia	Bausch + Lomb	Balafilcon A	14.0 / 36%	8.6	130 @ -3.00D / 0.07mm @ -3.00D / 9.00mm @ -3.00D
PureVision	Bausch + Lomb	Balafilcon A	14.0 / 36%	8.6	101 @ -3.00D / 0.09mm @ -3.00D / 8.0mm @ -3.00D
SofLens	Bausch + Lomb	Balafilcon A	14.5 / 38%	8.5, 8.8	8.4 @ -3.00D / 0.10mm @ -3.00D / 8.0mm @ -3.00D
Ultra for Presbyopia	Bausch + Lomb	Samfilcon A	14.2 / 46%	8.5	163 Dk/t @ center for -3.00D / 0.07mm for -3.00D
Essential Soft Toric	Blanchard Contact Lens	Hioxifilcon B	14.2, 14.4, 14.8 / 48%	14.2 to 8.2, 14.4 to 8.5, 14.8 to 8.8	15 / 0.12 / N/A
Esstech PS	Blanchard Contact Lens	Polymacon	14.5 / 38.6%	8.3, 8.7, 9.1	8.4 / 0.14 (-), 0.15 (+) / N/A
Esstech PSD	Blanchard Contact Lens	Polymacon	14.0 / 38%	8.3, 8.7, 9.1	8.4 / 0.14 (-), 0.15 (+) / N/A
Quattro	Blanchard Contact Lens	Hioxifilcon B	14.2 / 48%	14.2 to 8.4, 14.5 to 8.8	15 / 0.08 (-), 0.12 (+) / N/A
CO Soft 55 Crescent Custom Bi-focal*	California Optics	Methafilcon A	14.5, 15.0 / 55%	8.6, 8.9, 9.2	18.8 / varies
CO Soft 55 Custom Progressive*	California Optics	Methafilcon A	14.5, 15.0 / 55%	8.3, 8.6, 8.9, 9.2	18.8 / varies
Biofinity	CooperVision	Silicone Hydrogel	14	8.6	128 / 0.08 (-3.00)
Clariti 1-day	CooperVision	Somofilcon A	14.1 / 56%	8.6	60 / 0.07
Proclear 1-day	CooperVision	Omafilcon A	14.2 / 60%	8.7	25 / 0.09 (-3.00)
Proclear EP	CooperVision	Omafilcon A	14.4 /60%	8.7	33 / 0.16 (-3.00)
Proclear*	CooperVision	Omafilcon A	14.4 / 62%	8.7	34 / 0.16
Proclear XR	CooperVision	Omafilcon A	14.4 / 59%	8.7	34 / 0.16 (-3.00)
Triton Soft Translating Bi-Focal	GelFlex USA	Hioxifilcon B	15.0, 13.4, 14.5 to 13.4 / 48%	8.0, 8.2, 8.4, 8.6, 8.8, 9.0, 9.2	Varies / 0.15 / varies
iSight MCL	GP Specialists	Hioxifilcon A	13.0 to 15.5	8.0 to 9.5	59.8 / 0.08 / 1.8 to 3.5
1-Day Acuvue Moist	Johnson & Johnson	Etafilcon A	14.3 / 43%	8.4	26.0 / 0.084 (-3.00)
Acuvue Oasys for Presbyopia	Johnson & Johnson	Senofilcon A	14.3 / 38%	8.4	103 / 0.070 (-3.00)
Metrofocal*	Metro Optics	Polymacon	14.0 / 38%	8.6, 8.9	8.4 / 0.10 / 9.0
Definition Aberration Control	Optical Connection	Methafilcon A	14.2 / 55%	8.6	19.5 / 0.09 @ -3.00 / 11.0 @ -3.00
54 Bifocal/Mutlifocal Sphere*	SpecialEyes	Hioxifilcon D	12.5 to 16.0 in 0.1mm steps / 54%	6.9 to 9.5 in 0.1mm steps	23 / 0.10 to 0.30 / Custom Distance and Near
Duette	SynergEyes	Perfilcon A	14.5	7.1 to 8.3 in 0.2mm steps	130
SynergEyes PS	SynergEyes	Paflufocon D hem-iberfilcon A	14.5 / 27%	7.20 to 8.2 in 0.1mm steps	100 / 0.23mm, -3.00D / 7.8
C Vue 55*	Unilens	Methafilcon A	14.4 / 55%	8.5, 8.8	18.8 / varies / varies
C Vue Advanced HydraVue*	Unilens	Efrofilcon A	13.5 to 16.0 / 74%	8.0 to 9.5	60 / 0.12 to 3.00 / 8.0
C Vue Advanced*	Unilens	Hioxifilcon D	13.5 to 16.0 / 55%	8.0 to 9.5	23 / 0.07 + 0.40 / 8.0
C Vue	Unilens	Polymacon	14.5 / 36%	8.5, 8.8	8.4 / 0.10 / 8.0
C Vue ADDvantage	Unilens	Balafilcon A	14.0 / 36%	8.6	91 / 0.07 to 3.00 / 9.0
C Vue HydraVue	Unilens	Balafilcon A	14 / 36%	8.6	91 / 0.09 to 3.00 / 9.0
LifeStyle 4-Vue	Unilens	Polymacon	14.5 / 38%	8.8	16 / 0.17
LifeStyle 4-Vue Hi-Add	Unilens	Polymacon	14.5 / 38%	8.5, 8.8	16 / varies / varies
Lifestyle MV2*	Unilens	Polymacon	14.5 / 38%	8.5, 8.8	16 / varies
Lifestyle Xtra	Unilens	Polymacon	14.5 / 38%	8.5	16 / varies / varies
SimulVue	Unilens	Hefilcon A	14.5 / 45%	8.4, 8.7, 9.0	11.6 / 0.14 / 9.0
SimulVue 38	Unilens	Polymacon	14.5 / 45%	8.4, 8.7, 9.0	8.4 / 0.10 / 8.0
Softsite	Unilens	Polymacon	14.5 / 38%	8.4, 8.7	8.4 / 0.10 / 8.0
Unilens	Unilens	Hefilcon A	14.5 / 45%	8.4, 8.7, 9.0	11.6 / 0.16 / 9.0
Unilens 38	Unilens	Polymacon	14.5 / 38%	8.4, 8.7, 9.0	84 / 0.10 / 8.0
Unilens EMA	Unilens	Polymacon	14.5 / 38%	8.5, 8.8	8.4 / 0.10 / 8.0
UCL Bifocal*	United Contact Lens	Ocufilcon C	14.5, 15.0 / 55%	8.3, 8.6, 8.9, 9.2	18.8 / 0.08, 0.30 / 1.7, 2.0, 2.3, 2.6, 2.9, 3.2
UCL Multifocal*	United Contact Lens	Ocufilcon C	14.7 / 55%	8.3, 8.7, 9.0	18.8 / 0.06 to 0.22 / 8.0 to 10.0
Horizon Bicon Sphere*	X-Cel Specialty Contacts	Various	14.0 to 15.0, 1mm steps / 49, 55, 59, 74%	8.0 to 9.2 in 0.1mm steps	0.14 to 0.37, varies / 1.8, 2.0, 2.5, 3.0, 3.5, 4.0
Horizon Progressive*	X-Cel Specialty Contacts	Various	14.0 to 15.0 in 0.1mm steps / 49, 55, 59%	8.0 to 9.2 in 0.1mm steps	varies
IdealSoft PS	X-Cel Specialty Contacts	Polymacon	14.0 / 38%	8.3, 8.6, 8.9	8.4 / varies

*Toric versions also available. **Source: 2016 *Review of Cornea & Contact Lenses* Annual Lens Guide. Data is provided by manufacturers and is not independently verified.

For this patient, the unique blend of the three-zone design was exactly what she needed to reduce the aberrations that the prior gas permeable lens designs had produced and the refit process took just two visits.

Matching the Lens to the Patient

Most manufacturers offer no-cost soft multifocal lens designs in a trial version to incorporate into practice. Because eye care practitioners often develop close bonds with their patients, however, in some cases lens costs can become a factor: fitting them into a trial lens and then discussing price later does not do them any favors. Additionally, withholding information about the latest technologies for fear of a price conversation is not the answer either.

Overall, practitioners must step back and actively inform patients of all current and new lens options and their prices prior to demonstrating any to them, so as to avoid any confusion. There are three distinct designs of multifocal lenses: concentric, aspheric and translating. Translating designs are predominantly used in rigid gas permeable fits and may require more customized placement of the segment height for near optics, while most soft multifocal designs incorporate aspheric designs with each manufacturer blending the near-center transition to distance zones in a proprietary way. Some patients fare better in some designs while others do well in others; materials may also play a factor in patient success *(Figure 2)*. As such, it is beneficial for us to familiarize ourselves with all lens options available *(Table 1)*.

Given the numerous innovations in multifocal contact lens design that have taken place in recent years, more comfortable new materials and the convenience of frequent lens replacement at a rate suitable to each patient's lifestyle, our chances to succeed have never been greater. It is key to a practice's success to approach these patients, and the multifocal lens category overall, with enthusiasm rather than trepidation. The state of the art will always continue to improve as manufacturers continue to refine their products, but today's options are better than ever, and motivated patients fill our waiting rooms. Success is within your reach—and theirs. ■

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Multifocal Sales: Opportunity is Near

With new modalities, materials and designs, don't bypass this practice-building correction for your presbyopes. **By Jane Cole, Contributing Editor**

It's estimated that there are more than a billion presbyopes in the world. With this in mind, chances are, members of the over-forty crowd are sitting in your chair on a daily basis. And the landscape for presbyopic correction has never been broader. But if you're ignoring multifocal contact lenses as a go-to for your presbyopes, experts say you're missing the boat.

"I have witnessed many doctors not even bringing up contact lenses to their presbyopes," says Justin Bazan, OD, of Brooklyn, NY. "It's simply a bad habit of assuming that presbyopes, who are not there for a contact lens exam, are not interested. This is a huge missed opportunity." In this case, optometrists should be asking every presbyopic patient, including previously failed wearers and those who have never worn contact lenses, "'How come we're not doing a contact lens exam as well today?'" Dr. Bazan says. "You will find that many of them have reasons that are easily overcome with today's innovative contact lenses."

The latest multifocal contact lenses are far more advanced than

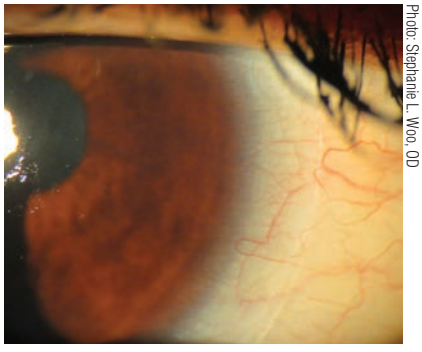

Photo: Stephanie L. Woo, OD

Those looking for soft multifocal contact lenses have many options with today's advances.

the previous generation and run the gamut from soft disposables that provide better day-to-day comfort, to new platforms such as hybrids and scleral lenses. Additionally, there are a variety of designs on the market that can allow a practitioner to customize the lenses by using multiple designs for patients, says Julie DeKinder, OD, director of academic programs and residencies, chief of contact lens services and associate clinical professor at the University of Missouri-St. Louis College of Optometry. These new options include center-near or center-distance lenses and a variety of add powers in soft contact lenses, Dr. DeKinder says. And, these lenses are available in all replacement modalities.

"The manufacturers have done most of the heavy lifting," says practice management consultant Gary Gerber, OD, of the Power Practice. "The only barrier left is the doctor's inertia."

Here, your colleagues offer some pearls on how you can bolster multifocal contact lens sales in your practice, improving patient satisfaction and your bottom line.

Let's Talk

One of the most effective, yet often underused, ways to get your presbyopes into multifocal contact lenses is simply bringing up this option during the exam, the experts say.

"Most patients don't realize that multifocal contacts even exist. It is up to the OD to recommend these to patients," says Stephanie Woo, OD, of Lake Havasu City, Ariz. "Out of thousands of contact lens patients, only a handful have actually asked me about trying a multifocal lens. If I don't take the initiative and bring it up as an

option, they would never know."

All presbyopes need refractive correction, but few-to-none are wearing multifocal contacts, with the majority of these patients opting for reading glasses or monovision for near vision, says Mile Brujic, OD, of Bowling Green, Ohio. This is mainly because optometrists are shying away from communicating the options to patients, he adds. "If a presbyopic patient says they are not interested in contact lenses, it's good to understand why. If there are real limitations, or if a patient tried a multifocal contact lens six months to a year ago and it didn't work, that's one thing." But optometrists are remiss if a patient says they tried a multifocal 10 years ago and it didn't work without informing them about the advances in today's designs and suggesting multifocal contacts as a viable option again, Dr. Brujic adds.

"I think we are reactionary when it comes to our presbyopes," says Dr. Brujic. "We often feel that if we make a recommendation or offer a solution, and the patient says, 'No, I'm not interested,' we should simply stop offering it to all our other patients unless a patient comes in and specifically asks for it." If a patient comes into the office and says they simply need correction for near vision, optometrists often make assumptions and suggest reading glasses or progressives or bifocals, he says. "We need to educate every presbyopic patient that there are contact lens options available to them as well."

Optometrists need to have routine conversations with presbyopic patients on multifocal contact lenses and their benefits, Dr. Woo says. "Typically, I might say something like, 'Andrea, right now you are having to wear cheaters on top of your contact lenses to see anything up close. Would you be interested in a contact lens that could limit your dependency on glasses?' Many patients are intrigued at this idea and want to learn more."

For Dr. DeKinder, the best way to build a multifocal practice is to start educating patients. During the exam, if the patient is a spectacle lens wearer, she will ask if they have ever thought about wearing contact lenses. "I will then educate them about their contact lens options and which lenses I believe will work best for them. I find this gives the patient something to think about. The patient doesn't always want contact lenses, but after I educate them and let them know about the type of visual outcome they could have, they will think more carefully about their options," she says.

Photo: Julie DeKinder, OD

Dr. DeKinder uses loose lenses to perform an over-refraction binocularly while fitting a patient with multifocal contact lenses. Fitting specialty lenses can take more time, so be sure to charge an appropriate fee for your time and expertise.

For a patient who needs multifocal contact lenses but is a current distance-only contact lens wearer, Dr. DeKinder always discusses multifocal lenses. "I also encourage the patient to let me fit them with a multifocal lens by telling them they really have nothing to lose. If the multifocal works, that is great for them. If the multifocal doesn't work, they can always go back to their current modality. However, I must say, it is rare that a patient will ever have to go back to their current modality."

Lens Pricing and Setting Fees

One of the keys of multifocal contact lens sales is the annual supply, says Dr. Woo. Since multifocals generally cost more than traditional lenses, the patient may push back after hearing the price increase, she says. But there are some ways around this, she adds.

"Manufacturers have really helped this by offering great rebates when patients order an annual supply. Your office can show the patient how much they will save if they order an annual supply, and that can help overcome some of the price hurdles," she says.

Although patient satisfaction is paramount when fitting multifocal contact lenses, they can be a huge revenue source for the practice as well, says Dr. DeKinder. "The fees for fitting specialty lenses are higher, the lenses are specialty and thus are priced higher; additionally, the presbyopic patient should always have a backup pair of progressive spectacles and a nice pair of non-prescription sunglasses," she says.

Always separate professional and material fees to allow for comparative pricing, suggests Glenda Secor, OD, of Huntington Beach, Calif. Take advantage of all manufacturer incentives to stay competitive and

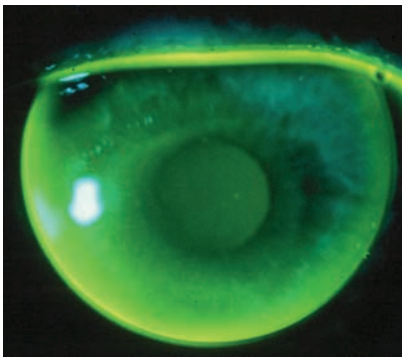

Photo: Edward S. Bennett, OD

If you fit patients well, such as with the aspheric multifocal gas permeable lens seen here, they'll love the freedom from reading glasses you enabled for them.

don't devalue your professional time, she adds.

Advances in lens design are breaking down barriers, too. In light of higher patient acceptance of newer designs, "our success after the first visit is so high, we have set our fees for a multifocal contact lens design to our basic level," says Dr. Bazan. "Chair time historically was much more for multifocal contacts, but we have found that not to hold true today for us." If a multifocal contact lens fitting goes beyond the second visit, Dr. Bazan says his practice simply upgrades the patient to a higher fee. "Lowering the financial barrier may help get them into a multifocal contact. For us, it means that every patient who is a candidate for a multifocal contact gets to try at least one of them."

Free In-Office Trials, Referrals and More

One of the best selling points for multifocal contact lenses is simply getting them on your patients' eyes, Dr. Bazan suggests. "If it is an option, get the lenses on them. Get passionate about multifocal contacts. It's contagious, and your patients will share in the excitement," he says. Dr. Bazan also suggests letting the apprehensive patient try a free in-office trial while they browse for glasses. Often, they are so impressed, the patients will enthusiastically get the contact lens exam on the spot, he says.

Another marketing tip that has worked for Dr. Bazan is being aggressive about getting referrals. "Get their spouses in. I've found that the spouses are often excited and look forward to experiencing the lenses for themselves. Simply ask for the referral," he says.

A television with a slideshow running in the waiting area that highlights specific lens designs is a great way to educate patients before they see the doctor, Dr. DeKinder adds. A simple question on the patient questionnaire asking if patients are interested in contact lenses gives the doctor another avenue to present lens options, she says.

Keep it Simple

Experts suggest that instead of describing the optics of multifocal contact lenses in minute, scientific detail to patients, keep it simple to avoid potential confusion.

"I tell patients, 'We have a multifocal lens that can provide you more freedom from your reading glasses,'" Dr. Brujic says. "Often, when people hear 'multifocal contact lenses,' they think they're going to have to tip their head back to get in the near zone. I tell them they won't have to do that with these lenses. And I tell the patient, with multifocal contact lenses, they are going to have more peripheral vision and not be as constrained with their glasses."

When striving to keep it simple, let the lenses do the talking, Dr. Bazan says. "Keep the initial information brief," he says. "I simply

Get Your Patients Psyched!

Optometrists today face enormous competitive pressures on the retail component of our practices, and rarely is this felt more acutely than in contact lens sales. But we all know buying is not just about getting the lowest price. There are many complementary factors—convenience, to name one—commonly discussed as influencers of buying decisions. However, I feel the factor that is most appropriate to understand, yet often overlooked, is the psychology of what gets people to say yes to the sale. It's the notion that people who feel indebted to you after you have provided them with exceptional care and an extraordinary experience will return the favor, i.e., buy from you.

What I'm talking about is known as "the Rule of Reciprocation." This especially holds true when we blow away our patients' expectations. At my practice, we are often able to do exactly that with the innovative multifocals that have recently been added to our repertoire. Surprisingly few optometrists offer multifocals routinely, and providing this service is an excellent way to showcase your expertise. In my experience, the enthusiastic and grateful multifocal wearer is least likely to even be thinking of shopping around, let alone to be driven by price. They are so thankful and pumped up they can't wait to get their order in. This psychological factor is something that first came to me as I read a book about human behavior called *Influence: The Psychology of Persuasion* by Dr. Robert Cialdini.

When you combine that realization with the tried-and-true methods of capturing the annual sale—i.e., optimal hand off, annual supply discount, doctor-only rebates, ready inventories—you can expect to enjoy a high in-office sales capture rate.

Thinking that we can compete on price with the 1-800s of the world is a delusion that leads many practitioners astray. That's a race to the bottom we simply cannot win. Results will be better for patient and practitioner alike when we aim high.

—Justin Bazan, OD
Park Slope Eye, Brooklyn, NY

reassure the patient that they are going to love them. I have found a lot of questions are from a patient's apprehension, but often a doctor's explanation leads to even *more* apprehension." Much of this stems from the doctor's previous experience with older multifocal technology, he adds.

Photo: Julie DeKinder, OD

Fitting patients into multifocal contact lenses doesn't have to cut into your dispensary sales. Patients still need a backup pair of progressive spectacles and a nice pair of non-prescription sunglasses, Dr. DeKinder says.

Let Staff Be Your Ambassadors

Look no further than your staff as advocates for multifocal contact lenses at your practice, Dr. Brujic says. Those who are candidates for multifocals should be given lenses to try so they can share their experiences and success stories with your patients.

Staff at Dr. Brujic's practice also helps in marketing the lenses by watching patients' body language. "A tech or staff person may notice during the pretest that a patient is putting on and taking off their glasses to perform certain tasks, or that they are tipping their head back and looking at objects in the near portion of their progressive lenses. When we see this, we can actually offer these patients an opportunity with multifocal lenses to be free from having to do these things on a daily basis," Dr. Brujic says.

Timing is Everything

At Dr. Bazan's practice, he has found the best successes in transitioning a presbyope into multifocal lenses is to not test out vision until the patient has had a minimum of 15 minutes of neural adaptation. "I have them spend the first five minutes looking out the window people watching, the next five minutes trying on sunglasses and the last five minutes using their phone. Then I ask them what their experience was like. If they love the lenses, shut your mouth. Don't sabotage the experience by bringing up past experiences you had with previous patients who were probably in less innovative designs, and consequently, had less than stellar experiences. If they are having a great experience, let them enjoy it." Then, Dr. Bazan suggests optometrists reinforce how well the patients are doing in their lenses and let them know their experiences should only continue to get better. "VAs are important, but you don't have to immediately put up the 20/10 line and push them. In fact, don't."

It takes staff and chair time to explore new modalities such as multifocal contact lenses with patients, but the time necessary to fit and follow a potentially successful patient will benefit both the patient and doctor in tangible and intangible ways, Dr. Secor says. "Don't miss an opportunity to be successful," she says.

Dr. Gerber's final piece of advice: "Pretend monovision and readers don't exist. Seriously, it's a great way to start changing your thinking." ■

Determining Multifocal Parameters for a Better Fit

Improve multifocal success by selecting the best design for your patient.

By Robert L. Davis, OD

The discussion of multifocal contact lenses usually results in the rendering of a blank stare from my students. They understand the concepts of multifocals, but are often indecisive in selecting lens designs for patients. They are also motionless when I discuss lens parameter changes to resolve patient's visual complaints. To prescribe for success, the practitioner must understand a few fundamental concepts of multifocals.

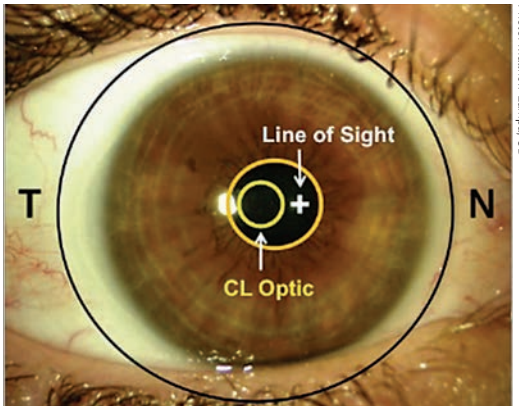

Photo: Matthew Lampa, OD

Fig. 1. Line of sight offset (lens is pushed off temporally from scleral asymmetry).

Distance and Near

First and foremost, unlike in multifocal spectacles, the distance and near powers of many multifocal contact lenses are organized in an annular center-and-surround configuration; thus, successful fitting of these lenses requires proper centration and careful monitoring of the patient's pupil size. In the case of spectacles, however, when the patient views at distance, the only prescription the patient is viewing through is distance. The advantage of having a stabilizing nosepiece on spectacles is that the frame can be modified so that the multifocal can be positioned with the line of sight at the exact location that the patient's eye would transcend down through to reach the lens's near power area. In the case of multifocal contact lenses, the distance and near prescription areas reside within the pupil's range so that both prescriptions can be viewed simultaneously. The only exception is alternating vision lens designs.

Commonly, the line-of-sight aligns the viewing target with the fovea through the nodal point, which must be taken in consideration when developing a multifocal lens design. Angle λ, which can be used to represent the difference between the visual axis and the pupillary axis, for the most part does not play a significant role in the success of single vision lenses because of their consistent power profile across the optical zone of the lens surface (*Figure 2*). This is true in the case of multifocal spectacles, but not so in multifocal contact lenses.

These specialty lenses rely much more on centration over the patient's visual axis to achieve optimum multifocal optics in line with the patient's line of sight; as such, without a stabilizing force to balance out the weight of the multifocal lens, successful centering of the optics in front of the pupil for the rays of light to accurately focus onto the retina may be dif-

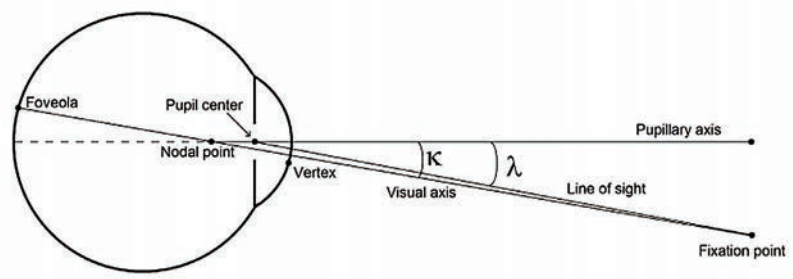

Fig. 2. Difference between angle kappa and angle lambda.

ficult. Typically, line of sight is off-center by about 9 to 11 degrees, and can degrade vision due to the onset of coma and astigmatism. Furthermore, if the line of sight or lens centration is several millimeters off from the center of the pupil, full exposure to the multifocal optics portion of the lens will not be possible and can result in optical aberrations.

The lens design of a multifocal may also have a bearing on the fitting parameters: a center-near lens design will typically have a steeper profile in the center of the lenses surrounded by a flatter zone, while a center-distance lens design most likely exhibits a flatter profile centrally that is surrounded by a steeper profile. Using a topographer to measure the difference between the center of the pupil and the central ring of the videokeratoscopic image as it is centered over the patient's line of sight can become increasingly important as the add prescription is increased.

Practitioners often experience difficulty aligning the line of sight because the multifocal soft lens is usually positioned temporally due to scleral asymmetry, while the line of sight is nasal to the geometric center of the eye (*Figure 1*). The nasal sclera is more elevated than the temporal scleral; as such, when a contact lens is placed upon the eye, the lens is pushed temporally. The optics of the contact lens can be displaced opposite to the amount of temporal decentration. This depends on the decentered optics, which is itself caused by the lack of centration. At times, the zone size can also be modified to improve the resultant visual acuity as long as there is a consistent power profile.

The choice of a multifocal lens design is controlled by pupil size: if the patient's pupil is smaller than the zone configuration, vision will be impossible to view through the peripheral zone.

Fitting the Patient

Each multifocal lens available on the market today has a unique distance and near zone configuration, which can impact the wearer's vision in distinctly different ways.

Practitioners should also keep in mind that the average pupil size varies from patient to patient, and

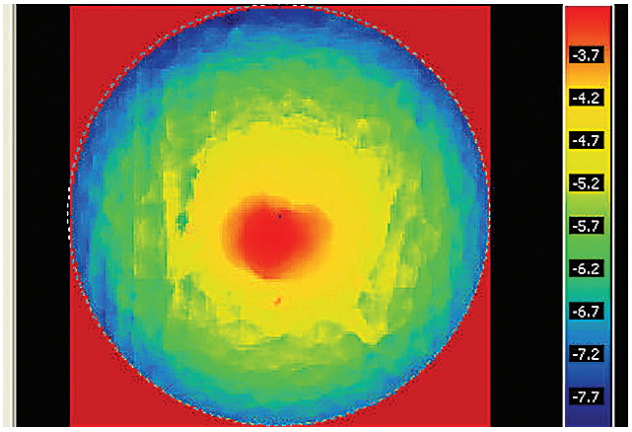

Fig. 3. A contact lens near-center power profile.

also changes when exposed to both dark and light environments—facts that may further affect the selection of a lens design. Overall, multifocal lens design choice is controlled by pupil size: if the patient's pupil is smaller than the zone configuration, vision will be impossible to view through the peripheral zone. Additionally, the older the patient is, the smaller their pupil area likely will be, due to senile miosis. As such, spreading the lens power across the distance and near zones is how most multifocal designs are created. This is typically done by measuring the patient's pupil size under both scotopic and photopic scenarios during the initial fitting examination.

Instituting these concepts into practice can help develop a systematic approach for multifocal selection and can help you make any necessary modifications to the lens. Gathering the patient's refraction values, photopic and scotopic pupil size measurements and their near and distance visual requirements can assist with solidifying the initial parameters for the lens. Addressing the lens prescription typically follows a simple rule: patient's requiring smaller adds generally perform better with distance-centered lens designs. In this case, line of sight will have a minimal effect and pupil size will likely be larger. The spread function of powers through a low add power aspheric multifocal design is also less compressed than high power adds, so the pupil will, for the most part, have the space to capture the near prescription powers. Higher add prescriptions, however, are more likely to perform successfully in near-center designs due to the add power spread function compression. With this design, smaller pupils will result in improved distance vision as it dilates under scotopic conditions (*Figure 3*).

Higher add prescriptions are more likely to perform successfully in near-center designs due to the add power spread function compression.

Customization

Tailoring a multifocal lens design to the patient's needs plays an important role when the necessary parameters are not available in stock multifocal lens designs. Setting specific zone size configurations and decentering optics to position line of sight are important tools in ensuring multifocal lens success.

Customized lenses can also help with reduced contrast sensitivity, coma, astigmatism and ghosting, which are some of the optical reasons patients complain of poor vision through multifocal lenses.

When conversing with the patient regarding their specific visual needs, it is important to determine whether they are near-centric or distance-centric. To achieve this, the common practice is to display the Snellen chart to the patient and ask them which lines they can see clearly. Though the chart is needed, the real analysis should occur when the patient goes home and performs at work, where they can assess whether the lenses are suitable or further modifications are necessary in different environments.

Selecting the Design

The same philosophies hold true whether the patient is wearing soft, hybrid or gas permeable multifocal contact lenses. Hybrid, scleral and soft lenses tend to move minimally on the eye with blinking, while rigid corneal gas permeable lenses move vertically. Because intermediate vision is an important zone for most patients today with the pervasive use of computers and cell phones in daily life, concentric designs have fallen out of favor in deference to aspheric ones. Concentric lens designs still have use when the patient's accommodative facility remains active enough to trigger intermediate vision.

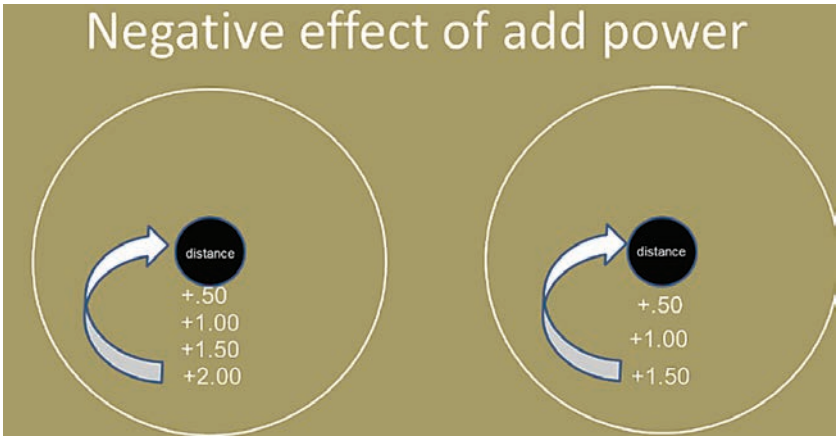

Fig. 4. Negative impact of near surround zone affecting distance-center lens zone. Increasing the strength of the add increases the strength of the impact.

However, in cases in which higher add prescriptions are necessary, the only configuration that will work successfully is modified monovision.

Hybrid multifocal contact lenses can be fabricated in both a concentric and aspheric progressive lens design. The concentric stock zone parameter is typically configured in a 1.9mm or 2.2mm near-center design, while the aspheric lens design has a 3.0mm near-center aspheric lens design. The advantage of these multifocal lens designs is that the lens configurations center extremely well; however, the fact that the near center zones are fixed can be a problem. In order to improve the patient's visual success, you can modify the optical zones in both bifocal and multifocal lens designs: For example, as the center zone increases in size, it has a negative effect on the surrounding area, while if the surrounding area increases in size, then it has a negative effect on the center area *(Figure 4)*.

Severe dry eye patients, such as those who suffer from Sjögren's syndrome, graft-vs-host disease or Stevens-Johnson syndrome, may benefit from scleral multifocal contact lens wear, as the lens vaults the cornea to land on the sclera and contains a fluid-filled compartment to assist with corneal surface hydration. These lenses are also suitable for patients with keratoconus or other corneal irregularities. This is especially the case since a scleral lens design can be customized and tailored to fit the patient's unique pupil size and corneal configuration.

For most patients, following assessment of pupil size under photopic and scotopic conditions using the Volk eye check, ruler or pupillometer, the lens design should be configured in either an aspheric or concentric lens design. Note, the most successful design configuration for these patients may be a near aspherical zone, surrounded by an aspheric zone and then a spherical distance zone: a patient requiring an oblate design with a 3.3mm photopic pupil and 4.1mm scotopic pupil would ultimately end up with a lens comprised of a 1.8mm near central spherical zone and a 1.2 aspheric zone, with the distance zone starting at 3.0mm extending out to 8.0mm, or the size of the total optic zone (*Figure 5*).

Scleral lens designs also allow

for decentered optics to be ordered, which can help neutralize line of sight offsets. The inclusion of quadrant specific peripheral curves is an additional option that may help provide better centration.

Multifocal soft lenses are available in daily, monthly and quarterly as well as yearly replacement schedules, while lens designs can be fabricated in near-center, distance-center, aspheric, concentric and combination options. Soft multifocal lenses generally contain fixed zone size parameters, regardless of the wearer's pupil size or line of sight, which can lead to a trial and error approach for fitting. Customized soft multifocal lenses are able to be fabricated in any zone size, diameter, base curve and also with decentered optics to neutralize offsets of line of sight. Regardless, however, soft multifocal lenses provide a good option for simultaneous vision due to their restricted movement on the eye during blink.

Use of a multifocal simulator may be a good starting point when determining the lens's zone size configuration, as it specifies either a near center design or distance center design (*Figure 6*). Furthermore, in the simulator, the add power will provide the visual outcome relationship between distance, intermediate and near.

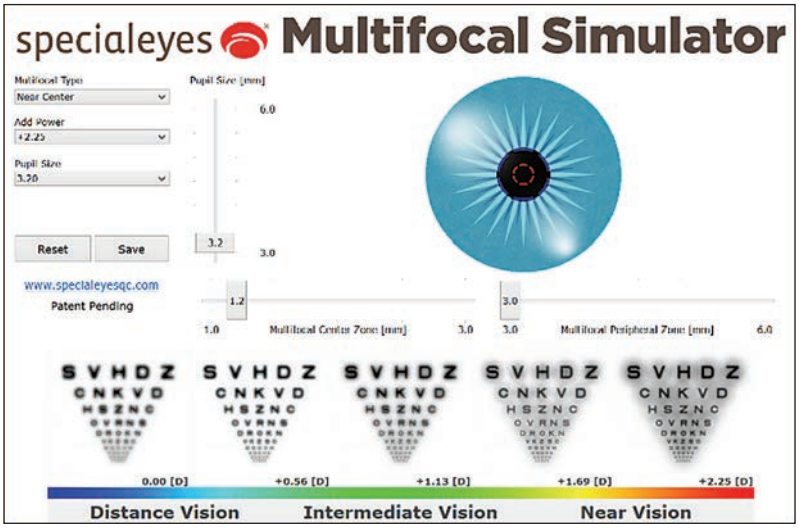

Fig. 6. Multifocal Simulator. Variables include pupil size, add power, zone size, distance-center or near-center design.

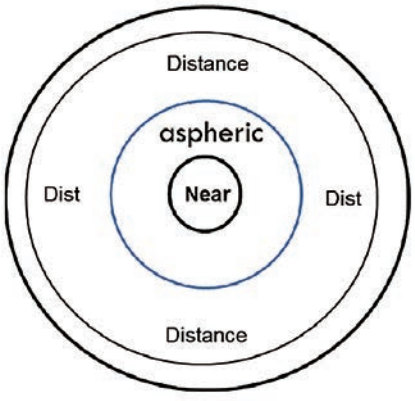

Fig. 5. A common multifocal design (spherical near aspheric intermediate and spherical periphery distance).

The resultant visual acuity is represented by a series of Snellen acuities across the entire visual range. The multifocal simulator also illustrates the fact that when add power increases, contrast sensitivity decreases; it also demonstrates the resultant visual acuity in cases when the pupil size or add changes, without the need to place a lens on the eye. Simulation can also help portray the difference between the resultant acuity in cases when a near-center lens is employed, as opposed to a distance-centered lens.

Rigid GPs

Corneal gas permeable multifocal lenses are an additional lens design that can be considered by presbyopic patients. Unlike hybrid, scleral and hydrophilic lenses, corneal GPs move on the eye—a unique characteristic that enables the lens to translate on the ocular surface itself, enabling the eye to move vertically through the lens upon downward gaze to reach the add power. Centering the lens in front of the pupil can be achieved via altering the lift of the lens. Because corneal GP lenses float on a layer of tears, controlling the tear layer will lead the lens to ride either higher or lower on the eye. This can done either by changing the lens's base curve, or by altering the diameter of the lens. As such, when the tear layer becomes deficient or changes during wearing time, visual acuity can be compromised due to adjustments in lens movement and lift, which affects lens position on the eye.

As stated earlier, pupil size is the controlling factor of every multifocal design, and corneal GP lenses are no exception to this concept. Corneal GP multifocal optics are most commonly adjusted by changing the eccentricity of the lens design. Pupil size and near power requirements determine the rate of flatting throughout the optics of a GP lens: for example, a larger pupil can capture more of the peripheral zone than a smaller pupil (*Figure 7*). A small pupil will also need a more rapid power change through

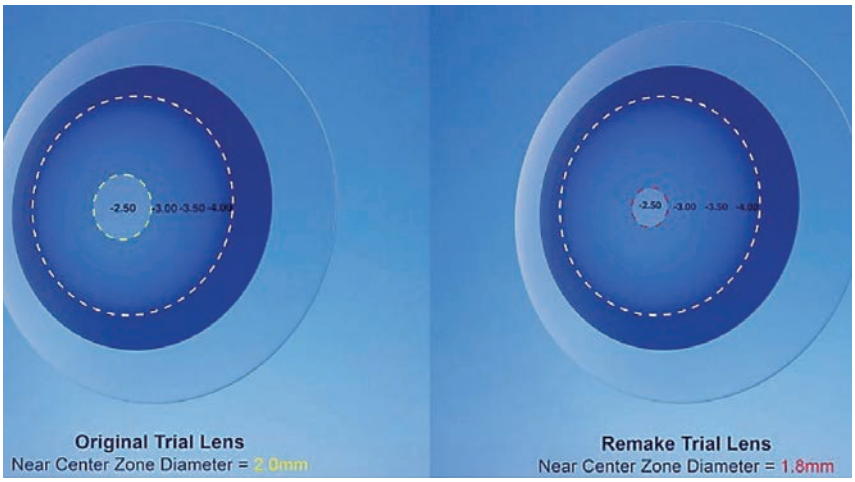

Fig. 7. Reduced center-near zone to change aspheric power compression.

the optics of the lens to reach the peripheral zone prescription. Furthermore, smaller adds require less lens power change, while larger add powers require a more significant power change. Power compression in the case of aspheric lens designs is controlled through eccentricity: by measuring pupil size, eccentricity can be prescribed to enhance both distance and near vision. Overall, success with aspheric multifocal lenses can be achieved via control of lens placement on the eye. This is accomplished by adjusting lift and power requirements, which are associated with eccentricity defined by pupil zone.

While the options for multifocal contact lenses are more numerous than ever before, the presbyopic population still, for the most part, remains underserved. Though dry eye syndrome is one major cause of contact lens dropout, requiring patients to wear reading glasses in addition to their contact lenses can frustrate many of them and cause them to forgo contact lenses entirely. Constructing a multifocal contact lens design in which the line of sight transcends into the refractive add power while avoiding the degradation of distance acuity can help increase interest in multifocal lenses.

The making of zone size modifications related to pupil size is another way to boost product visibility and patient satisfaction, while base curve, diameter, power, pupil size, eccentricity and near-center or distance-center lens designs are the key parameters to select for to improve the prescription of multifocal contact lenses.

Above all, however, a final frontier exists in improving patient comfort in this population. Ultimately, material enhancements will prove the source of the greatest comfort during wear for all of the multifocal contact lens patients we see in the clinic. ■

Dr. Davis practices in Oak Lawn, Ill. He is a cofounder of EyeVis Eye and Vision Research Institute, where he develops contact lens designs and anterior segment pathophysiology research. Dr. Davis is an inductee in the National Academy Practice in Optometry and is an advisor to the Gas Permeable Lens Institute. He has also been honored as one of the 50 most influential optometrists in 2015.

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Controlling Diabetes with Oral Agents

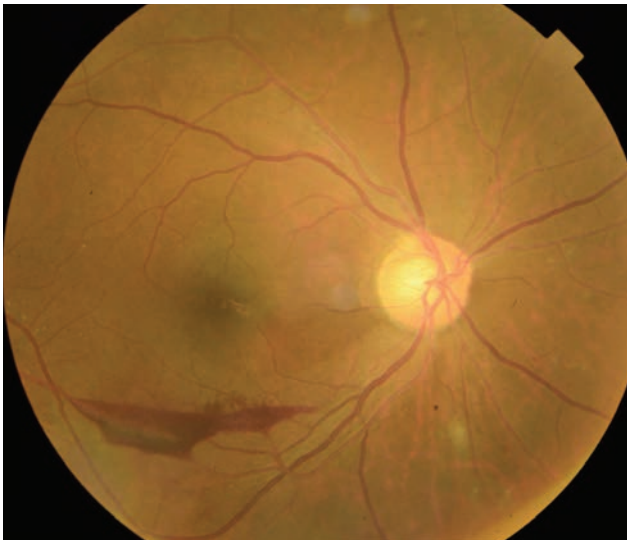
Systemic meds are essential allies when fighting this condition and its ocular effects. To provide full-scope care, ODs should understand precisely how they work.

By Candice Tolud, OD, and Joy Harewood, OD

Even though the Centers for Disease Control (CDC) estimates that one in three Americans are on pace to develop diabetes by 2050, only 65% of patients with the disease report receiving an annual dilated eye exam.[1] The CDC approximates that 28.5% of diabetic patients will develop some level of diabetes retinopathy (DR) or diabetic macular edema (DME).[1] However, 100% of them are at risk.

To adequately serve these patients, optometrists must develop the skills now to combat this risk by employing current treatment models. Part of that treatment includes keeping abreast of emerging oral therapies.

This article will review the basics of diabetic classifications, oral therapies, new drugs and drug targets to control diabetes and diabetic eye diseases.



A 50-year-old Hispanic male with proliferative diabetic retinopathy.

Diabetes Classifications

Type 1 diabetes, previously called juvenile-onset or insulin-dependent diabetes, is characterized by cellular-

Release Date: August 2016
Expiration Date: August 15, 2019
Goal Statement: With rates of diabetes rising and expected to continue rising, optometrists find themselves on the front lines of controlling diabetic eye diseases, such as diabetic macular edema and diabetic retinopathy. To successfully control these conditions, they should have an in-depth understanding of the mechanisms, contraindications and side effects of oral medications. This article provides an overview of the many agents available for these patients.
Faculty/Editorial Board: Candice Tolud, OD, and Joy Harewood, OD.
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Disclosure Statement: The authors have no relationships to disclose.

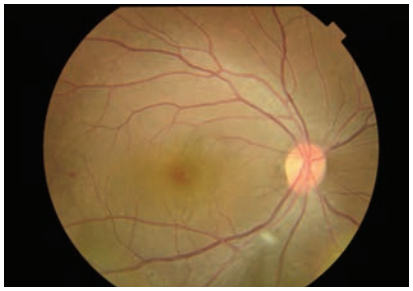
Table1. Summary of Major Oral Antihyperglycemic Medications[12,30, 31]

Agent Class	Name(s)	Mechanism of Action	↓Fasting Plasma Glucose (mg/dl)	↓HbA1c (%)
Sulfonylureas	Glyburide Glipizide Glimepride	Stimulates sustained insulin release.	60-70	1.0-2.0
Meglitinides	Repaglinide Nateglinide	Stimulates insulin release.	65-75	1.0-2.0
Biguanides	Metformin (Glucophage)	Decreases hepatic glucose production, increases intestinal absorption of glucose.	50-70	1.0-2.0
Thiazolidinediones	Rosiglitazone (Avandia) Pioglitazone (Actos)	Increases insulin sensitivity.	60-80	0.5-1.5
DPP4 Inhibitors	Sitagliptin (Januvia) Saxagliptin (Onglyza)	Incretin Enhancers. Increase insulin secretion.	12-28	0.5-0.8
SGLT Inhibitors	Canagliflozin (Invokana) Dapagliflozin (Farxiga) Empagliflozin (Jardiance)	Decreased glucose reabsorption by the kidneys.	23-29	0.5-1.0
Alpha-Glucosidase Inhibitors	Acarbose (Precose) Miglitol (Glyset)	Delays carbohydrate absorption.	25-30	0.7-1.0
Bile Acid Sequestrants	Colesevelam (Welchol)	May reduce endogenous liver glucose production.	15	0.5

mediated autoimmune destruction of the beta-cells in the pancreas and usually leads to severe insulin deficiency.[2]

Type 2 diabetes, previously referred to as adult-onset or noninsulin-dependent diabetes, is characterized by insulin resistance causing a relative, rather than an absolute, insulin deficiency. Type 2 diabetes patients have lost 20% to 65% of their functioning beta cells at diagnosis.[3] Between 90% and 95% of all patients with diabetes have Type 2 diabetes.[2]

Other common risk factors for the development of Type 2 diabetes include: aging, family history of diabetes, a personal history of gestational diabetes, physical inactivity, hypertension, high cholesterol, race and ethnicity. Type 2 diabetes can also be drug-induced, chemical-induced or secondary to kidney or pancreatic disease. African or Hispanic ethnicities have a disproportionately high prevalence of diabetes compared with Americans of European descent (12.6%, 11.8%, 7.0%, respectively).[2]



A 38-year-old Hispanic female with moderate NPDR.

Gestational diabetes is defined as any degree of glucose intolerance resulting in hyperglycemia and is diagnosed during pregnancy, usually during the second or third trimester.[1] Gestational diabetes affects 14% of pregnant women.[3] Gestational diabetes can lead to neonatal hypoglycemia, respiratory distress syndrome, increased rates of birth trauma and caesarean delivery.[4] Adequate glycemic control decreases maternal and fetal complications and can be accomplished through diet and exercise, while some will require pharmacologic intervention.[4] Due to the short and temporary course of gestational diabetes, it does not lead to the development of DR. However, women diagnosed with gestational diabetes have a 35% to 60% increased chance of developing Type 2 diabetes in the future.[5]

Prediabetes refers to glycemic parameters above normal, but below diabetes thresholds. These patients are in a high-risk state for diabetes with an annualized conversion rate of 5% to 10% with similar proportion converting back to normal levels. Research shows prediabetes is associated with the simultaneous presence of insulin resistance and beta cell dysfunction.[6] Prediabetes is also associated with early forms of nephropathy, diabetic retinopathy and increased risk of macrovascular disease.[6]

Oral Therapies for Diabetes

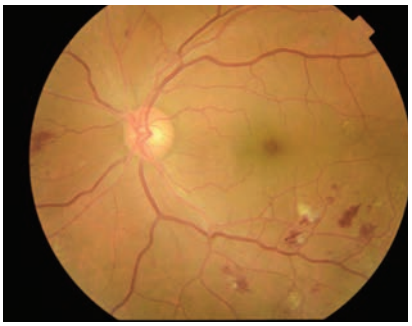
The selection and application of a glucose lowering therapy are

dependent on a number of considerations including: severity of hyperglycemia, liver and kidney functions, risk of hypoglycemia, body-mass index, ability to self-monitor blood glucose and cost of medications. We will focus on the treatment options for Type 2 diabetes.

Biguanides are generally considered first-line diabetes therapy in the United States—specifically the biguanide metformin, an insulin sensitizer. Its mechanism of action reduces production of glucose in the liver.[7] It also increases liver sensitivity to insulin and decreases extraction of gluconeogenic substrates. For metformin to work, the body must be producing, or concurrently be injected with, insulin.[7]

Metformin is not metabolized by the body. It is absorbed and eliminated through urine. Because of this elimination pathway, it had been thought that patients required good renal function to safely use metformin.[8] However, recent evidence shows that metformin may be used in patients with mild renal impairment, as long as they're under close supervision of a physician.[8] Other relative contraindications include cardiac or respiratory insufficiency, a history of alcohol abuse or a history of metabolic disease.[8]

It is effective, reducing HbA1c by 1% to 2%, and has the added benefits of improving lipid profile and stabilizing body weight.[7] Researchers postulate that metformin causes weight loss through depletion of fat mass and its effect on appetite.[9] The main reason why it is often a first-line therapy may be because it has a low probability of producing hypoglycemia. Side effects include abdominal discomfort, diarrhea and, most severely, lactic acidosis. Roughly 10% of patients cannot tolerate metformin at any dosage.[7] The adverse gastrointestinal effects can be reduced, or even avoided, by taking metformin with or immediately before a meal, or by slowly titrating the dosage or by using metformin XR extended release.[7] It can be combined with other medications and is available in combination with the sulfonylurea glibenclamide (Glucovance) and the SGLT2 inhibitor canagliflozin (Invokamet).[7]



A 52-year-old Hispanic male with moderate NPDR.

Sulfonylureas bind to B-cell receptors in the pancreas and stimulate insulin secretion. Similar to metformin, these drugs reduce HbA1c by 1% to 2%.[10] Since they cause unregulated insulin release, they do promote some weight gain, so using them in patients of normal weight is ideal. Insulin's main role is to help the body absorb glucose nutrients. These drugs cause the body to store more glucose—as fat—making weight gain inevitable, unless the patient reduces calorie intake or increases exercise.[11] Sulfonylureas rely on B-cell function to act, so a patient must have some level of B-cell function for them to be effective. Treatment failure with sulfonylureas is often an indicator of poor B-cell function and may signal that insulin therapy should be initiated.

Side effects include sensitivity reactions and weight gain of about two pounds to eight pounds, but the most important risk is hypoglycemia. Sulfonylureas will release insulin regardless of the glucose level in the blood, which can push the body into a hypoglycemic state. Twenty percent of patients treated with sulfonylureas in the United Kingdom Prospective Diabetes Study (UKPDS) had suspected hypoglycemic events, with 1% having severe hypoglycemic crises.[12] Investigators have also expressed some concern that these drugs contribute to adverse cardiovascular events.[13,14] The links are postulated, in part, because these medications bind to the receptors SUR2A and SUR2B, which are both found in some form on cardiac and smooth muscle.[15] Not all types of these medications have binding capabilities and only in high concentrations have these effects been found.

Meglitinides, or glinides, also stimulate insulin release. These drugs bind to a receptor on the plasma membrane of the B-cell with a similar action as sulfonylureas. They are preferred by some, since they're short acting, lowering the risk of

Table 2. Retinopathy Staging

Degree of Retinopathy	Findings
Mild NPDR	At least 1 MA
Moderate NPDR	Hemorrhages and/or MAs (2A), CWS, or VB(<6B) or IRMA (<8A)
Severe NPDR	4/2/1 (Hemorrhages, VB, IRMA)
Very severe NPDR	2 of severe findings
PDR	Definite NVD or NVE and/or VH/PRH

Note: CWS=cotton-wool spots; IRMA=intraretinal microvascular abnormalities; MAs=microaneurysms; NPDR=nonproliferative diabetic retinopathy; NVD=neovascularization of the optic disc; NVE=neovascularization elsewhere; PDR=proliferative diabetic retinopathy; VB=venous beading; VH/PRH=vitreous hemorrhage/preretinal hemorrhage.

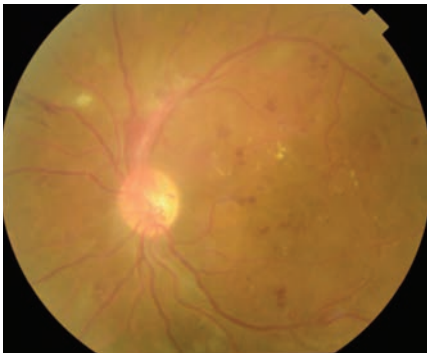
hypoglycemia. Glinides are metabolized rapidly and removed from the body by the liver. They can cause a small weight gain, and can be used in combination with other drug classes.[7] The overall reduction A1c is 1% to 2%, which is comparable to the previously mentioned drugs.[7]

Patients with predictable eating patterns may not need this drug, but it is a boon to those with irregular eating patterns. It is to be taken orally at least 15 minutes before a meal and works for three hours. It can be combined with metformin for even tighter control of blood sugar.

Thiazolidinediones stimulate receptors that lead to enhanced effects of endogenous insulin. Because of this mechanism of action, there needs to be functional insulin for there to be an effect. These medications are quickly absorbed and metabolized by the liver.[7] They can be used in monotherapy or in combination with sulfonylureas or biguanides. They lower hemoglobin A1c by 0.5% to 1.5% but have side effects of fluid retention, reduced hemoglobin and reduced hematocrit. This can put a patient at risk of peripheral edema and anemia. Thiazolidinediones can also increase the risk of macular edema, particularly in patients on concurrent or high dose insulin therapy.[16] They can be associated with an increase in total cholesterol and in mild weight gain. Hypoglycemia is possible with these medications but usually only when they are used in combination.

Dipeptidyl peptidase 4 (DPP-4) inhibitors improve glycemic control by preventing the inactivation of the incretin hormone GLP-1, which thereby stimulates insulin secretion, and reduces glucagon and glucose levels after meals.[17]

As a class, DPP4 inhibitors have been shown to decrease fasting glucose by 12mg/dL to 28mg/dL and HbA1c by 0.5% to 0.8%.[17] There was no shown effect on body weight or lipid levels. DPP-4 Inhibitors are often used in combination with sulfonylureas as an add-on therapy.[17]



A 57-year-old white male with severe PDR.

Reports show increased risk of pancreatitis with the use of DPP-4 inhibitors; gastrointestinal events can occur, but are rare. Headaches, nasopharyngitis and upper respiratory tract infections have also been reported.[17]

Sodium-glucose transport protein-2 (SGLT2) inhibitors are naturally occurring proteins that aid in the reabsorption of glucose in the kidneys. SGLT2 inhibitors work to block the reabsorption of glucose and increase its excretion in the urine, thereby lowering blood glucose levels.[17]

SGLT inhibitors are shown to decrease HbA1c 0.7% to 1.5% and lower weight one to three pounds; and this was attributed to its diuretic effect.[17] The most common side effects seen are urinary tract infections, postural hypotension, vaginal yeast infections and increased urination.[17]

In 2015, at the European Association for the study of Diabetes Meeting, the results of the Empagliflozin Cardiovascular Outcome Event Trial in Type 2 Diabetes Mellitus Patients (EMPA-REG) trial were released.[18] This study looked at 7020 patients over a median of three years and showed that those patients treated with either 10mg or 25mg of empagliflozin (Jardiance) had a statistically significant reduced rate of mortality from cardiovascular causes, decreased rates of hospitalization for heart failure, as well as decreased rate of death from any cause, as compared with placebo in patients already receiving standard of care treatment with Type 2 diabetes.[18]

Alpha-glucosidase inhibitors are saccharides that decrease the digestion of carbohydrates, such as starches and table sugar, by competitively inhibiting the binding sites in the small intestine, thereby resulting in a smaller rise in blood glucose concentration following meals.[17]

Alpha-glucosidase inhibitors lower fasting plasma glucose 25mg/dl to 30mg/dl and lower HbA1c 0.7% to 1.0% with no effect on lipid levels or body weight.[16] This class of drug is used in combination with sulfonylureas and is known to cause gastrointestinal disturbances in up to 30% of patients and is contraindicated in patients with inflammatory bowel disease, cirrhosis or elevated plasma creatinine levels.[17]

Bile acid sequestrants (BAS) were initially developed as lipid lowering agents for hypercholesterolemia and were also found to improve the glycemic index. The exact mechanism for its anti-hyperglycemic effect is unknown; however, one proposed mechanism is its effect on the farnesoid X receptor within the liver reduces endogenous glucose production.[17,19]

BAS has been shown to decreased fasting glucose 15mg/dl and decrease HbA1c 0.5%. Gastrointestinal side effects are common with BAS treatment, since these agents bind to bile acids within the intestine.[17,19]

Oral Therapies for DR

Many ocular complications accompany diabetes, including, but not limited to, dry eye, premature cataract formation, increased risk of glaucoma, retinal vein and artery occlusions and most commonly DR. Researchers estimate that up to 93 million people worldwide are affected by diabetic eye disease and, in developed countries, DR is the leading cause of vision loss in adults of working age.[20]

Key factors in the pathogenesis of DR include microangiopathy and capillary occlusion, which cause a breakdown of the blood-retinal barrier and result in hemorrhage, exudates and edema.[21] Microvascular occlusion and ischemia contribute to the formation of cotton-wool spots, arteriovenous shunting and neovascularization.[21] Additionally, research shows an increase in vascular endothelial growth factor (VEGF) contributes to the progression of DR.[21]

Oral diabetes medications discussed above, as well as insulin, act to control diabetes and that control ultimately reduces the likelihood of diabetic retinal changes.[22] The Diabetes Control Complications Trial demonstrated that tight control of blood sugar lowers the risk of these complications by roughly 60%.[23] For each 10% reduction in hemoglobin A1c (i.e., 8% to 7.2%), there was a 42% reduction in the risk for retinopathy.[23]

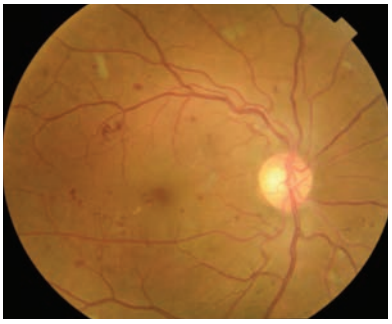
For moderate to severe forms of retinopathy, therapies such as intravitreal VEGF medications and laser photocoagulation help to treat vascular proliferation.

There are, however, other targets in the retina that move beyond the vascular tree. These novel targets may be the future of treatment of diabetic retinopathy, especially in its early stages. As the understanding of the pathophysiological pathways of diabetes expands, more novel therapies and therapeutic targets will be discovered. We will touch on a few such therapies and targets, but this list is not exhaustive.

Tetracyclines. The upregulation of immune modulators in the retina has shown to be associated with diabetic retinopathy. Microglia are the primary immune cells in the retina and are part of the inflammatory cascade that leads to diabetic retinopathy. These cells have been shown to grow in the diabetic retina, causing increased inflammation and damage. The tetracycline class of antibiotics has showed promise in attacking this pathway. Minocycline is a second generation tetracycline with known anti-inflammatory properties.[24] Microglia happen to be targeted by minocycline, thus it has been investigated as a therapy for diabetic retinal changes.

A few small studies have demonstrated improvement in diabetic macular edema and visual acuity in patients that took minocycline more than six months. One such study shows mean improvement in retinal thickness and no increase in edema in four out of five patients who had taken 200mg of oral minocycline after six months.[24] Almost all patients in the intervention group had mean improvement in best corrected visual acuities.

Doxycycline is another tetracycline shown to have a positive effect on retinal function in patients with diabetes. One study used the change in mean foveal sensitivity, measured by frequency-doubling perimetry, as the primary measure of retinal function.[25] Study participants with severe nonproliferative diabetic retinopathy and non-high risk proliferative diabetic retinopathy were randomized to placebo or 50mg of oral doxycycline per day. The mean foveal sensitivity improved the treatment group as opposed to the placebo group after six months.[25] This outcome, however, was not replicated in an identical study that enrolled patients with mild or moderate nonproliferative diabetic retinopathy.[25]



A 74-year-old black female with severe nonproliferative diabetic retinopathy.

Limitations of all studies on oral tetracyclines are the small sample size and the lack of repeatable results. More work is needed to show the practical use of these drugs, as well as uncovering other targets.

Vitamin and Mineral Therapy

Patients with poorly controlled diabetes are susceptible to multiple micronutrient deficiencies.[26] While we've seen anecdotal evidence of the benefits of supplementation of minerals—including chromium, zinc and calcium; and vitamins A, C and E—diabetes patients should be educated about the importance of acquiring daily vitamin and mineral requirements from natural food sources, including a plant-based diet.[26] At the present time there are no placebo-controlled trials demonstrating benefits from vitamin or mineral supplementation in patients with diabetes who do not have underlying deficiencies, above the recommended dietary intake.[26]

Microbiome therapy

Researchers have referred to intestinal microbiota itself as a "new organ" which affects many biological systems throughout the body, including the immune and nervous

systems and metabolic functions.[27] Type 2 diabetes is associated with abnormal energy metabolism and low-level chronic inflammation, and the resident microbiota associated with chronic inflammation is shown to contribute to the disease's onset.[28]

Intestinal bacteria are in an essential symbiotic relationship with their human host, aiding in the regulation of intestinal permeability and immune system function. Growing evidence shows an altered composition of gut microbiota, in particular a higher Firmicutes/Bacteriodetes ratio in patients with insulin resistance compared with healthy patients.[27-29] Researchers propose that the altered microbiota negatively affect intestinal permeability, and can lead to an increase in various opportunistic pathogens, particularly endotoxin producing gram-negative bacteria. An accumulation of gut-derived bacterial inflammatory molecules in the intestine is thought to accelerate the inflammation, considered a deterioration factor in Type 2 diabetes.[28]

Some probiotic strains are able to modulate blood glucose homeostasis, and improve Type 2 diabetes and its related complications.[28] While the exact mechanism for the improvement seen with the use of probiotics is not yet clear, researchers propose its favorable effects are due to immune system modulation through antioxidative properties.[28]

Current approaches that are being investigated are: probiotic supplementation with live strains of *Bifidobacteria* and *Lactobacilli* and prebiotics, which are nondigestible fermentable fibers that shift the composition of gut microbiota by stimulating the growth or activity of beneficial species—such as inulin and lactulose.[29]

However, further research is needed to identify the specific therapeutic types of bacterial strains that will elucidate beneficial patterns in gut microbiota composition.

Fenofibrate

One drug has received major attention as novel medical treatment for DR and has shown promise in the prevention of diabetic microvascular complications. Fenofibrate is an orally administered fibric acid derivative that is conventionally used to treat hypertriglyceridemia, low HDL-C levels or as adjunct to statin therapy in dyslipidemia.[29] Fenofibrate is also shown to have beneficial effects on inflammation, angiogenesis and cell apoptosis.[29]

Two prospective randomized controlled trials were conducted to evaluate its effect on cardiovascular outcomes and included the assessment of fenofibrate as a possible systemic treatment for DR in substudies:

- ***Fenofibrate Intervention and Event Lowering in Diabetes (FIELD) Study***

The FIELD study looked at 9,795 patients for more than five years and found patients with existing DR who were treated with 200mg/day of fenofibrate required treatment with laser photocoagulation less frequently than those who had not received fenofibrate.[31]

- ***The Action to Control Cardiovascular Risk in Diabetes (ACCORD) Eye Study.***

Researchers from the ACCORD Eye Study followed 2,856 subjects for four years and found that those treated with 160mg/day of fenofibrate along with simvastatin had a 40% decrease in DR progression compared with simvastatin alone.[32]

Based on both the FIELD and the ACCORD studies, new recommendations are being considered to include the use of fenofibrate in Type 2 diabetes patients with preproliferative DR or DME or both, requiring laser along with statin therapy to reduce the progression of DR and reduce the need for laser intervention.[33,34]

Hypertensive Therapy

Systemic hypertension is a known risk factor for the progression of DR.[2,35-37] In the UKPDS, tight blood pressure control (defined as target blood pressure <150/85mm Hg) in patients with Type 2 diabetes reduced the risk of both microvascular disease and deterioration of visual acuity; it also decreased the rate of progression of DR.[13,35,36]

Certain medications that affect

Micro-nutritional Supplements

The effect diabetes plays on visual function is more apparent than ever—specifically, its impact on contrast and visual field sensitivity, color vision, macular pigment density and multifocal ERG prior to the development of DR. New attention is being given to the use of nutritional supplementation.

The Diabetes Visual Function Supplement Study (DiVFuSS), a randomized controlled clinical trial performed in 2015, looked at supplementation as an additional way to improve visual function in diabetes patients.[41]

The DiVFuSS formula consists of: vitamins C, D3 and E (d-*a* tocopherol), zinc oxide, eicosapentaenoic acid, docosahexaenoic acid, *a*-lipoic acid (racemic mixture), coenzyme Q10, mixed tocotrienols/tocopherols, zeaxanthin, lutein, benfotiamine, N-acetyl cysteine, grape seed extract, resveratrol, turmeric root extract, green tea leaf and Pycnogenol.[41]

At the end of the six-month trial, the study showed statistically significant improvement in visual function in those patients taking the multi component nutritional supplement compared with placebo among subjects with established diabetes early DR or both, and without significantly affecting blood glucose control.[41]

the diabetic microvascular complication of diabetic nephropathy have also been studied for their effects in treating DR. The Diabetic Retinopathy Candesartan Trials (DIRECT) shows that candesartan reduces the incidence of retinopathy in patients with Type 1 diabetes, and increased regression of retinopathy in patients with Type 2 diabetes.[38,39] However, regression was only seen in cases of mild retinopathy, and candesartan was not shown to have any effect on incidence or progression of DME.[35,38,39]

The Renin-Angiotensin System Study (RASS) study shows enalapril and losartan both reduce the risk of retinopathy progression.[35] However, this effect was independent of blood pressure changes and it was proposed that risk reduction of diabetic retinopathy seen during the study was not mediated by the effect on hypertension.[35,38,39]

Intensive blood pressure control for the sole purpose of slowing the progression of DR is not recommended; rather, hypertensive control in diabetes patients should be targeted on reducing other vascular complications, such as nephropathy and decreasing mortality.[35,40]

Optometric Considerations

The control of blood sugar is a tight balance. The diagnosis of diabetes is characterized by the inability of the body to process glucose properly, leading to elevated blood glucose, or hyperglycemia. While we often worry about blood glucose being too high for these patients, hypoglycemia can also be dangerous. Measured blood glucose of less than 70mg/dl is considered hypoglycemic.[42] Symptoms include shakiness, increased anxiety, increased sweating, clammy hands and skin, confusion and headache. If severe, a hypoglycemic event can lead to seizures, loss of consciousness and death.

If a diabetes patient shows any of these signs and has not eaten recently, the patient should take in roughly 15g to 20g of simple carbohydrates. This equates to two tablespoons of raisins, four ounces of juice or regular soda, one tablespoon of a sweetener (honey, corn syrup, sugar) or eight ounces of nonfat milk.[42] There are commercially available glucose tablets or gels that provide this glucose as well. Having some or all of these simple carbohydrates in the office can save your diabetes patient's life someday.

After ingesting simple sugars, the patient's blood sugar should be measured in 15 minutes. If it continues to be low, more of the simple carbohydrate should be taken. If severe cases of hypoglycemia glucagon must be injected. Glucagon is a hormone that stimulates the release of stored glucose into the blood stream. It is to be injected intramuscularly into the buttock, arm or thigh.

With the rate of diabetes only projected to increase, optometrists stand to be an integral part of the comanagement of diabetes and prediabetes patients. Understanding the role of oral medications in the treatment of diabetes both systemically and from an ocular standpoint will enhance overall patient care and improve treatment outcomes. ■

Dr. Tolud is in practice at South Jersey Eye Physicians, Columbus, NJ.

Dr. Harewood is in practice at Staten Island University Hospital, Retina Center, Staten Island, NY.

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1. Oral diabetic medications are used to treat what type of diabetes?
a. Type 1 diabetes.
b. Type 2 diabetes.
c. Both.
d. Neither.

2. What class of antibiotics has shown to have a positive effect on the diabetic retina?
a. Macrolides.
b. Penicillins.
c. Cephalosporins.
d. Tetracyclines.

3. What class of oral diabetic medications includes metformin?
a. Biguanides.
b. Sulphonylureas.
c. Bile acid sequestrants.
d. Meglitinides.

4. What drug class has the highest incidence of hypoglycemia?
a. Biguanides.
b. Sulfonylureas.
c. Alpha-glucosidase inhibitors.
d. Bile acid sequestrants.

5. Symptoms of hypoglycemia include which of the following?
a. Clammy skin.
b. Slowed pulse.
c. Sweating.
d. All of the above.

6. What is the most commonly prescribed oral Type 2 diabetes medication in the US?
a. Pioglitazone.
b. Actos.
c. Januvia.
d. Metformin.

7. True or false? Doxycycline and minocycline are proven treatments for diabetic retinopathy.
a. True in patients with mild nonproliferative diabetic retinopathy.
b. True in patients with proliferative diabetic retinopathy.
c. Preliminary studies are promising but there is no consensus on their use in a clinical setting.
d. Only doxycycline is a proven to treat diabetic retinopathy.

8. Which study showed tight control of blood sugar can reduce diabetic retinopathy risk?
a. Diabetic Change Study.
b. Diabetic Retinopathy Study.
c. Diabetic Retinopathy and Vitrectomy Study.
d. Diabetes Control and Complications Trial.

9. According to the American Diabetic Association, what level of blood glucose is considered to be hypoglycemic?
a. 80 mg/dl.
b. 90 mg/dl.
c. 70 mg/dl.
d. 100 mg/dl.

10. Which is a suitable serving of food to treat a patient that may be having a hypoglycemic event?
a. Two tablespoons of raisins.
b. Twenty ounces of juice or regular soda.
c. One tablespoon of honey.
d. a & c.

11. Which of the following was NOT a conclusion of the EMPA-REG trial?
a. Patients treated with empagliflozin showed decreased rates of mortality from cardiovascular events.
b. Patients treated with 25mg of empagliflozin showed decreased rates of hospitalization compared to those treated with 10mg.
c. Patients treated with empagliflozin showed decreased rates of death from any cause compared with placebo.
d. None of the above.

12. Alpha-glucosidase inhibitors are contraindicated in patients with:
a. Postural hypotension.
b. Vaginal yeast infections.
c. Inflammatory bowel disease.
d. Headaches.

13. Which of the following statements is false in regards to Intestinal microbiota?
a. Intestinal bacteria have a symbiotic relationship with its human host.
b. Microbiota support intestinal permeability and immune system function.
c. A lower Firmicutes/Bacteriodetes ratio is seen in patients with insulin resistance.
d. Intestinal microbiota is considered an organ.

14. What is a benefit of fenofibrate use?
a. Increasing HDL levels.
b. Decreasing inflammation.
c. Decreasing diabetic retinopathy progression.
d. B and C.

15. According to the UKPDS, what is tight blood pressure control?
a. <140/80.
b. >150/85.

OSC QUIZ

c. <120/80.
d. <150/85.

16. Female patients who are diagnosed with gestational diabetes have a _____% increased chance of developing type 2 diabetes in the future.
a. 5% to 10%.
b. 20% to 50%.
c. 35% to 60%.
d. 70% to 100%.

17. Which of the following is taken into consideration prior to initiating glucose lowering therapy?
a. BMI
b. Kidney function
c. Severity of hyperglycemia
d. All of the above

18. Which of the following is true?
a. Type 1 diabetes is more prevalent than Type 2.
b. Type 2 diabetes patients have no damage to their beta cells.
c. Type 1 diabetes is associated with more severe ocular complications.
d. Type 2 diabetes patients comprise a small portion of those affected with visual impairment due to diabetes.

19. The DiVFuSS Study showed that:
a. Calcium had antioxidative effects on the retina.
b. Patients taking multi component nutritional supplementation showed improved visual function.
c. Probiotics help with regression of moderate forms of diabetic retinopathy in type 1 diabetics.
d. None of the above.

20. The DIRECT study showed:
a. Candesartan had no effect on the incidence of retinopathy in patients with Type 1 diabetes.
b. Enalapril caused increased regression of retinopathy in patients with type 2 diabetes.
c. Candesartan improved diabetic macular edema in both type 1 and type 2 diabetics.
d. Candesartan increased regression in mild forms of retinopathy.

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8.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
9.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
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19.	Ⓐ	Ⓑ	Ⓒ	Ⓓ
20.	Ⓐ	Ⓑ	Ⓒ	Ⓓ

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Getting Back in Shape

Practitioners faced with lens flexure should take note of how to solve the problem.

Edited by Joseph P. Shovlin, OD

Q A scleral lens wearer presents to the clinic with significant corneal ectasia and what is believed to be a high amount of flexure (as opposed to residual astigmatism coming through). What is a method that can be used to help identify the issue for certain, and how can it be treated or solved?

A "Flexure with scleral lenses is not unusual," says Edward S. Bennett, OD, assistant dean for student services and alumni relations at the College of Optometry at the University of Missouri-St. Louis. "If diagnosed as such, [it] can be successfully managed." Dr. Bennett adds that lens flexure can be most commonly diagnosed using keratometry or topography performed over the lenses while the patient is wearing them. Ideally, the results from the exams should demonstrate a spherical value like 43 x 43, while presence of a toric overkeratometry value of 43 x 44, for example, indicates flexure possibly caused by a steep base curve radius that leads to apical clearance, a thin lens design and/or the presence of a hyperpermeable lens material.

Stephanie L. Woo, OD, of the Havasu Eye Center specialty lens practice in Arizona, points out that there are several ways to reduce or eliminate lens flexure, most notably by increasing the center thickness of the lens. "This [method] works in some cases, but the oxygen to the cornea will be reduced," she cautions, "so please take that into consideration. As I see more and more patients with lens flexure, I have come to realize [that] many patients ultimately need a toric peripheral curve due to the toric nature of the sclera." She adds that most of her current patients are wearing a toric peripheral design, especially in the case of larger lenses over 15.5mm in diameter being prescribed.

Jason Jedlicka, OD, clinical associate professor and chief of the cornea and contact lens service at the University of Indiana, suggests a similar initial approach. "Any time visual acuity is reduced in a scleral lens, a spherocylindrical overrefraction should be done to determine if there is astigmatic correction that is unresolved," he suggests. "If there is, determine if the astigmatism that is refracted is due to flexure, or bending of the lens on the ocular surface, or if it is due to residual astigmatism from the internal eye."

When performing keratometry or topography over the lens, Dr. Jedlicka notes, practitioners should ensure that the patient does not widen their eyes too much during either test, as this can impact the measurements taken. Following the exam, "if there is an amount of toricity measured that matches the astigmatism in the overrefraction, then the problem is lens flexure," he concludes, agreeing with Dr. Woo that adding thickness to the lens is a good solution to fix cases of low flexure (i.e., 1D or less).

However, for those patients who exhibit higher amounts of flexure, practitioners should consider adding back surface toricity to the scleral zone of the lens to allow it to better fit the eye and decrease pressure along the meridian of flexure. If even more significant flexure is present, the front optic of the lens can also be added to. Dr. Jedlicka points out that some lens manufacturers can make all three changes simultaneously, but that practitioners should exercise caution when asking for the front toric to be added as the placement of this feature prior to the other two possibilities can lead to overcorrection of the patient's astigmatism.

Finally, Dr. Jedlicka says, in this particular case, if flexure is not ultimately the cause of the lens issue, the addition of a front toric with or without a back toric haptic to provide rotational stability is one solution that could fix the problem. ■

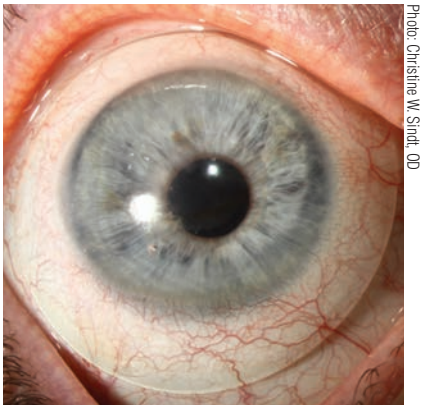

Photo: Christine W. Sindt, OD

Increasing center thickness is one way to reduce lens flexure, experts say, but it reduces oxygen transmission. Modifying the design by adding a toric peripheral curve may be a better approach.

PATIENT AND PRACTICE SUCCESS: FOCUSING ON PATIENT NEEDS

Pamela A. Lowe, OD, FAAO
Private Practice, Professional Eye Care Center, Niles, Illinois

If your optometry practice is similar to mine, you are likely surrounded by super-size retailers that offer eye care services at a price few private practitioners can meet. However, I don't view these retailers as a threat, but rather as a unique opportunity for my practice. I know that I offer patients something that the big box stores can never match: attention to my patients' eye care and lifestyle needs and expertise in the most innovative contact lens materials on the market.

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I don't attempt to compete with retailers on price, but rather on the true value I bring to the entirety of my patients' eye care.

Value includes a price component, but more importantly it measures *all* of the ways in which a contact lens can meet a patient's desire for a high-performing option, including outstanding end-of-day comfort and excellent visual performance. In my experience, DAILIES TOTAL1® contact lenses are an excellent high-performance choice for many of my patients. I like to think that the attributes of these technologically advanced lenses parallel the design of my own practice—they are the ones that stand out from a commoditized market and make a patient say, "Wow, so this is what great eye care feels like." I believe I provide my patients with better care when I don't prejudge what I *think* they want, but rather educate them about the best technology available for their eyes and let them decide which lenses they *know* they want.

So what makes DAILIES TOTAL1® contact lenses so special that I would write about them? They are the first-and-only water gradient contact lenses on the market, with two unique components: a silicone hydrogel core and a hydrophilic gel surface to provide a cushion of moisture.[1-4] The core of the lens is only 33% water, allowing for high breathability, and from there the concentration gradient approaches 100% water at the outer surface of the lens to help provide excellent lubricity.[1-4]

As a business owner as well as a clinician, I'm also reassured to learn that many patients appreciate DAILIES TOTAL1® contact lenses and are willing to pay for them.[5] It's also important for my business

that, having told my patients about the benefits of an innovative technology, I, in fact, have the ability to fit them into the appropriate lenses. Alcon has made this easy for me by expanding the parameters of DAILIES TOTAL1® contact lenses to a range of +6.00 to -12.00 and by introducing a multifocal design in the latter part of 2016. When I can combine the highest level of patient care with long-term practice outcomes, I no longer worry about competition from the big box retailer next door. Instead, I focus on what's most important to me—helping patients see, look, and feel their best every time they leave my office.

Our passion is to help your patients see, look, and feel their best.

SEE LOOK FEEL

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Dr. Lowe was compensated by Alcon for her participation in this advertorial.

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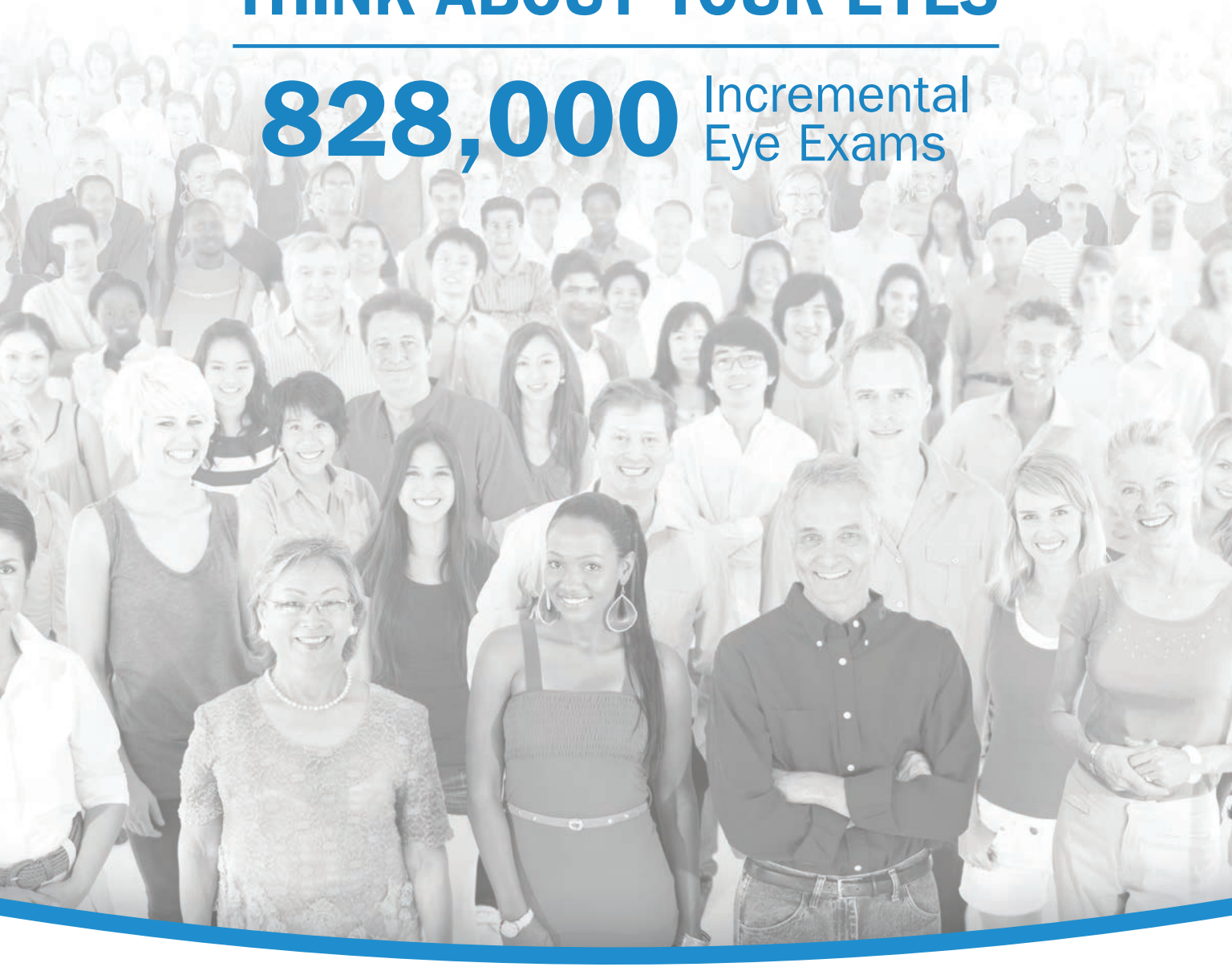

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He Never Saw It Coming

A 35-year-old patient woke up without vision in one eye. Can you identify why?

By Mark T. Dunbar, OD, and Nabila Gomez, OD

A 35-year-old male presented with painless vision loss in his left eye since awakening that morning. The patient first went to an outside MD, where an anterior chamber paracentesis was performed and, then, he was referred to us.

The patient's past medical history was significant for beta thalassemia minor, depression and hypothyroidism.

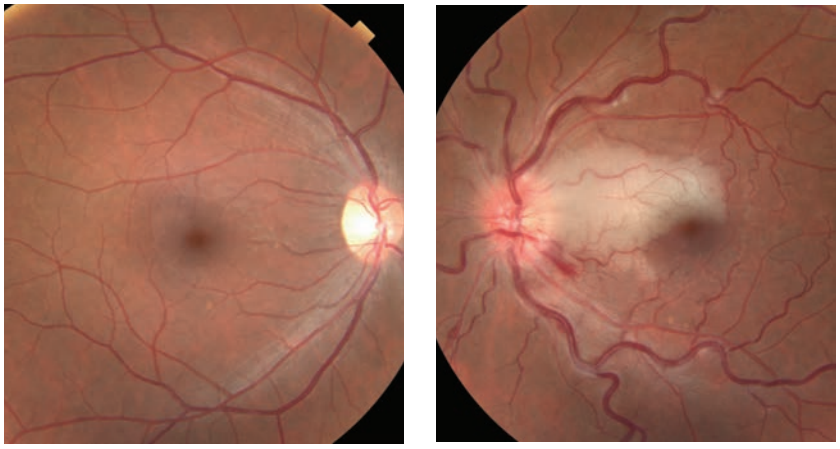
He was taking finasteride, bupropion and levothyroxine. He was a current everyday smoker. His systemic vital signs were normal.

His uncorrected visual acuity was 20/20 OD, 20/400 OS with pinhole improvement to 20/70 OS. His intraocular pressure (IOP) was 17mm Hg OD and 15mm Hg OS. Pupils were pharmacologically dilated from the earlier doctor visit and trace APD in the left eye was identified by reverse. Confrontation fields and extraocular motilities were all normal.

Anterior segment was unremarkable in both eyes; there was a temporal corneal anterior paracentesis track in the left eye.

Posterior segment of the right eye was normal; the left eye had optic nerve edema, superior macular large area of edema and infarction extending from the optic nerve to nasal border of fovea (*Figures 1a and 1b*).

OCT and OCT angiography (OCT-A) were obtained. They are available for your review on pages 70 and 72 (*Figures 2 and 3*).



Figs. 1a and 1b. Fundus photo of the right eye (at left) was normal, but the left eye (at right) shows a large optic nerve edema, superior to the macula and infarction extending from the optic nerve to the nasal border of fovea.

Take the Retina Quiz

1. What type of vascular occlusion is most consistent with our patient's left fundus findings?
a. Branch retinal artery occlusion
b. Central retinal artery occlusion
c. Branch retinal vein occlusion
d. Cilioretinal artery occlusion

2. Which of the following is not associated with cilioretinal artery occlusion?
a. Embolism.
b. Anterior ischemic optic neuropathy.
c. Hypotony.
d. Hypotension.

3. What are the OCT findings in the left eye?
a. Hyporeflectivity of the inner retina corresponding to intraretinal edema.
b. Hyperreflectivity of the inner retina corresponding to intraretinal edema.
c. Hyperreflectivity of the inner retina corresponding to exudates.
d. Subretinal fluid.

4. What is the most appropriate management for this patient?
a. Intravitreal antibiotics.
b. Immediate photodynamic therapy.
c. Observation.
d. Workup to identify underlying cause.
e. C and D.

Diagnosis

Our patient was an otherwise young, healthy individual before the onset of his left eye visual symptoms. History, clinical evaluation and imaging confirmed a diagnosis of cilioretinal artery occlusion (CLRAO) with impending central

retinal vein occlusion (CRVO).

The retina is normally supplied by branches of the ophthalmic artery. In about 32% of eyes, a cilioretinal artery is present and arises from the posterior ciliary circulation. This is independent of the central retinal artery. In cases of central retinal artery occlusion (CRAO), the presence of an additional cilioretinal blood supply to the macula can help preserve central vision.

For answers, see page 82.

Discussion

CLRAO was first described in 1968 and is an occlusion and infarction of retina supplied by the cilioretinal artery. Its etiologically is of three distinct types: Non-arteritic isolated CLRAO, arteritic CLRAO associated with giant cell arteritis (GCA) and CLRAO associated with CRVO) hemi-CRVO.[2]

Isolated non-arteritic CLRAO accounts for 5% of retinal artery occlusions.[1] Systemic evaluation within this group revealed evidence of carotid atherosclerosis in 60% of patients.[1] Other etiologies include: embolism, vasospasm, increased blood viscosity, hypercoagulable states, collagen vascular disease and hypotension. This condition has excellent visual prognosis—90% achieve 20/40 or better vision.[1] Visual fields revealed scotomas with borders corresponding to the areas of obstruction. Scotomatous defects reduced in size at follow up visits.

Types

Arteritic CLRAO is a rare form of CLRAO. Exam findings for this entity include chalky white disc edema with associated characteristic retinal infarction on the area of cilioretinal artery perfusion. It can also have posterior—rather than inferior—ischemic optic neuropathy.

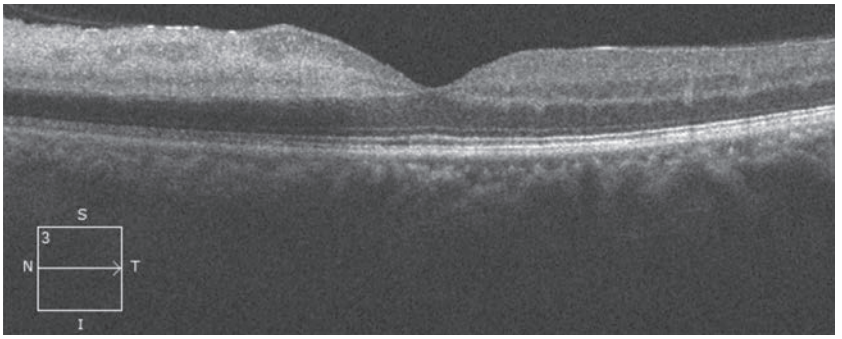


Figure 2. OCT of the patient's left eye.

Arteritic CLRAO is often associated with GCA, and requires immediate workup and steroid treatment. It has poor visual prognosis and the goal is often to prevent visual loss in the fellow eye. The decreased visual acuity of this subgroup may primarily occur secondary to the optic neuropathy component.[3]

CLRAO is most commonly observed in the setting of CRVO. Often, vision loss is noticed on first awakening and a third of patients have a history of visual disturbances, possibly due to CLRAO or macular edema.[4] Visual prognosis is good, as 70% of eyes improved to 20/40 or better.[1] However, the severity of the CRVO plays a role in the visual prognosis. Systemic examination commonly reveals hypertension, diabetes, atherosclerotic disease and valvular cardiac disease. The risk factors of CRVO (and combined CLRAO and CRVO) are: acquired/inherited hypercoagulable states, myeloproliferative disorders, diabetes, hypertension, smoking, hyperlipidemia, increased intraocular pressure, oral contraceptives, volume depletion, renal failure and inflammatory disorders (Behcet's syndrome, Wegener's granulomatosis, sarcoidosis and Goodpasture's syndrome).

Our patient's risk factors included smoking and borderline homocysteine. Noncontributory medical history was hypothyroidism (TSH normal), beta thalassemia minor (since there is no evidence of iron overload that would cause end-organ damage) and his medications, finasteride and bupropion (which are not associated with any vascular occlusions in the literature). Given our patient's time and onset of symptoms, risk factors and clinical presentation showing edematous optic nerve, engorged retinal veins, several flame-shaped hemorrhages and macular infarction corresponding to the cilioretinal artery, we suspected our patient had an impending CRVO with CLRAO.

OCT imaging of our patient reveals early hyper-reflectivity corresponding to intraretinal edema, and then late atrophy. The OCT angiography is quite interesting. *Figure 3* shows a 3mm X 3mm composite of the superficial and deep retinal vascular layers. Here, we can see that there is good intensity, but the flow is compromised superiorly in the area of previous infarction in left eye.

Retinal arterial circulation can be obstructed at any point from the ophthalmic artery to the distal arterioles. The location of the obstruction determines the pattern of visual loss and clinical signs. The most common complaint is sudden, painless loss of central vision restricted to one eye. Thirty percent of symp-

toms occur upon awakening, which may be due to reduced retinal perfusion secondary to nocturnal hypotension.[1]

Management and Treatment

Our patient was given 325mg of aspirin in office and was sent immediately to the nearest ER for stroke work up. In addition, our patient was required to get the following promptly: laboratory work (CMP, HLA-B27, D-dimer, HLA-B51, ESR/CRP, Anti ds-DNA, lipid panel, anti- CCP, ACE, anti-cardiolipin antibodies, ANA, ANCA, TSH, iron studies, HIV), hypercoagulable state, carotid doppler, ECHO, hematologist evaluation, neuroimaging and neuro consult.

Laboratory workup came out normal except for CBC Hb 12.5, MCV 62.5, hemoglobin electrophoresis consistent with beta thalassemia trait and borderline homocysteine.

Brain MRI, head/neck CTA and carotid Doppler were all normal. From these results, the patient was told to continue aspirin and clopidogrel. In addition, the rheumatologist started him on oral prednisone with slow taper for suspected vasculitis and collagen vascular disease.

One month from initial presentation, visual acuity OS improved to 20/20 and visual field showed a paracentral defect while off aspirin and with prednisone tapering. Four months from initial presentation, the patient's visual acuity remained 20/20 in both eyes and visual field defect improved on clopidrogel and off prednisone.

Overall the prognosis of CLRAO combined with CRVO depends on type of CRVO (ischemic, non-ischemic).[2] Ischemic CRVO has more complications with possible neovascularization and, ultimately, poorer visual outcome. Nonischemic CRVO patients usually recover visual acuity of 20/40 or better in 70% of patients. Visual field defects (often paracentral) are due to CLRAO, and improve over time.[1]

No proven treatments for CLRAO exist. Management usually consists of observation, identification of the underlying cause and treating complications including macular edema and neovascularization when combined CRVO/CLRAO.[5] Our patient was treated with AC paracentesis before presentation at BPEI. This may have been done to help lower the IOP which may allow the embolus to dislodge and move further downstream.

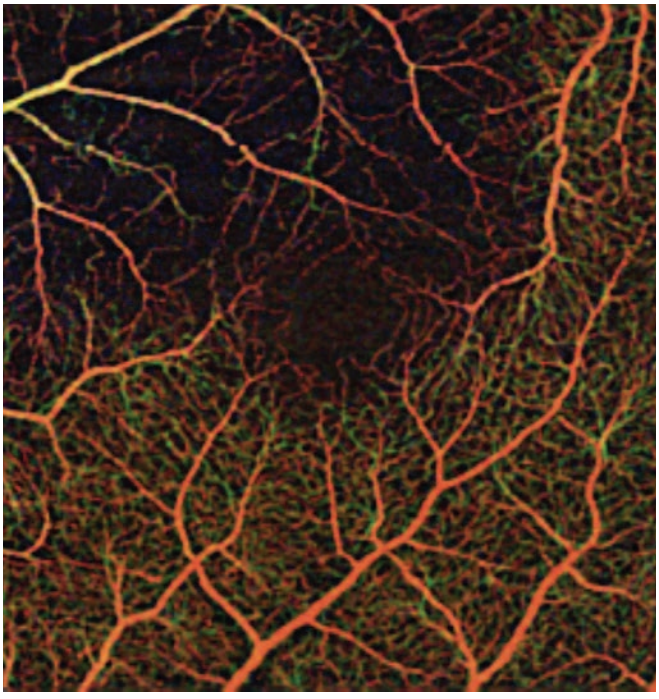


Figure 3. OCT Angiography of the patient's left eye.

Whether treatment over observation helped improve this patient's visual outcome will remain unknown.

Despite the realization that these cilioretinal artery obstructions involve the macula, the visual prognosis is quite good.[2] Even if a portion of the fovea is involved and the presenting visual acuity is poor, the vision usually improves over a period of days to weeks. Most likely an area of borderline hypoxia is present at the peripheral margins of the injured retina.[5] It seems that the poorest prognostic sign is encirclement of the entire foveola by retinal opacification. ■

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Edited By Derek N. Cunningham, OD, and Walter O. Whitley, OD, MBA

Two is Better than One

A new device, the Kahook Dual Blade, could improve IOP lowering and safety in MIGS.

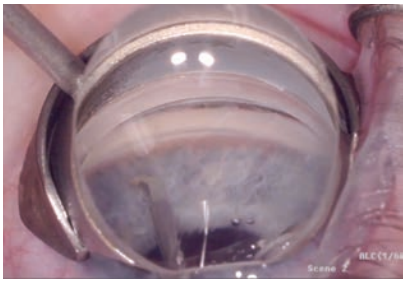
By Justin Schweitzer, OD

Minimally invasive glaucoma surgeries (MIGS) continue to provide safe and effective options for eye care providers (ECP) caring for patients with mild to moderate glaucoma. Combining MIGS with cataract surgery, or performing them as standalone procedures, potentially provides powerful IOP lowering and a greater safety profile than traditional filtration surgeries. The Kahook Dual Blade (New World Medical) is yet another device that has recently made its debut in the world of MIGS.

Kahook Dual Blade

The device is designed to facilitate the reduction of IOP by removing a section of trabecular meshwork (TM) and the inner wall of Schlemm's canal. Using direct gonioscopy, the dual blade is inserted through a clear corneal incision and advanced to the opposite angle. The blade is designed to conform to the drainage angle anatomy of the human eye. The sharp tip of the device penetrates the TM and enters Schlemm's canal. The ramp of the device elevates the TM toward the dual blades, where it is incised. It performs an *ab interno* trabeculectomy by engaging TM and cutting the target tissue while minimizing leaflets left in place and damage to adjacent tissues. The result is nearly complete excision of TM.

It can be a stand-alone procedure, which is quick, or performed in combination with cataract surgery. Some surgeons are combining the Kahook Dual Blade, which targets aqueous outflow, with endocyclophotocoagulation, which targets aqueous production.



The dual blade is designed to allow the surgeon to lift and excise the trabecular meshwork completely.

Supporting Research

A study compared tissue samples undergoing histologic processing and comparative analyses of a dual-blade device, a microvitreoretinal (MVR) blade and Trabectome (NeoMedix Corporation).[1] Researchers also performed human eye perfusion studies to evaluate IOP lowering effects of each device.[1] All devices resulted in statistically significant lowering of IOP during perfusion model studies, with the dual-blade device achieving a more complete removal of TM without injury to surrounding tissues compared with the other devices.[1]

Advantages

Because the Kahook Dual Blade procedure is quick and painless, requiring no sutures and providing rapid postoperative visual recovery, patient satisfaction is often high. Unlike trabeculectomies, it carries no risk of bleb-related infections or bleb leaks.

Disadvantages

Visualizing the angle anatomy and TM is crucial, and using the Kahook Dual Blade without it can be challenging. Additionally, visual acuity can be reduced postoperatively secondary to mild hyphema, which is a typical finding after most forms of goniotomy. If visual acuity is reduced, patient education is imperative to explain that resolution of the hyphema and visual recovery will take about a week.

Postoperative Care

The Kahook Dual Blade, when used for a standalone procedure, is managed postoperatively with an NSAID plus a topical antibiotic for prophylaxis. If the procedure is done in conjunction with cataract surgery, ECPs can prescribe a typical regimen of topical steroid, NSAID and topical antibiotic for prophylaxis. Antibiotic-steroid injections, such as TriMoxiVanc/TriMoxi (Imprimis Pharmaceuticals), are another option. ■

Dr. Schweitzer is a cornea, glaucoma, cataract and refractive surgery specialist at Vance Thompson Vision in Sioux Falls, SD.

To see a narrated video of this procedure, visit www.reviewofoptometry.com, or scan the QR code.

1. Seibold LK, Soohoo JR, Ammar DA, Kahook MY. Preclinical investigation of ab interno trabeculectomy using a novel dual-blade device. Am J Ophthalmol. December 4, 2012. [Epub ahead of print].

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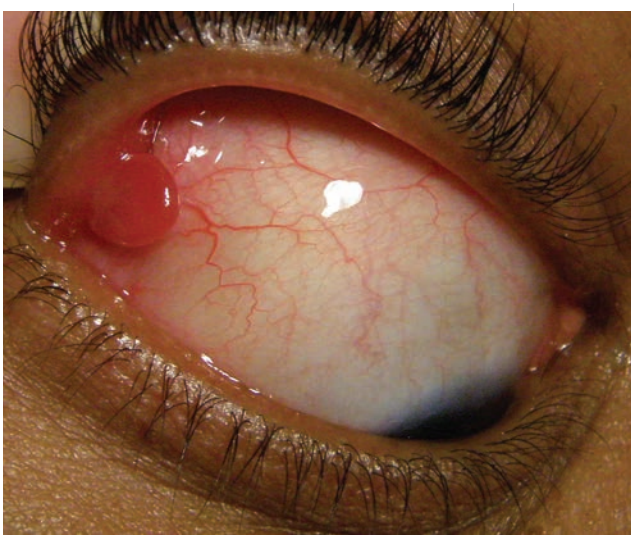
Diagnostic **Quiz**

The Red Menace

By Andrew S. Gurwood, OD

History

A 10-year-old white female, accompanied by her parents, presented to the clinic with foreign body sensation and a "growth" in her right eye, superior temporally. The patient had just recently undergone strabismus surgery to help correct a small constant right exotropia. The growth started a couple of weeks prior and had been rapidly growing over the past week, according to her father. The patient had no remarkable systemic pathology, no known drug allergies, no other contributory history and took no medications.



The "growth" in this young patient's right eye developed following strabismus surgery. Could the two be related? What's your diagnosis?

Diagnostic Data

Her best-corrected entering visual acuity was 20/20 OD and 20/20 OS, through a mild, myopic astigmatic correction. External examination revealed a non-tender, red, pedunculated, soft, nodular papule on the right superior temporal palpebral conjunctiva (*See Figure*). All other external findings were normal with no evidence of afferent pupil defect. The balance of anterior segment structures and anterior chamber was normal. Applanation pressures measured 15mm Hg OD and 13mm Hg OS. Dilated fundus examination was unremarkable in both eyes.

Your Diagnosis

Does this case require any additional tests? What does this patient's history and clinical findings tell you about her likely diagnosis?

To find out, please visit www.reviewofoptometry.com. ■

Next Month in the Mag

In September, *Review of Optometry* will present its 39th annual technology report.

Topics include:

- *Annual Technology Survey: What's on Your New Gadget Wish List?*
- *Pearls on Proper Use of Retinal Imaging Devices*
- *EHR in 2016: A Status Report*
- *OCT for Glaucoma Monitoring*

Also in this issue:

- *Optometric Study Center: The 100 Most Commonly Prescribed Drugs* (earn 2 CE credits)
- *How to Manage Conjunctival Neoplasm*
- *Get More Active in DME Diagnosis*

Retina Quiz Answers *(from page 69):* 1) d; 2) c; 3) b; 4) e.

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