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November 15, 2013

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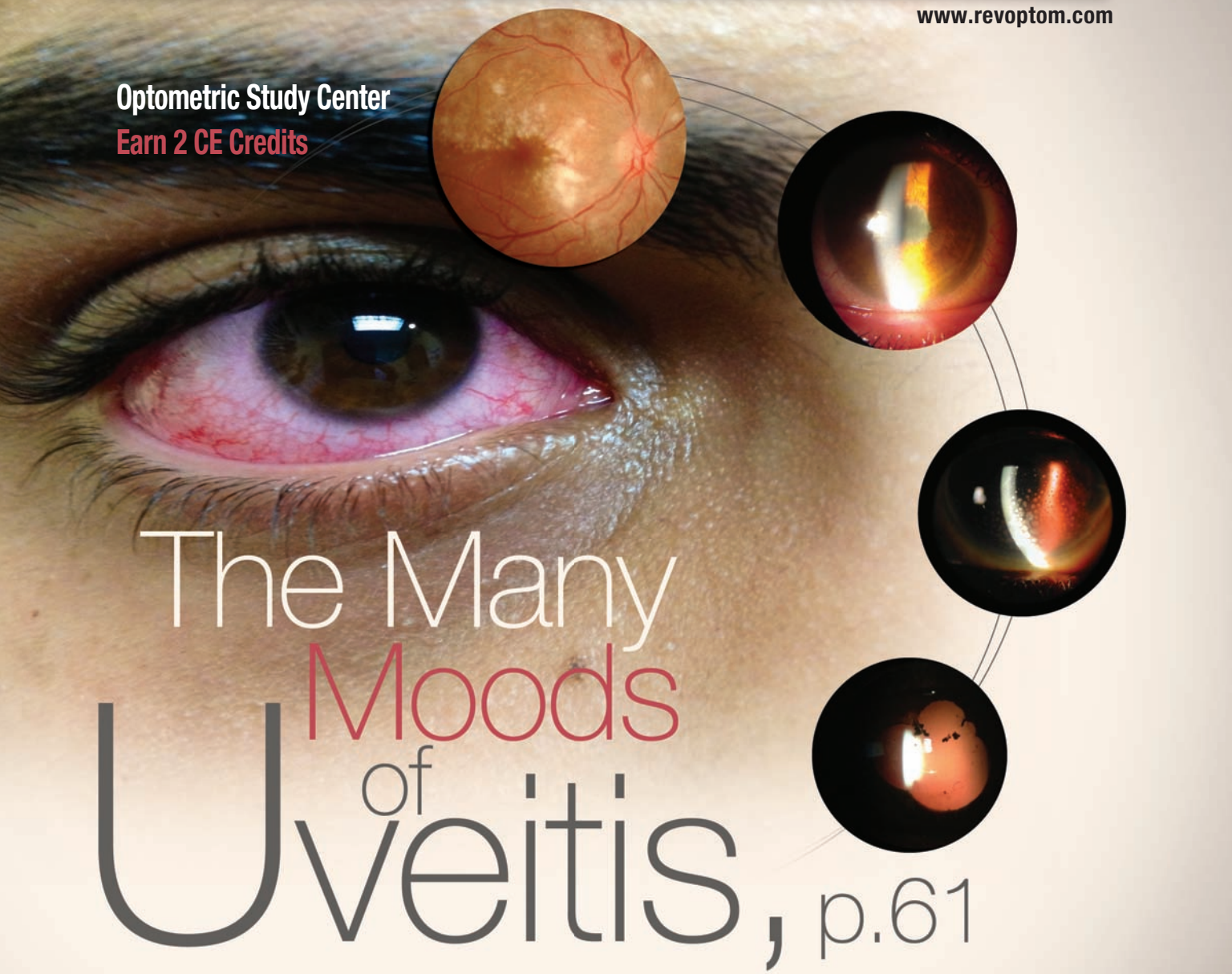

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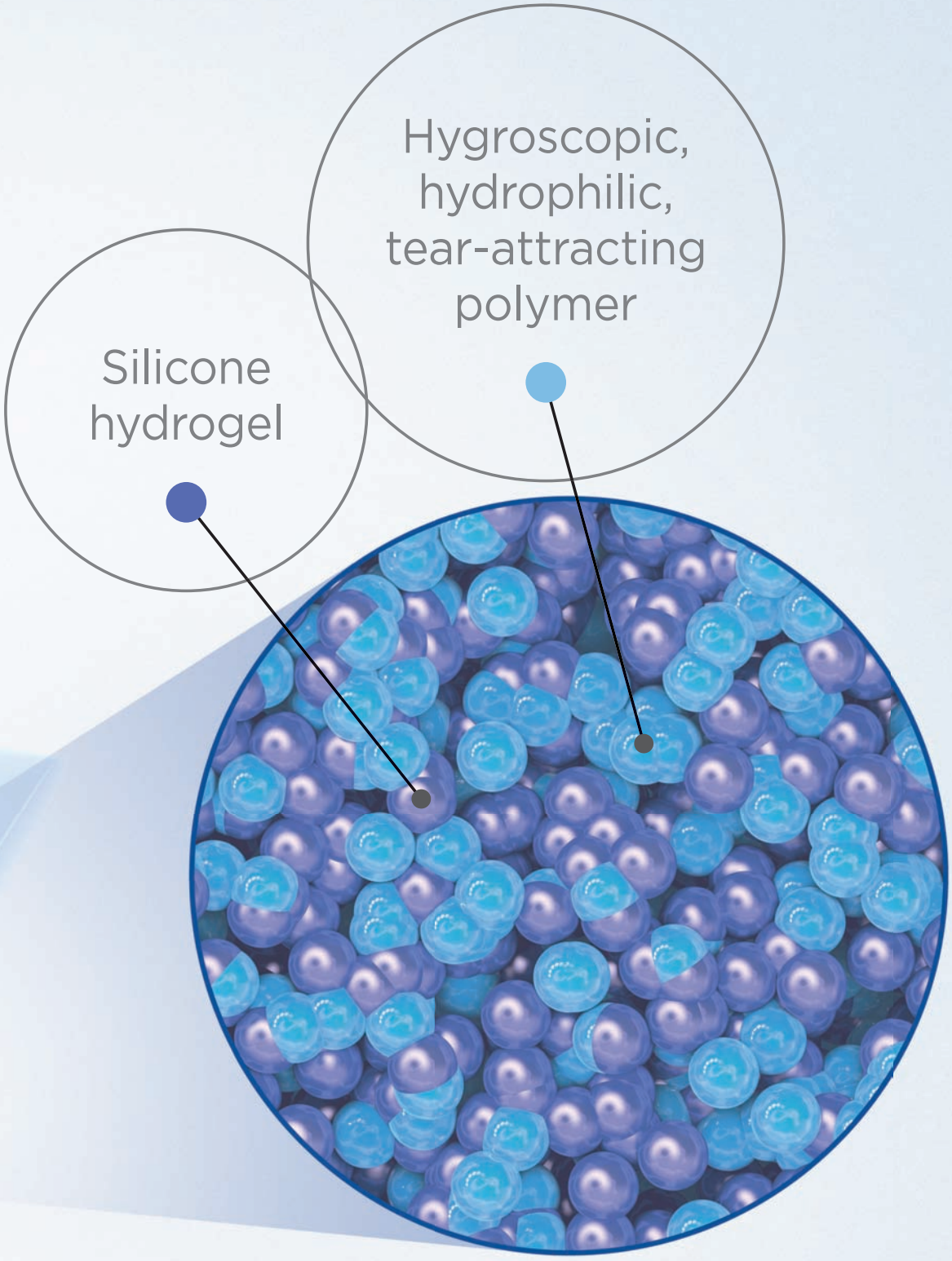

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VOL. 150 NO. 11 ■ NOVEMBER 15, 2013

IN THE NEWS

Salus University recently welcomed Rear Admiral **Michael H. Mittelman, OD, MPH**, as its sixth president. Dr. Mittelman is a 1980 graduate of the university's **Pennsylvania College of Optometry**, as well as the former deputy surgeon general of the US Navy and the Navy's deputy chief of the Bureau of Medicine and Surgery.

"I believe it is our destiny to set a new standard and lead the transition of American health, educational and rehabilitation education through this century and beyond," Dr. Mittelman recently posted on Salus' blog. "As I've said in the past, the challenges will be great, but the rewards will be many."

Dr. Mittelman succeeds outgoing president **Thomas L. Lewis, OD, PhD**.

John G. Flanagan, PhD, MCOptom, professor at the University of Waterloo School of Optometry and Vision Science, in Ontario, Canada, has been appointed as the eighth dean of the **University of California Berkeley School of Optometry**.

Dr. Flanagan is currently director of the Glaucoma Research Unit, Toronto Western Research Institute, a senior scientist at the Toronto Western Hospital, University Health Network, and executive vice president of the Optometric Glaucoma Society.

Dr. Flanagan, whose term at Berkeley will begin in June 2014, succeeds outgoing dean **Dennis Levi, OD, PhD**.

ODs Win Third Court Battle Against Spectera

Georgia ODs sued the company for violating the Patient Access to Eye Care Act. **By John Murphy, Executive Editor**

The third time's the charm for Georgia optometrist Steven Wilson in a three-year court battle with Spectera.

In October, the Supreme Court of the State of Georgia ruled in favor of Dr. Wilson and his associates' lawsuit against Spectera. Dr. Wilson and his associates had previously won the suit in lower courts, but Spectera appealed. His victory in state Supreme Court may finally settle the matter for good.

Dr. Wilson initially filed the suit after Spectera announced in October 2010 that it was "phasing out" its Patriot provider agreement. To continue as Spectera providers, Dr. Wilson and other private practice optometrists had to sign a new contract that required providers to use Spectera's optical lab network for eyeglass orders and formulary contact lenses.

The lawsuit argued that Spectera's new contract had the effect of taking the preparing, supplying and selling of eyeglasses and contact lenses out of the private practitioner's hands, essentially giving the patient no real choice at all—only Spectera's materials and services. In Dr. Wilson's suit against the company, he argued that this violated the Patient Access to Eye Care Act.

The county Superior Court agreed in September 2011, but Spectera appealed the decision. The Court of Appeals upheld the Superior Court's ruling, so Spectera took its case to the state Supreme Court. Last month, the state Supreme Court agreed to the lower courts' earlier decisions.

The Supreme Court also ruled that Spectera cannot terminate a provider for any reason not related to eye care. (After Dr. Wilson filed his initial lawsuit, Spectera had terminated his and his associates' contracts.)

Because these were state court decisions, these rulings apply only to practitioners in Georgia.

Diabetes Guideline Ready for Review

"Eye Care of the Patient with Diabetes Mellitus," the American Optometric Association's first evidence-based clinical practice guideline, is now available for review and comment until November 30. All comments will be reviewed by the AOA Evidence-Based Optometry Guideline Development Group. A final copy of the guideline will be released in January 2014. To read and reveiw the guideline, go to http://stage.aoa.org/Optometrists/Tools-and-Resources/Evidenced-based-Optometry/CPG-3--Eye-Care-of-the-Patient-with-Diabetes-Mellitus.

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BEND THE RULES

Dispute in Texas Over In-store Exams

A battle is brewing in Texas as Lubbock ophthalmologist Peter M. Ho, MD, and eyewear chain National Vision Inc. have sued the Texas Optometry Board in hopes of overturning a law that bans optometrists from operating practices inside national eyewear chain stores.

The suit challenges the optometry board's authority to regulate Dr. Ho's practice, Texas Vision Associates, and calls the rule protectionist and anti-consumer.

Central to the dispute is that Dr. Ho's practice offers eye exams in the same location where National Vision offers prescription eyewear. The Texas Optometry Act bans independent optometrists from sharing the same space as national eyewear providers. In the case of a chain operation, such as National Vision, an optometrist cannot occupy space in an eyewear business. Any related optometry business must be separated from the eyewear business by a floor-to-ceiling wall, and the two businesses may not share an entrance.

According to newspaper reports, Dr. Ho said the optometry board is unconstitutionally targeting his practice for competing with in-state optometrists by hiring his own optometrist and sharing space with an eyewear retailer. Also, the optometry board has reportedly threatened disciplinary action against optometrist Brian Kern, who is employed by Dr. Ho, for being in violation of the co-location rule.

Requests for comment from Dr. Ho, his attorney and the Texas Optometry Board were all declined.

Face-Offs in Other States

Other states have faced similar battles. Earlier this year, the US Supreme Court rejected optical companies' challenge to a California law—backed by optometrists—that prohibits eyeglass sellers from using their offices to conduct eye exams. The 1969 law bars opticians who sell eyewear from leasing space to eye doctors, while allowing doctors who check patients' eyesight to also sell eyeglasses in their offices. A federal judge struck down the law in 2006, saying it was a protectionist measure designed to limit competition from out-of-state optical chains. But the 9th US Circuit Court of Appeals in San Francisco reinstated the law in two rulings in 2009 and 2012, saying it had the legitimate purpose of protecting California's medically-trained optometrists from takeovers by large businesses.

In 2005, LensCrafters, along with several other interstate optical companies and their national trade association, appealed the district court's summary judgment upholding the constitutionality of a Tennessee state statute that prohibits optical companies from leasing space to optometrists to perform eye exams in their retail eyewear stores.

On appeal, LensCrafters claimed the provision violated the Commerce, Equal Protection and Due Process Clauses of the US Constitution. The 6th US Court of Appeals dismissed the suit and upheld a previous ruling.

In Virginia, state boards are immune from prosecution as part of a corporate practice prohibitions clause under state law. Despite this safeguard, Virginia has seen a repeated effort by LensCrafters, the National Association of Optometrists and Opticians, and big box stores to change the current legislation, according to Virginia Optometric Association Executive Director Bruce Keeney. However, all attempts have been defeated.

"Eight years or so ago, we even had to define the term, 'in'," Mr. Keeney says.

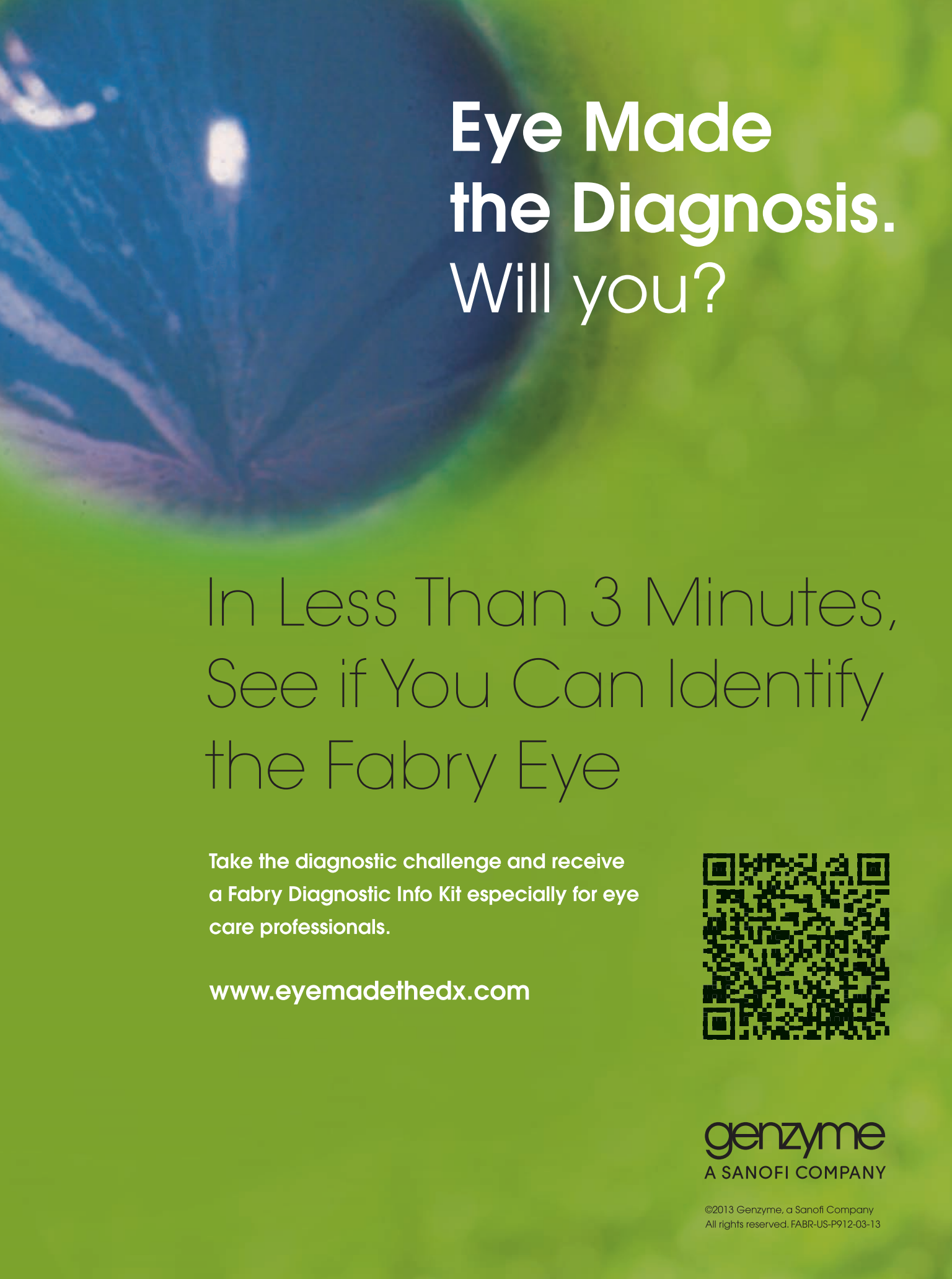
At that time, certain big-box stores attempted to circumvent Virginia's law by leasing interior space to an ophthalmologist, who then arranged for a doctor of optometry to provide services in that office. The big-box stores argued the OD was practicing in the ophthalmologist's office and not in the commercial or mercantile establishment. Noting the ophthalmologist's office was still "in" the commercial establishment, the Virginia Optometric Association successfully had legislation enacted that defined "in," so that this circumventing of Virginia law was clearly not permitted.

Urine Test Could Diagnose Retinitis Pigmentosa

Researchers at Bascom Palmer Eye Institute and Duke University have discovered a link between a patient's urine and the gene mutations that cause retinitis pigmentosa (RP).

The researchers analyzed subjects' urine using liquid chromatography and mass spectrometry to detect organic compounds called dolichols, which are indicators for RP mutation. Their findings appear online in the *Journal of Lipid Research*.

The researchers hope to develop the dolichol profiling method as a first-line diagnostic test to identify RP patients, especially in young children whose retinal degeneration has not fully developed.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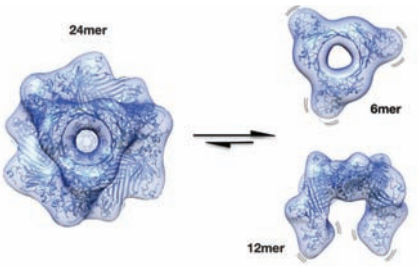
Protein Discovery Could Lead to Cataract Drug

Researchers in Germany have made a new discovery about the biological mechanism that keeps the crystalline lens transparent, according to a study in the October 1 issue of *Proceedings of the National Academy of Sciences*.

This breakthrough could be used to create a therapeutic agent to treat cataracts and skip the surgical procedure.



Researchers learned that protective lens proteins are in a permanently dissolved state (left). Under stress, they break apart (right) and prevent the other lens proteins from clumping together and forming a cataract.

In their report, the researchers evaluated the protective effect of two proteins, αA-crystallin and its relative αB-crystallin, which are small, heat shock proteins that help prevent other proteins from clumping together when subjected to significant heat or stress.

Previous researchers have been unable to determine what these protective proteins looked like or how they performed. However, the German scientists made a breakthrough by deciphering the molecular structure of the most important form of the αB-crystallin protein—a molecule comprising 24 subunits.

Under normal conditions (i.e., no stress), this molecule exists in an idle form that contributes little to the prevention of protein aggregation. But when stressed, the protective mechanism of the αB-crystallin molecule is activated. It breaks into smaller units that serve to prevent clumping of other proteins.

This finding could lead to the development of a novel medication that would trigger the αB-crystallin activation mechanism, and potentially clear a clouded crystalline lens.

Furthermore, because αB-crystallin also plays a role in other tissue cells—including cancer cells—a new agent could be developed to inhibit the protein from interfering with programmed cell death.

Peschek J, Braun N, Rohrberg J, et al. Regulated structural transitions unleash the chaperone activity of αB-crystallin. Proc Natl Acad Sci U S A. 2013 Oct 1;110(40):E3780-9.

Treatment of MicroRNAs Halts Neovascularization

Researchers at The Scripps Research Institute have found a way to target and inhibit the action of microRNAs in mouse eyes, which stops abnormal blood vessel growth without damaging existing vasculature or neurons.

This could represent a novel and effective way to treat a broad range of neovascular eye diseases, such as diabetic retinopathy, macular degeneration and macular telangiectasia, say the investigators. Their results are published in the November issue of the *Journal of Clinical Investigation*.

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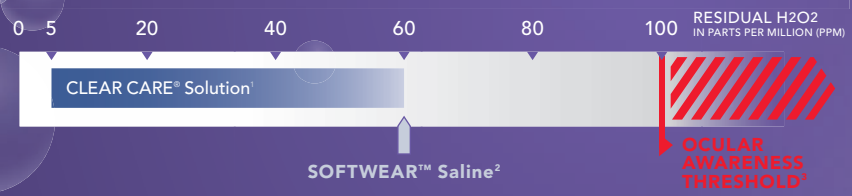

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Sold Out CE Boosts VEW Attendance

At this year's Vision Expo West meeting, organizers hoped to give optometrists the confidence and knowledge needed to treat—not just refer—glaucoma patients.

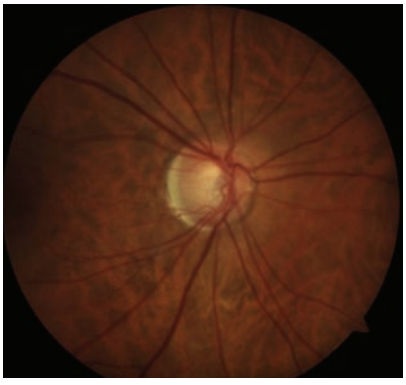
If attendance numbers are any indication, VEW's endeavor was a success. VEW celebrated its 25th anniversary meeting with an 11% increase in educational course attendance, according to optometrist Kirk Smick, VEW chair.

A capacity crowd fills one of the many courses at last month's Vision Expo West.

Don't Hold Back

"Many of our programs sold out, including our exclusive 14-hour glaucoma program," Dr. Smick says of the four-day-event, held last month in Las Vegas. "The whole concept behind the glaucoma track was that many optometrists are diagnosing glaucoma and then referring. These courses were created to help optometrists intervene in treatment. Many optometrists are still holding back."

The glaucoma track included such courses as "Optic Nerve and Imaging," presented by optometrist Ben Gaddie. "The optic nerve examination is still the first clinical test that will alert you to glaucomatous damage, not the OCT or visual field," Dr. Gaddie says. "One of the biggest reasons clinicians miss optic nerve findings related to early glaucoma is because of looking at the cup rather than the neuroretinal rim. A systematic approach to optic nerve examination—aided by OCT retinal nerve fiber layer and ganglion cell layer analyses, as well as a careful review of OCT optic nerve parameters—gives the highest sensitivity."



VEW's glaucoma track aimed to help ODs get more involved in glaucoma care.

Other Hot Topics

Other clinical highlights from VEW: a new nutraceutical track with courses that covered macular degeneration and nutritional supplements that impact both the front and back of the eye.

"With AREDS2 just out, there has been a lot of confusion and a lot of questions about what supplements should be given to patients," Dr. Smick says. To that end, two leaders in nutraceuticals, Stuart Richer, OD, PhD, and Jeff Anshel, OD, presented the "Nutrition in Eyecare Symposium," educating attendees on how Americans are self-prescribing and spending more than $20 billion annually on herbal and dietary supplements, and also that eye care providers need to receive timely, evidence-based information to address the risks and benefits of supplements to their patients. The duo provided an overview of the issues related to nutritional influences on visual health, including details of the recently released data of AREDS2 study.

Another first at VEW was a new lens specialist program, designed for both opticians and optometrists. "We realize there are so many spectacle lens options now and so many new designs, and it's hard for opticians and optometrists to keep up. Now more and more optometrists are getting involved in prescribing lenses," Dr. Smick says.

One popular course in the spectacle lens specialist track was "How Important Are the Measurements You Take?" presented by Laurie Pierce, LDO, ABOM, NCLC, who provided the whys and hows of advanced optical measurements and their importance to provide the best visual experience possible for patients.

VEW also shone a spotlight on the latest advances in eye care. Dr. Smick co-presented "What's New in Optometry," where he shared three new technologies that are changing the way optometrists practice, including new cheek swab genetic testing for AMD (Macula Risk PGx, ArcticDx), a dry eye test that generates an osmolarity number based on a patient's tear sample (TearLab, TearLab Corp.), and a diagnostic test that aids in the rapid differential diagnosis of acute conjunctivitis (AdenoPlus, Nicox).

Mark your calendar for the next Vision Expo West, to be held at the Las Vegas Sands Expo & Convention Center, September 17 to 20, 2014. ■

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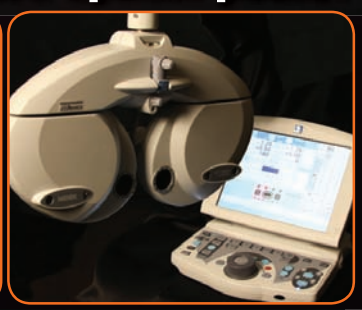

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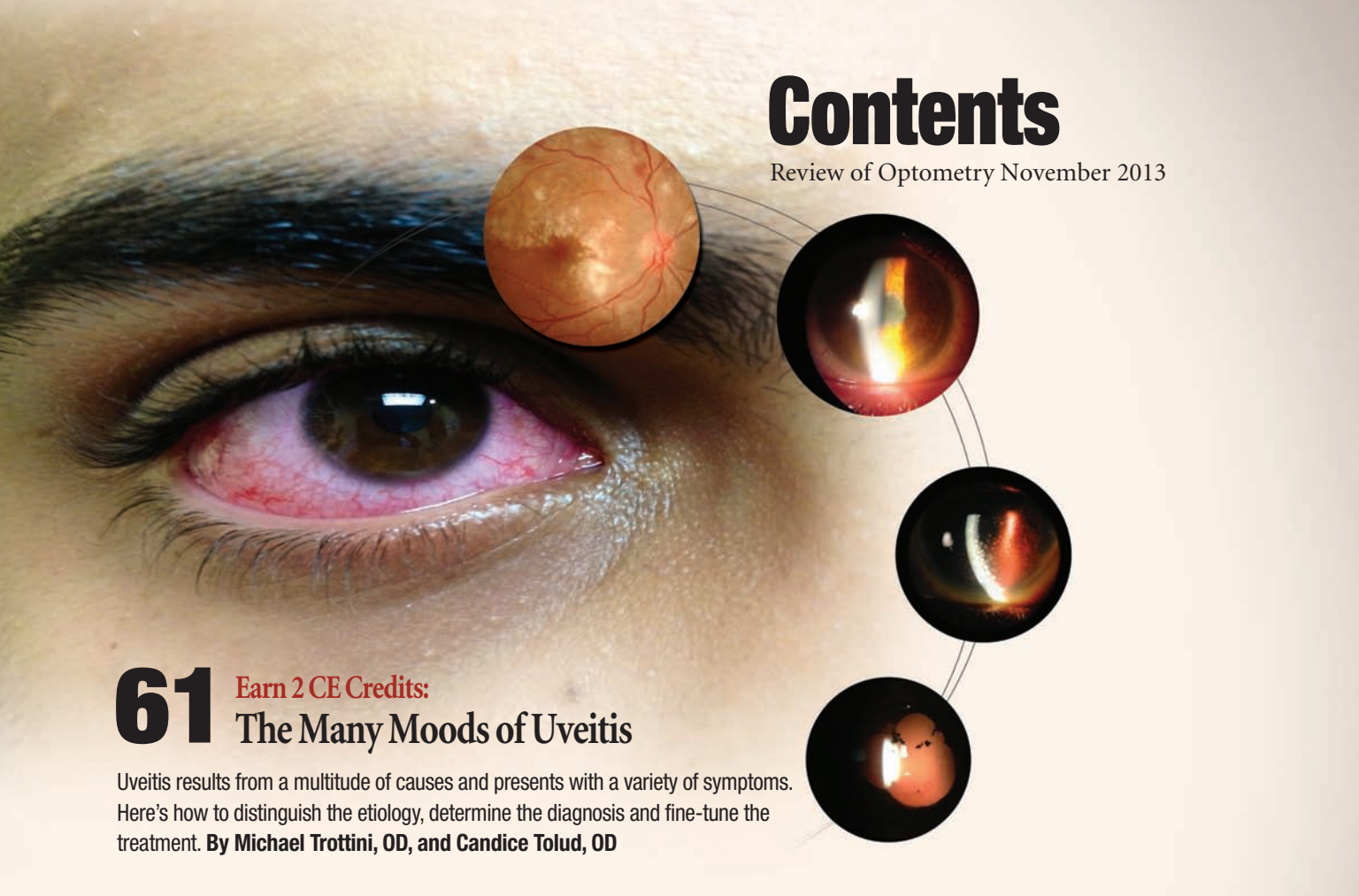

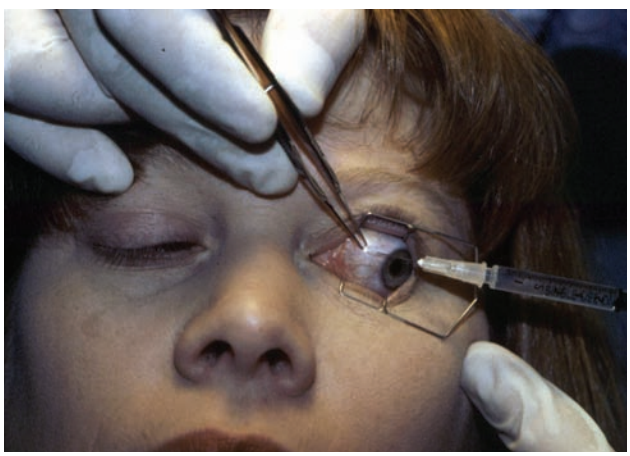

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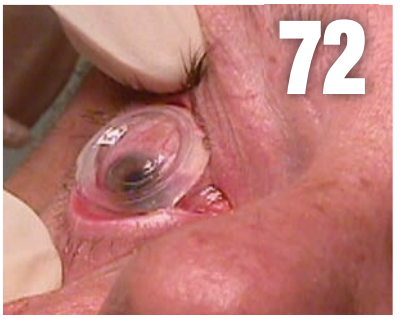

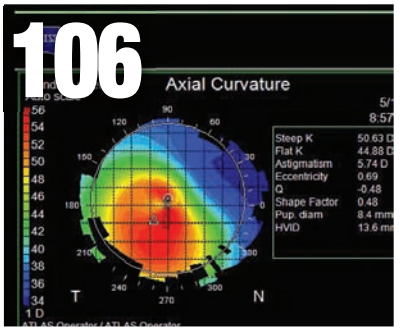

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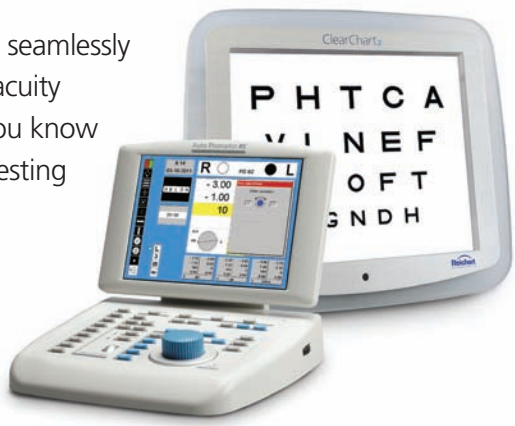

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Toward a 20/20 View of 2020

In just seven years, one third of the US population will be over age 60. ODs who prepare now will be ready to meet that need. **By Paul M. Karpecki, OD, Chief Clinical Editor**

A look at the Baby Boomer population reveals the significant opportunity in optometry's future—if we embrace medical eye care and set up comanagement protocols with our ophthalmology colleagues. Over the next 20 years, we're going to see the largest-ever patient population growth. By 2020, one out of three people will be over age 60. This has never happened in the history of the US, nor is it likely to again.

The diseases most prevalent will include AMD, glaucoma, ocular surface disease, diabetes and cataracts, with the latter likely at the very top of that list. We currently perform about 3.3 million cataract surgeries annually in the US. That could double in the next 15 years. What's most amazing is that this trend begins in 2017!

But as the ranks of our cataract patients grow, we're not likely to see a commensurate increase in the number of surgeons. In fact, this number may be even decrease in next 10 or 15 years. In the end, ophthalmology's appetite for scope of practice battles will be neutralized by simple math.

With an insufficient supply of surgeons, comanagement is going to be essential. Ophthalmology practices are going to hire optometrists to see patients postoperatively or independent optometry will seize this opportunity for the future.

Yes, embracing medical management entails complex challenges such as credentialing, insurance verification, managing vision insurance with medical insurance, coding, billing, collecting and accounts receivable of medical insurance. These can all be mastered in the long term and outsourced in the short term.

Companies like Optometric Medical Solutions, Practice Resource Management, PECAA, Vision Source, OD Lean, Prima, FYidoctors (in Canada), to name a few, can help with various business principles in medical eye care. These companies have solved these challenges for numerous practitioners at less cost than hiring full-time staff, limiting any excuses for optometry to not be involved in medical eye care right now.

Better for Everyone

As gatekeepers, ODs are better positioned to manage medical patients and truly drive the comanagement relationship. For example, an OD who has provided 20 years of care for a patient prior to cataracts will know the type of person they're dealing with. Is the patient a 'type-A' personality? If so, the patient may not do well with a premium IOL. Have they previously failed monovision? Which patients did fine tolerating their mild astigmatism masked by contact lenses, and which absolutely required correction? The latter may be better suited to toric IOLs.

We also have better, closer relationships to understand the patient's specific needs. This would be very difficult for a surgeon to ascertain in a single pre-op assessment. So, it's in the best interests of patient care for optometry to be proactive in comanagement.

Comanagement is not only our greatest growth area over the next 15 to 17 years, it's also imperative. Doctors who don't get on board may lose patients. More than 65% of patients do research on the Internet before to seeing a doctor when a certain condition, such as cataracts, is present. These patients then ask their doctor about their symptoms—so, if you can answer their questions, *you* will always be their eye doctor.

Thus, educational opportunities for new IOLs, surgical advances such as femtosecond lasers and perioperative care are important for us to embrace, to best serve our patients. Now is the time to enhance this part of your practice, as we position for one of the greatest growth areas of any medical condition for the next two decades.

Optometric practices need to ready themselves now; those who do are likely to be most successful. ODs involved in the medical model tend to have incomes in the upper 5% of the profession. These practitioners are not choosing medical at the expense of their dispensary; rather, they allow patients to have all their eye care needs met at one center, and typically have dispensaries that do just as well, or better.

Your medical and traditional optical businesses can work synergistically—just as optometrists and ophthalmologists are increasingly learning to do. ■

Complaint is a Pain in the Brain

Headaches are sometimes related to vision. But, if you are a single parent with four teenagers, don't blame your headaches on your glasses. **By Montgomery Vickers, OD**

One of the top 10 chief complaints I hear from patients is that of frequent headaches. Since most of the patients are not medical practitioners dealing with the Affordable Care Act, my first impulse to scream something like, "YOU CALL *THAT* A HEADACHE?" I have, however, found that patients don't want to hear about *my* symptoms while trying to explain their own.

My least favorite headache is one that is announced by some fifth grader who can't do his homework because it gives him a headache. It's often easy to explain that the headache is not serious—nothing more than a mild reaction to Social Studies. (YOU try writing a paper about the Magna Carta with no pain between your ears.)

As a matter of fact, a study by our OMD colleagues determined that childhood headaches are almost never caused by the eyes. They left out the part about childhood headaches being caused by contact with OMDs.

But, just when you think it's safe to count "headache" as a worthy symptom, some doctor writes an article here in *Review of Optometry* about a patient who complained of frequent headaches, and it turned out to be some brain-boring millipede infestation! Try explaining why you thought it was just the patient's sinuses, like it is for 99.99999999999999999999% of other patients, while some brain-boring-millipede-infestation specialist sits there under oath explaining how this was so obvious that any numbskull should have diagnosed it properly just by what the patient told your receptionist about why he was 30 minutes late for his appointment.

The Chocolate Chip Etiology

My own headaches are self-inflicted injuries caused by my attempts at suicide by cookies—my drug of choice when stress kicks in. Oh, I've learned to just walk right by the cookie jar most of the time when I'm freaking out about something optometric—like why they change the rules every day, or why people tell me there's nothing more important than their vision when they show up once every 17 years, or why they don't have enough money to update their glasses but they had a great two weeks at Disney World, or they have to cancel their appointment this afternoon because they have a pedicure scheduled, and on and on. Why would that cause a headache? Must be the cookies!

But even when I have a headache, I get in the car and get to the office. A couple ibuprofen and I'm at it. Interesting that if a staff member has a headache, they have to take the day off and go shopping with friends. The only reason scientists think migraine headaches can be related to bright sunlight is that my staff members happen to get migraines only when it's beautiful and sunny and they have to take a "sick day." Maybe migraines are also related to when the city pool is open.

Still, it's important to pay close attention to any patient who presents with a headache. Make sure you carefully examine all aspects of their ocular health and visual system while evaluating appropriately for neuro-ophthalmic symptoms and/or signs, other medical concerns, and possible medication side effects. Then send their manic six-year-old out to grandma in the reception area and watch the patient's headache disappear.

Oh, and confiscate any cookies for "analysis." ■

A Contact Lens that Works with the Tear Film

In **DAILIES® AquaComfort Plus®** contact lenses, multiple wetting technologies work in tandem to maintain tear film integrity—and all-day comfort. — **Kristopher A. May, OD, FAAO**

Research over the last decade has expanded the traditional three-layer (mucin/aqueous/lipid) model of the tear film to a more complex continuum. We now see that mucins are both bound to the epithelial glycocalyx and dissolved in the aqueous tears; that proteins, electrolytes, growth factors, and antioxidants comingle in aqueous solution; and that a thin complex of phospholipids, fatty acids, and esters prevents evaporation.[1]

When functioning properly, the tear film reduces friction during blink, protects against infection, delivers nutrients and clears wastes; and, importantly, provides a smooth refracting surface for light entering the eye. Disruption of the tear film can set the stage for the signs and symptoms of dryness to develop.[1]

Add a Contact Lens

When placed on the eye, a contact lens splits the tears into a pre-lens tear film and a post-lens tear film. Dividing the tears in this way causes the layer on top of the lens to be thinner and break up more rapidly. This loss of volume and faster breakup, which happen irrespective of lens type, is believed to be due to thinning of the lipid layer.[2]

A shortened tear film breakup time (TFBUT) can leave parts of the lens' front surface exposed to air, and these dry spots can affect lens performance. Soft contact lenses are dynamic structures: When covered by tear fluid, the hydrophilic heads of the lens polymer chains are stable at the lens surface; but when the tears break up and expose areas of the lens surface to air (which is hydrophobic), the hydrophilic moieties within the lens are driven toward the moisture within the lens bulk, leaving hydrophobic (non-wettable) areas on the lens surface.[3]

Decreased lens surface wetting leads to greater friction and greater susceptibility to protein and lipid deposition—which can contribute to discomfort for wearers.

Engineered for Tear Film Stability

DAILIES® AquaComfort Plus® contact lenses take a multi-tiered approach to wettability. First, these lenses benefit from an innovative manufacturing process called Lightstream™ Technology, which uses ultraviolet light, rather than chemical processing, to polymerize the lens material. This efficient photo-lithographic process does not require the chemical byproduct-extraction step necessary for other contact lens manufacturing processes.[4]

The material, nelfilcon A plus, contains polyvinyl alcohol (PVA), a water-soluble polymer commonly used as a wetting agent in artificial tears. Most of the PVA in DAILIES® AquaComfort Plus® contact lenses is bound to the lens matrix, but the small amount of unbound PVA present in the lenses is gradually released from the lens matrix by normal blinking.[5]

The moisturizing agent polyethylene glycol, a medium-sized molecule that binds to PVA and further extends its release, is also embedded in the lens matrix and helps to support a stable pre-lens tear film. Hydroxypropyl methylcellulose (HPMC), a smaller molecule added to the packaging solution of DAILIES® AquaComfort Plus® contact lenses, enhances comfort on insertion. The optimized polyvinyl alcohol (PVA) is gradually released over a 20-hour period.[6,7] This staged combination of wetting strategies results in a stable tear film—and all-day comfort for wearers.[8]

Because they do not require care solutions or complex cleaning regimens, I like to think of daily disposable lenses as having "built-in" patient compliance. Prescribing DAILIES® AquaComfort Plus® contact lenses—daily disposables with "built-in" comfort and tear film stability—helps keep my contact lens patients happy and healthy.

PROVEN PERFORMANCE, BUILT-IN

Wolffsohn and coworkers examined the clinical performance of four daily disposable lens types, all of which had some form of comfort enhancement. Lenses were worn for 8, 12, and 16 hours; and clinical measurements (taken with the lens in place) included pre-lens non-invasive TFBUT, tear prism height, bulbar hyperemia, and ocular surface temperature.[5]

For all tested lenses, the tear prism height, pre-lens non-invasive TFBUT, and ocular surface temperature decreased after longer hours of wear. However, the tear film was found to be most stable on the surface of DAILIES® AquaComfort Plus® contact lenses, whose multi-tier wettability technology outperformed its rivals.[5]

Kristopher A. May, OD, FAAO, practices at Coldwater Vision Center in Coldwater and Ashland, MS.

REFERENCES

1. Craig JP, Tomlinson A, McCann L. Tear Film. In: Dartt D, Bex P, D'Amore P, et al. *Ocular Periphery and Disorders.* 1st ed. New York: Elsevier; 2010:254-62.
2. Stapleton F, Stretton S, Papas E, et al. Silicone hydrogel contact lenses and the ocular surface. *Ocul Surf.* 2006;4(1):24-43.
3. Nichols JJ, Sinnott LT. Tear film, contact lens, and patient-related factors associated with contact lens-related dry eye. *Invest Ophthalmol Vis Sci.* 2006;47(4):1319-28.
4. Nicholson PC, Vogt J. Soft contact lens polymers: an evolution. *Biomaterials.* 2001;22:3273-83.
5. Wolffsohn JS, Hunt OA, Chowdhury A. Objective clinical performance of 'comfort-enhanced' daily disposable soft contact lenses. *Contact Lens Anterior Eye.* 2010;33:88-92.
6. Laboratory study comparing release profiles; significance demonstrated at the 0.05 level; Alcon data on file, 2007.
7. Giles T, Fahmy M. Performance of daily disposable contact lenses with moisturizing agents. *Optician.* 2008;6150:31-3.
8. Peterson RC, Wolffsohn JS, Nick J, Winterton L, et al. Clinical performance of daily disposable soft contact lenses using sustained release technology. *Contact Lens Anterior Eye.* 2006;29:127-34.

Who's Writing the Rx Anyway?

How do you control patient outcomes when your spectacle prescriptions are hijacked by vision plans? **By John Rumpakis, OD, MBA, Clinical Coding Editor**

In the six years that I've been writing this column, I've always dedicated it to topics about medical coding and compliance. This column is going to be different.

This time I'm asking *you* for answers.

Who's Minding the Patient?

Managed vision care plans (MVCP) have a significant impact on the financial wellbeing of most optometric practices. Many ODs have voiced to me their desire to sever ties to these plans—but they are fearful about the economic consequences.

Many articles, in this publication and in others, have detailed the rationale that should be applied when joining and renewing your contractual obligations with these carriers.

That said, I'm more curious about your thoughts when these MVCPs begin to restrict your ability to recommend and prescribe what you believe is best for your patients. We've effectively fought this battle with pharmacists who turn our medication prescriptions into less efficacious generic medications.

But, what do you do about the MVCP that tells you what type of spectacle lens or contact lens you must prescribe?

After all, if the future health care system is going to grade us, as providers, on patient outcomes, shouldn't we control the product we prescribe to obtain the best outcome?

Who's Managing Who?

As MVCPs become more vertically integrated, this appears to be the direction that we're all headed.

VSP, for example, is now far more than a benefit plan; it owns and produces ophthalmic frames, EMR and practice management software, and spectacle lenses. Luxottica, one of the largest frame manufacturers in the world, owns EyeMed, one of the major players in the MVCP space. WellPoint purchased 1-800-Contacts, and so on and so on.

If the future health care system is going to grade us, as providers, on patient outcomes, shouldn't we control the product we prescribe to obtain the best outcome?

Does this concern anyone but me? I realize that there are a multitude of pressures on the individual practitioner, and many of these changes put upon us are cloaked in "rewards programs" and "incentives." It makes me wonder: When will it end? Where is the line drawn when the doctor ultimately decides what is best?

As the lines get blurrier and blurrier, the best care that we want to provide our patients could be restricted by the contract that we now have to uphold; be mindful that it may not be the contract that you originally agreed to, but one that has been unilaterally modified.

Of course, you could opt-out of your provider agreement; however, that might feel like financial suicide for many practices. What do you think?

Let Your Voice Be Heard

So, here's what I would like to ask of you: I've constructed a very basic seven-question survey (seven is my lucky number). It should take you only about three minutes to complete, but your honest responses—the good, the bad and the ugly—are all very important.

Take This Survey on Managed Vision Care Plans

Go to this link and take this quick survey on issues related to managed care vision plans: http://tinyurl.com/ROCodingSurvey.

Thanks in advance for taking the time to respond to this questionnaire, and be assured that your responses are completely anonymous.

I'll publish the results in another column soon, so you'll have a timely snapshot of this intensifying issue. ■

Please send your questions and comments to CodingAbstract@gmail.com.

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ADVERTORIAL

By Jimmy D. Bartlett, OD, DOS, ScD

Pathogens in Eye Care

The more you understand about pathogens, the better able you'll be to combat them in practice.

Methicillin-resistant *Staphylococcus aureus* (MRSA) was described in 1961 not long after the introduction of methicillin.[1] Since that time, MRSA has spread worldwide, and its prevalence has increased in both healthcare and community settings. In 2005, there were an estimated 478,000 hospitalizations with a diagnosis of *S. aureus* infection in U.S. hospitals.[2] Of these, roughly 278,000 were related to MRSA.[2] Klevens et al. reported that also in 2005, about 94,000 persons developed their first invasive (i.e., serious) MRSA infection, of which approximately 19,000 died. Of these infections, about 86% were healthcare-associated and 14% were community-associated.[3]

ABOUT MRSA

The Centers for Disease Control and Prevention define MRSA as a type of staphylococcus bacteria that is resistant to beta-lactam antibiotics.[4] Methicillin, penicillin and amoxicillin are examples of beta-lactams.[4] According to the Ocular Tracking Resistance in the United States Today (TRUST) study, 70% of the bacteria isolated in hospitals are resistant to at least one conventional antibiotic.[5] This study also revealed that more than half the *S. aureus* isolates sent to the TRUST laboratory between 2006 and 2007 were methicillin-resistant.[5]

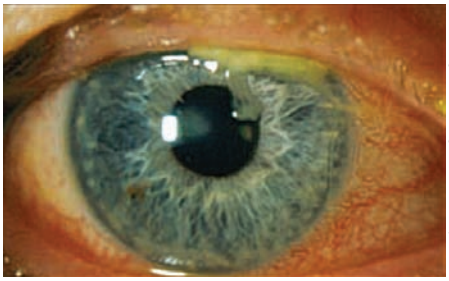
While it has become a major public health problem,[3] rates of invasive MRSA infections in the United States are falling.[4] This is obviously promising news; however, MRSA remains an important public health problem that warrants continued effort to further decrease risks of developing these infections. Infection by MRSA has important implications for both systemic and ophthalmic health.

S. aureus is a common bacterium that is colonized on human skin and in the noses of 25% to 30% of the population of healthy people.[4] Interestingly, less than 2% are colonized with MRSA.[6] It has been reported that the endo- and exotoxins from *Staphylococcus* on the eyelids can cause inflammatory conditions such as staphylococcal blepharitis, phlyctenular conjunctivitis and infiltrative keratitis.[7]

Clinical Significance for the OD

As with methicillin-sensitive *S. aureus* infections, MRSA can be associated with a wide range of ophthalmic infections. It is important for the optometrist to recognize that common manifestations of ophthalmic MRSA infections include not only preseptal cellulitis and conjunctivitis, but sight-threatening infections—including corneal ulcers, endophthalmitis, orbital cellulitis, and blebitis—can also occur.[7,8] Moreover, empirical antibiotic treatment of these infections may not adequately cover for the MRSA isolate in up to half of the cases.[7]

Although the prospect of ocular infection by a multidrug-resistant strain can be frightening, clinicians should note that resistance breakpoints reported by laboratories are developed based on drug concentrations that can be achieved in human serum. Ocular infections, however, are usually treated topically, which allows for much higher drug concentrations in the target tissue. Thus, a bacterial isolate that is labeled "resistant" to a given drug may nevertheless be treated successfully topically if the ocular tissue drug concentration sufficiently exceeds the medication's minimum inhibitory concentration (MIC).[8]



Courtesy of Jimmy D. Bartlett, OD

Acute bacterial conjunctivitis

The increasing prevalence of MRSA has resulted in a paradigm shift to include this group of organisms in the differential diagnosis of numerous ocular infections. Effective antimicrobial therapy may require treatment with either topical agents or systemic medications.

Managing MRSA

Basic infection prevention control measures are relatively simple and consist of good personal hygiene, avoidance of unclean/unsanitary environments and the use of barriers to avoid bacterial transmission. Let's take a closer look at these measures. Good personal hygiene means regularly washing hands with soap and water, not sharing personal items that come into contact with bare skin, not touching other people's wounds or bandages and keeping skin abrasions and cuts covered to prevent them from becoming infected.[9,10] Additionally, high-touch surfaces should be kept clean, as should all surfaces that might come into direct contact

with people's skin. Healthcare workers should always wear gloves when managing wounds and clean any shared equipment between uses.

Despite efforts to prevent MRSA, you will likely still encounter the infection from time to time. Keep in mind that patients who have concomitant risk factors such as diabetes or immune deficiency or who take steroids are at a higher risk for MRSA. In these cases, you may want to consult with an infectious disease and/or critical care specialist. It's also advisable to review the results of culture and sensitivity testing before deciding how to treat your patient.

The location, severity and speed of progression of the infection, as well as the age and health of the patient, can influence the specific treatment necessary. Without question, invasive staphylococcal infections require antibiotics, but such treatment should be based on susceptibility testing. Note that all MRSA strains are considered resistant to penicillins, cephalosporins, and other beta-lactam antibiotics regardless of susceptibility testing.[11] Antibiotics used to treat serious, multiple drug-resistant MRSA infections include vancomycin, as well as newer drugs such as linezolid, tigecycline and daptomycin.[12–14]

Asbell and colleagues advise practitioners to consider the possibility of methicillin or multi-drug resistance with any *S. aureus* ocular infection, even in the absence of recognized risk factors because of recent increases in the prevalence of MRSA and the inability of clinical or epidemiological risk factors to reliably distinguish between community-associated methicillin-resistant *S. aureus* (CA-MRSA)and methicillin-susceptible *S. aureus* (MSSA).[6,14] The Antibiotic Resistance Monitoring in Ocular micRoorganisms (ARMOR) surveillance study[15,16] sheds even more light on the topic of antibiotic resistance. Read on to learn what this study has uncovered.

ARMOR Trial

ARMOR was initiated in 2009 to monitor resistance trends among bacterial pathogens of ocular significance.[15,16] Such data can guide clinicians in the empiric treatment of ocular infections. This study found that antibacterial resistance is a significant concern in ocular isolates of *S. aureus* and coagulase-negative staphylococci (CNS) and that there are significant differences in the potency of commonly used antibiotics against these organisms.[16] Of the 228 *S. aureus* isolates collected, 50% were MRSA and 36% were both MRSA and ciprofloxacin non-susceptible (CIP-NS).

In 2011, 32 sites were enrolled to submit ocular isolates of Streptococcus pneumoniae, *S. aureus*, coagulase-negative staphylococci (CoNS), *Pseudomonas aeruginosa* and *Haemophilus influenzae* for antibiotic susceptibility testing.[17] Broth microdilution minimum inhibitory concentrations (MIC) were determined for 14 to 16 representative antibiotics against 786 isolates per Clinical and Laboratory Standards Institute methods.[17] The investigators found that resistance among the staphylococci was highest for azithromycin (63% to 65%), oxacillin (41% to 48%) and ciprofloxacin (36% to 44%) and that all isolates of *S. pneumoniae* were susceptible to the fluoroquinolones.[17] The investigators concluded that multidrug resistance in staphylococcal isolates remains prevalent. However, compared to the data from the two previous ARMOR studies,[15,16] the current surveillance data show similar or decreased levels of non-susceptibility for most bacteria/drug combinations.

The 2012 ARMOR surveillance study[18] subjected 455 isolates of *S. pneumoniae*, *S. aureus*, CoNS, *P. aeruginosa* and *H. influenzae* from 25 sites to antibiotic susceptibility testing using the same methods as in previous years. The study investigators determined that multidrug resistance remains remarkably prevalent among the MRSA and methicillin-resistant CoNS isolates and that continued vigilance is warranted to monitor long-term patterns of drug-resistance among bacterial pathogens that are prevalent in ocular infections.[18]

Conclusion

The prevalence of MRSA continues to increase, which is why eye-care practitioners should heed infection prevention control measures to avoid the transmission of MRSA. Fortunately, clinicians and patients alike can take certain steps (e.g., aggressive hand hygiene programs and interventions to reduce surgical site infections) to control its spread. Because bacteria are capable of mutating and forming bactericidal-resistant strains, the demand for more effective antibacterial agents is ongoing. Fortunately, there are available antibiotic drugs to treat ocular infections.

Dr. Bartlett is professor emeritus at the University of Alabama at Birmingham and president of PHARMAKON Group.

1. Barber M. Methicillin-resistant staphylococci. J Clin Pathol 1961; 14:385.
2. Klein E, Smith DL, Laxminarayan R. Hospitalizations and deaths caused by methicillin-resistant Staphylococcus aureus, United States, 1999–2005. Emerg Infect Dis. 2007;13(12):1840-6.
3. Klevens RM, Morrison MA, Nadle J, et al. Active Bacterial Core surveillance (ABCs) MRSA Investigators. Invasive methicillin-resistant Staphylococcus aureus infections in the United States. JAMA. 2007;298(51):1763-1771.
4. Centers for Disease Control and Prevention. Available at: http://www.cdc.gov/mrsa/. Last accessed: July 2013.
5. Asbell PA, Colby KA, Deng S, et al. Ocular TRUST: nationwide antimicrobial susceptibility patterns in ocular isolates. Am J Ophthalmol. 2008 Jun;145(6):951-58.
6. Gorwitz RJ, Kruszon-Moran D, McAllister SK, et al. Changes in the prevalence of nasal colonization with Staphylococcus aureus in the United States, 2001–2004. J Infect Dis. 2008:197(9):1226-34.
7. Blomquist PH. Methicillin-resistant Staphylococcus aureus infections of the eye and orbit (an American Ophthalmological Society Thesis). Trans Am Ophthalmol Soc. 2006;104:322–345.
8. Bartlett JD, Snyder C. Methicillin-resistant Staphylococcus aureus: challenges and risk, part I: overview of methicillin-resistant Staphylococcus aureus (MRSA). Contact Lens Spectrum. 2010;21 (suppl):3–9.
9. MedlinePlus. National Institute of Allergy and Infectious Diseases. MRSA. Available at: nlm.nih.gov/medlineplus/mrsa.html Last accessed November 2009.
10. Centers for Disease Control and Prevention. Methicillin-resistant Staphylococcus aureus (MRSA), October 2007 CDC podcast transcript. Available at www2.cdc.gov/podcasts/player.asp?f=6936#transcript Last accessed November 2009.
11. Lee JH. Methicillin (Oxacillin)-resistant Staphylococcus aureus strains isolated from major food animals and their potential transmission to humans. Appl Environ Microbiol. 2003;69(11):6489-94.
12. Boucher H, Miller LG, Razonable RR. Serious infections caused by methicillin-resistant Staphylococcus aureus. Clin Infect Dis. 2010;51 Suppl 2:S183-97.
13. Karpecki P, Shechtman DL. Besivance combats MRSA. Rev Optom. 2009 AUG. 146(8):93-4.
14. Miller LG, Perdreau-Remington F, Bayer AS, et al. Clinical and epidemiologic characteristics cannot distinguish community-associated methicillin-resistant Staphylococcus aureus infection from methicillin-susceptible S. aureus infection: a prospective investigation. Clin Infect Dis. 2007;44:471-482.
15. Haas W, Pillar CM, Torres M, et al. Monitoring antibiotic resistance in ocular microorganisms: results from the Antibiotic Resistance Monitoring in Ocular micRoorganisms (ARMOR) 2009 surveillance study. Am J Ophthalmol. 2011;152:567–574.
16. Haas W, Pillar CM, Morris TW, Sahm DF. Antibiotic Resistance Trends in Ocular Pathogens–An Update from the ARMOR 2009 and ARMOR 2010 Surveillance Studies. Poster D1129. Annual Meeting of the Association for Research in Vision and Ophthalmology, May 1–5, 2011, Ft. Lauderdale, Fla.
17. Haas W, Deane J, Morris TW, Sahm DF. Antibiotic resistance profile of ocular pathogens – an update from the ARMOR 2011 surveillance study. Poster D1055. Annual Meeting of the Association for Research in Vision and Ophthalmology, May 10, 2012, Ft. Lauderdale, Fla.
18. Haas W, Deane J, Morris TW, Sahm DF. Antibiotic surveillance of ocular pathogens – four years of ARMOR study results. Poster 2904/B0273. Annual Meeting of the Association for Research in Vision and Ophthalmology, May 5–9, 2013, Seattle, Wash.

19th Annual Surgery Report

CXL: Refractive Surgery's Missing Link?

Can corneal collagen crosslinking expand the refractive surgery market? The simple answer is 'yes.' But there's a little more to it than that.

By Marshall A. Walker, OD, and J. Christopher Freeman, OD

In recent years, corneal topography devices have been used with greater frequency during refractive surgery work-ups. This is largely because eye care providers want to identify poor candidates and avoid the dreaded complication of postoperative keratectasia.

Preliminary testing and laser refractive technology have continued to advance, allowing for safer, more predictable procedures and improved surgical outcomes. From placido disc corneal curvature topography to anterior and posterior corneal elevation, curvature and corneal thickness maps, optometrists are better positioned to identify corneal abnormalities than ever before.

Nevertheless, some patients are still deemed non-candidates and consequently may suffer from debilitating progressive vision loss.

Several years ago, LASIK eclipsed photorefractive keratectomy (PRK) as the primary mode for laser vision correction surgery. While the incidence of post-LASIK ectasia is low, with reported rates from 0.04% to 0.2%, clinicians are meticulous about screening patients' corneal maps.[1,2]

When suspicious signs of potential preoperative keratoconus or other risk factors are found, the patient typically is considered a non-candidate. The same is true for patients with very thin corneas or those who require very deep excimer laser treatments for full ametropia correction.

Fortunately, corneal collagen crosslinking (CXL) may allow certain patients with preexisting ectatic conditions or extremely thin corneas to enjoy the benefits of laser vision correction. Here, we'll discuss how CXL may help expand the refractive surgery market in the near future.

CXL 101

For several years, corneal collagen crosslinking (CXL) has been employed to slow or halt

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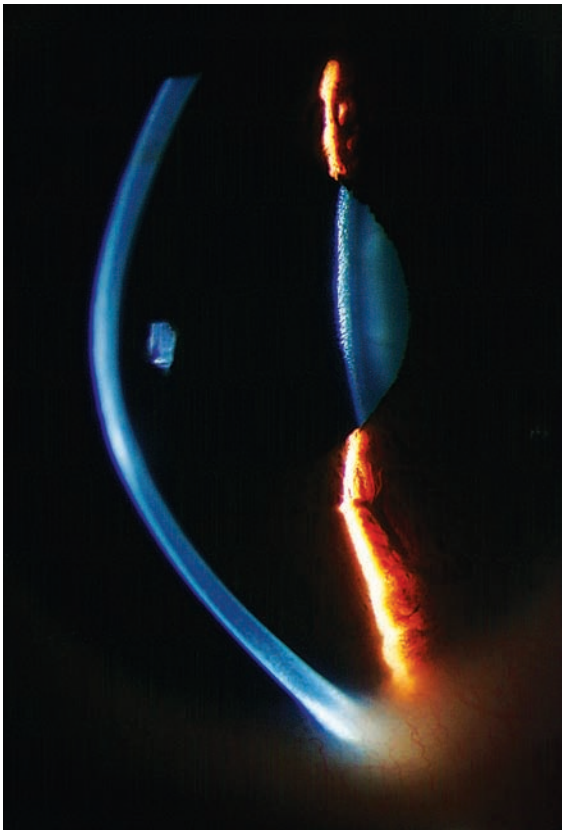
ectatic disease by stabilizing the weakened corneal infrastructure.[3] While not yet approved by the FDA, CXL has gained popularity around the world and in US clinical trials. Relatively long-term data over a four- to six-year period indicated that CXL is successful at stopping the progression of keratoconus.[4]

In a corneal collagen crosslinking procedure, the clinician saturates the cornea with topical riboflavin applied to the surface and then exposes the tissue to a narrow spectrum of UV-A. The procedure creates a biochemical reaction when the riboflavin is photo-activated, resulting in increased covalent bonding between collagen fibers.[5] This process increases the biomechanical strength and rigidity of the corneal stroma. CXL's ability to arrest disease progression is well-documented, with published results showing a 98% to 100% success rate.[6,7]

It's also worth noting that, in addition to keratoconus, practitioners abroad have used CXL to treat a wide range of conditions, including microbial keratitis and pseudophakic bullous keratopathy.[8,9]

Photo: Christine W. Sindt, OD



This patient presented with apical thinning, a mild scar and evidence of Fleischer's ring—hallmark findings associated with keratoconus. Could corneal collagen crosslinking slow disease progression in this patient?

Combined CXL and Laser Vision Correction

If the corneal stability achieved by CXL is permanent, could it be a cure for post-LASIK ectasia? In other words—could the procedure help broaden the market for laser vision correction by permitting some traditional non-candidates to undergo LASIK? It seems rather likely, but this notion is still in its infancy.

Corneal collagen crosslinking typically induces some corneal flattening and hyperopic shift.[10] Therefore, these variables must be considered during a combined excimer laser surgery and CXL procedure to ensure accurate, predicable results.

While the incidence of keratoconus in the general population is low—maybe as modest as 0.01%—it may be closer to 1% among refractive surgery candidates.[4] While still a relatively low figure, it poses a clinically significant concern because many patients with keratoconus may seek surgery for ametropia correction.

Clinical evidence suggests that the application of CXL in conjunction with surface ablation or LASIK could prevent regression in hyperopic patients, prove beneficial with femtosecond astigmatic keratectomy, provide enhanced biomechanical stability in the treatment of high-risk patients with keratoconic corneas—such as those with forme fruste or frank keratoconus. To date, many researchers have initiated successful protocols for combined laser vision correction CXL.[11-14]

• ***Hyperopia correction.*** In 2008, A. John Kanellopoulos, MD, introduced a procedure that included combined high-irradiance, short-exposure CXL and myopic LASIK—termed "LASIK Xtra" (Avedro, Inc.).[14,15] Then in 2012, he and several colleagues described a second combination procedure involving hyperopic LASIK and prophylactic intrastromal CXL in the *Journal of Refractive Surgery*.[15]

In this study, 34 patients received combined hyperopic LASIK and CXL in one eye and only hyperopic LASIK in the other. The protocol for CXL was 0.1% sodium phosphate riboflavin solution delivered under the flap followed by a three-minute treatment with 10mW/cm^2 UV-A light. The preoperative mean spherical equivalent refraction was +3.15D +/- 1.46D in the combined procedure group and +3.40D +/- 1.78D in the LASIK- only group.

At a mean follow-up of 23 months, the average spherical equivalent refraction measured -0.20D +/- 0.56D in the combined

If only you could predict how ocular inflammation will behave.

DUREZOL® Emulsion has head-to-head data vs prednisolone acetate in patients with endogenous anterior uveitis.[1]

Scan the QR code with your smartphone or log on to **www.inflammationhappens.com** to see the results for yourself.

INDICATIONS AND USAGE: DUREZOL® Emulsion is a topical corticosteroid that is indicated for:

- The treatment of inflammation and pain associated with ocular surgery.
- The treatment of endogenous anterior uveitis.

Dosage and Administration

- For the treatment of inflammation and pain associated with ocular surgery instill one drop into the conjunctival sac of the affected eye 4 times daily beginning 24 hours after surgery and continuing throughout the first 2 weeks of the postoperative period, followed by 2 times daily for a week and then a taper based on the response.
- For the treatment of endogenous anterior uveitis, instill one drop into the conjunctival sac of the affected eye 4 times daily for 14 days followed by tapering as clinically indicated.

IMPORTANT SAFETY INFORMATION

Contraindications: DUREZOL® Emulsion, as with other ophthalmic corticosteroids, is contraindicated in most active viral diseases of the cornea and conjunctiva including epithelial herpes simplex keratitis (dendritic keratitis), vaccinia, and varicella, and also in mycobacterial infection of the eye and fungal diseases of ocular structures.

Warnings and Precautions

- Intraocular pressure (IOP) increase – Prolonged use of corticosteroids may result in glaucoma with damage to the optic nerve, defects in visual acuity and fields of vision. If this product is used for 10 days or longer, IOP should be monitored.
- Cataracts – Use of corticosteroids may result in posterior subcapsular cataract formation.
- Delayed healing – The use of steroids after cataract surgery may delay healing and increase the incidence of bleb formation. In those diseases causing thinning of the cornea or sclera, perforations have been known to occur with the use of topical steroids. The initial prescription and renewal of the medication order beyond 28 days should be made by a physician only after examination of the patient with the aid of magnification such as slit lamp biomicroscopy and, where appropriate, fluorescein staining.
- Bacterial infections – Prolonged use of corticosteroids may suppress the host response and thus increase the hazard of secondary ocular infections. In acute purulent conditions, steroids may mask infection or enhance existing infection. If signs and symptoms fail to improve after 2 days, the patient should be re-evaluated.
- Viral infections – Employment of a corticosteroid medication in the treatment of patients with a history of herpes simplex requires great caution. Use of ocular steroids may prolong the course and may exacerbate the severity of many viral infections of the eye (including herpes simplex).
- Fungal infections – Fungal infections of the cornea are particularly prone to develop coincidentally with long-term local steroid application. Fungus invasion must be considered in any persistent corneal ulceration where a steroid has been used or is in use.
- Contact lens wear – DUREZOL® Emulsion should not be instilled while wearing contact lenses. Remove contact lenses prior to instillation of DUREZOL® Emulsion. The preservative in DUREZOL® Emulsion may be absorbed by soft contact lenses. Lenses may be reinserted after 10 minutes following administration of DUREZOL® Emulsion.

Most Common Adverse Reactions

- Post Operative Ocular Inflammation and Pain – Ocular adverse reactions occurring in 5-15% of subjects included corneal edema, ciliary and conjunctival hyperemia, eye pain, photophobia, posterior capsule opacification, anterior chamber cells, anterior chamber flare, conjunctival edema, and blepharitis.
- In the endogenous anterior uveitis studies, the most common adverse reactions occurring in 5-10% of subjects included blurred vision, eye irritation, eye pain, headache, increased IOP, iritis, limbal and conjunctival hyperemia, punctate keratitis, and uveitis.

For additional information about DUREZOL® Emulsion, please refer to the brief summary of prescribing information on adjacent page.

DUREZOL®
(difluprednate ophthalmic emulsion) 0.05%

The results you want. The relief they need.

Alcon®
a Novartis company

Reference: 1. DUREZOL® Emulsion package insert.

DUREZOL®
(difluprednate ophthalmic emulsion) 0.05%

BRIEF SUMMARY OF PRESCRIBING INFORMATION

INDICATIONS AND USAGE
Ocular Surgery
DUREZOL® (difluprednate ophthalmic emulsion) 0.05%, a topical corticosteroid, is indicated for the treatment of inflammation and pain associated with ocular surgery.
Endogenous Anterior Uveitis
DUREZOL® Emulsion is also indicated for the treatment of endogenous anterior uveitis.

DOSAGE AND ADMINISTRATION
Ocular Surgery
Instill one drop into the conjunctival sac of the affected eye 4 times daily beginning 24 hours after surgery and continuing throughout the first 2 weeks of the postoperative period, followed by 2 times daily for a week and then a taper based on the response.

Endogenous Anterior Uveitis
Instill one drop into the conjunctival sac of the affected eye 4 times daily for 14 days followed by tapering as clinically indicated.

DOSAGE FORMS AND STRENGTHS
DUREZOL® Emulsion contains 0.05% difluprednate as a sterile preserved emulsion for topical ophthalmic administration.

CONTRAINDICATIONS
The use of DUREZOL® Emulsion, as with other ophthalmic corticosteroids, is contraindicated in most active viral diseases of the cornea and conjunctiva including epithelial herpes simplex keratitis (dendritic keratitis), vaccinia, and varicella, and also in mycobacterial infection of the eye and fungal disease of ocular structures.

WARNINGS AND PRECAUTIONS
IOP Increase
Prolonged use of corticosteroids may result in glaucoma with damage to the optic nerve, defects in visual acuity and fields of vision. Steroids should be used with caution in the presence of glaucoma. If this product is used for 10 days or longer, intraocular pressure should be monitored.

Cataracts
Use of corticosteroids may result in posterior subcapsular cataract formation.

Delayed Healing
The use of steroids after cataract surgery may delay healing and increase the incidence of bleb formation. In those diseases causing thinning of the cornea or sclera, perforations have been known to occur with the use of topical steroids. The initial prescription and renewal of the medication order beyond 28 days should be made by a physician only after examination of the patient with the aid of magnification such as slit lamp biomicroscopy and, where appropriate, fluorescein staining.

Bacterial Infections
Prolonged use of corticosteroids may suppress the host response and thus increase the hazard of secondary ocular infections. In acute purulent conditions, steroids may mask infection or enhance existing infection. If signs and symptoms fail to improve after 2 days, the patient should be re-evaluated.

Viral Infections
Employment of a corticosteroid medication in the treatment of patients with a history of herpes simplex requires great caution. Use of ocular steroids may prolong the course and may exacerbate the severity of many viral infections of the eye (including herpes simplex).

Fungal Infections
Fungal infections of the cornea are particularly prone to develop coincidentally with long-term local steroid application. Fungus invasion must be considered in any persistent corneal ulceration where a steroid has been used or is in use. Fungal culture should be taken when appropriate.

Topical Ophthalmic Use Only
DUREZOL® Emulsion is not indicated for intraocular administration.

Contact Lens Wear
DUREZOL® Emulsion should not be instilled while wearing contact lenses. Remove contact lenses prior to instillation of DUREZOL® Emulsion. The preservative in DUREZOL® Emulsion may be absorbed by soft contact lenses. Lenses may be reinserted after 10 minutes following administration of DUREZOL® Emulsion.

ADVERSE REACTIONS
Adverse reactions associated with ophthalmic steroids include elevated intraocular pressure, which may be associated with optic nerve damage, visual acuity and field defects; posterior subcapsular cataract formation; secondary ocular infection from pathogens including herpes simplex, and perforation of the globe where there is thinning of the cornea or sclera.

Ocular Surgery
Ocular adverse reactions occurring in 5-15% of subjects in clinical studies with DUREZOL® Emulsion included corneal edema, ciliary and conjunctival hyperemia, eye pain, photophobia, posterior capsule opacification, anterior chamber cells, anterior chamber flare, conjunctival edema, and blepharitis. Other ocular adverse reactions occurring in 1-5% of subjects included reduced visual acuity, punctate keratitis, eye inflammation, and iritis. Ocular adverse reactions occurring in < 1% of subjects included application site discomfort or irritation, corneal pigmentation and striae, episcleritis, eye pruritis, eyelid irritation and crusting, foreign body sensation, increased lacrimation, macular edema, sclera hyperemia, and uveitis. Most of these reactions may have been the consequence of the surgical procedure.

Endogenous Anterior Uveitis
A total of 200 subjects participated in the clinical trials for endogenous anterior uveitis, of which 106 were exposed to DUREZOL® Emulsion. The most common adverse reactions of those exposed to DUREZOL® Emulsion occurring in 5-10% of subjects included blurred vision, eye irritation, eye pain, headache, increased IOP, iritis, limbal and conjunctival hyperemia, punctate keratitis, and uveitis. Adverse reactions occurring in 2-5% of subjects included anterior chamber flare, corneal edema, dry eye, iridocyclitis, photophobia, and reduced visual acuity.

USE IN SPECIFIC POPULATIONS
Pregnancy
Teratogenic Effects
Pregnancy Category C. Difluprednate has been shown to be embryotoxic (decrease in embryonic body weight and a delay in embryonic ossification) and teratogenic (cleft palate and skeletal) anomalies when administered subcutaneously to rabbits during organogenesis at a dose of 1–10 mcg/kg/day. The no-observed-effect-level (NOEL) for these effects was 1 mcg/kg/day, and 10 mcg/kg/day was considered to be a teratogenic dose that was concurrently found in the toxic dose range for fetuses and pregnant females. Treatment of rats with 10 mcg/kg/day subcutaneously during organogenesis did not result in any reproductive toxicity, nor was it maternally toxic. At 100 mcg/kg/day after subcutaneous administration in rats, there was a decrease in fetal weights and delay in ossification, and effects on weight gain in the pregnant females. It is difficult to extrapolate these doses of difluprednate to maximum daily human doses of DUREZOL® Emulsion, since DUREZOL® Emulsion is administered topically with minimal systemic absorption, and difluprednate blood levels were not measured in the reproductive animal studies. However, since use of difluprednate during human pregnancy has not been evaluated and cannot rule out the possibility of harm, DUREZOL® Emulsion should be used during pregnancy only if the potential benefit justifies the potential risk to the embryo or fetus.

Nursing Mothers
It is not known whether topical ophthalmic administration of corticosteroids could result in sufficient systemic absorption to produce detectable quantities in breast milk. Systemically administered corticosteroids appear in human milk and could suppress growth, interfere with endogenous corticosteroid production, or cause other untoward effects. Caution should be exercised when DUREZOL® Emulsion is administered to a nursing woman.

Pediatric Use
DUREZOL® Emulsion was evaluated in a 3-month, multicenter, double-masked, trial in 79 pediatric patients (39 DUREZOL® Emulsion; 40 prednisolone acetate) 0 to 3 years of age for the treatment of inflammation following cataract surgery. A similar safety profile was observed in pediatric patients comparing DUREZOL® Emulsion to prednisolone acetate ophthalmic suspension, 1%.

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

NONCLINICAL TOXICOLOGY
Carcinogenesis, Mutagenesis, and Impairment of Fertility
Difluprednate was not genotoxic *in vitro* in the Ames test, and in cultured mammalian cells CHL/IU (a fibroblastic cell line derived from the lungs of newborn female Chinese hamsters). An *in vivo* micronucleus test of difluprednate in mice was also negative. Treatment of male and female rats with subcutaneous difluprednate up to 10 mcg/kg/day prior to and during mating did not impair fertility in either gender. Long term studies have not been conducted to evaluate the carcinogenic potential of difluprednate.

Animal Toxicology and/or Pharmacology
In multiple studies performed in rodents and non-rodents, subchronic and chronic toxicity tests of difluprednate showed systemic effects such as suppression of body weight gain; a decrease in lymphocyte count; atrophy of the lymphatic glands and adrenal gland; and for local effects, thinning of the skin; all of which were due to the pharmacologic action of the molecule and are well known glucocorticosteroid effects. Most, if not all of these effects were reversible after drug withdrawal. The NOEL for the subchronic and chronic toxicity tests were consistent between species and ranged from 1–1.25 mcg/kg/day.

PATIENT COUNSELING INFORMATION
Risk of Contamination
This product is sterile when packaged. Patients should be advised not to allow the dropper tip to touch any surface, as this may contaminate the emulsion. Use of the same bottle for both eyes is not recommended with topical eye drops that are used in association with surgery.

Risk of Secondary Infection
If pain develops, or if redness, itching, or inflammation becomes aggravated, the patient should be advised to consult a physician.

Contact Lens Wear
DUREZOL® Emulsion should not be instilled while wearing contact lenses. Patients should be advised to remove contact lenses prior to instillation of DUREZOL® Emulsion. The preservative in DUREZOL® Emulsion may be absorbed by soft contact lenses. Lenses may be reinserted after 10 minutes following administration of DUREZOL® Emulsion.

Revised: May 2013
U.S. Patent 6,114,319

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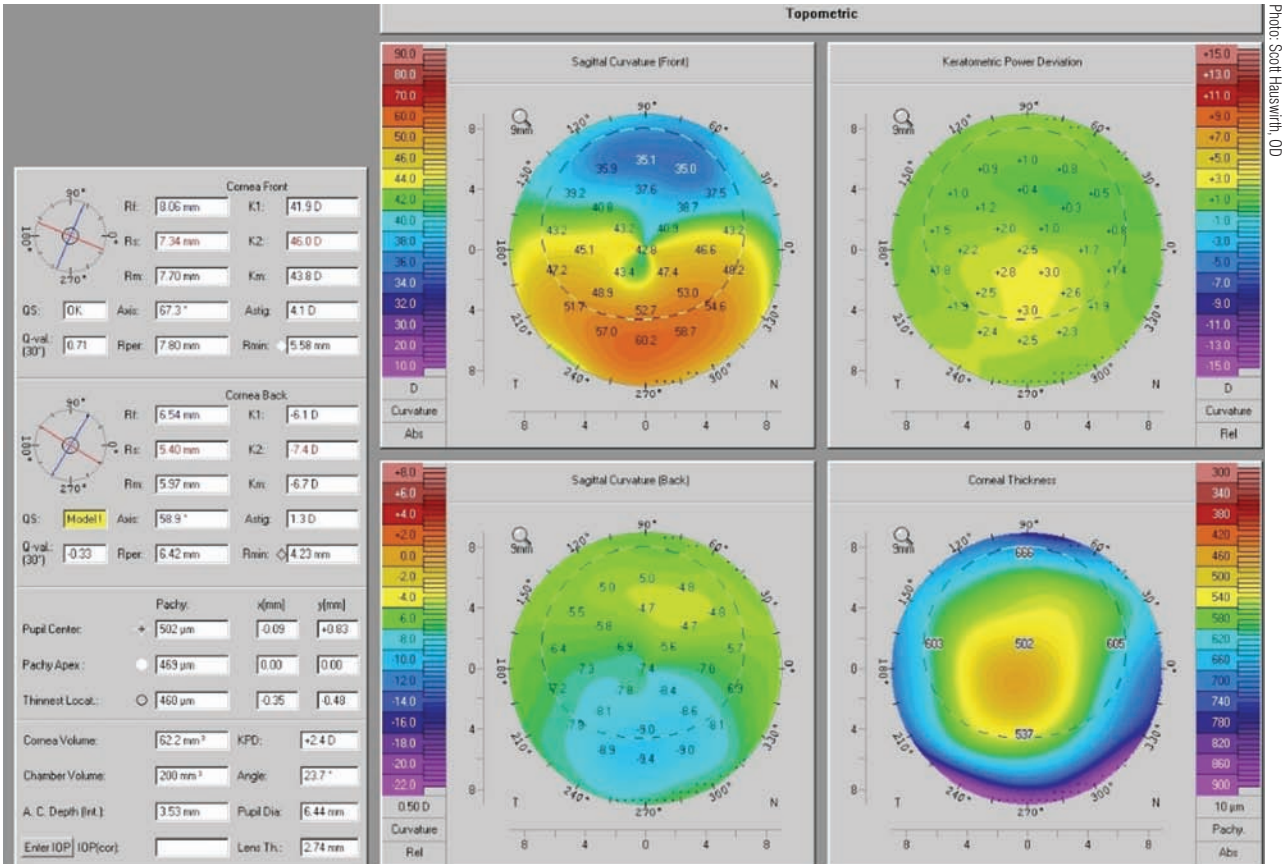


Photo: Scott Hauswirth, OD

Corneal collagen crosslinking could be used to prevent ectasia following LASIK, as seen here.

procedure group and +0.20D +/- 0.40D in the LASIK-only group. The analysis showed that eyes that underwent hyperopic LASIK without CXL exhibited greater regression (+0.72D +/- 0.19D) than eyes that had the combined procedure (+0.22D +/- 0.31D).[15] Although the sample size was limited, follow-up revealed a statistically significant difference in hyperopic regression between the two groups. This finding indicated that a larger volume of successful refractive outcomes is achievable with the application of combined hyperopic LASIK and CXL.

• ***Astigmatism correction.*** In a separate study, Dr. Kanellopoulos and associates evaluated the use of same-day, combined surface ablation and CXL for the treatment of astigmatism and myopia in patients with keratoconus.[16] The authors theorized that combined photorefractive keratectomy (PRK) and CXL might have a synergistic effect on thin ectatic corneas, because of the corneal remodeling that occurs during PRK.

Their protocol began with a 6.5mm phototherapeutic keratectomy (PTK) of 50µm of epithelium. Then, topography-guided PRK using Pentacam HR (Oculus) was performed with a 5.5mm optical zone centered on the corneal apex using the Allegretto excimer laser platform (Alcon).

Immediately afterward, the researchers applied 0.002mg/mL of mitomycin C for 30 seconds. Next, 0.1% sodium phosphate riboflavin solution was instilled into the cornea every two minutes over a 10-minute duration. Then, UV-A light irradiated at 5-mW/cm² was applied for 18 minutes.

The study evaluated 325 total eyes—127 were treated in a conventional sequential fashion and 198 underwent a same-day, combined procedure. The sequential group exhibited a mean improvement in uncorrected visual acuity from 20/160 to 20/63.

Those who received same-day surgery, experienced a mean improvement in uncorrected visual acuity from 20/180 to 20/40.[16] Also, those in the same-day group achieved a statistically significant reduction in mean manifest refraction spherical equivalent and keratometry values.

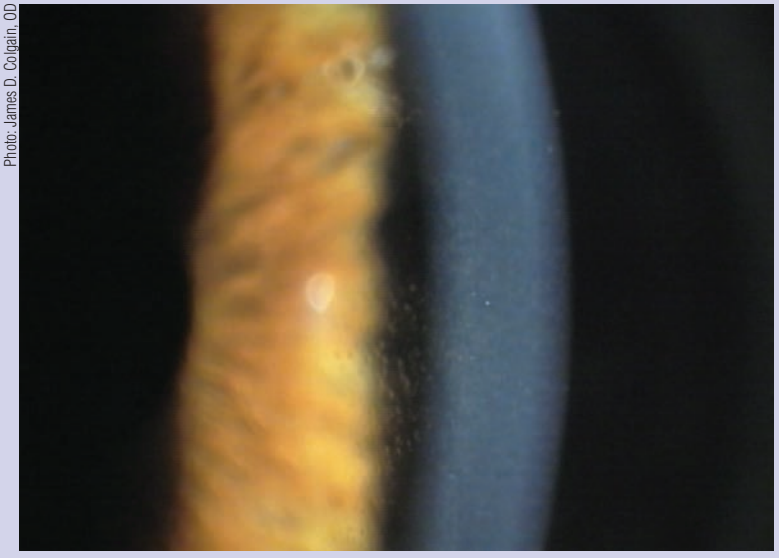
The researchers determined that

Common Complications of CXL

Generally, CXL is a safe and well-tolerated procedure for the treatment of keratectasias and other corneal conditions. While rare, the majority of complications are related to corneal epithelium removal. One study published in 2009 estimated that the rate of significant complication was approximately 3%.[3] The researchers evaluated 117 eyes over a 12-month period and found that patients older than 35 years of age, with best-corrected visual acuities of 20/25 or better and keratometry values greater than 58D in the steeper meridian were more likely to experience an adverse event.

The most common complications included postoperative corneal haze, persistent epithelial defect, diffuse lamellar keratitis and infectious keratitis.[3] Of these, stromal haze or scarring was most likely. Stromal haze appears soon after treatment and can persist up to one year. Some residual haze or scarring represents the site of crosslinking and is considered normal. These findings usually are not detrimental to vision.

Photo: James D. Colgain, OD



Diffuse lamellar keratitis, as seen in this patient, is one of the more common complications associated with corneal collagen crosslinking.

PRK followed by same-day CXL actually prevents ablation of crosslinked corneal tissue—unlike when CXL is performed before PRK.[16] Further, they noted that PRK and CXL are beneficial—both from a refractive and a therapeutic perspective—for patients with keratectasias. Finally, they determined that same-day, combined procedures yield better visual outcomes than sequential procedures.[16]

• ***Enhanced surgical stability.*** In a case series of 14 patients with keratoconus, researchers assessed the efficacy, predictability, safety and stability of a combined treatment that featured customized PRK and prophylactic CXL for residual refractive error correction after lamellar keratoplasty.[17] The mean residual ametropia was -6.11D, with a range from -2.50D to -9.50D.

The patients received custom PRK with the excimer laser platform (Ivis Technologies), with the ablation center calculated over the corneal apex. Afterward, the epithelial ablation was enlarged to a 9mm diameter for the subsequent corneal crosslinking procedure. The mean ablation depth was 100µm, and the minimum mean estimated residual stromal thickness was 463µm. The researchers applied Ricrolin (0.1% riboflavin A, Sooft Italia) for 15 minutes and UV-A light at 3mW/cm² for 30 minutes.

At a mean follow-up of 15 months, all eyes gained a minimum of one line of Snellen distance uncorrected visual acuity, and four patients gained three lines of best-corrected visual acuity.[17] The mean postoperative spherical equivalent measured -0.79D. The combined treatment showed improved refractive outcomes and stability over the follow-up interval.

Corneal collagen crosslinking has been shown to slow or halt progression of keratoconus and post-LASIK ectasia. However, more research is required and existing nomograms need to be refined to more accurately predict procedural end points.

While the incidence of keratoconus may be greater in a refractive surgery practice than in the general population, it's still low. Thus, the potential to treat these patients serves to broaden the refractive surgery market—but only modestly. However, the possibility of improved uncorrected and best-corrected vision through simultaneous protective adjunct therapy is exciting. ■

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1. Randleman JB, Russell B, Ward MA, et al. Risk factors and prognosis for corneal ectasia after LASIK. Ophthalmology. 2003 Feb;110(2):267-75.
2. Rad AS, Jabbarvand M, Saifi N. Progressive keratectasia after laser in situ keratomileusis. J Refract Surg. 2004 Sep-Oct;20(5 Suppl):S718-22.
3. Koller T, Mrochen M, Seiler T. Complication and failure rates after corneal crosslinking. J Cataract Refract Surg. 2009 Aug;35(8):1358-62.
4. O'Brart, DP, Kwong TQ, Patel P, et al. Long-term follow-up of riboflavin/ultraviolet A (370nm) corneal collagen cross-linking to halt the progression or keratoconus. Br J Ophthalmol. 2013 Apr;97(4):433-7.
5. Sung HW, Chang WH, Ma CY, Lee MH. Crosslinking of biological tissues using genipin and/or carbodiimide. J Biomed Mater Res A. 2003 Mar 1;64(3):427-38.
6. Raiskup-Wolf F, Hoyer A, Spoerl E, Pillunat LE. Collagen crosslinking with riboflavin and ultraviolet-A light in keratoconus: long-term results. J Cataract Refract Surg. 2008 May;34(5):796-801.
7. Wittig-Silva C, Whiting M, Lamoureux E, et al. A randomized controlled trial of corneal collagen cross-linking in progressive keratoconus: preliminary results. J Refract Surg. 2008 Sep;24(7):S720-5.
8. Makdoumi K, Mortensen J, Crafoord S. Infectious keratitis treated with corneal crosslinking. Cornea. 2010 Dec;29(12):1353-8.
9. Ghanem RC, Santhiago MR, Berti TB, et al. Collagen crosslinking with riboflavin and ultraviolet-A in eyes with pseudophakic bullous keratopathy. J Cataract Refract Surg. 2010 Feb;36(2):273-6.
10. Copeland RZ, Afshari NA. Copeland and Afshari's Principles and Practice of Cornea. 1st ed. New Delhi, India: Jaypee-Highlights Medical Publishers, Inc., 2012.
11. Kanellopoulos AJ. Comparison of sequential vs same-day simultaneous collagen cross-linking and topography-guided PRK for treatment of keratoconus. J Refract Surg. 2009 Sep;25(9):S812-8.
12. Kymionis GD, Kontadakis GA, Kounis GA, et al. Simultaneous topography-guided PRK followed by corneal collagen cross-linking for keratoconus. J Refract Surg. 2009 Sep;25(9):S807-11.
13. Nguyen MK, Chuck RS. Corneal collagen cross-linking in the stabilization of PRK, LASIK, thermal keratoplasty, and orthokeratology. Curr Opin Ophthalmol. 2013 Jul;24(4):291-5.
14. Kanellopoulos AJ, Pamel GJ. Review of current indications for combined very high fluence collagen cross-linking and laser in situ keratomileusis surgery. Indian J Ophthalmol. 2013 Aug;61(8):430-2.
15. Kanellopoulos AJ, Khan J. Topography-guided hyperopic LASIK with and without high irradiance collagen cross-linking: Initial comparative clinical findings in a contralateral eye study of 34 consecutive patients. J Refract Surg. 2012 Nov;28(11 Suppl):S837-40.
16. Kanellopoulos AJ, Binder PS. Management of corneal ectasia after LASIK with combined, same-day, topography-guided partial transepithelial PRK and collagen cross-linking: The Athens Protocol. J Refract Surg. 2011 May;27(5):323-31.
17. Spadea L, Paroli M. Simultaneous topography-guided PRK followed by corneal collagen cross-linking after lamellar keratoplasty for keratoconus. Clin Ophthalmol. 2012;6:1793-800.

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References: 1. Kassan SS, Moutsopoulos HM. Clinical manifestations and early diagnosis of Sjögren syndrome. *Arch Intern Med*. 2004;164:1275-1284. **2.** Sjögren's Syndrome Foundation. Sjögren's Syndrome Foundation. 2001. Available at http://www.sjogrens.org. Accessed September 5, 2013. **3.** Liew M, Zhang M, Kim E, et al. Prevalence and predictors of Sjögren's syndrome in a prospective cohort of patients with aqueous-deficient dry eye. *Br J Ophthalmol*. 2012;96:1498-1503. **4.** Martin LS, Massafra U, Migliore A. Sjögren's syndrome: an under-diagnosed disorder. *CLI*. May 2004.

19th Annual Surgery Report

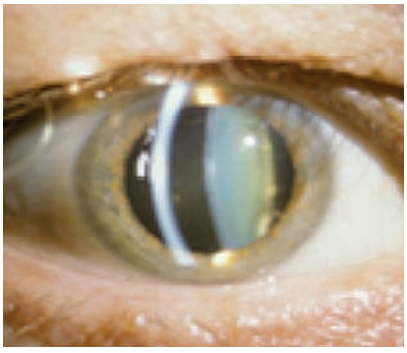
Cataract Surgery in LVC's 'Early Adopters'

Patients who had laser vision correction back in the 1990s are starting to return with age-related cataracts. What potential obstacles must we navigate during the cataract comanagement process? By Maynard Pohl, OD

Over the last 20 years, more than 16 million patients have undergone laser vision correction worldwide.[1] Interestingly, many of refractive surgery's "early adopters" (i.e., those who had a procedure in the mid 1990s) have already reached age 50 to 60, and we are now beginning to see them return with visually significant cataracts and presbyopia.

A sizeable majority of early adopters had some form of laser corneal reshaping procedure—either LASIK or PRK. A history of corneal reshaping poses a unique challenge to optometrists when considering a cataract procedure. For example, intraocular lens (IOL) calculations and corneal refractive measurements may be substantially different from what generally is anticipated in patients who have not undergone laser vision correction.

Despite the inherent challenges in comanaging refractive surgery's early adopters, it is your responsibility to discuss all the available cataract surgery options with these patients to determine the most suitable way to meet or exceed their visual expectations.



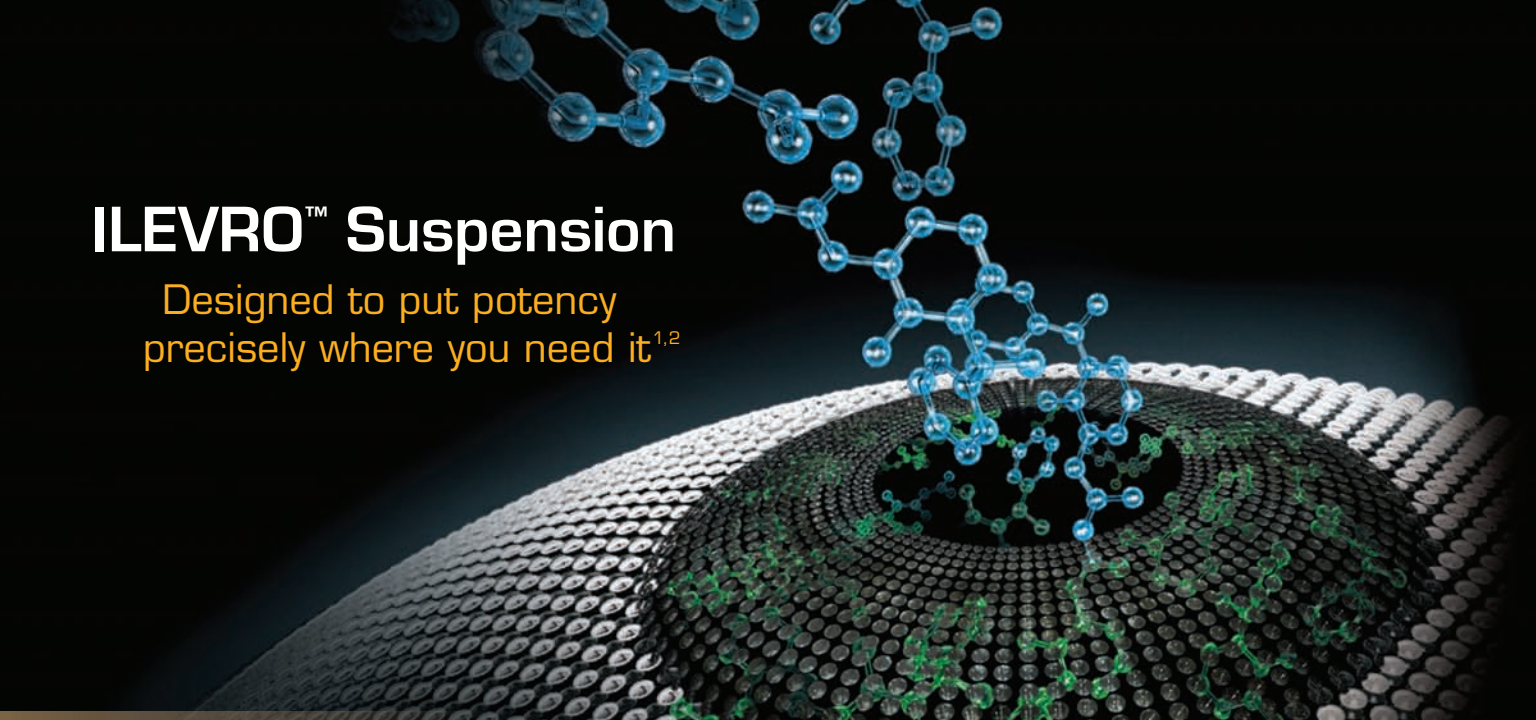
This "early adopter" underwent LASIK many years ago. Now, he has developed a visually significant cataract. How should we approach the surgical work-up?

The Patient Education Process

Our patients are always increasing their awareness of current refractive procedures and premium IOL technologies through a variety of sources, including the Internet. Nevertheless, optometrists remain the primary educators when guiding patients through their final assessment and comprehensive surgical plan. No other eye care providers are better positioned for this task than primary care optometrists.

As such, practitioners who have worked with patients during a previous laser vision correction process are especially familiar with their anticipated visual expectations following surgery. And because many of these patients expect significant visual improvements with today's latest innovations, you should make every effort to keep up to date with all current IOL options, including standard, toric and presbyopia-correcting modalities.

Be sure to provide a thorough overview of each IOL's benefits and disadvantages, as well as have a discussion about the desired refractive outcome, before you refer a patient for surgery. Educating patients on every aspect of their future cataract surgery and playing an active role in both their pre- and postoperative care will ensure that their visual needs are best met. If a referral for surgery is made without adequately discussing the preoperative information, including all available treatments and lens options, patients



ILEVRO™ Suspension

Designed to put potency precisely where you need it[1,2]

ONCE-DAILY POST-OP

One drop should be applied once daily beginning 1 day prior to surgery through 14 days post-surgery, with an additional drop administered 30 to 120 minutes prior to surgery[3]

Use of ILEVRO™ Suspension more than 1 day prior to surgery or use beyond 14 days post-surgery may increase patient risk and severity of corneal adverse events[3]

INDICATIONS AND USAGE

ILEVRO™ Suspension is a nonsteroidal, anti-inflammatory prodrug indicated for the treatment of pain and inflammation associated with cataract surgery.

Dosage and Administration

One drop of ILEVRO™ Suspension should be applied to the affected eye one-time-daily beginning 1 day prior to cataract surgery, continued on the day of surgery and through the first 2 weeks of the postoperative period. An additional drop should be administered 30 to 120 minutes prior to surgery.

IMPORTANT SAFETY INFORMATION

Contraindications

ILEVRO™ Suspension is contraindicated in patients with previously demonstrated hypersensitivity to any of the ingredients in the formula or to other NSAIDs.

Warnings and Precautions

- Increased Bleeding Time – With some nonsteroidal anti-inflammatory drugs including ILEVRO™ Suspension there exists the potential for increased bleeding time. Ocularly applied nonsteroidal anti-inflammatory drugs may cause increased bleeding of ocular tissues (including hyphema) in conjunction with ocular surgery.
- Delayed Healing – Topical nonsteroidal anti-inflammatory drugs (NSAIDs) including ILEVRO™ Suspension may slow or delay healing. Concomitant use of topical NSAIDs and topical steroids may increase the potential for healing problems.
- Corneal Effects – Use of topical NSAIDs may result in keratitis. In some patients, continued use of topical NSAIDs may result in epithelial breakdown, corneal thinning, corneal erosion, corneal ulceration or corneal perforation. These events may be sight threatening. Patients with evidence of corneal epithelial breakdown should immediately discontinue use.

  Patients with complicated ocular surgeries, corneal denervation, corneal epithelial defects, diabetes mellitus, ocular surface diseases (e.g., dry eye syndrome), rheumatoid arthritis, or repeat ocular surgeries within a short period of time may be at increased risk for corneal adverse events which may become sight threatening. Topical NSAIDs should be used with caution in these patients.

  Use more than 1 day prior to surgery or use beyond 14 days post-surgery may increase patient risk and severity of corneal adverse events.
- Contact Lens Wear – ILEVRO™ Suspension should not be administered while using contact lenses.

Adverse Reactions

The most frequently reported ocular adverse reactions following cataract surgery occurring in approximately 5 to 10% of patients were capsular opacity, decreased visual acuity, foreign body sensation, increased intraocular pressure, and sticky sensation.

For additional information about ILEVRO™ Suspension, please refer to the brief summary of prescribing information on adjacent page.

References: 1. Ke T-L, Graff G, Spellman JM, Yanni JM. Nepafenac, a unique nonsteroidal prodrug with potential utility in the treatment of trauma-induced ocular inflammation, II: In vitro bioactivation and permeation of external ocular barriers. *Inflammation.* 2000;24(4):371-384. **2.** Data on file. **3.** ILEVRO™ Suspension package insert.

ILEVRO™
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ILEVRO™

(nepafenac ophthalmic suspension) 0.3%

BRIEF SUMMARY OF PRESCRIBING INFORMATION

INDICATIONS AND USAGE
ILEVRO™ Suspension is indicated for the treatment of pain and inflammation associated with cataract surgery.

DOSAGE AND ADMINISTRATION
Recommended Dosing
One drop of ILEVRO™ Suspension should be applied to the affected eye one-time-daily beginning 1 day prior to cataract surgery, continued on the day of surgery and through the first 2 weeks of the postoperative period. An additional drop should be administered 30 to 120 minutes prior to surgery.

Use with Other Topical Ophthalmic Medications
ILEVRO™ Suspension may be administered in conjunction with other topical ophthalmic medications such as beta-blockers, carbonic anhydrase inhibitors, alpha-agonists, cycloplegics, and mydriatics. If more than one topical ophthalmic medication is being used, the medicines must be administered at least 5 minutes apart.

CONTRAINDICATIONS
ILEVRO™ Suspension is contraindicated in patients with previously demonstrated hypersensitivity to any of the ingredients in the formula or to other NSAIDs.

WARNINGS AND PRECAUTIONS
Increased Bleeding Time
With some nonsteroidal anti-inflammatory drugs including ILEVRO™ Suspension, there exists the potential for increased bleeding time due to interference with thrombocyte aggregation. There have been reports that ocularly applied nonsteroidal anti-inflammatory drugs may cause increased bleeding of ocular tissues (including hyphemas) in conjunction with ocular surgery. It is recommended that ILEVRO™ Suspension be used with caution in patients with known bleeding tendencies or who are receiving other medications which may prolong bleeding time.

Delayed Healing
Topical nonsteroidal anti-inflammatory drugs (NSAIDs) including ILEVRO™ Suspension, may slow or delay healing. Topical corticosteroids are also known to slow or delay healing. Concomitant use of topical NSAIDs and topical steroids may increase the potential for healing problems.

Corneal Effects
Use of topical NSAIDs may result in keratitis. In some susceptible patients, continued use of topical NSAIDs may result in epithelial breakdown, corneal thinning, corneal erosion, corneal ulceration or corneal perforation. These events may be sight threatening. Patients with evidence of corneal epithelial breakdown should immediately discontinue use of topical NSAIDs including ILEVRO™ Suspension and should be closely monitored for corneal health. Postmarketing experience with topical NSAIDs suggests that patients with complicated ocular surgeries, corneal denervation, corneal epithelial defects, diabetes mellitus, ocular surface diseases (e.g., dry eye syndrome), rheumatoid arthritis, or repeat ocular surgeries within a short period of time may be at increased risk for corneal adverse events which may become sight threatening. Topical NSAIDs should be used with caution in these patients.

Postmarketing experience with topical NSAIDs also suggests that use more than 1 day prior to surgery or use beyond 14 days post surgery may increase patient risk and severity of corneal adverse events.

Contact Lens Wear
ILEVRO™ Suspension should not be administered while using contact lenses.

ADVERSE REACTIONS
Because clinical studies are conducted under widely varying conditions, adverse reaction rates observed in the clinical studies of a drug cannot be directly compared to the rates in the clinical studies of another drug and may not reflect the rates observed in practice.

Ocular Adverse Reactions
The most frequently reported ocular adverse reactions following cataract surgery were capsular opacity, decreased visual acuity, foreign body sensation, increased intraocular pressure, and sticky sensation. These events occurred in approximately 5 to 10% of patients.

Other ocular adverse reactions occurring at an incidence of approximately 1 to 5% included conjunctival edema, corneal edema, dry eye, lid margin crusting, ocular discomfort, ocular hyperemia, ocular pain, ocular pruritus, photophobia, tearing and vitreous detachment.

Some of these events may be the consequence of the cataract surgical procedure.

Non-Ocular Adverse Reactions
Non-ocular adverse reactions reported at an incidence of 1 to 4% included headache, hypertension, nausea/vomiting, and sinusitis.

USE IN SPECIFIC POPULATIONS
Pregnancy
Teratogenic Effects.
Pregnancy Category C: Reproduction studies performed with nepafenac in rabbits and rats at oral doses up to 10 mg/kg/day have revealed no evidence of teratogenicity due to nepafenac, despite the induction of maternal toxicity. At this dose, the animal plasma exposure to nepafenac and amfenac was approximately 70 and 630 times human plasma exposure at the recommended human topical ophthalmic dose for rats and 20 and 180 times human plasma exposure for rabbits, respectively. In rats, maternally toxic doses ≥10 mg/kg were associated with dystocia, increased post-implantation loss, reduced fetal weights and growth, and reduced fetal survival.

Nepafenac has been shown to cross the placental barrier in rats. There are no adequate and well-controlled studies in pregnant women. Because animal reproduction studies are not always predictive of human response, ILEVRO™ Suspension should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Non-teratogenic Effects.
Because of the known effects of prostaglandin biosynthesis inhibiting drugs on the fetal cardiovascular system (closure of the ductus arteriosus), the use of ILEVRO™ Suspension during late pregnancy should be avoided.

Nursing Mothers
ILEVRO™ Suspension is excreted in the milk of lactating rats. It is not known whether this drug is excreted in human milk. Because many drugs are excreted in human milk, caution should be exercised when ILEVRO™ Suspension is administered to a nursing woman.

Pediatric Use
The safety and effectiveness of ILEVRO™ Suspension in pediatric patients below the age of 10 years have not been established.

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

NONCLINICAL TOXICOLOGY
Carcinogenesis, Mutagenesis, Impairment of Fertility
Nepafenac has not been evaluated in long-term carcinogenicity studies. Increased chromosomal aberrations were observed in Chinese hamster ovary cells exposed *in vitro* to nepafenac suspension. Nepafenac was not mutagenic in the Ames assay or in the mouse lymphoma forward mutation assay. Oral doses up to 5,000 mg/kg did not result in an increase in the formation of micronucleated polychromatic erythrocytes *in vivo* in the mouse micronucleus assay in the bone marrow of mice. Nepafenac did not impair fertility when administered orally to male and female rats at 3 mg/kg.

PATIENT COUNSELING INFORMATION
Slow or Delayed Healing
Patients should be informed of the possibility that slow or delayed healing may occur while using nonsteroidal anti-inflammatory drugs (NSAIDs).

Avoiding Contamination of the Product
Patients should be instructed to avoid allowing the tip of the dispensing container to contact the eye or surrounding structures because this could cause the tip to become contaminated by common bacteria known to cause ocular infections. Serious damage to the eye and subsequent loss of vision may result from using contaminated solutions.

Use of the same bottle for both eyes is not recommended with topical eye drops that are used in association with surgery.

Contact Lens Wear
ILEVRO™ Suspension should not be administered while wearing contact lenses.

Intercurrent Ocular Conditions
Patients should be advised that if they develop an intercurrent ocular condition (e.g., trauma, or infection) or have ocular surgery, they should immediately seek their physician's advice concerning the continued use of the multi-dose container.

Concomitant Topical Ocular Therapy
If more than one topical ophthalmic medication is being used, the medicines must be administered at least 5 minutes apart.

Shake Well Before Use
Patients should be instructed to shake well before each use. U.S. Patent Nos. 5,475,034; 6,403,609; and 7,169,767.

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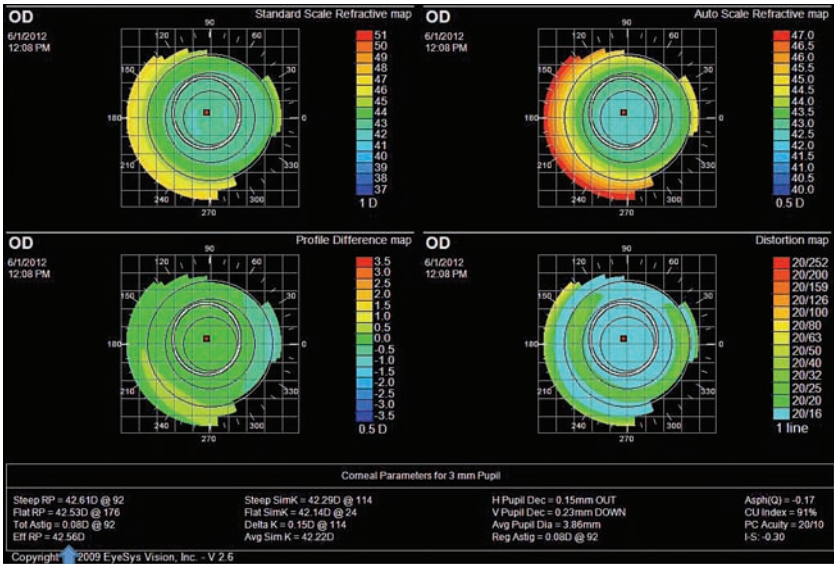
could be unhappy with their postoperative result and might seek the services of a different eye care provider for all future needs.

IOL Calculations and 'Refractive Surprise'

A review of each patient's ocular surgery history is pertinent, especially for those who have previously undergone corneal reshaping. If a patient has had laser vision correction or incisional keratotomy, it is imperative to educate the individual about the potential for a "refractive surprise" that may result from challenges in determining the effective corneal curvature values used in IOL calculations.

There are several ways to calculate the effective corneal curvature (or keratometry [K]) values, including the historical method, the contact lens approach and via computerized topography.[2] Because each calculation method includes some inherent element of unpredictability and uncertainty, it may be most practical to use the simplest approach to derive the effective Ks. Thus, computerized topography remains my method of choice.

• ***The historical method*** relies on the gathering of pre-corneal shaping surgical information, including K values and refractive error, and comparing it to the postoperative data. The difference in refractive error from before and after the corneal reshaping procedure is subtracted from the pre-refractive surgery K values to arrive at the effective Ks needed in the IOL calculation. Ideally, you'd like to know the patient's post-corneal shaping refractive error prior to cataractogenesis. But, we don't always have this information on file before cataract development, which increases the potential for error when adjusting the original K values.



Automated topography is one of the most accurate methods to determine IOL calculations in patients who've previously undergone a corneal reshaping procedure.

• ***The contact lens method*** requires you to apply a plano rigid lens of a known base curve onto the surface of the postoperatively reshaped cornea. Then, you must perform an over-refraction, which will allow you to determine the resultant tear lens power. This figure then can be factored into the known contact lens curvature to arrive at the effective K value needed in the IOL calculation.

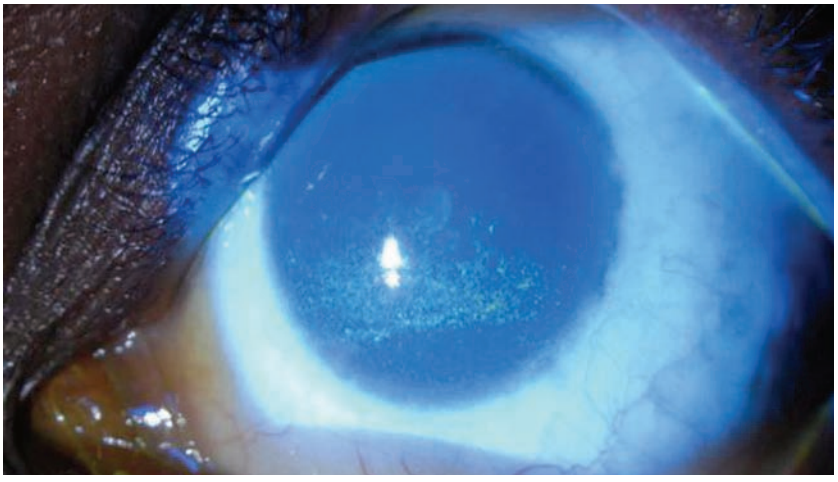
• ***Automated topography*** captures many refractive data points on the anterior corneal surface and determines effective K values through one of the formulas contained in the corneal topography software.

If given a choice between available formulas, I prefer to select the flattest effective K values possible, thereby resulting in an IOL calculation with additional plus power. This approach enhances the likelihood that a patient may experience a residual myopic outcome, rather than a highly undesirable residual hyperopic outcome.

Also, because the effective Ks often overestimate the cornea's true focusing power, I'll usually target a refractive endpoint of -0.75D to further avoid the potential for a hyperopic result. In my experience, this often yields a spherical equivalent close to plano.

Additionally, we use several diagnostic instruments and newer technologies to help with our IOL calculations—including the Lenstar (Haag Streit) and the Pentacam (Oculus). These technologies measure central and peripheral pachymetry, lens thickness, anterior and posterior topography, axial length, anterior chamber depth and white-to-white distances, as well as calculate the effective K values in post-corneal reshaping patients.

It is worth noting that aberrometry can be particularly helpful in post-corneal reshaping surgery patients who are interested in premium IOLs. If, for example, the patient exhibits significant higher-order aberrations, such as trefoil or coma, a mulifocal IOL—which yields further contrast loss—would be contraindicated.



This patient developed significant corneal epitheliopathy following PRK. Such pre-existing ocular surface disease must be treated effectively before referring any individual for cataract surgery.

Individualized Considerations

• ***A history of RK or AK.*** Patients who have undergone an incisional procedure (i.e., radial keratotomy or astigmatic keratotomy) are evaluated and managed in the same manner as those who have had laser vision correction. These patients likely will report persistent diurnal vision changes following cataract surgery if they had similar issues following incisional keratotomy. Additionally, they are more likely to experience persistent glare under dim lighting conditions secondary to incisions entering the scotopic pupil zone.[3]

• ***Astigmatism.*** Ideally, you should instruct the surgeon to make the cataract wound incision further away from the limbus (i.e., a mini scleral tunnel incision, rather than a clear corneal incision) to reduce the potential impact on corneal shape in patients with previous incisional keratotomy.

Otherwise, limbal relaxing incisions made at the time of cataract surgery or postoperative PRK enhancement could help reduce residual astigmatic error that a standard IOL may not correct.[4]

Provided there is significant corneal astigmatism, all previous corneal reshaping patients also can be considered candidates for a premium toric IOL.

• ***Presbyopia.*** Likewise, presbyopia-correcting IOLs are an option in post-corneal reshaping patients. Again, keep in mind that implantation of multifocal IOLs can exacerbate the severity of higher-order aberrations in some individuals who have undergone corneal reshaping. Patients who are highly disinterested in wearing glasses, express reasonable visual expectations and have otherwise unremarkable internal and ocular surface examinations may be suitable candidates for multifocal IOLs.

Careful evaluation, including similar documentation of the corneal topography measurements used in pre-laser vision correction, is required for post-corneal reshaping patients who are deciding the suitability of multifocal IOLs. As with virgin corneas, macular and ocular surface health also must be ascertained in all patients who are considering presbyopia-correcting IOLs.

Preoperative Management

Successful comanagement truly is the result of continuous communication amongst all involved parties, including the referring optometrist, cataract surgeon and—most importantly—the patient. During the preoperative period, educate the patient about his or her pre-existing ocular conditions and IOL options in an effort to design the optimal individualized plan for the entire cataract surgery experience.

Further, during the preoperative work-up, we administer a simple questionnaire to determine each patient's lifestyle demands and visual expectations. (*An electronic version of the questionnaire we use in our office is available at www.revoptom.com.*)

Carefully explaining the intraoperative details and positioning yourself as the individual chiefly responsible for the patient's postoperative care not only will help solidify his or her trust in you, but also will help foster a mutually respectful relationship between you and the surgeon, ultimately benefitting the overall care of the patient.

All patients—regardless of whether they have undergone previous corneal reshaping—who elect premium IOLs implantation should be informed that their very best possible visual outcome may only be attained via fine tuning with spectacles or contact lenses. Always be sure to discuss this consideration in every pre-cataract surgery evaluation—particularly if the patient has high or unrealistic visual demands.

Pre-existing ocular surface conditions (i.e., dry eye status) and personality characteristics are among the most important considerations during the IOL selection process in post-refractive cataract surgery candidates. The identification and aggressive treatment of dry eye and

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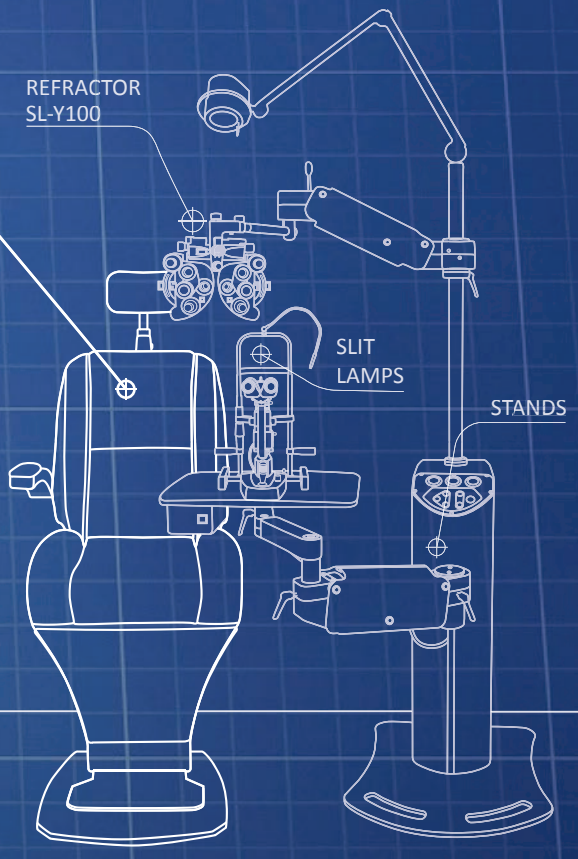

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significant tear film instability are essential prior to surgical referral. In my experience, topography scans have revealed IOL calculation errors as high as 1.50D in patients with unstable cornal surface health.

Postoperative Management

Following careful preoperative consideration and meticulous intraoperative techniques applied by an expert cataract surgeon, it is your responsibility to address postoperative complications. Patients who do not experience optimal visual results or have unmet expectations will seek your guidance. Reasons for decreased vision following cataract surgery include residual refractive error, exacerbated dry eye disease, posterior capsular opacification (PCO) and cystoid macular edema (CME). Fortunately, you are able to manage many of these conditions postoperatively.

Dry eye can be remedied via aggressive treatment with artificial tear supplements, topical anti-inflammatories, punctal occlusion and omega-3 fatty acids to improve the quantity and quality of tears.

Posterior capsular opacification is a common etiology for decreased vision following otherwise unremarkable cataract extraction—although it is important to always carefully examine the macula to rule out the possibility of pseudophakic CME.

In the absence of CME and the presence of PCO, a YAG capsulotomy may help restore vision. Keep in mind that a YAG procedure should be considered earlier in the postoperative period for patients with multifocal IOL implantations, because these individuals could be more sensitive to decreased contrast. If cystoid macular edema is detected, treat with both topical and periocular corticosteroids as well as non-steroidal anti-inflammatory agents—deferring YAG capsulotomy until the CME has resolved.

Enhancements and Exchanges

The potential for refractive surprise must be discussed in all previous corneal reshaping patients. During the preoperative period, be sure to inform them that a subsequent refractive enhancement may be performed if they are unhappy with their uncorrected vision following IOL implantation. Because re-lifting the LASIK flap after one to two years post-op can result in epithelial cell ingrowth, PRK typically is advised in these instances.[5] Keep in mind, however, that any laser vision enhancement is contingent upon a suitable corneal profile, including sufficient thickness and a healthy ocular surface.

We generally give patients six weeks to stabilize post-cataract extraction, but sometimes they require a longer period of adaptation before deciding upon the need for postoperative enhancement. Remember to inform them that residual refractive error may be a blessing in disguise, permitting them to function well with intermediate range tasks such as computer usage.

Should the post-cataract surgery outcome be significantly different than planned, an IOL exchange is another enhancement option—but only if the potential benefits of another intraocular procedure outweigh the risks. If desired, an IOL exchange should be done within three months following the initial IOL implantation to reduce the risk of complications.

Prior to confirming the IOL power necessary for a fellow cataract eye with previous corneal reshaping, I'll review the refractive outcome of the first eye and make IOL power adjustments based on the predicted healing response and visual result. Should a patient decide to proceed with a postoperative laser enhancement to the first eye, it is recommended that he or she first undergo cataract implantation in the fellow eye and wait for bilateral stabilization. This affords the patient a longer adaptation period, as well allows him or her to fully weigh the pros and cons of proceeding with an enhancement. Then, if still desired, a laser enhancement can be conveniently performed bilaterally after a minimum of six weeks following the second cataract procedure.

Refractive surgery's earliest adopters are becoming increasingly eager to learn about their potential cataract surgery options. As we refine our clinical skills in managing these patients, our primary responsibility is to serve as the directors and counselors of their overall care. In particular, this includes the creation of a tailored assessment and surgical plan that best meets the needs of those who've previously undergone corneal reshaping procedures. ■

Dr. Pohl is the clinical director at Pacific Cataract and Laser Institute in Bellevue, Wash. Additionally, he serves as an adjunct assistant professor at the Pacific University College of Optometry.

1. Solomon KD, Fernández de Castro LE, Sandoval HP, et al. LASIK world literature review: quality of life and patient satisfaction. Ophthalmology. 2009 Apr;116(4):691-701.
2. Wang L, Hill WE, Koch DD. Evaluation of intraocular lens power prediction methods using the American Society of Cataract and RefractiveSurgeons Post-Keratorefractive Intraocular Lens Power Calculator. J Cataract Refract Surg. 2010 Sep;36(9):1466-73.
3. Salamon SA, Hjortdal JO, Ehlers N. Refractive results of radial keratotomy: a ten-year retrospective study. Acta Ophthalmol Scand. 2000 Oct;78(5):566-8.
4. Pisella PJ. Post-operative residual astigmatism after cataract surgery: Current surgical methods of treatment. J Fr Ophtalmol. 2012 Mar;35(3):226-8.
5. Macsai MS, Fontes BM. Refractive enhancement following presbyopia-correcting intraocular lens implantation. Curr Opin Ophthalmol. 2008 Jan;19(1):18-21.

CHANTEL GARCIA, OD

Dr. Garcia received her doctor of optometry from NOVA Southeastern University and practices at Eye Doctors of Washington, serving patients in the areas of Washington, D.C., Maryland and Virginia.

Prepping Staff for Multifocal Success

Let your team help do the legwork and engage patients about multifocal contact lenses before they sit in your chair.

As baby boomers age, presbyopic contact lens fittings will be one of your best practice builders. Some practitioners are apprehensive about fully embracing multifocal contact lenses because of lingering perceptions of increased chair time and poor patient satisfaction. But that's where a well-trained staff can prove invaluable.

Behind every great doctor is a great supporting cast. Your staff is a vital aspect of patient care, and they undoubtedly spend more face time with your patients than you do. Encourage them to seize each opportunity they can to engage patients about multifocal lenses prior to chair time with you.

Staff Takes the Lead

Staff should be able to identify presbyopes and initiate a conversation about the benefits of multifocal contact lenses, which will spark patient interest. Educate your staff about presbyopia and encourage them to engage patients about the subject. Asking the 40-something patient about near-vision changes, problems reading in low light and whether they use reading glasses are all easy ways for the staff to identify the presbyope.

Encourage your front desk staff to communicate to patients the availability of multifocal contact lenses in your practice. It's also helpful if one or more of these staffers wears multifocal contact lenses themselves and can offer real-world experience.

The Tech's Starring Role

Your ophthalmic technician plays a critical role in fitting multifocal contact lens patients. This staffer is key in gauging which patients are candidates and can greatly assist in minimizing chair time. Their role should include:

Picking up on cues. Techs should be on the lookout for visual signs of presbyopes (e.g., decreased near visual acuity).

Lens selection and troubleshooting. New technology, such as the Precision Profile Design of AIR OPTIX® AQUA Multifocal contact lenses, makes it easy for staff to aid in the fitting process. Familiarize your staff with the uncomplicated fitting guidelines, which can be easily referenced for fitting and troubleshooting tasks. Technicians can also learn more about fitting AIR OPTIX® AQUA Multifocal contact lenses at www.myalcon.com.

Setting expectations. Considering the age group, patients who have never worn contact lenses may be apprehensive at first. It is important for staff to stress the convenience of multifocal lenses. A supportive and attentive technician will convert a motivated candidate into a satisfied multifocal wearer.

Cater to Every Need

Multifocal contact lens wearers may need adjunctive glasses such as back-up glasses and nonprescription polarized sunglasses, and avid readers tend to prefer a small near prescription over their contact lenses. Optical staff can address any minor issue patients may have and help ensure success with their new multifocal lens.

Distinguish Yourself

The demand for multifocal presbyopic correction is on the rise. Equip your practice with advanced lenses such as AIR OPTIX® AQUA Multifocal contact lenses and train your staff to be engaging, optimistic and well-educated about the product. It's an excellent way to differentiate your practice while giving your patients the best possible outcome.

19th Annual Surgery Report

Current Trends in Comanagement

Four out of five ODs say they've increased their comanagement in the past five years. The reasons involve more patients, more medical eye care, and more acceptance among MDs. **By John Murphy, Executive Editor**

Comanagement is a risky venture. When you refer a patient, you must trust the surgeon or specialist to provide appropriate treatment for that patient's care—and you have to trust that the doctor will return the patient to you once the treatment has been provided.

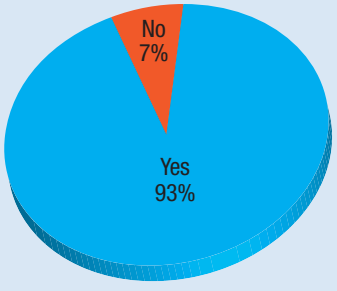
Even with these concerns, optometrists are comanaging more patients with surgeons, specialists and other ODs. Specifically, 93% of ODs who answered our recent Comanagement Survey say they participate in some form of comanagement at least once a month. And 80% report that the number of patients they comanage has been increasing during the past few years.

The survey was sent by email to some 32,000 ODs. More than 10% opened the email and nearly 400 optometrists responded to the survey.

We found that the number of patients that individual optometrists comanage varies widely—from less than one patient per month to upwards of 400 (according to an OD in a referral center). But, if we separate out those ODs who work in referral centers and in large OD/MD practices, as well as those ODs who don't comanage at all, then we find that the "average" OD comanages about 12 patients a month (actually 12.33, but you can't bill on one-third of a patient).

Of that number, our respondents comanaged an average of 11 patients per month for surgical

Do you participate in comanagement whatsoever?



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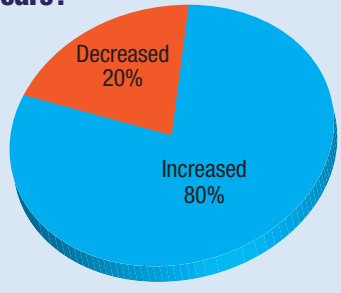
Has that number increased or decreased in the past five years?



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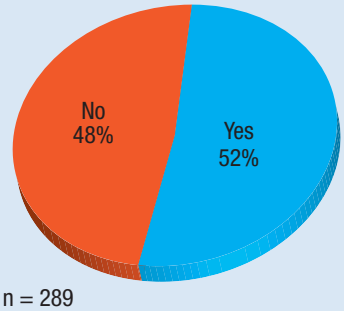
Do you ever comanage patients with other optometrists?



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procedures (again, varying from zero to up to 50), and comanaged about one or two patients a month (ranging from zero to 30) for non-surgical treatments (such as for vision therapy or low vision).

More Patients, More Acceptance

There are several reasons for the increase in comanagement. But here are the two biggest ones:

• More cataract patients. You've heard it a million times before: the Baby Boomers are coming! Guess what? They're finally here.

"The average age of my patients is increasing the longer I am in practice, which has resulted in more cataract surgery and glaucoma comanagement," says Mark Snyder, OD, of Hyannis, Mass.

Indeed, a recent study from the Mayo Clinic found that the number of cataract procedures has increased steadily for more than three decades, and reached record levels in 2011.[1] The study also found that people are getting the procedure at a younger age, and are frequently having it done on the second eye sooner.

• Surgeons are more accepting. Although the number of cataract patients is increasing, the number of ophthalmic surgeons is not. That may be one reason why an increasing number of surgeons are lowering their resistance to optometric comanagement. Or, it could be a sign of the times—more surgeons have seen that it works and have accepted the idea.

"I have comanaged refractive surgery and cataracts for more than 20 years," says Dawn Rakich, OD, of San Antonio. "Our new surgeon has allowed one-day post-ops for cataracts now, so postoperative care is passed off to me immediately after surgery."

Not all comanagement is growing, though. "We've increased the number of cataract surgery patients, but we've seen a significant decrease in the number of LASIK patients," says Paul Heersink, OD, of Monte Vista, Colo. LASIK procedures began a decline even before the economy bottomed out in 2009, and still haven't recovered.

How Do You Typically Manage These Situations?

	Treat myself	Refer to MD	Refer to OD	Send to OD referral center
Cataract	18%	77%	1%	3%
Glaucoma	67%	30%	2%	1%
AMD	49%	48%	1%	1%
Other retinal disorders	19%	79%	1%	1%
Vision therapy	23%	3%	67%	6%
Low vision	25%	5%	64%	6%
Refractive surgery	7%	86%	1%	6%
Orthokeratology	37%	7%	51%	5%
Neuro disorders	9%	88%	2%	1%
Blepharoplasty	2%	96%	1%	2%
Cosmetic surgery	2%	97%	1%	1%
Ocular foreign body	90%	9%	1%	0%
OCT	60%	27%	10%	3%
Fluorescein angiography	3%	92%	1%	4%

OD-to-OD Comanagement

We also asked, "Do you ever comanage patients with another optometrist?" Responses were almost evenly divided: 52% say they do, 48% say they don't.

Some ODs responded with equivalent of a shrug: "Why would I do that? What is the added value for the patient?" one optometrist asks.

But other optometrists do see the value. "Some colleagues have equipment I don't. So I refer to them for the testing as needed," says one optometrist who responded anonymously.

Said another from Florida: "I will refer for advanced contact lens fittings when I do not have a particular trial lens set, such as scleral multifocals."

Besides specialty contact lens fitting, vision therapy and low vision were the most cited reasons for comanaging a patient with another OD—although several ODs say they will occasionally share the glaucoma or AMD care with another optometrist who specializes in those conditions.

The survey also asked whether optometrists send patients to an optometric referral center for secondary or tertiary care. About 27% say they've done this. Many of the rest answered that they don't have one nearby—or that they've never even heard of such a thing. (To explain: An optometric referral center is an optometrist-owned multispecialty eye care practice. It employs ODs and MDs but handles no primary care, only secondary or tertiary care. The Omni Eye Centers are a prime example. "Every

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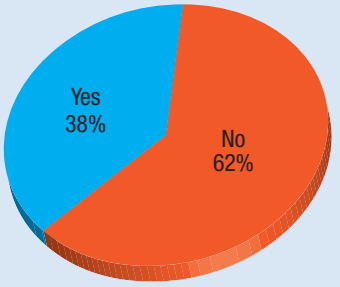
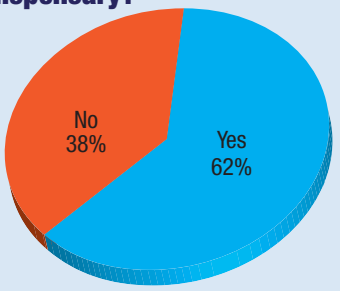
Have you ever encountered a comanagement situation in which you did not feel the other doctor was providing adequate care for the patient?



n = 279

Will you refer a patient to an ophthalmologist who has a dispensary?



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patient is sent in by a referring optometrist and returned to the referring optometrist," responds an OD who works at one such center.)

Typical Situations

Although more optometrists are participating in comanagement in general, that doesn't tell the whole story. ODs are also handling more medical eye care themselves. For instance, 67% say they will manage a typical glaucoma patient on their own, while 30% will refer to an MD. That percentage has nearly flip-flopped since our Comanagement Survey in 1998. Back then, 64% of optometrists said they send their typical glaucoma patient to an MD, and only 46% said they manage the patient themselves.

Meanwhile, slightly fewer ODs handle vision therapy and low vision themselves, as compared to 1998. They're now more inclined to send those patients to an optometric colleague who can provide those specialized services.

When a Referral Goes South

Our survey also found that 38% of optometrists had a problem in which the comanaging doctor did not seem to provide adequate or appropriate care. How do ODs handle this? In many cases, ODs simply stop referring patients to that doctor and send the patient to a different surgeon or provider instead. Sometimes, they just take over the care themselves.

But this non-confrontational approach may not be the best. If you're faced with such a situation, don't be afraid to call your MDs on it—literally. "I picked up the phone, called and talk to them about it," says Marla L. Moon, OD, of State College, Pa. "If they changed their ways and improved, I continued to refer. If not, they stopped getting referrals from me."

Similarly, "I made direct contact on each specific patient to discuss the care that was being provided," says R. Ted Watson, OD, of Greenville, NC. "In each case, the comanagement dialogue was beneficial for all concerned." ■

'What Are Your Biggest Concerns When You Comanage a Patient?'

Lisa Ely, OD, of Clarksville, Tenn., voices one of optometrists' most common fears of comanagement: "My biggest concern is losing the patient. I do not refer to offices that don't care about my patients or don't send them back to me."

Other major concerns among optometrists who responded to our recent Comanagement Survey include:

- "Complications that get 'shuffled' between providers," says Stephanie Ommen, OD, of Butler, Ala.
- "Getting paid by the insurance company," says one OD who responded anonymously. "I worry about the insurance aspect of comanagement, and how convoluted it has become," says another.
- "That the comanaging doctor will contradict me to the patient or otherwise bad-mouth me," says an OD in North Carolina.
- "That the treatment protocols and the level of care are consistent among the comanaging doctors," says George Eischens, OD, of Prattville, Ala. "Also, that the patient is not confused as to how to participate in the treatment protocol or who to call for assistance/questions."
- "That the patient will show up for the appointment!" says an anonymous OD.
- Many ODs voiced a desire to get reports from the surgeon about the patient's status. "I want to know in a timely manner how the patient is being treated," says Andrew D. Hoffman, OD, of New Haven, Ind.

But the biggest concern is one you might expect—that the patient gets the kind of good, attentive eye care that optometrists themselves provide: "One of my biggest concerns is the care that the patient receives," says Jenni C. Drake, OD, of Broomfield, Colo. "I want them to get quality treatment and excellent results, but I also want them to feel as they are not just a number to the surgeon."

1. Gollogly HE, Hodge DO, St Sauver JL, Erie JC. Increasing incidence of cataract surgery: population-based study. J Cataract Refract Surg. 2013 Sep;39(9):1383-9.

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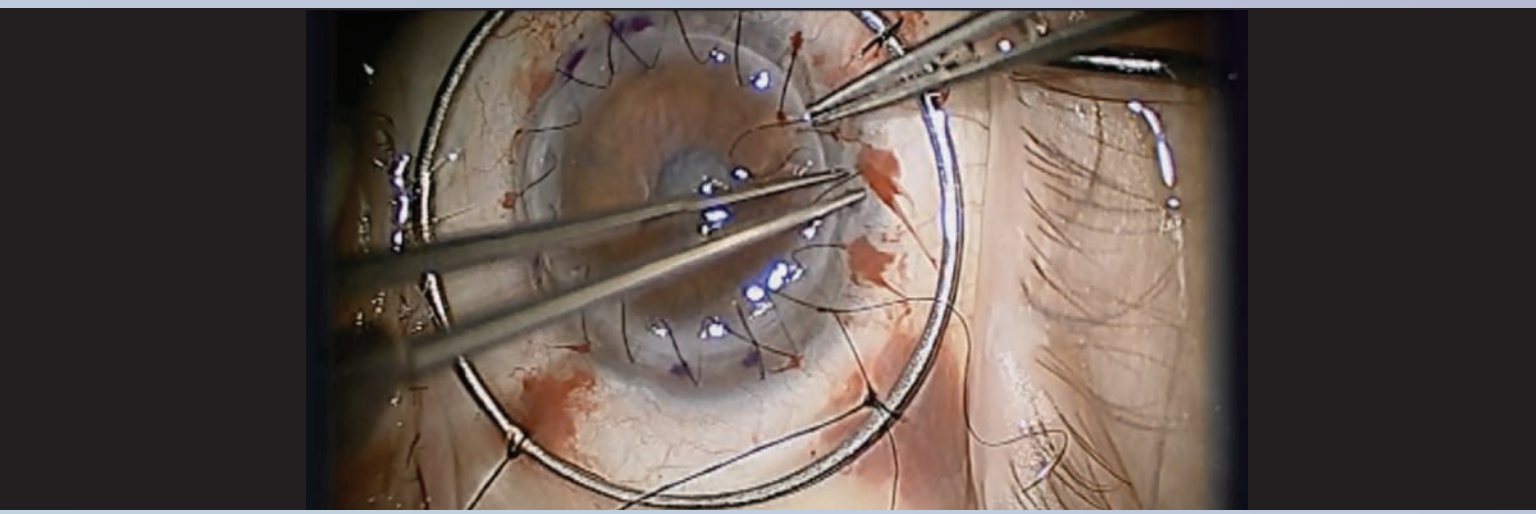
Surgical Minute

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



See the view through the operating microscopes of some of the best eye surgeons in the US, with expert commentary from comanaging optometrists.

Surgical Minute

PK: Right on the Button

When all else fails, penetrating keratoplasty offers a chance for better acuity.

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

On The Web >> View a narrated video of penetrating keratoplasty.

Penetrating keratoplasty (PK) is a full-thickness transplant in which the damaged central cornea (7mm to 9mm) is removed and replaced with donor tissue. Compared with other types of tissue transplants, it has a long and outstanding record of success; more than 46,000 corneal transplants were performed in 2011, according to Eye Bank Association of America.

The most common indications for penetrating keratoplasty are regrafting, keratoconus, Fuchs' endothelial dystrophy, pseudophakic bullous keratopathy, perforated corneas, traumatic scars and viral keratitis.

The advantages of penetrating keratoplasty include the full removal of damaged corneal tissue, improved optical clarity, restored corneal anatomy, ease of performance compared to other corneal transplant procedures, improved cosmetic appearance and the potential for good optical results.

Some disadvantages are a higher risk of graft rejection, post-op astigmatism, suture management, intraocular complications and traumatic corneal rupture.

Variations of the procedure include deep anterior lamellar keratoplasty (DALK), Descemet's stripping endothelial keratoplasty (DSEK) and Descemet's membrane endothelial keratoplasty (DMEK). The choice of procedure (PK or one of the above variations) depends on which corneal layers have been affected.

The procedure begins with the preparation of the donor tissue. A trephine (a circular cutting device) is used to cut the donor cornea, followed by trephination of a similar sized portion (7mm to 9mm) of the patient's cornea. Once the recipient's corneal button has been removed, the anterior chamber is filled with balanced salt solution or sodium hyaluronate and the donor button is placed into position.

Four cardinal sutures of 10-0 nylon are placed at 90° intervals in the donor graft, just above Descemet's membrane. The sutures are then passed into the recipient's cornea at the same level, at approximately 1.5mm into the host tissue. Once the needle is passed though, the suture is tied and buried. After the cardinal sutures are in place, suturing can be completed with a single running suture or interrupted sutures.

Postoperatively, patients are prescribed topical antibiotics for one to two weeks as well as topical steroids, which are tapered over several months. Many times, patients are kept on low-dose topical steroids to reduce the risk of graft rejection and failure. Sutures can be removed as soon as two to three months, if needed. Or, if a patient has little astigmatism and the sutures are not causing any problems, they can be left in place for many years.

As comanaging optometrists, our main concern is the long term management and visual function. Postoperatively, corneas may take anywhere from 18 to 24 months to fully stabilize, so be sure to continuously monitor patients for adequate visual acuity and functional vision. Communicate with your corneal specialist to decide when patients are sufficiently stable for contact lenses. A specialty contact lens (GP or hybrid) may be considered as soon as three months after surgery, but may need several changes and modifications once the sutures are removed. ■

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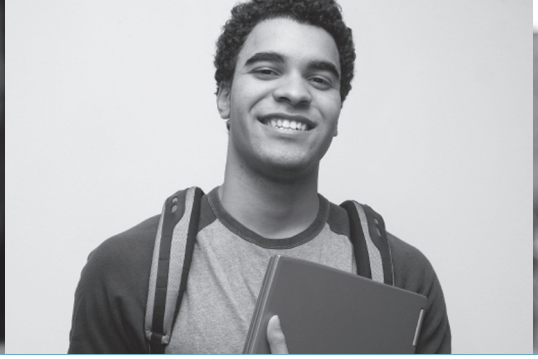


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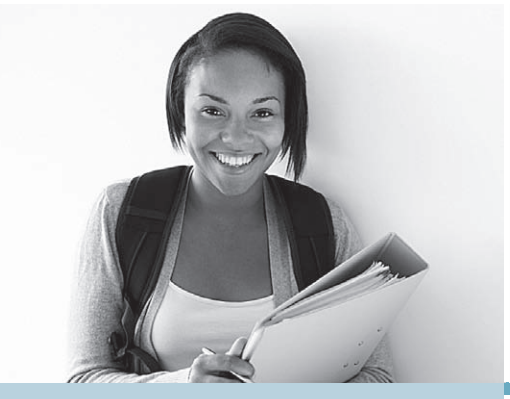

About Rick

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Don't Avoid Steroid Use in Glaucoma Patients

Yes, corticosteroids can increase IOP. But, responsible prescribing and consistent monitoring can help treat the patient without dialing up the pressure.

By Scott Ensor, OD, MS

As an educator, it's been my experience that young practitioners often struggle with the notion that some patients have multiple conditions at the same time. We're compelled to sweepingly label them as "glaucoma patients," the "iritis patients" or "conjunctivitis patients.

The management of ocular disease becomes far more complicated when the individual exhibits one or more concomitant conditions. This predicament is no more apparent than when a patient presents with significant inflammation in the presence of open-angle glaucoma.

The mainstay treatment for ocular inflammation is corticosteroid therapy, and every practicing optometrist knows the inherent risk of increasing a patient's intraocular pressure (IOP) with the addition of a steroid. We stress this fact so often that young practitioners are apprehensive about using corticosteroids effectively. When prescribed responsibly, corticosteroids continue to be a valuable component of our pharmaceutical armamentarium against inflammation in our glaucoma patients.

When prescribed responsibly, steroids continue to be a valuable component of our pharmaceutical armamentarium against inflammation in our glaucoma patients.

Basic Pharmacology of Corticosteroids

Inflammation involves the activation and proliferation of many types of chemical messengers and immune cells, including cytokines, macrophages and prostaglandins.[1] Since the 1950s, corticosteroids—or just "steroids" for most of us—have been shown to effectively treat most types of inflammation.[1] Steroids' anti-inflammatory effect is due to their ability to directly or indirectly alter gene transcription.

Corticosteroids penetrate cell membranes and bind to receptors in the cytoplasm, yielding a conformational change in the receptor and facilitating transportation of the receptor-steroid complex into the cell nucleus, where it binds to specific sequences on DNA.[2] Genes activated by corticosteroids include those that decrease inflammatory signal transduction, inhibit macrophage function and diminish the distribution of leukocytes.[1,2] Another effect of corticosteroids is their ability to deactivate genes that code for synthesis of prostaglandins, leukotrienes and platelet-activating factor. Additionally,

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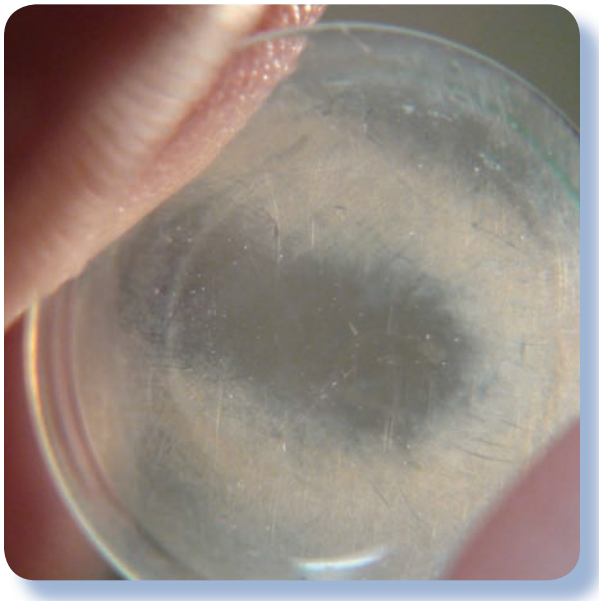
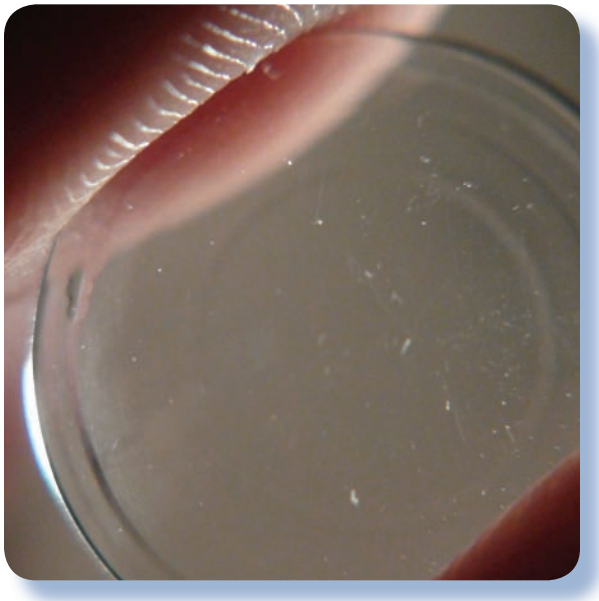


Before



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Before and after photos courtesy of Stephen P. Bynes, OD, Londonderry, NH. 16.5mm diameter FSA lens with a Dk of 141.

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they reduce the expression of cyclooxygenase-2, which leads to a further decrease in prostaglandin synthesis.[2] It has been shown that corticosteroids render an additional effect at the level of mRNA, leading to further reduction in protein synthesis.[1]

It is important to note that widespread use of corticosteroids can cause multiple adverse reactions. Tissue and metabolic changes, such as facial swelling, fat redistribution, increased hair growth, weight gain and muscle weakness, have all been shown in patients on long-term corticosteroid treatment. Other changes include hyperglycemia, glucose intolerance, high blood pressure and osteoporosis. Of greater interest to optometrists, however, is the potential for posterior subcapsular cataracts and increased IOP.[3]

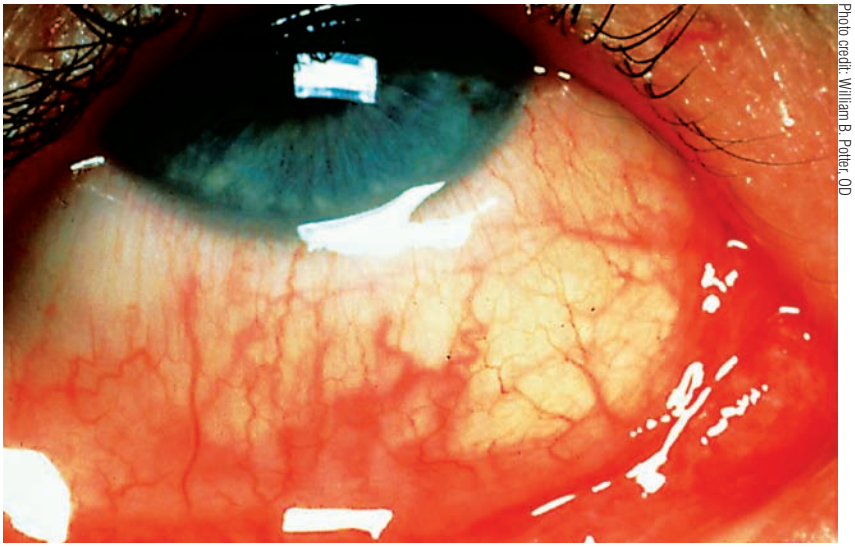

Photo credit: William B. Potter, OD

Topical corticosteroids are often used to treat allergic conjunctivitis, seen here, as well as a host of other ophthalmic conditions.

Mechanism of Effect on IOP

The primary association between corticosteroid use and elevated IOP seems to be decreased aqueous outflow secondary to the aggregation of extracellular matrix material in the trabecular meshwork (TM).[4] More specifically, one study indicated that corticosteroids reduce the release of chemicals responsible for mucopolysaccharide degradation in the TM.[5] Accumulation of these mucopolysaccharides likely is responsible for increased aqueous outflow resistance. It has also been shown that corticosteroids may cause a reversible crosslinking of actin fibers within TM cells, further contributing to increased outflow resistance.[6]

Several studies have compared the steroid response of patients both with and without glaucoma.[7-10] J.Francois, MD, published the first case report on corticosteroid-induced glaucoma in 1954.[7] He suggested that IOP increase occurs within six to 12 months in patients on mild corticosteroids (e.g., prednisone), but could take just a few weeks for patients on more potent agents (e.g., dexamethasone).[7] Then in 1963, Bernard Becker, MD, and Donald Mills, MD, showed that patients who were previously diagnosed with open-angle glaucoma or were identified as glaucoma suspects exhibited a much greater IOP response to corticosteroids than healthy controls.[8]

It is important to note that widespread use can cause multiple adverse reactions.

In 1975, P.F. Palmberg, MD, PhD, and associates documented that IOP increase secondary to corticosteroid dosing was consistent and repeatable on the same patient over different periods of time.[9] Ten years later, Robert N. Weinreb, MD, and associates showed that the IOP response is significantly more rapid in patients with previously diagnosed glaucoma than in those with a normal IOP.[10] It is worth noting that both the Becker and Mills study and the Weinreb study showed that corticosteroid response in glaucoma patients occurred independently of the patient's treatment status.

Considering these study data, it appears that glaucoma patients on corticosteroid thrapy are much more likely to experience an IOP increase than the rest of our patients. Thus, we must remain extremely cautious when choosing an anti-inflammatory therapy for these individuals.

Steroid Use in Eye Care

• ***Topical corticosteroids*** are commonly used to treat a host of ophthalmic conditions, including allergic reactions of the eyelids,

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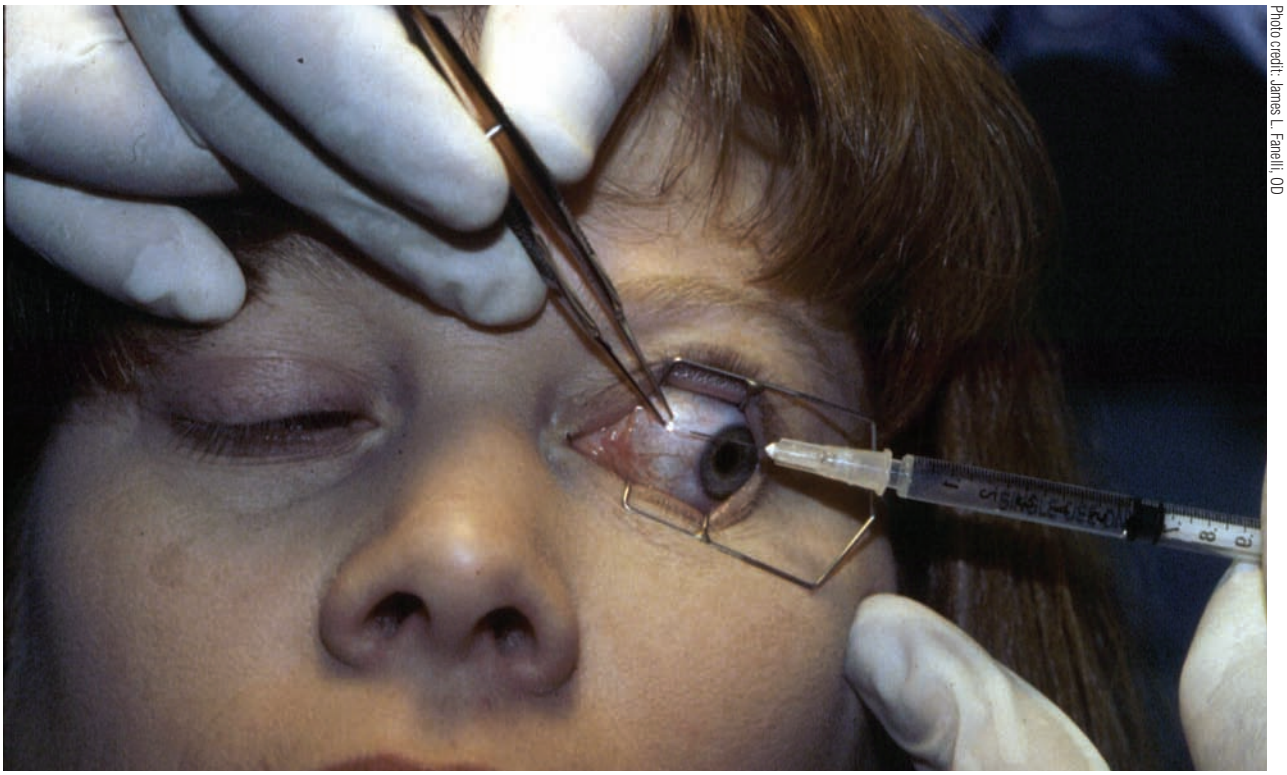

Photo credit: James L. Fanelli, OD

Practice laws have been updated and expanded in certain states, making injected steroid use more common for optometrists.

conjunctiva or cornea; scleritis and episcleritis; anterior and posterior uveitis; giant-cell arteritis; scar prevention following ocular trauma; herpes zoster ophthalmicus; and practically any other ocular condition that involves inflammation.[11]

Topical dosing delivers therapeutic drug levels to the cornea and aqueous humor. Numerous forms of conjunctivitis, as well as episcleritis, scleritis, anterior uveitis and other anterior segment diseases, respond well to topical therapy.[12] Another study by Dr. Becker showed that topical corticosteroids produced an IOP response similar to that associated their systemic counterparts, and that the response also was greater in patients with glaucoma than in those with normal IOP measurements.[12]

If topical eyelid or adnexa treatment is required, dermatological preparations or ocular ointments also can elevate IOP.[13] Further, pressure increases have been shown in patients who use inhaled or nasal steroids.[14]

• ***Systemic steroid therapy*** is very common, and many of our patients will use these agents for one reason or another. In optometric practice, it's sometimes necessary to add a systemic corticosteroid when posterior segment inflammation is involved or if anterior segment inflammation is not responding to topical therapy. It should be no surprise that treatment with systemic corticosteroids increases IOP in some patients; however, it is somewhat unusual that the response often is less significant—or takes longer to manifest—than that seen in patients on topical therapy.[15] This consideration is important to remember when scheduling follow-up visits.

• ***Injected steroid*** use has become more common for optometrists, as scope of practice laws have been updated and expanded in certain states. Subconjunctival preparations of corticosteroids have been made available for use in patients who do not respond well to topical treatments or those who are unable to apply topical medications (i.e., severe arthritis). Intraocular pressure response to injected steroids typically is lengthier and more pronounced than that caused by topical corticosteroid use.[16] While a topical medication can be discontinued rapidly, an injection cannot be reversed, and natural IOP lowering will not occur until the medication has completely dissipated.[16]

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injections also produce an effect on IOP, but the increase often is delayed beyond the point that we might expect the reaction to occur.[17]

Corticosteroid Use in Glaucoma Patients

We've extensively discussed the greater risk of steroid-induced IOP elevation in our glaucoma patients. So how, then, are we to manage external or internal ocular inflammation in this population? The key is to make responsible decisions in corticosteroid selection and then follow the patient diligently so that consequent IOP increase can managed properly.

Corticosteroids differ in their ability to produce an IOP response. In general, the more potent the drug, the greater the hypertensive effect.[4] Dexamethasone has the greatest potential to increase IOP, followed by prednisolone, fluoromethalone and hydrocortisone.[18] The typical timeframe for a patient to exhibit an IOP with these medications is three to six weeks.[18]

Difluprednate is a relatively new topical corticosteroid that shows increased penetration into the eye and increased bioavailability. Unfortunately, it has also been shown to produce a greater IOP response over a shorter period when compared to prednisolone.[19]

Loteprednol was developed with a different chemistry than other drugs in this class. The structural replacement of a ketone with an ester makes it possible for loteprednol to be metabolized by esterases—thus limiting the potential side effects of this medication.[20] One study showed significant decreases in ocular hypertensive effects with loteprednol, without severe reductions in anti-inflammatory activity.[20]

It's advisable to avoid corticosteroids in patients with glaucoma—but that's not always possible. When a corticosteroid is needed, it's better to use the least potent agent at the smallest possible dose that still yields a desirable anti-inflammatory effect.[4] Typically, my first choice is either loteprednol or fluoromethalone. Then, if neither agent proves effective, I will switch to prednisolone or difluprednate—but only in doses small enough to produce a therapeutic effect.

Prudent use, not avoidance, is the key to effective treatment of inflammation in glaucoma patients.

While your patient is on a corticosteroid, it's important to monitor his or her IOP more closely than normal. A baseline measurement should be taken before therapy is initiated, as well as two to three weeks after. IOP should then be measured every three to four weeks while the corticosteroid therapy is ongoing. If your patient is undergoing intravitreal corticosteroid treatment, IOP should be monitored every two to three weeks for several months following the injection.[4]

Management of Increased IOP

Corticosteroid-induced IOP increases in the non-glaucomatous population are relatively easy to manage. In most instances, IOP returns to baseline within one to four weeks after treatment discontinuation. The IOP responds to treatment with most of our widely used topical antiglaucoma medications, including beta-blockers, prostaglandin analogues, alpha agonists, carbonic anhydrase inhibitors and miotics.[4]

Keep in mind that the management process becomes more complicated when a patient exhibits a steroid response while already on a glaucoma medication. Latanoprost has been shown to be effective in lowering IOP in patients with corticosteroid-induced glaucoma.[21] However, it also has been shown to cause anterior segment inflammation, including uveitis. Therefore, the prostaglandin analogues might not be the best first choice to add to a patient who is undergoing treatment for uveitis.[4]

Further, one study indicated that long-term brimonidine can cause an anterior uveitis after one year or more of continuous dosing.[22] This finding should not prevent a clinician from using brimonidine to treat steroid-induced IOP increases altogether. Nevertheless, it's something to consider as a possible cause of uveitis in a glaucoma patient.

Beta blockers and carbonic anhydrase inhibitors are both very effective in controlling corticosteroid-induced glaucoma, and should be considered the "first-line" choice for patients unless otherwise contraindicated.

The side effects of corticosteroid use and the risk of increased IOP in glaucoma patients should not deter us from using corticosteroids. When appropriate, the clinician should choose a less potent topical corticosteroid at a smaller dose than usual, and

make adjustments based on the patient's response to the therapy. No matter which medication is selected, IOP must be monitored every few weeks while the patient remains on the medication or for a few months after intravitreal injection. Prudent use, not avoidance, is the key to effective treatment of inflammation in glaucoma patients. ■

Dr. Ensor is an assistant professor at the Southern College of Optometry in Memphis. He has no industry disclosures or direct financial interest in any of the products mentioned.

1. Barnes PJ. How corticosteroids control inflammation: Quintiles prize lecture 2005. Br J Pharmacol. 2006 Jun;148(3):245-54.
2. Katzung BG, Masters SB, Trevor AJ. Basic & Clinical Pharmacol. 12th ed. New York: McGraw-Hill; 2012.
3. Brenner GM, Stevens CW. Pharmacol. 4th ed. Philadelphia: Elsevier; 2013.
4. Kersey JP, Broadway DC. Corticosteroid-induced glaucoma: a review of the literature. Eye (Lond). 2006 Apr;20(4):407-16.
5. Armaly MF. Effect of corticosteroids on intraocular pressure and fluid dynamics: II. The effect of dexamethasone in the glaucomatous eye. Arch Ophthalmol. 1964 May;71:636-44.
6. Clark AF, Wilson K, McCartney M, et al. Glucocorticoid-induced formation of cross-linked actin networks in cultured human traecular meshwork cells. Invest Ophthalmol Vis Sci. 1994 Jan;35(1):281-94.
7. Francois J. Corticosteroid glaucoma.Ann Ophthalmol. 1977 Sep;9(9):1075-80.
8. Becker B, Mills D. Corticosteroids and intraocular pressure. Arch Ophthalmol. 1963 Oct;70:500-7.
9. Palmberg PF, Mandell MD, Wilensky JT, et al. The reproducibility of the intraocular pressure response to dexamethasone. Am J Ophthalmol. 1975 Nov;80(5):844-56.
10. Weinreb RN, Polansky JR, Kramer SG, Baxter JD. Acute effects of dexamethasone on intraocular pressure in glaucoma. Invest Ophthalmol Vis Sci. 1985 Feb;26(2):170-5.
11. Dinning WJ. Steroids and the eye – indications and complications. Postgrad Med J. 1976 Oct;52(612):634-8.
12. Becker B. Intraocular pressure response to topical corticosteroids. Invest Ophthalmol. 1965 Apr;4:198-205.
13. Cubey RB. Glaucoma following the application of corticosteroid to the skin of the eyelids. Br J Dermatol. 1976 Aug;95(2):207-8.
14. Garbe E, LeLorier J, Boivin JF, Suissa S. Inhaled and nasal glucocorticoids and the risks of ocular hypertension or open-angle glaucoma. JAMA. 1997 Mar 5;277(9):722-7.
15. Bernstein H, Schwartz B. Effects of long-term systemic steroids on ocular pressure and tonographic values. Arch Ophthalmol. 1962 Dec;68:742-53.
16. Kalina RE. Increased intraocular pressure following subconjunctival corticosteroid administration. Arch Ophthalmol. 1969 Jun;81(6):788-90.
17. Smithen LM, Ober MD, Maranan L, Spaide RF. Intravitreal triamcinolone acetonide and intraocular pressure. Am J Ophthalmol. 2004 Nov;138(5):740-3.
18. Cantrill H, Palmberg P, Zink H, et al. Comparison of in vitro potency of corticosteroids with ability to raise intraocular pressure. Am J Ophthalmol. 1975 Jun;79(6):1012-7.
19. Meehan K, Vollmer L, Sowka J. Intraocular pressure elevation from topical difluprednate use. Optometry. 2010 Dec;81(12):658-62. doi: 10.1016/j.optm.2010.09.001.
20. Amon M, Busin M. Loteprednol etabonate ophthalmic suspension 0.5%: efficacy and safety for postoperative anti-inflammatory use. Int Ophthalmol. 2012 Oct;32(5):507-17. Epub 2012 Jun 16.
21. Scherer W, Hauber F. Effect of latanoprost on intraocular pressure in steroid-induced glaucoma. J Glaucoma. 2000 Apr;9(2):179-82.
22. Byles D, Frith P, Salmon J. Anterior uveitis as a side effect of topical brimonidine. Am J Ophthalmol. 2000 Sep;130(3):287-91.

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The Many Moods of Uveitis

Uveitis results from a multitude of causes and presents with a variety of symptoms. Here's how to distinguish the etiology, determine the diagnosis and fine-tune the treatment. **By Michael Trottini, OD, and Candice Tolud, OD**

Uveitis is a broad topic that encompasses not only ocular sequelae, but a large spectrum of associated systemic diseases. Management of these patients can prove to be challenging in controlling inflammation, preventing ocular morbidities and dealing with potential side effects of treatments.

In addition to treating the uveitis, the optometrist often must evaluate the patient for underlying etiologies and comanage with internal medicine, rheumatology and infectious disease physicians.

This article reviews the common symptoms and clinical findings, with a goal of helping the clinician determine the correct diagnosis and etiology, and providing the most appropriate treatment and care.

Classifications

Inflammation of the uvea (iris, ciliary body and choroid) is termed uveitis; however, there is a more precise classification system that depends on the location of the structure(s) involved. In addition, uveitis is often classified based on the onset and duration.

• ***Location.*** The International Uveitis Study Group (IUSG) has four classifications based on anatomic location of the primary source of inflammation: Anterior uveitis (anterior chamber), intermediate uveitis (vitreous), posterior uveitis (retina and choroid).[1] The fourth classification, panuveitis, is used when there is no predominant site of inflammation, with involvement of the anterior chamber, vitreous, retina and/or choroid.[2]

• ***Onset.*** The Standardization of Uveitis Nomenclature (SUN) Working Group classifies onset as either "sudden," which is characterized by pain, redness and photophobia, or "insidious," where the eye is painless and white.[2]

• ***Duration.*** Duration is defined as either "acute," where episodes have a sudden onset and limited duration, or "chronic," with persistent relapses occurring less than three months

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Goal Statement: Managing patients with uveitis can be a challenge in controlling inflammation, preventing ocular morbidities, and dealing with potential side effects of treatments. To that end, this course reviews the common symptoms and clinical findings of uveitis, with a goal of helping the clinician determine the correct diagnosis and etiology, and providing the most appropriate treatment and care.
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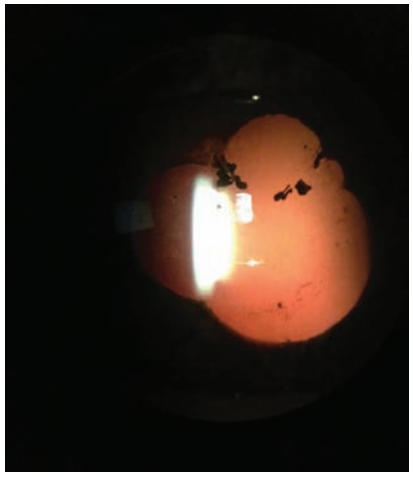
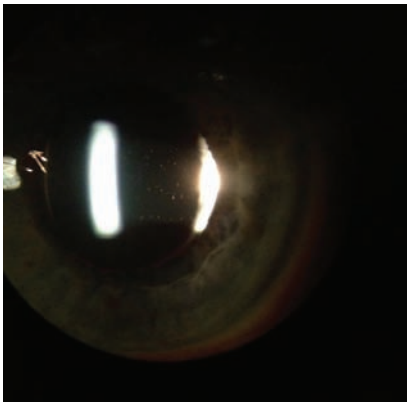


Unequal pupil dilation in a patient with posterior synechiae.



Cells and flare should be evaluated under high magnification after dark adaptation.

after discontinuation of therapy.[2] "Recurring" episodes are defined by repeating episodes that occur more than three months after discontinuation of therapy.[2]

Symptoms

Symptoms can vary depending on the involved structures and level of inflammation.

• ***Acute pain.*** In acute cases of anterior uveitis, patients often present with pain (generally described as an ache in and around the eye), photophobia and redness. Pain and photophobia are a result of ciliary body inflammation and spasm, but can also be due to moderately elevated intraocular pressure.

• ***Chronic pain.*** In cases of chronic anterior or intermediate uveitis, pain and redness are generally absent, although patients commonly note blurred vision and floaters.

• ***Blur/loss of vision.*** Depending on the severity of inflammation, presence of macular edema or media obstruction, vision may be unaffected, partially or significantly decreased.

Clinical Findings

A careful and detailed examination is required to properly differentiate and describe the findings of uveitis. These findings can vary based on the underlying etiology driving the inflammation.

Let's look at how each area can be involved.

• ***Conjunctiva.*** Perilimbal vessel engorgement of the conjunctival and episcleral vasculature (ciliary flush) is a characteristic finding of anterior uveitis. Diffuse injection can also be seen.

• ***Anterior chamber.*** Cells within the anterior chamber are a result of inflammatory cellular infiltration while flare is due to an influx of proteins. A grading system defined by the SUN Group helps quantify the amount of cells and flare seen on examination.[2] (*See "Standardized Grading Scales for Uveitis," below.*) Evaluate cells and flare under high magnification following relative dark adaptation. The slit beam should be 1mm x 1mm at high intensity at a 45- to 60-degree angle.[3]

Keratic precipitates (KPs) are cellular deposits of aggregated polymorphonuclear cells and lymphocytes located on the corneal endothelium.[4] Classification of KPs is of clinical importance and may help narrow the differential diagnosis of any underlying cause. Non-granulomatous KPs are small, white precipitates on the posterior cornea while granulomatous KPs are larger and have a yellow or mutton-fat appearance.[4] KPs generally deposit as an inverted triangle on the central to inferior cornea (Arlt's triangle) due to aqueous convection currents.[5] However, in patients with Fuchs' heterochromic iridocyclitis, KPs are stellate and distributed over the entire corneal endothelium.[4]

Fibrin, generally associated with HLA-B27 uveitis, is due to a breakdown of the blood/aqueous barrier leading to a large amount of protein leakage.[3] Increased intraocular pressure (IOP) can develop from accumulation of fibrin around the lens and iris.

Hypopyon formation results from an accumulation of white blood cells (WBCs) layering in the anterior chamber. It is most commonly seen with Behcet's disease, HLA-B27 uveitis and herpetic uveitis.[6] In addition to WBCs, pigmented cells from the iris or red blood cells from iris neovascu-

Standardized Grading Scales for Uveitis[2]

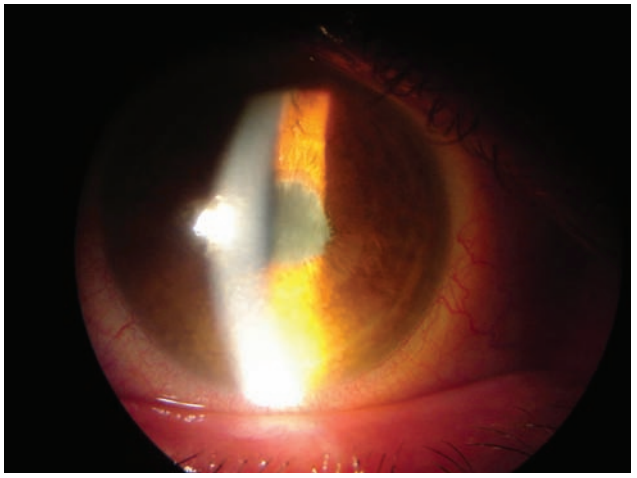
SUN Grading Scheme for Anterior Chamber Cells

Grade	Cells in Field
0	< 1
0.5+	1 – 5
1+	6 – 15
2+	16 – 25
3+	26 – 50
4+	50+

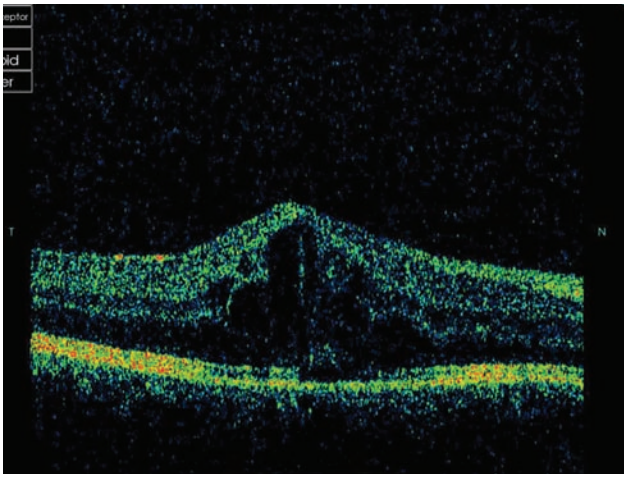
(using 1mm slit beam)

SUN Grading Scheme for Anterior Chamber Flare

Grade	Description
0	None
1+	Faint
2+	Moderate (iris/lens details clear)
3+	Marked (iris/lens details hazy)
4+	Intense (fibrin/plastic aqueous)



The iris is bound to the lens in this patient with anterior uveitis who waited one month before seeking treatment.



In the same patient, an OCT scan shows macular edema that is related to the uveitis.

larization or trauma may be noted on exam.

• ***Iris and pupil.*** Persistent inflammation can cause scarring of the iris to anterior lens (posterior synechia) or adhesions of the iris to cornea (anterior synechia). Significant synechia formation can lead to elevations in IOP.

In certain conditions that cause granulomatous uveitis, such as sarcoidosis, inflammatory nodules can be noted. Koeppe, Busacca and Berlin nodules are granulomas seen on the pupillary margin, iris and angle respectively.[3]

• ***Vitreous.*** According to the SUN Group, "intermediate uveitis" is when the primary source of inflammation is within the vitreous.[2] Pars planitis, a subset of intermediate uveitis, describes snowbanking or snowball formation only in idiopathic cases; the term intermediate uveitis is used if there is an underlying infectious or autoimmune cause.[2]

• ***Posterior chamber.*** Posterior uveitis involves primary inflammation of the retina and/or choroid. Retinits and choroiditis can be focal, multifocal or diffuse.[3] Vasculitis, macular edema and neovascularization are common complications seen as a result of posterior inflammation. The differential diagnoses of posterior uveitis are broad and include white dot syndromes, collagen vascular and infectious diseases.

• ***Intraocular pressure.*** Uveitis can either increase or decrease the intraocular pressure. Ciliary body inflammation results in a decrease of aqueous production leading to a decrease in IOP.[7] Drops in IOP can be significant, although the risk of hypotony is less than 2%.[8]

Alternatively, an elevation in IOP can occur either from resistance to aqueous outflow by inflammatory cells and proteins, pupil block, inflamed trabecular meshwork (trabeculitis), or as a response to steroid therapy.[7] Steroid responders generally develop an increase in IOP after two to six weeks of therapy, but it can occur at any point.[7] Children are more susceptible to a steroid response than adults and generally develop increased IOP earlier on.[9]

Etiologies of Uveitis

Because there are many causes of uveitis documented, we'll discuss the more commonly associated conditions and their pertinent uveitic findings. Causes of uveitis can be broadly separated into *non-infectious* and *infectious* etiologies.

Non-Infectious Etiologies

HLA-B27 Seronegative Spondyloarthropathies

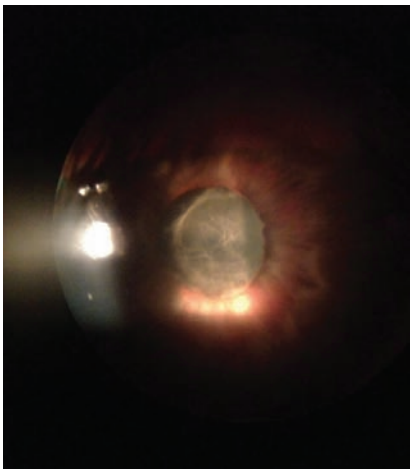
The seronegative spondyloarthropathies are a group of inflammatory disorders with a negative rheumatoid factor and a strong relationship to the human leukocyte antigen (HLA)-B27.

HLA-B27 is a major histocompatibility class 1 molecule.[10] While it's only found in about 8% to 10% of the general population, HLA-B27-associated uveitis accounts for 18% to 32% of anterior uveitis cases in the Western population, although the exact mechanism by which it causes inflammation has yet to be determined.[11]

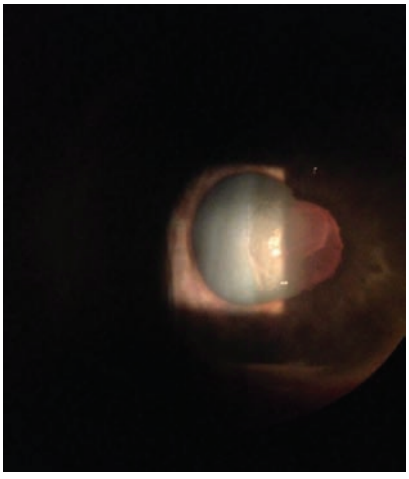
HLA-B27-associated anterior uveitis generally presents with a more acute rather than a chronic pattern with frequent recurrences.[11] Clinically, it is common to see fibrin, significant levels of cells and flare, and hypopyon.[11]

There has been a strong association found between patients with HLA-B27 spondyloarthropathy (SpA) and uveitis.[11] Below are diseases belonging to the seronegative spondyloarthropathies:

• ***Ankylosing spondylitis.*** This is a chronic inflammatory disorder that



Fibrin membrane formation is a common presentation in patients with HLA-B27 uveitis.



After inserting a cotton pledget soaked in cyclopentolate, homatropine and phenylephrine, the membrane starts to break.

is the prototype of SpA. Ankylosing spondylitis (AS) is characterized by sacroiliitis, spinal inflammation and enthesitis (inflammation of the site where tendons and ligaments insert into the bone, commonly occurring at the heel near the Achilles tendon).[12] The chronic inflammation found with AS leads to fibrosis and ossification mostly at the edges of inter-vertebral discs.[13] There is a male predominance of 2:1, and symptoms can range from asymptomatic to debilitating.[3]

• ***Reactive arthritis syndrome.*** Formerly known as Reiter's syndrome, reactive arthritis syndrome (RAS) has a classic triad of urethritis, polyarthritis and conjunctival inflammation. Non-granulomatous anterior uveitis is the second most common ocular finding after conjunctivitis, and is often acute and unilateral.[3] Previous infection of the genitourinary or gastrointestinal tract in HLA-B27-predisposed patients is thought to play a role in the pathophysiology of RAS.[14] It occurs most commonly in men between the ages of 20 to 35.[14]

• ***Psoriatic arthritis.*** This as an inflammatory joint condition associated with skin psoriasis.[15] Commonly, dermatologic changes are noted decades before arthritis, and nail pitting is frequently seen.[15,16] Peak incidence is between 40 to 50 years, but can occur at any age, with a slight male predominance.

• ***Inflammatory bowel disease.*** This term encompasses a variety of different conditions, with the main two types being Crohn's disease (CD) and ulcerative colitis (UC).[17] Both of these conditions are characterized by chronic inflammation of the gastrointestinal tract. CD affects the entire intestinal tract (mouth to anus) with a patch-like pattern of inflammation, while UC affects mainly the large intestine as a continuous area of inflammation.

For all types of HLA-B27 spondyloarthropathies, recommended testing includes HLA-B27, rheumatoid factor (RF), and imaging of the spine and sacroiliac joint.

Juvenile Idiopathic Arthritis

Juvenile idiopathic arthritis (JIA)—also known as juvenile rheumatoid arthritis and juvenile chronic arthritis—is the most common cause of arthritis in children under the age of 16.[3] The subsets of JIA are divided by the mode of presentation and the level of joint inflammation within the first six weeks:

• ***Oligoarticular onset*** (previously named pauciarticular) involving four or fewer joints, categorized as either persistent or extended. This is the most common form of JIA, affecting 60% of patients.[18]

• ***Polyarticular onset*** involves five or more joints. This subset is further divided into RF positive or RF negative groups. Patients in the RF positive group rarely develop uveitis.[3]

• ***Systemic onset*** (also known as Still's disease) presents with fever and rash, lymphadenopathy, heptomegaly or splenomegaly.[14]

Of the subsets of JIA, the oligoarticular form is the most likely to be associated with the development of uveitis.[3] The clinical presentation of JIA-associated uveitis is typically a chronic bilateral nongranulomatous anterior uveitis, more frequently affecting girls. Due to the chronic nature of inflammation, patients may also develop cataracts or band keratopathy.[3]

Laboratory testing of suspect patients should include RF and antinuclear antibody (ANA).

Sarcoidosis

Sarcoidosis is a multisystem disease characterized by granulomatous infiltration of organ tissue. The etiology remains unknown, but theories state that granulomas develop in genetically predisposed individuals after an inflammatory response is triggered by environmental and infectious agents.[19] Although sarcoidosis usually affects the lungs, ocular involvement does occur in up to 50% of patients.[3]

Sarcoidosis generally causes a chronic, bilateral, anterior uveitis with mutton-fat keratic precipitates. Busaca/Koeppe nodules, anterior and posterior synechiae, and increased intraocular pressure can been seen in sarcoid-related anterior uveitis.

Rarely, nodules on the conjunctiva are noted.

Posterior segment involvement occurs in 20% to 30% of patients with ocular sarcoidosis.[3,19] Posterior findings include vitritis, snowballs, periphlebitis, granulomas along venules (candle-wax drippings) and cystoid macular edema.

Recommended lab tests include angiotension converting enzyme (ACE), serum lysozyme and chest radiography.

Systemic Lupus Erythematous

Systemic lupus erythematous (SLE) is a multi-organ connective tissue disorder that occurs more frequently in women.[20] A type III hypersensitivity reaction, SLE is a disease in which B cells produce autoantibodies directed toward the DNA, cytoplasm and cell membrane.[21] This results in inflammation, vasculitis, immune complex deposition, vasculopathy and end-organ damage.[20]

Anterior uveitis from SLE seldom occurs in isolation and is more commonly associated with scleritis or posterior uveitis.[21] Lupus retinopathy and choroidopathy indicate systemic disease activity and can present with retinal vasculitis, neovascularization and serous exudation.[22]

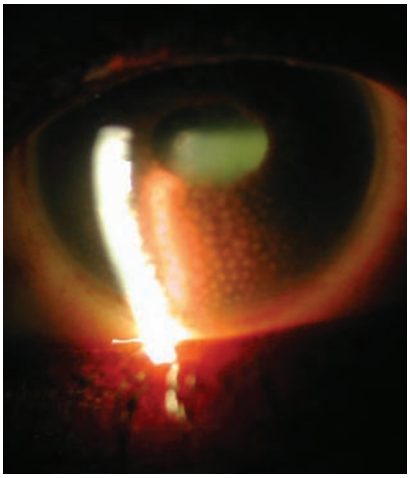
Antibody testing in suspected cases of SLE can include ANA, anti-SM, anti-dsDNA, anti-SSa/anti-SSb, anti-RNP and anticardiolipin (ACA).

Behcet's Disease

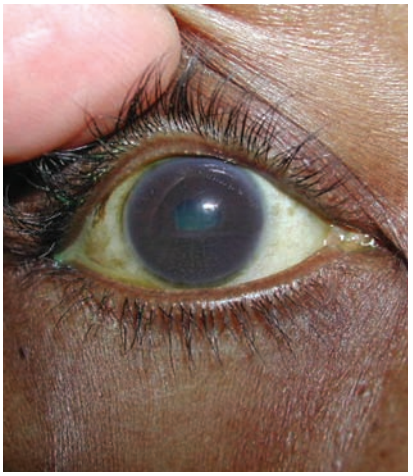
Behcet's disease (BD) is a multi-organ and multisystem chronic, relapsing, occlusive vasculitis. Although the etiology is unknown, BD has been associated with HLA-B51.[3] BD is characterized by its triad of oral ulcers, genital ulcers and uveitis. Diagnosis is based mostly on clinical findings.

BD is associated with a nongranulomatous anterior and/or posterior uveitis, KPs, posterior synechiae and normal to low IOP.[23] Up to 25% of cases present with hypopyon, which typically indicates worse visual prognosis.[23] Variable amounts of vitritis, necrotizing vasculitis and cystoid macular edema can be found posteriorly.[23]

There is no specific laboratory test for BD, but testing can include HLA-B51 and a skin pathergy test.



Note the granulomatous keratic precipitates in this patient with uveitis related to sarcoidosis.



Characteristic "mutton-fat" keratic precipitates, deposited as an inverted triangle on the inferior cornea (Arlt's triangle).

Vogt-Koyanagi-Harada Disease

Vogt-Koyanagi-Harada (VKH) disease is a multisystem autoimmune disorder principally affecting pigmented tissues in the ocular, auditory, integumentary and central nervous systems.[24] The pathogenesis of VKH is thought to be related to an aberrant T cell-mediated immune response directed against self-antigens found on melanocytes.[24] VKH affects mainly darkly pigmented populations, including East and Southeastern Asians, Asian Indians, Middle Easterners, Hispanics and Native Americans; people of European and African descent are rarely affected.[24]

VKH presents in four stages: prodromal, acute uveitic, convalescent and chronic recurrent.[3,24] The prodromal phase is marked by flu-like symptoms. The acute uveitic stage presents as a diffuse, bilateral, granulomatous anterior uveitis.[24] There may be some vitritis and choroiditis along with multiple, serous retinal detachments.[3,24] Mutton-fat KPs, iris nodules and increased IOP can also be present.[3] In the convalescent stage, depigmentation occurs, affecting the skin (vitiligo), eyelashes (poliosis) and choroid, giving the fundus a "sunset glow" appearance.[25] The relapse of uveitis is what constitutes the chronic recurrent stage.

HLA associations have been reported with VKH, but they are neither diagnostic nor required.

Fuchs' Heterochromic Iridocyclitis

Fuchs' heterochromic iridocyclitis (FHI) is a chronic, low-grade, unilateral nongranulomatous anterior uveitis that accounts for 2% to 3% of all uveitis cases.[26] Patients are usually asymptomatic. Signs are typically mild, with little to no conjunctival injection.[26] Despite persistent cells and flare, synechiae rarely occurs.[26] With FHI, KPs have a characteristic diffuse, stellate appearance.[4,26]

Heterochromia is a key diagnostic finding in FHI—the lighter

iris (which can have a "moth-eaten appearance") represents the involved eye.[26] This can vary based on iris pigmentation and level of stromal atrophy.[26] Reversed heterochromia is also possible, especially in lighter-eyed patients; in such a case, the darker iris represents the eye with inflammation due to stromal atrophy exposing large areas of iris-pigmented epithelium.[26]

Diagnosis of FHI is largely clinical and no routine testing is needed.

Treatment of FHI is directed toward bouts of increased inflammation. Although topical corticosteroids lessen inflammatory findings, they do not eliminate them.[14] Common sequelae of FHI are cataracts and glaucoma, the latter of which is often difficult to manage.[3,14]

Infectious Etiologies

Herpes Virus

• ***Herpes simplex.*** Herpes simplex virus (HSV), a member of the herpesvirus family, is acquired via direct contact of an active lesion. In most infected individuals, the virus remains latent in the neural ganglia. Once activated, HSV causes painful vesicular lesions in the corresponding area that the ganglia supplies. Virus reactivation can be induced by several factors such as stress, illness or sunlight exposure. Malaise and fever may accompany an active infection and skin lesions generally last for one to two weeks.

HSV anterior uveitis is most commonly unilateral, associated with diffuse endothelial KPs and causes elevated IOP. So, unilateral uveitis with significantly elevated IOP generally indicates herpetic uveitis.

Treatment of HSV anterior uveitis requires topical and sometimes oral corticosteroids, oral antiviral medicines and, when indicated, anti-glaucoma medications for elevated IOP.

HSV IgG and IgM antibodies can be tested in cases when the clinical course is questionable; however, negative serology doesn't exclude the diagnosis, as sensitivity to serologic testing is poor.

• ***Herpes zoster.*** Varicella zoster virus (chicken pox) causes an acute infection generally occurring in childhood. Similar to HSV, the herpes zoster virus remains latent in the neural ganglia until reactivated. A prodromal phase consisting of general malaise, fever and paraesthesia can occur before skin lesions appear. An eruptive phase of painful vesicular lesions, following the affected dermatome, generally lasts one to two weeks.

Zoster-related uveitis can be acute in conjunction with the eruptive phase or persist chronically. The uveitis always occurs on the same side as the affected dermatome. Less common findings are retinitis, progressive outer retinal necrosis or multifocal choroiditis.

Diagnosis of herpes zoster virus is based largely on clinical findings and laboratory testing is not required.

Acute herpes zoster virus is treated with oral antivirals, and anterior uveitis is managed with corticosteroids.

Syphilis

Acquired syphilis is a sexually-transmitted disease caused by the spirochete *Treponema pallidum*. It can infect multiple organ systems and has been called the "great masquerader" because its appearance is similar to many other diseases.[27]

The phases of syphilis infection are:

• ***Primary.*** *T. pallidum* replicates at the site of initial inoculation and induces a painless chancre that occurs three to six weeks after infection.[28]

• ***Secondary.*** This occurs four to 10 weeks after primary infection and its most common clinical manifestation is a disseminated maculopapular rash.[28] Malaise, fever, headache, hepatitis and meningitis can also occur.[28]

• ***Latent.*** The latent phase occurs as the clinical findings of secondary syphilis resolve and most patients become asymptomatic. Recurrences of secondary syphilis are common.

• ***Tertiary.*** Approximately one-third of patients with untreated latent syphilis develop tertiary syphilis.[3] Although rarely seen, manifestations of tertiary syphilis are gummas or granulomatous lesions affecting multiple organs, aortic aneurysm and syphilitic meningitis.[28]

Syphilitic uveitis can be unilateral or bilateral, granulomatous or nongranulomatous, and affect the anterior, intermediate or posterior segment.[3] Vascularized papules (iris papulos) or red nodules (iris nodosa) can be seen with iridocyclitis.[3] Retinitis, chorioretinitis and vitritis can also occur.

Fluorescent treponemal antibody-absorption (FTA-ABS) has a high sensitivity for diagnosis of syphilis.

Tuberculosis

Tuberculosis (TB) is a disease caused by the acid-fast *Mycobacterium tuberculosis*. Commonly affecting the lungs, TB is responsible for 0.6% of cases of uveitis in the US.[29]

The clinical manifestations of intraocular TB include acute anterior uveitis, chronic granulomatous anterior uveitis, intermediate uveitis, vitritis or endophthalmitis.[29] Granulomas can be noted on the iris, angle or choroid.

Testing for TB can include purified protein derivative (PPD), and chest radiography. An anergy panel is used as an adjunct to PPD in patients who are immunocompromised.

Lyme Disease

Lyme disease (LD) is caused by the spirochete *Borrelia burgdorferi* and is transmitted via tick bites. The Centers for Disease Control and Pre-

vention (CDC) estimate that 300,000 people are infected with LD each year, mostly in the northeastern and upper midwestern states.[30]

There are three stages of LD:

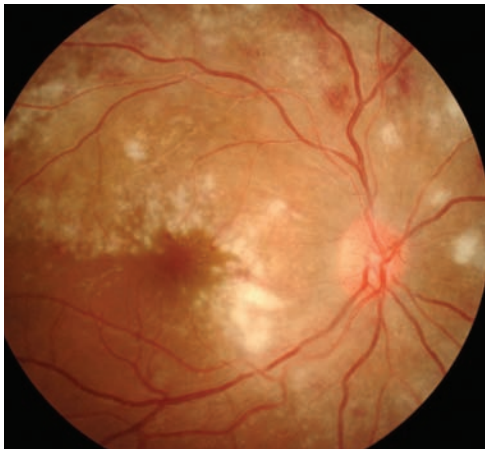
• ***Stage 1*** is early-localized disease presenting with classic bull's-eye rash and fever.[31]

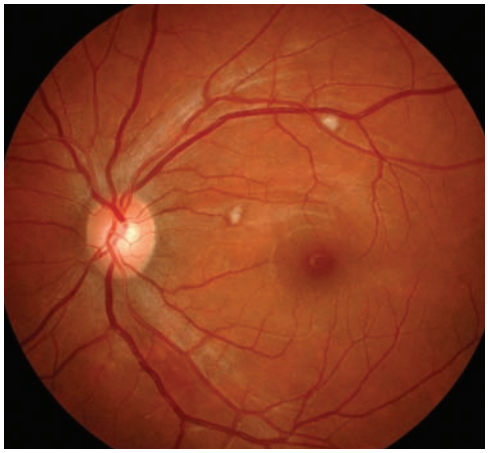
• ***Stage 2*** occurs as the infection disseminates and patients can develop cardiac, neurologic and arthritic manifestations.[31]

• ***Stage 3*** commonly manifests as Lyme arthritis, along with neuropsychiatric dysfunction.[31]

Uveitis secondary to LD is most commonly reported with stage 2 and 3 disease and can present as all forms of uveitis.[3]

When LD is suspected, enzyme-linked immunosorbent assay (ELISA) is used to identify *B. burgdorferi* antibodies. If the ELISA is positive, a Western blot test is performed to confirm the diagnosis.





HIV positive patient who presented with bilateral retinitis, OD>OS. The patient presented with dull eye pain, decreased vision and floaters. Exam revealed cotton-wool spots, retinal hemorrhages, exudate and perivascular sheathing. A moderate vitritis, OD>OS, was noted on exam as well.

Toxoplasmosis

Toxoplasmosis is caused by the parasite *Toxoplasma gondii*, which is commonly contracted from eating undercooked meat or from exposure to cats or cat feces.[14,32]

Toxoplasmosis presents as a unilateral retinochoroiditis with creamy-white retinal necrosis and dense overlying vitritis giving the appearance of "headlights in a fog."[14,32] New retinal lesions are typically found adjacent to areas of old lesions. Additionally, perivasculitis, macular edema, subretinal neovascularization and mild anterior chamber reaction can occur.[14,32]

Suspected cases of toxoplasmosis can be confirmed with toxoplasma IgG and IgM serology.

Histoplasmosis

Histoplasmosis is fungal infection due to contact with spores of *Histoplasma capsulatum* with a high incidence found along the Ohio and Mississippi river valleys.[33]

Ocular histoplasmosis syndrome (OHS) is a chorioretinitis and presents with the triad of peripapillary atrophy, peripheral chorioretinal atrophy (histo-spots) and maculopathy.[14,33] OHS is limited to the posterior segment and the absence of vitritis is key for diagnosis.[14,33]

Laboratory testing is not required but can include chest radiograph or histoplasma skin testing.[14]

Treatment

Treatment of uveitis largely depends on the severity of inflammation. Goals of treatment should be aimed at reducing the ocular inflammation and managing any associated complications.

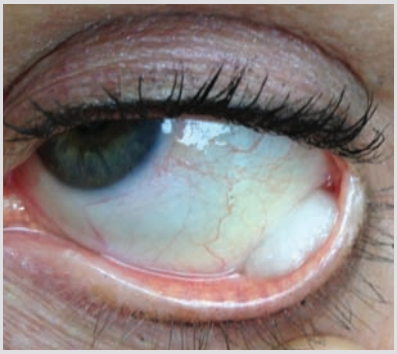
• ***Anti-inflammatories.*** Corticosteroids are the mainstay treatment of uveitis. The frequency of dosing is individualized based on the amount and location of inflammation.

The two major topical corticosteroids for uveitis are Pred Forte (prednisolone acetate 1%, Allergan) and Durezol (difluprednate 0.05%, Alcon). Durezol is indicated for treatment of inflammation and pain associated with ocular surgery as well as treatment of endogenous anterior uveitis. It has been shown to be as effective (dosed QID) as Pred Forte 1% (dosed eight times/day) for the treatment of inflammation and pain associated with anterior uveitis.[34] The advantage of difluprednate (an emulsion) over prednisolone (a suspension) is not only the reduced frequency of administration, but also the elimination of shaking before use.

Other topical corticosteroids, such as Lotemax (loteprednol 0.5%, Bausch + Lomb), carry the benefit of having less IOP increase, but are not quite as effective as prednisolone in treating anterior uveitis.[35]

Oral steroids can be used to complement topical therapy or if there is an underlying systemic cause that requires treatment. Prednisone is used most commonly and the dosage is individualized based on the amount of inflammation, but generally 1mg/kg/day. In order to minimize the gastrointestinal effects of prednisone, proton pump inhibitors, such as omeprazole, or H2-blockers, such as ranitidine, are used in conjunction. Vitamin D and calcium

A Pledge to Break Synechia



In our practice, we've successfully used an in-office cotton "pledget" soaked with a cocktail of cyclopentolate 2%, homatropine 5% and phenylephrine 10% in order to break pupillary fibrin membranes and synechia. This method is generally employed when there are a significant amount of iris lens adhesions that do not break with standard cycloplegia.

Prepare the pledget by soaking a cotton swab in the drug cocktail until saturated. (Be sure to check the patient's blood pressure prior to instillation of 10% phenylephrine.) Anesthetize the eye with proparacaine and temporally insert the soaked pledget in the inferior conjunctival cul-de-sac for approximately 20 to 30 minutes. It may require more than one application; we follow patients every 24 to 48 hours if we anticipate that another treatment will be needed. Additionally, patients should continue their prescribed cycloplegic as directed.

supplementation is recommended with longer use to prevent osteoporosis. Consult with the patient's internist when oral administration of prednisone may exacerbate pre-existing conditions, such as diabetes, hypertension, chronic GERD, and in patients who are immunocompromised.

Periocular corticosteroids using a sub-Tenon approach are indicated for uveitis unresponsive to topical treatment, intermediate or posterior inflammation, macular edema, or for patients who are non-compliant.[3] Infectious etiologies that corticosteroids could exacerbate should be ruled out prior to administration.

In cases unresponsive to topical, periocular and systemic steroids, or for control of macular edema, intravitreal steroid injections are used.[36] Intravitreal triamcinolone has been shown to effectively reduce macular edema resulting from uveitis.[37] The risk of sterile endophthalmitis may occur in 1% to 6% of patients receiving injections; however, the FDA recently approved Triesence (Alcon), a preservative-free triamcinolone.[3] Fluocinolone acetonide (Retisert) is a sustained-release implant used for treating chronic non-infectious posterior uveitis. Although it provides good long-term control of inflammation, it has been associated with cataract formation and glaucoma.[3]

In patients with recalcitrant ocular inflammation, steroid intolerance or lack of response to steroid treatment, immunomodulating therapies (IMT) can provide a great benefit. They can be prescribed by the internist or rheumatologist to treat the underlying disease, but can also be used in idiopathic cases with chronic ocular inflammation. Additionally, IMT offers the benefit of corticosteroid sparing due to the side effects associated with chronic prednisone use. Methotrexate is a commonly used agent for treatment of chronic non-infectious uveitis. A retrospective case series of 160 patients showed methotrexate to adequately control uveitis in 76.2% of patients treated, with a steroid-sparing effect achieved in 56% of patients.[38]

• ***Cycloplegics.*** Topical cycloplegics are used to treat pain associated with ciliary spasm, stabilize the blood-aqueous barrier and help prevent or break synechiae formation. Longer-acting cycloplegics such as homatropine, scopolamine and atropine are generally used. In cases of significant synechiae, a pledget can be instilled in the office. (*See "A Pledge to Break Synechia," left.*)

• ***Glaucoma treatment.*** In the US, approximately 20% of patients with uveitis develop glaucoma.[7] Uveitic glaucoma can be secondary to open or closed angle. Treatment of the inflammation with corticosteroids often controls the IOP, but the use of anti-glaucoma medicines is also very common. Topical prostaglandin analogs (PGAs), beta-blockers, carbonic-anhydrase inhibitors (CAIs) and alpha-adrenergic agonists all have been reported and used to control uveitic glaucoma. Typically, aqueous suppressants such as topical beta-blockers and CAIs are used in treating acute IOP spikes during active inflammation. When IOP cannot be controlled with topical medications, an oral CAI such as acetazolamide is used up to 1,000mg per day.[7] When the ocular inflammation is quiescent, PGAs can be used to control intraocular pressure and are not associated with an increased risk of macular edema.[39,40]

When medical therapy is unsuccessful in controlling IOP, consider selective laser trabeculoplasty. Laser iridotomy can treat pupillary block from synechia or persistent fibrin membrane formation.

Lastly, if all other therapies fail, trabeculectomy or valve implantation is required.[7]

Laboratory Testing

The most important steps prior to obtaining any laboratory tests are a careful and thorough history and clinical examination. Testing should be ordered based on signs and review of symptoms rather than taking a one-size-fits-all approach.

Complete blood counts (CBC), erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP) can be included to indicate active systemic

Lab Tests for Etiologies of Uveitis	
Systemic Disease	**Recommended Testing**
Seronegative spondylarthopathies	HLA-B27, RF Spine and sacroiliac X-ray
Juvenile idiopathic arthritis	RF ANA
Sarcoidosis	ACE, lysozyme Chest X-ray
Systemic lupus erythematosus	ANA, anti-SM, anti-dsDNA, anti-SSa/anti-SSb, anti-RNP, anticardiolipin
Behcet's disease	HLA-B51 Skin pathergy test
Herpes simplex	HSV IgG/IgM
Syphilis	VDRL FTA ABS RPR
Tuberculosis	PPD, chest X-ray
Lyme disease	ELISA Western blot
Toxoplasmosis	Toxoplasma IgG/IgM
Histoplasmosis	Chest X-ray Histoplasma serology

inflammation. Testing is not routinely done on asymptomatic individuals with uncomplicated initial episodes of mild non-granulomatous anterior uveitis. Indications for testing are: positive systemic history; recurrences, worsening or recalcitrant inflammation; bilaterality; granulomatous inflammation; and intermediate or posterior uveitis.

When attending to the patient with uveitis, be sure to first recognize the key characteristics of their presentation and then tailor the treatment and laboratory testing appropriately. Appropriate treatment and management of ocular inflammation helps prevent the complications of uveitis and preserves visual function.

Optometrists can play an important role in not only the diagnosis and management of ocular findings with uveitis but also in uncovering the systemic causes as well. ■

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1. Bloch-Michel E, Nussenblatt RB. International Uveitis Study Group recommendations for the evaluation of intraocular inflammatory disease. Am J Ophthalmol. 1987 Feb 15;103(2):234-5.
2. Jabs DA, Nussenblatt RB, Rosenbaum JT; Standardization of Uveitis Nomenclature (SUN) Working Group. Standardization of uveitis nomenclature for reporting clinical data. Results of the First International Workshop. Am J Ophthalmol. 2005 Sep;140(3):509-16.
3. Moorthy RS. 2011-2012 Basic and Clinical Science Course, Section 9: Intraocular Inflammation and Uveitis. San Francisco, CA: American Academy of Ophthalmology; 2011.
4. MC Mocan, S Kadayifcilar, M Irkec. Keratic precipitate morphology in uveitic syndromes including Behçet's disease as evaluated with in vivo confocal microscopy. Eye (Lond). 2009 May;23(5):1221-7.
5. Van Gelder RN, Prasad AG. Review of Uveitis. Thorofare, NJ; Slack Inc; 2008: 33.
6. D'Alessandro LP, Forster DJ, Rao NA. Anterior uveitis and hypopyon. Trans Am Ophthalmol Soc. 1991;89:303-9.
7. Siddique SS, Suelves AM, Baheti U, Foster CS. Glaucoma and uveitis. Surv Ophthalmol. 2013 Jan-Feb;58(1):1-10.
8. Daniel E, Pistilli M, Pujari SS, et al. Risk of hypotony in noninfectious uveitis. Ophthalmology. 2012 Nov;119(11):2377-85.
9. Yamashita T, Kodama Y, Tanaka M, et al. Steroid-induced glaucoma in children with acute lymphoblastic leukemia: a possible complication. J Glaucoma. 2010 Mar;19(3):188-90.
10. Suhler EB, Martin TM, Rosenbaum JT. HLA-B27–associated uveitis: overview and current perspectives. Curr Opin Ophthalmol. 2003 Dec;14(6):378-83.
11. Chang JH, McCluskey PJ, Wakefield D. Acute anterior uveitis and HLA-B27. Surv Ophthalmol. 2005 Jul-Aug;50(4):364-88.
12. Slobodin G, Rosner I, Rimar D, et al. Anklyosing spondylitis: field in progress. Isr Med Assoc J. 2012 Dec;14(12):763-7.
13. Zambrano-Zaragoza JF, Agraz-Cibrian JM, González-Reyes C, et al. Anklyosing spondylitis: from cells to genes. Int J Inflam. 2013;2013:501653.
14. Multack RF, Genge MR, Skorin L. Immune Disease. In: Onofrey B, Skorin L, Holdeman NR (eds). Ocular Therapeutics Handbook: A Clinical Manual, 2nd ed. Philadelphia, PA: Lippincott Williams & Wilkins; 2005:236-88.
15. Goldenstein-Schainberg C, Favarato MH, Ranza R. Current and relevant concepts in psoriatic arthritis. Rev Bras Reumatol. 2012 Jan-Feb;52(1):98-106.
16. Gladman DD, Antoni C, Mease P, et al. Psoriatic arthritis: epidemiology, clinical features, course, and outcome. Ann Rheum Dis. 2005 March; 64(Suppl 2): ii14–ii17.
17. Schoultz M, Atherton I, Hubbard G, Watson AJ. Assessment of causal link between psychological factors and symptom exacerbation in inflammatory bowel disease: a protocol for systematic review of prospective cohort studies. Syst Rev. 2013 Jan 23;2:8.
18. Kahn P. Juvenile idiopathic arthritis :an update for the clinician. Bull NYU Hosp Jt Dis. 2012;70(3):152-66.
19. Bonfioli AA, Orefice F. Sarcoidosis. Semin Ophthalmol. 2005 Jul-Sep;20(3):177-82.
20. Mok CC, Lau CS. Pathogenesis of systemic lupus erythematosus. J Clin Pathol. 2003 Jul;56(7):481-90.
21. Sivaraj RR, Durrani OM, Denniston AK, et al. Ocular manifestations of systemic lupus erythematosus. Rheumatology (Oxford). 2007 Dec;46(12):1757-62.
22. Nguyen QD, Uy HS, Akpek EK, et al. Choroidopathy of systemic lupus erythematosus. Lupus. 2000;9(4):288-98.
23. Bonfioli AA, Orefice F. Behçet's disease. Semin Ophthalmol. 2005 Jul-Sep;20(3):199-206.
24. Damico FM, Kiss S, Young LH. Vogt-Koyanagi-Harada disease. Semin Ophthalmol. 2005 Jul-Sep;20(3):183-90.
25. Keino H, Goto H, Usui M. Sunset glow fundus in Vogt-Koyanagi-Harada disease with or without chronic ocular inflammation. Graefes Arch Clin Exp Ophthalmol. 2002 Oct;240(10):878-82.
26. Bonfioli AA, Curi AL, Orefice F. Fuchs' heterochromic cyclitis. Semin Ophthalmol. 2005 Jul-Sep;20(3):143-6.
27. Romero CP, Urzúa SC, Gallardo VP, et al. Ocular syphilis: presentation of ten cases and review of the literature. Rev Chilena Infectol. 2010 Dec;27(6):525-32.
28. Ho EL, Lukehart SA. Syphilis: using modern approaches to understand an old disease. J Clin Invest. 2011 Dec;121(12):4584-92.
29. Abu El-Asrar AM, Abouammoh M, Al-Mezaine HS. Tuberculous uveitis. Middle East Afr J Ophthalmol. 2009 Oct;16(4):188-201.
30. How many people get Lyme disease? Centers for Disease Control and Prevention website. Updated: August 23, 2013. Available at: www.cdc.gov/lyme/stats/humanCases.html.
31. Mikkilä HO, Seppälä IJ, Viljanen MK, et al. The expanding clinical spectrum of ocular lyme borreliosis. Ophthalmology. Mar 2000;107(3):581-7.
32. Vasconcelos-Santos DV. Ocular manifestations of systemic disease: toxoplasmosis. Curr Opin Ophthalmol. 2012 Nov;23(6):543-50.
33. Prasad AG, Van Gelder RN. Presumed ocular histoplasmosis syndrome. Curr Opin Ophthalmol. 2005 Dec;16(6):364-8.
34. Foster CS, Davanzo R, Flynn TE, et al. Durezol (difluprednate ophthalmic emulsion 0.05%) compared with Pred Forte 1% ophthalmic suspension in the treatment of endogenous anterior uveitis. J Ocul Pharmacol Ther. 2010 Oct;26(5):475-83.
35. Controlled evaluation of loteprednol etabonate and prednisolone acetate in the treatment of acute anterior uveitis. Loteprednol Etabonate US Uveitis Study Group. Am J Ophthalmol. 1999 May;127(5):537-44.
36. Degenring RF, Jonas JB. Intravitreal injection of triamcinolone acetonide as treatment for chronic uveitis. Br J Ophthalmol. 2003 March; 87(3): 361.
37. Kok H, Lau C, Maycock N, et al. Outcome of intravitreal triamcinolone in uveitis. Ophthalmology. 2005 Nov;112(11):1916-21.
38. Samson CM, Waheed N, Baltatzis S, Foster CS. Methotrexate therapy for chronic noninfectious uveitis: analysis of a case series of 160 patients. Ophthalmology. 2001 Jun;108(6):1134-9.
39. Fortuna E, Cervantes-Castañeda RA, Bhat P, et al. Flare-up rates with bimatoprost therapy in uveitic glaucoma. Am J Ophthalmol. 2008 Dec;146(6):876-82.
40. Chang JH, McCluskey P, Missotten T, et al. Use of ocular hypotensive prostaglandin analogues in patients with uveitis: does their use increase anterior uveitis and cystoid macular oedema? Br J Ophthalmol. 2008 Jul;92(7):916-21.

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1. Which of the following is NOT an ocular complication associated with uveitis?
a. Elevated intraocular pressure.
b. Hypotony.
c. Iridodialysis.
d. Macular edema.

2. Keratic precipitates will generally deposit along the inferior corneal endothelium as an inverted triangle (Arlt's triangle) except with:
a. Sarcoidosis related uveitis.
b. Fuchs' heterochromic uveitis.
c. HLA-B27 associated uveitis.
d. Idiopathic uveitis.

3. Hypopyon is NOT a common finding in which etiology of uveitis?
a. Behcet's disease.
b. HLA-B27 spondyloarthopathies.
c. Herpetic uveitis.
d. Histoplasmosis.

4. Which classification best describes a patient presenting with vitreal snowballs and snowbanking associated with sarcoidosis?
a. Anterior uveitis.
b. Posterior uveitis.
c. Intermediate uveitis.
d. Pars planitis.

5. Any of the following can cause an increase in intraocular pressure EXCEPT:
a. Use of topical steroids.
b. Ciliary body inflammation.
c. Trabecular meshwork inflammation.
d. Synechia formation.

6. Which statement is INCORRECT about HLA-B27 spondyloarthropathies?
a. There is a male predominance.
b. The HLA-B27 molecule is found in 18% to 32% of the general population.
c. There is a strong association with anterior uveitis.
d. Hypopyon is a common finding.

7. Which finding is NOT considered a part of the triad of Reiter's syndrome?
a. Uveitis.
b. Arthritis.
c. Urethritis.
d. Conjunctivitis.

8. Which form of juvenile idiopathic arthritis (JIA) is most commonly associated with the development of uveitis?
a. Oligoarticular onset.
b. Polyarticular onset.
c. Systemic onset.
d. Still's disease.

9. In a patient presenting with bilateral uveitis with Busacca nodules and mutton-fat keratic precipitates, which laboratory test is LEAST likely to produce a positive result?
a. Angiotension converting enzyme (ACE).
b. Chest X-ray.
c. Lysozyme.
d. Anti-nuclear antibody (ANA).

10. Which condition is NOT associated with granulomatous keratic precipitates?
a. Behcet's disease.
b. Vogt-Koyanagi-Harada syndrome.
c. Sarcoidosis.
d. Tuberculosis.

11. An aberrant T cell-mediated immune response directed against self-antigens found on melanocytes is proposed as the pathophysiology of:
a. Systemic lupus erythematous.
b. Vogt-Koyanagi-Harada disease.
c. Behcet's disease.
d. Fuchs' heterochromic iridocyclitis.

12. In Fuchs' heterochromic iridocyclitis, which characteristic is typically diagnostic for the involved eye?
a. Conjunctival injection.
b. Synechiae.
c. Lighter colored iris.
d. Darker colored iris.

13. If a patient presents with unilateral anterior uveitis with diffuse keratic precipitates and an elevated IOP of 50mm Hg, the most probable diagnosis is:
a. Sarcoid related uveitis.
b. Herpetic uveitis.
c. HLA-B27 associated uveitis.
d. Vogt-Koyanagi-Harada disease.

14. Maculopapular rash, malaise, fever, headache, hepatitis and meningitis are common findings of:
a. Still's disease.
b. Lyme disease.
c. Syphilis.
d. Herpes zoster.

15. Uveitis secondary to Lyme disease:
a. Can be confirmed by chest X-ray.
b. Is typically associated with trabeculitis.
c. Is commonly reported with stages 2 and 3 of Lyme disease.
d. Rarely requires systemic evaluation.

16. The triad of chorioretinal atrophy, maculopathy and peripapillary atrophy is characteristic of:
a. Tuberculosis.
b. Toxoplasmosis.
c. Histoplasmosis.
d. Sarcoidosis.

17. A patient presents with an acute anterior uveitis, and a 2+ anterior chamber cell is noted on exam. Which is the least desirable first-line anti-inflammatory treatment?
a. Prednisolone acetate 1%.
b. Loteprednol 0.2%.
c. Difluprednate emulsion 0.05%.
d. Dexamethasone suspension 0.1%.

18. A patient diagnosed with pars planitis and associated macular edema has been using Durezol (difluprednate emulsion, Alcon) drops for two weeks with no improvement and persistent macular edema. What would be the most appropriate treatment at this point?
a. Durezol with simultaneous Retisert

OSC QUIZ

implantation.
b. Durezol with simultaneous sub-Tenon steroid injection.
c. Durezol with simultaneous oral prednisone.
d. Durezol with simultaneous methotrexate.

19. Which is an indication for the use of a cycloplegic in a patient with uveitis?
a. Stabilization of the blood/aqueous barrier.
b. Treatment of pain.
c. Prevention of synechia formation.
d. All of the above.

20. Which treatment is least desirable for reducing elevated intraocular pressure associated with active uveitis?
a. Timolol 0.5%.
b. Brimonidine 0.2%/timolol 0.5%.
c. Brinzolamide 1%.
d. Bimatoprost 0.01%.

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Lesson 109524 RO-OSC-1113

When the Defect Doesn't Heal

Two options for a non-healing epithelial defect are autologous serum drops or an amniotic membrane graft. These let the healing begin. **Edited by Paul C. Ajamian, OD**

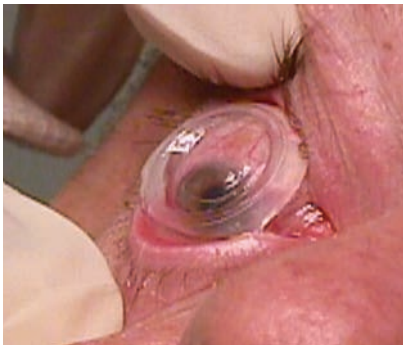
Q I have a patient with a non-healing epithelial defect. What are my options?

A First, be sure you know what you're dealing with. "Initially, be concerned if a correct diagnosis has been missed—such as with a parasitic or viral infection—and that's the reason for the non-healing defect," says corneal surgeon Rishi Parikh of Omni Eye Services, in Atlanta. "However, if this is not the case, then it is most likely a neurotrophic ulcer."

First-line treatment for a neurotrophic ulcer is aggressive lubrication with preservative-free artificial tears and a bandage contact lens, Dr. Parikh says. Punctal plugs can also help with lubricating the eye. In addition, he says, discontinue any unnecessary drops because these could be toxic to the cornea and delay healing. "This approach helps heal the majority of cases. But be patient, as these heal much more slowly than a typical epithelial defect."

Occasionally, the defect remains despite this treatment. Options for a stubborn, non-healing defect include:

• ***Autologous serum drops.*** Autologous serum, which is created from the patient's blood serum, contains growth factors, fibronectin and vitamins that support proliferation, migration and differentiation of the corneal and conjunctival epithelium. The drops have been found to be extremely useful in persistent epithelial defects and severe dry eye.[1]



A ProKera amniotic membrane graft is applied to an epithelial defect. A growing number of ODs are performing this procedure and being reimbursed for it.

"There is no standard regimen to use the drops, so it is generally titrated to the percentage and drop frequency based on the healing of the defect," says Dr. Parikh. Unfortunately, it can be difficult to find a lab and compounding pharmacy that will make the drops for the patient. And, even when the drops are made, they may not be covered by insurance and will probably be fairly expensive, he says.

• ***Amniotic membrane graft (AMG).*** Harvested from placental tissue after a cesarean section, an AMG provides vital cytokines and growth factors that work to repair and regenerate the damaged ocular surface tissue of an epithelial defect. AMGs have also been used for many other purposes with good results, such as with filamentary keratopathy to more severe cases of Stevens-Johnson syndrome and severe chemical burns.[2]

"The graft is placed on the area of the defect for anywhere from one to four weeks. The membrane dissolves on its own and only the support (either the plastic ring as with ProKera [Bio-Tissue, Inc.] or the bandage contact lens as with AmbioDisk [IOP Ophthalmics]) is removed once the defect is healed," Dr. Parikh says. "With this support, the defect is more likely to heal. This therapy is very advantageous because it takes the burden of treatment out of the patient's hands."

Once the defect has healed, follow-up visits can be slowly extended out. When the patient returns to the optometrist, monitor for any early signs of dry eye such as punctate keratitis or complaints of foreign body sensation, Dr. Parikh says. If these signs occur, increase the frequency of the artificial tears and treat aggressively to prevent a new ulcer from forming.

"The best way to prevent the defect from occurring again is with aggressive lubrication with preservative-free tears and ointments," Dr. Parikh says. Also consider permanent punctal plugs, and if autologous serum drops worked previously, maintenance serum drops can help prevent a subsequent occurrence.

If this regimen fails and a recurrence occurs, surgical options—such as a lateral tarsorrhaphy or conjunctival flap—can be considered. ■

1. Tsubota K, Goto E, Shimmura S, Shimazaki J. Treatment of persistent corneal epithelial defect by autologous serum application. Ophthalmology. 1999 Oct;106(10):1984-9.
2. Ricardo JR, Barros SL, Santos MS, et al. Amniotic membrane transplantation for severe acute cases of chemical ocular burn and Stevens-Johnson syndrome. Arq Bras Oftalmol. 2009 Mar-Apr;72(2):215-20.

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References: (1) Richer S, Stiles W, Statkute L, et al. Double-masked, placebo-controlled, randomized trial of lutein and antioxidant supplementation in the intervention of atrophic age-related macular degeneration: the Veterans LAST study (Lutein Antioxidant Supplementation Trial). Optometry. 2004;75:3-15. (2) SanGiovanni JP, Chew EY, Clemons TE, et al. The relationship of dietary lipid intake and age-related macular degeneration in a case-control study. AREDS Report No. 20. Arch Ophthalmol. 2007;125:671-679. (3) Chiu CJ, Taylor A. Nutritional antioxidants and age-related cataract and maculopathy. Experimental Eye Research. 2007;84:229-245.

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Corneal Cartography

Extensively mapping each individual patient's cornea is a crucial step before recommending refractive surgery. **Edited by Joseph P. Shovlin, OD**

Q What are most clinicians doing today to assess the cornea for contraindications (such as loss of rotational symmetry and corneal thinning) prior to recommending refractive surgery? Are there any circumstances where you might recommend surgery in a person older than 30 who has signs of mild (forme fruste) keratoconus?

A Some corneas are better suited for refractive surgery than others. The first step in determining whether a patient is a good candidate for the procedure is a thorough review of corneal topography.

Corneal topography can be used to predict one of the most serious, yet rare, complications of refractive surgery: corneal ectasia.

"The most significant risk factor for ectasia is an irregular topography," says Eric Donnenfeld, MD, who practices in Long Island, NY. "Preoperative topography is the standard of care in all LASIK and PRK surgeries and, as in the past, direct visualization of the topography looking for skew deviation provides very valuable information."

"Now, however, software evaluates the topography, and can combine information from the posterior corneal surface and pachymetry to warn clinicians about risk factors for keratoconus," adds Dr. Donnenfeld. "I particularly look at the pachymetric maps on the Pentacam or Orbscan, looking for the pachymetry distribution."

According to Mujtaba Qazi, MD, director of Clinical Studies at Pepose Vision Institute in Missouri, reviews of ectasia after LASIK suggest an underlying or undiagnosed forme fruste keratoconus in a significant number of cases.

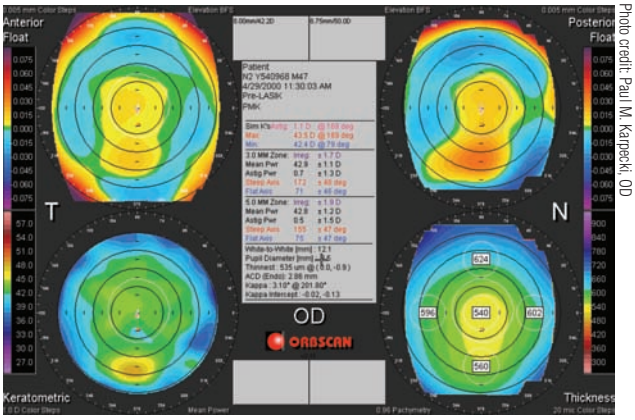

Photo credit: Paul M. Karpecki, OD

This patient exhibited forme fruste keratoconus on Orbscan (Bausch + Lomb).

"Based upon these retrospective studies, a number of factors have been recognized to increase the risk for developing post-refractive ectasia, including higher degrees of myopia, preoperative corneal curvature over 47D, preoperative central corneal thickness (CCT) of less than 500µm, residual stromal bed thickness less than 250µm, abnormal or asymmetric topographic patterns or patients under 25 years," explains Dr. Qazi.

It is imperative to know when surgery should be avoided. Pay special attention to corneal thickness before suggesting refractive surgery.

"In normal eyes, the cornea is thinnest centrally and thickens symmetrically to the periphery," says Dr. Donnenfeld. "When the thinnest point on the cornea is inferiorally/nasally displaced, this sends up a red flag that the patient may be at risk. In patients with irregular corneas in which I am able to obtain a quality wavefront aberrometry, I have a detailed and documented conversation with the patients, and will often suggest a wavefront PRK with concomitant riboflavin UV crosslinking."

"In the past, the recommendation for cases of forme fruste keratoconus was to avoid refractive surgery, as even cases with surface ablation have been reported to develop late-onset ectasia," says Dr. Qazi. "An additional screening tool to assist in this decision can be application of devices (i.e., Ocular Response Analyzer, Reichert or Corvis ST, Oculus) that measure the biomechanical response of the cornea to an external air pulse stimulus."

"If there are irregularities in corneal indentation, then keratorefractive surgery, including surface ablation, should be avoided," he adds. "Collagen crosslinking has been combined with photorefractive ablation in known cases of keratoconus, and thus can be considered as a prophylactic measure in forme fruste keratoconus as well." ■

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Vitamin D Comes to Light

We know that it fortifies teeth and bones. But what about other body systems, including the eye? **By Carlo J. Pelino, OD, and Joseph J. Pizzimenti, OD**

Vitamin D has long been viewed as a bone-builder—an essential contributor to fortifying the skeletal system, promoting calcium absorption in the digestive system and maintaining serum calcium and phosphate concentrations for mineralization. It helps prevent rickets in children, osteomalacia in adults, and—along with calcium—may help protect older adults from osteoporosis. Additionally, vitamin D may play a role in preventing or treating certain cancers, diabetes, atherosclerosis and multiple sclerosis.

But there's more to this powerhouse than building bones. Studies also show that vitamin D plays a notable role in ocular conditions, such as age-related macular degeneration (AMD) and diabetic retinopathy.

Synthesis in the Sun

Vitamin D is the only vitamin formed with the help of sunlight. Activated vitamin D (known as calciferol) is hormone-like and fat-soluble. The kidneys produce it to help regulate calcium, and thus prevent bone diseases.[1] We now know that vitamin D also regulates cells, systems and organs.[1,2]

Vitamin D synthesis begins when 7-dehydrocholestrol in the skin is converted to pre-vitamin cholcalciferol by UVB radiation (290nm to 320nm). This precursor molecule is then converted to the non-active storage form called 25-hydroxycholcalciferol—also called 25 (OH) D, or 25-hydroxyvitamin D—via hydroxylation in the liver.[1] Various body tissues activate calcitriol for local use.

Serum 25-Hydroxyvitamin D [25(OH)D] Concentrations and Health[10]

<12ng/mL	Deficiency, leading to rickets in infants and children and osteomalacia in adults
12-20ng/mL	Inadequate for bone and overall health in healthy individuals
>20ng/mL	Adequate for bone and overall health
>50ng/mL	Potential adverse effects

Ways To Get Enough

The three ways to obtain vitamin D are through food, sunlight and supplementation. Vitamin D3 (cholcalciferol) is abundant in fatty fish. Along with long-chain essential fatty acids, vitamin D3 is found in cold-water fish, such as sockeye salmon and sardines.[1] The less potent vitamin D2 is used to fortify milk (see "Sources of Vitamin D").

It takes only about 12 minutes of mid-day summer sun exposure for Caucasians to produce 3,000 IU of natural vitamin D3. Of course, achieving this level takes much longer for a person of color living in a northern climate.

The recommended daily allowance (RDA) for vitamin D is based on age, but makes no allowance for race, gender, season or location. For people aged one to 70 years, the RDA is 600 IU. For people over 70, 800 IU.[3] Populations vulnerable to deficiency include those living in northern regions, people of color, indoor workers, infants, the housebound elderly and those advised by their doctors to avoid sunlight.

Implications of Deficiency

Vitamin D deficiency has been linked to several types of cancer, cardiovascular disease, diabetes, multiple sclerosis, schizophrenia and influenza. Rickets in African Americans has returned to hospitals in Northern cities.[1]

Researchers have also studied the potential role of vitamin D as it relates to autism. Research has found that the degree of autism varies with distance from the equator.[4]

The 25 (OH) D blood test, a measure of vitamin D reserves, is inexpensive and widely available. The typical normative laboratory reference range is 30ng/ml to 100ng/ml. Any 25 (OH) D liver reserve value below 20ng/ml is considered deficient.

Sources of Vitamin D

Non-fat fortified milk	1 cup per day
Fish: salmon, tuna, sardines, mackerel, herring	at least three servings per week
"Sensible sunlight"	Five to 15 minutes, two to five times per week
Vitamin D3 supplements	1,000 IU per day

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SIMBRINZA™ Suspension provided additional 1-3 mm Hg IOP lowering compared to the individual components[1]

- IOP measured at 8 AM, 10 AM, 3 PM, and 5 PM was reduced by **21-35%** at Month 3[2-4]
- Efficacy proven in two pivotal Phase 3 randomized, multicenter, double-masked, parallel-group, 3-month, 3-arm, contribution-of-elements studies[2,3]
- The most frequently reported adverse reactions (3-7%) in a six month clinical trial were eye irritation, eye allergy, conjunctivitis, blurred vision, dysgeusia (bad taste), conjunctivitis allergic, eye pruritus, and dry mouth[5]
- Only available beta-blocker-free fixed combination[2,3]

INDICATIONS AND USAGE

SIMBRINZA™ (brinzolamide/brimonidine tartrate ophthalmic suspension) 1%/0.2% is a fixed combination indicated in the reduction of elevated intraocular pressure (IOP) in patients with open-angle glaucoma or ocular hypertension.

Dosage and Administration

The recommended dose is one drop of SIMBRINZA™ Suspension in the affected eye(s) three times daily. Shake well before use. SIMBRINZA™ Suspension may be used concomitantly with other topical ophthalmic drug products to lower intraocular pressure. If more than one topical ophthalmic drug is being used, the drugs should be administered at least five (5) minutes apart.

IMPORTANT SAFETY INFORMATION

Contraindications

SIMBRINZA™ Suspension is contraindicated in patients who are hypersensitive to any component of this product and neonates and infants under the age of 2 years.

Warnings and Precautions

Sulfonamide Hypersensitivity Reactions—Brinzolamide is a sulfonamide, and although administered topically, is absorbed systemically. Sulfonamide attributable adverse reactions may occur. Fatalities have occurred due to severe reactions to sulfonamides. Sensitization may recur when a sulfonamide is readministered irrespective of the route of administration. If signs of serious reactions or hypersensitivity occur, discontinue the use of this preparation.

Corneal Endothelium—There is an increased potential for developing corneal edema in patients with low endothelial cell counts.

Severe Hepatic or Renal Impairment (CrCl <30 mL/min)—SIMBRINZA™ Suspension has not been specifically studied in these patients and is not recommended.

Adverse Reactions

In two clinical trials of 3 months' duration with SIMBRINZA™ Suspension, the most frequent reactions associated with its use occurring in approximately 3-5% of patients in descending order of incidence included: blurred vision, eye irritation, dysgeusia (bad taste), dry mouth, and eye allergy. Adverse reaction rates with SIMBRINZA™ Suspension were comparable to those of the individual components. Treatment discontinuation, mainly due to adverse reactions, was reported in 11% of SIMBRINZA™ Suspension patients.

Drug Interactions—Consider the following when prescribing SIMBRINZA™ Suspension:

Concomitant administration with oral carbonic anhydrase inhibitors is not recommended due to the potential additive effect. Use with high-dose salicylate may result in acid-base and electrolyte alterations. Use with CNS depressants may result in an additive or potentiating effect. Use with antihypertensives/cardiac glycosides may result in additive or potentiating effect on lowering blood pressure. Use with tricyclic antidepressants may blunt the hypotensive effect of systemic clonidine and it is unknown if use with this class of drugs interferes with IOP lowering. Use with monoamine oxidase inhibitors may result in increased hypotension.

For additional information about SIMBRINZA™ Suspension, please see Brief Summary of full Prescribing Information on adjacent page.

Learn more at myalcon.com/simbrinza

References: 1. SIMBRINZA™ Suspension Package Insert. **2.** Katz G, DuBiner H, Samples J, et al. Three-month randomized trial of fixed-combination brinzolamide, 1%, and brimonidine, 0.2% [published online ahead of print April 11, 2013]. *JAMA Ophthalmol.* doi:10.1001/jamaophthalmol.2013.188. **3.** Nguyen QH, McMenemy MG, Realini T, et al. Phase 3 randomized 3-month trial with an ongoing 3-month safety extension of fixed-combination brinzolamide 1%/brimonidine 0.2%. *J Ocul Pharmacol Ther.* 2013;29(3):
290-297. **4.** Data on file, 2013. **5.** Whitson JT, Realini T, Nguyen QH, McMenemy MG, Goode SM. Six-month results from a Phase III randomized trial of fixed-combination brinzolamide 1% + brimonidine 0.2% versus brinzolamide or brimonidine monotherapy in glaucoma or ocular hypertension. *Clin Ophthalmol.* 2013;7:1053-1060.

SIMBRINZA™
(brinzolamide/brimonidine tartrate ophthalmic suspension) 1%/0.2%

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BRIEF SUMMARY OF PRESCRIBING INFORMATION
INDICATIONS AND USAGE

SIMBRINZA™ (brinzolamide/brimonidine tartrate ophthalmic suspension) 1%/0.2% is a fixed combination of a carbonic anhydrase inhibitor and an alpha 2 adrenergic receptor agonist indicated for the reduction of elevated intraocular pressure (IOP) in patients with open-angle glaucoma or ocular hypertension.

DOSAGE AND ADMINISTRATION

The recommended dose is one drop of SIMBRINZA™ Suspension in the affected eye(s) three times daily. Shake well before use. SIMBRINZA™ Suspension may be used concomitantly with other topical ophthalmic drug products to lower intraocular pressure. If more than one topical ophthalmic drug is being used, the drugs should be administered at least five (5) minutes apart.

DOSAGE FORMS AND STRENGTHS

Suspension containing 10 mg/mL brinzolamide and 2 mg/mL brimonidine tartrate.

CONTRAINDICATIONS

Hypersensitivity - SIMBRINZA™ Suspension is contraindicated in patients who are hypersensitive to any component of this product.

Neonates and Infants (under the age of 2 years) - SIMBRINZA™ Suspension is contraindicated in neonates and infants (under the age of 2 years*) see Use in Specific Populations*

WARNINGS AND PRECAUTIONS

Sulfonamide Hypersensitivity Reactions - SIMBRINZA™ Suspension contains brinzolamide, a sulfonamide, and although administered topically is absorbed systemically. Therefore, the same types of adverse reactions that are attributable to sulfonamides may occur with topical administration of SIMBRINZA™ Suspension. Fatalities have occurred due to severe reactions to sulfonamides including Stevens-Johnson syndrome, toxic epidermal necrolysis, fulminant hepatic necrosis, agranulocytosis, aplastic anemia, and other blood dyscrasias. Sensitization may recur when a sulfonamide is re-administered irrespective of the route of administration. If signs of serious reactions or hypersensitivity occur, discontinue the use of this preparation *[see Patient Counseling Information]*

Corneal Endothelium - Carbonic anhydrase activity has been observed in both the cytoplasm and around the plasma membranes of the corneal endothelium. There is an increased potential for developing corneal edema in patients with low endothelial cell counts. Caution should be used when prescribing SIMBRINZA™ Suspension to this group of patients.

Severe Renal Impairment - SIMBRINZA™ Suspension has not been specifically studied in patients with severe renal impairment (CrCl < 30 mL/min). Since brinzolamide and its metabolite are excreted predominantly by the kidney, SIMBRINZA™ Suspension is not recommended in such patients.

Acute Angle-Closure Glaucoma - The management of patients with acute angle-closure glaucoma requires therapeutic interventions in addition to ocular hypotensive agents. SIMBRINZA™ Suspension has not been studied in patients with acute angle-closure glaucoma.

Contact Lens Wear - The preservative in SIMBRINZA™, benzalkonium chloride, may be absorbed by soft contact lenses. Contact lenses should be removed during instillation of SIMBRINZA™ Suspension but may be reinserted 15 minutes after instillation *[see Patient Counseling Information]*.

Severe Cardiovascular Disease - Brimonidine tartrate, a component of SIMBRINZA™ Suspension, has a less than 5% mean decrease in blood pressure 2 hours after dosing in clinical studies; caution should be exercised in treating patients with severe cardiovascular disease.

Severe Hepatic Impairment - Because brimonidine tartrate, a component of SIMBRINZA™ Suspension, has not been studied in patients with hepatic impairment, caution should be exercised in such patients.

Potentiation of Vascular Insufficiency - Brimonidine tartrate, a component of SIMBRINZA™ Suspension, may potentiate syndromes associated with vascular insufficiency. SIMBRINZA™ Suspension should be used with caution in patients with depression, cerebral or coronary insufficiency, Raynaud's phenomenon, orthostatic hypotension, or thromboangitis obliterans.

Contamination of Topical Ophthalmic Products After Use - There have been reports of bacterial keratitis associated with the use of multiple-dose containers of topical ophthalmic products. These containers have been inadvertently contaminated by patients who, in most cases, had a concurrent corneal disease or a disruption of the ocular epithelial surface *[see Patient Counseling Information]*.

ADVERSE REACTIONS

Clinical Studies Experience - Because clinical studies are conducted under widely varying conditions, adverse reaction rates observed in the clinical studies of a drug cannot be directly compared to the rates in the clinical studies of another drug and may not reflect the rates observed in practice.

SIMBRINZA™ Suspension - In two clinical trials of 3 months duration 435 patients were treated with SIMBRINZA™ Suspension, and 915 were treated with the two individual components. The most frequently reported adverse reactions in patients treated with SIMBRINZA™ Suspension occurring in approximately 3 to 5% of patients in descending order of incidence were blurred vision, eye irritation, dysgeusia (bad taste), dry mouth, and eye allergy. Rates of adverse reactions reported with the individual components were comparable. Treatment discontinuation, mainly due to adverse reactions, was reported in 11% of SIMBRINZA™ Suspension patients.

Other adverse reactions that have been reported with the individual components during clinical trials are listed below.

Brinzolamide 1% - In clinical studies of brinzolamide ophthalmic suspension 1%, the most frequently reported adverse reactions reported in 5 to 10% of patients were blurred vision and bitter, sour or unusual taste. Adverse reactions occurring in 1 to 5% of patients were blepharitis, dermatitis, dry eye, foreign body sensation, headache, hyperemia, ocular discharge, ocular discomfort, ocular keratitis, ocular pain, ocular pruritus and rhinitis.

The following adverse reactions were reported at an incidence below 1%: allergic reactions, alopecia, chest pain, conjunctivitis, diarrhea, diplopia, dizziness, dry mouth, dyspnea, dyspepsia, eye fatigue, hypertonia, keratoconjunctivitis, keratopathy, kidney pain, lid margin crusting or sticky sensation, nausea, pharyngitis, tearing and urticaria.

Brimonidine Tartrate 0.2% - In clinical studies of brimonidine tartrate 0.2%, adverse reactions occurring in approximately 10 to 30% of the subjects, in descending order of incidence, included oral dryness, ocular hyperemia, burning and stinging, headache, blurring, foreign body sensation, fatigue/drowsiness, conjunctival follicles, ocular allergic reactions, and ocular pruritus.

Reactions occurring in approximately 3 to 9% of the subjects, in descending order included corneal staining/erosion, photophobia, eyelid erythema, ocular ache/pain, ocular dryness, tearing, upper respiratory symptoms, eyelid edema, conjunctival edema, dizziness, blepharitis, ocular irritation, gastrointestinal symptoms, asthenia, conjunctival blanching, abnormal vision and muscular pain.

The following adverse reactions were reported in less than 3% of the patients: lid crusting, conjunctival hemorrhage, abnormal taste, insomnia, conjunctival discharge, depression, hypertension, anxiety, palpitations/arrhythmias, nasal dryness and syncope.

Postmarketing Experience - The following reactions have been identified during postmarketing use of brimonidine tartrate ophthalmic solutions in clinical practice. Because they are reported voluntarily from a population of unknown size, estimates of frequency cannot be made. The reactions, which have been chosen for inclusion due to either their seriousness, frequency of reporting, possible causal connection to brimonidine tartrate ophthalmic solutions, or a combination of these factors, include: bradycardia, hypersensitivity, iritis, keratoconjunctivitis sicca, miosis, nausea, skin reactions (including erythema, eyelid pruritus, rash, and vasodilation), and tachycardia.

Apnea, bradycardia, coma, hypotension, hypothermia, hypotonia, lethargy, pallor, respiratory depression, and somnolence have been reported in infants receiving brimonidine tartrate ophthalmic solutions *[see Contraindications]*.

DRUG INTERACTIONS

Oral Carbonic Anhydrase Inhibitors - There is a potential for an additive effect on the known systemic effects of carbonic anhydrase inhibition in patients receiving an oral carbonic anhydrase inhibitor and brinzolamide ophthalmic suspension 1%, a component of SIMBRINZA™ Suspension. The concomitant administration of SIMBRINZA™ Suspension and oral carbonic anhydrase inhibitors is not recommended.

High-Dose Salicylate Therapy - Carbonic anhydrase inhibitors may produce acid-base and electrolyte alterations. These alterations were not reported in the clinical trials with brinzolamide ophthalmic suspension 1%. However, in patients treated with oral carbonic anhydrase inhibitors, rare instances of acid-base alterations have occurred with high-dose salicylate therapy. Therefore, the potential for such drug interactions should be considered in patients receiving SIMBRINZA™ Suspension.

CNS Depressants - Although specific drug interaction studies have not been conducted with SIMBRINZA™, the possibility of an additive or potentiating effect with CNS depressants (alcohol, opiates, barbiturates, sedatives, or anesthetics) should be considered.

Antihypertensives/Cardiac Glycosides - Because brimonidine tartrate, a component of SIMBRINZA™ Suspension, may reduce blood pressure, caution in using drugs such as antihypertensives and/or cardiac glycosides with SIMBRINZA™ Suspension is advised.

Tricyclic Antidepressants - Tricyclic antidepressants have been reported to blunt the hypotensive effect of systemic clonidine. It is not known whether the concurrent use of these agents with SIMBRINZA™ Suspension in humans can lead to resulting interference with the IOP lowering effect. Caution is advised in patients taking tricyclic antidepressants which can affect the metabolism and uptake of circulating amines.

Monoamine Oxidase Inhibitors - Monoamine oxidase (MAO) inhibitors may theoretically interfere with the metabolism of brimonidine tartrate and potentially result in an increased systemic side-effect such as hypotension. Caution is advised in patients taking MAO inhibitors which can affect the metabolism and uptake of circulating amines.

USE IN SPECIFIC POPULATIONS

Pregnancy - *Pregnancy Category C:* Developmental toxicity studies with brinzolamide in rabbits at oral doses of 1, 3, and 6 mg/kg/day (20, 60, and 120 times the recommended human ophthalmic dose) produced maternal toxicity at 6 mg/kg/day and a significant increase in the number of fetal variations, such as accessory skull bones, which was only slightly higher than the historic value at 1 and 6 mg/kg. In rats, statistically decreased body weights of fetuses from dams receiving oral doses of 18 mg/kg/day (180 times the recommended human ophthalmic dose) during gestation were proportional to the reduced maternal weight gain, with no statistically significant effects on organ or tissue development. Increases in unossified sternebrae, reduced ossification of the skull, and unossified hyoid that occurred at 6 and 18 mg/kg were not statistically significant. No treatment-related malformations were seen. Following oral administration of ^{14}C-brinzolamide to pregnant rats, radioactivity was found to cross the placenta and was present in the fetal tissues and blood.

Developmental toxicity studies performed in rats with oral doses of 0.66 mg brimonidine base/kg revealed no evidence of harm to the fetus. Dosing at this level resulted in a plasma drug concentration approximately 100 times higher than that seen in humans at the recommended human ophthalmic dose. In animal studies, brimonidine crossed the placenta and entered into the fetal circulation to a limited extent.

There are no adequate and well-controlled studies in pregnant women. SIMBRINZA™ Suspension should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Nursing Mothers - In a study of brinzolamide in lactating rats, decreases in body weight gain in offspring at an oral dose of 15 mg/kg/day (150 times the recommended human ophthalmic dose) were observed during lactation. No other effects were observed. However, following oral administration of ^{14}C-brinzolamide to lactating rats, radioactivity was found in milk at concentrations below those in the blood and plasma. In animal studies, brimonidine was excreted in breast milk.

It is not known whether brinzolamide and brimonidine tartrate are excreted in human milk following topical ocular administration. Because many drugs are excreted in human milk and because of the potential for serious adverse reactions in nursing infants from SIMBRINZA™ (brinzolamide/brimonidine tartrate ophthalmic suspension) 1%/0.2%, a decision should be made whether to discontinue nursing or to discontinue the drug, taking into account the importance of the drug to the mother.

Pediatric Use - The individual component, brinzolamide, has been studied in pediatric glaucoma patients 4 weeks to 5 years of age. The individual component, brimonidine tartrate, has been studied in pediatric patients 2 to 7 years old. Somnolence (50-83%) and decreased alertness was seen in patients 2 to 6 years old. SIMBRINZA™ Suspension is contraindicated in children under the age of 2 years *[see Contraindications]*.

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

OVERDOSAGE

Although no human data are available, electrolyte imbalance, development of an acidotic state, and possible nervous system effects may occur following an oral overdose of brinzolamide. Serum electrolyte levels (particularly potassium) and blood pH levels should be monitored.

Very limited information exists on accidental ingestion of brimonidine in adults; the only adverse event reported to date has been hypotension. Symptoms of brimonidine overdose have been reported in neonates, infants, and children receiving brimonidine as part of medical treatment of congenital glaucoma or by accidental oral ingestion. Treatment of an oral overdose includes supportive and symptomatic therapy; a patent airway should be maintained.

PATIENT COUNSELING INFORMATION

Sulfonamide Reactions - Advise patients that if serious or unusual ocular or systemic reactions or signs of hypersensitivity occur, they should discontinue the use of the product and consult their physician.

Temporary Blurred Vision - Vision may be temporarily blurred following dosing with SIMBRINZA™ Suspension. Care should be exercised in operating machinery or driving a motor vehicle.

Effect on Ability to Drive and Use Machinery - As with other drugs in this class, SIMBRINZA™ Suspension may cause fatigue and/or drowsiness in some patients. Caution patients who engage in hazardous activities of the potential for a decrease in mental alertness.

Avoiding Contamination of the Product - Instruct patients that ocular solutions, if handled improperly or if the tip of the dispensing container contacts the eye or surrounding structures, can become contaminated by common bacteria known to cause ocular infections. Serious damage to the eye and subsequent loss of vision may result from using contaminated solutions *[see Warnings and Precautions]*. Always replace the cap after using. If solution changes color or becomes cloudy, do not use. Do not use the product after the expiration date marked on the bottle.

Intercurrent Ocular Conditions - Advise patients that if they have ocular surgery or develop an intercurrent ocular condition (e.g., trauma or infection), they should immediately seek their physician's advice concerning the continued use of the present multidose container.

Concomitant Topical Ocular Therapy - If more than one topical ophthalmic drug is being used, the drugs should be administered at least five minutes apart.

Contact Lens Wear - The preservative in SIMBRINZA™, benzalkonium chloride, may be absorbed by soft contact lenses. Contact lenses should be removed during instillation of SIMBRINZA™ Suspension, but may be reinserted 15 minutes after instillation.

U.S. Patent No:
6,316,441

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Ocular Wellness and Vitamin D

Several epidemiological studies suggest an association between vitamin D deficiency and AMD. One such study in 2007 suggested that vitamin D may protect against age-related retinal changes. Researchers hypothesize that the beneficial effects are due to its anti-inflammatory activity.[5] In 2011, researchers evaluated monozygotic twin pairs with discordant AMD phenotypes to assess differences in behavioral and nutritional factors and found that the twin with the earlier stage of AMD, smaller drusen size and area, and less pigmentary disturbances had higher dietary vitamin D intake.[6]

In a cross-sectional study of 517 patients, vitamin D deficiency was associated with an increased prevalence of retinopathy in young people with type 1 diabetes.[7] The inflammatory and angiogenic effects of vitamin D deficiency in both types 1 and 2 diabetes may contribute to early retinal vascular damage; however, further investigations are needed.[8] Whether vitamin D supplementation in diabetic patients can prevent or improve the prognosis for retinopathy remains to be investigated.

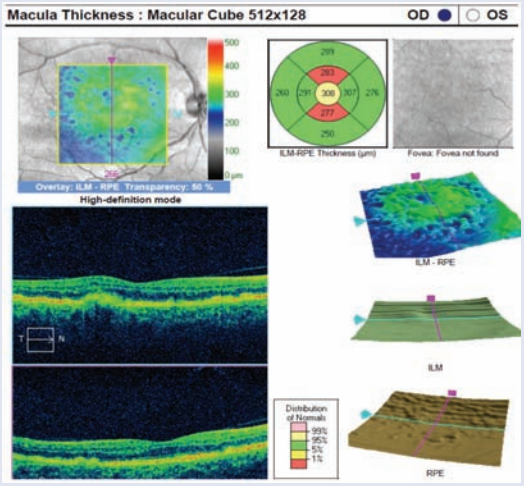
Researchers also found that myopes had lower levels of blood vitamin D by an average of 3.4 ng/ml compared with non-myopes when adjusted for age and dietary intake. Adjusted for dietary variables, myopes appear to have lower average blood levels of vitamin D than non-myopes.[9]

Many other vitamin D-associated conditions, such as cardiovascular disease, multiple sclerosis, inflammatory and neoplastic disease, have secondary ocular manifestations and the potential for sight-threatening complications.

Case Report

• *History.* A 77-year-old female of mixed descent (African and Northern European) recently moved to the United States from Toronto, where she had spent her entire life. Her systemic history was remarkable for type 2 diabetes of 18 years duration, which was being treated with insulin and oral medications.

She reported improved glycemic control following the start of a special "anti-inflammatory" diet prescribed by her registered dietitian. She recently underwent vitamin D lab testing for the first time and results were well below normal values. The patient's internist told her she probably has been vitamin D deficient for most of her life, based on her demographics.



Scanning laser image and OCT of OD Fundus exam and SD-OCT of the patient's right eye showed confluent macular and foveal soft drusen as well as two regions of retinal thinning (red areas on thickness map).

• *Diagnostic data.* The patient was a moderately high myope OU. Fundus evaluation showed extensive soft, confluent drusen in the macula of each eye (figure 1). The right eye went on to develop choroidal neovascularization, despite close monitoring, improved diet and supplementation.

Could her vitamin D deficiency have been a contributing factor to the worsening of her AMD?

Our Role

Eye care providers, particularly those in northern latitudes, should alert those vulnerable patients to the possibility of vitamin D deficiency. Dermatologist and researcher Michael Holick, MD, of Boston University advocates "sensible sunlight exposure"—five minutes, two to three times per week for Caucasians; five times that for people of color—and raising the RDA of vitamin D for all age groups. A great source of information is www.vitaminDcouncil.org.

We should urge our patients to have their 25 (OH) vitamin D liver reserve status checked, and increase consumption of cold-water fish and vitamin D. ■

Thanks to Stuart Richer, OD, PhD, for contributing to this article.

1. Richer SP, Pizzimenti JJ. The importance of vitamin D in systemic and ocular wellness. J Optom. 2013;6:124-33.
2. Pike JW, Glorieux FH, Feldman D. Vitamin D. 2nd ed. Waltham, MA: Elsevier; 2004.
3. Institute of Medicine, Food & Nutrition Board, and Dietary Reference Intakes for Calcium and Vitamin D. Washington, DC: National Academy Press, 2010.
4. Grant WB, Soles CM. Epidemiologic evidence supporting therole of maternal vitamin D deficiency as a risk factor forthe development of infantile autism. Dermatoendocrinol. 2009 Jul;1(4):223-8.
5. Parekh N, Chappell RJ, Millen AE, et. al. Association between vitamin D and age-related macular degeneration in the Third National Health and Nutrition Examination Survey, 1988 through 1994. Arch Ophthalmol. 2007 May;125(5):661-9.
6. Seddon JM, Reynolds R, Shah HR, Rosner B. Smoking, dietarybetaine, methionine, and vitamin D in monozygotic twins with discordant macular degeneration: epigenetic implications. Ophthalmology. 2011 Jul;118(7):1386-94.
7. Kaur H, Donaghue KC, Chan AK, et al. Vitamin D deficiency is associated with retinopathy in children and adolescents with type 1 diabetes. Diabetes Care. 2011 Jun;34(6):1400-2.
8. Payne JF, Ray R, Watson DG, et al. Vitamin D insufficiency indiabetic retinopathy. Endocr Pract. 2012 Mar-Apr;18(2):185-93.
9. Mutti DO, Marks AR. Blood levels of vitamin D in teens and young adults with myopia. Optom Vis Sci. 2011 Mar;88(3):377-82.
10. Dietary Supplement Fact Sheet: Vitamin D. National Institutes of Health Web site. Available at: www.nih.gov/factsheets/vitaminD.com. Accessed Oct. 16, 2013.

The Need for Closure

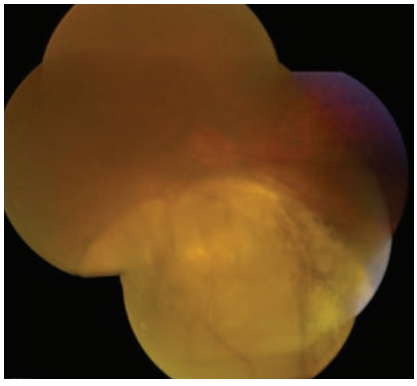
This patient experienced poor visual acuity in her right eye for as long as she could remember. Now her left eye is failing. Can we help her? **Edited by Mark T. Dunbar, OD**

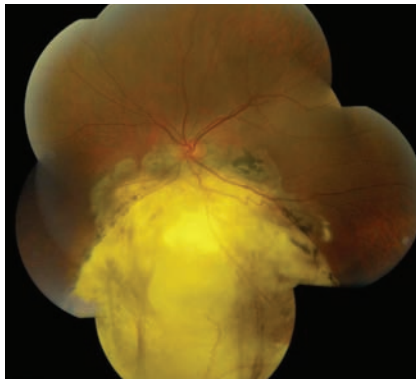
A 66-year-old Hispanic female presented with a longstanding history of poor vision at distance and near, which improved only minimally with spectacle correction. She had reduced visual acuity in her right eye since birth, and stated that the vision in her left eye began to decline approximately a decade ago. Her ocular history was significant for a "laser procedure" 10 years earlier OS. Her systemic history was unremarkable, and she reported using no medications of any kind.

Her best-corrected visual acuity measured 20/100 OU. Confrontation visual fields revealed mild constriction of the superior temporal quadrant OU. The right pupil was irregular and fixed. The left pupil was miotic and minimally reactive to light.

Anterior segment evaluation of the right eye was significant for an absence of iris tissue inferiorly, spanning from 5 to 6 o'clock. We documented grade 3 nuclear sclerosis of the lens. Anterior segment evaluation of the left eye was significant for grade 1+ nuclear sclerosis of the lens, but otherwise unremarkable.

Her intraocular pressure measured 18mm Hg OU. Dilated fundus examination of the right eye revealed a hazy view of the retina secondary to dense brunescent cataract (*figure 1*). The view into the left eye was clear, which revealed a similar finding to that documented in the fellow eye (*figure 2*). We performed a spectral-domain optical coherence tomography (SD-OCT) scan of both eyes (*figures 3 and 4*).





1, 2. Montages of our patient's OD (left) and OS (right) posterior poles.

Take the Retina Quiz

1. How do you account for the changes seen in the posterior segments of both eyes?
   a. Retinal atrophy.
   b. Retinal detachment.
   c. Progressive myopia.
   d. Incomplete closure of the optic fissure during fetal development.

2. What term is commonly used to describe the funduscopic findings?
   a. Chorioretinal atrophy.
   b. Posterior staphyloma.
   c. Coloboma.
   d. Degenerative myopia.

3. Common associated ocular complications include all of the following, *except*:
   a. Hypotony.
   b. Retinal detachment.
   c. Amblyopia.
   d. Visual field scotoma.

4. What is the best description of the SD-OCT findings in the patient's left eye?
   a. Choroidal neovascularization.
   b. Atrophy of the retinal pigment epithelium (RPE) and loss of the photoreceptor integrity layer (PIL).
   c. Chronic cystoid macular edema (CME).
   d. Persistent vitreomacular adhesion (VMA).

5. How should the patient be treated?
   a. Monitoring.
   b. Scleral buckle.
   c. Enucleation.
   d. Intravitreal anti-VEGF injection.

For answers, turn to page 106.

Discussion

The posterior segment findings represent bilateral chorioretinal colobomas. These result from incom-

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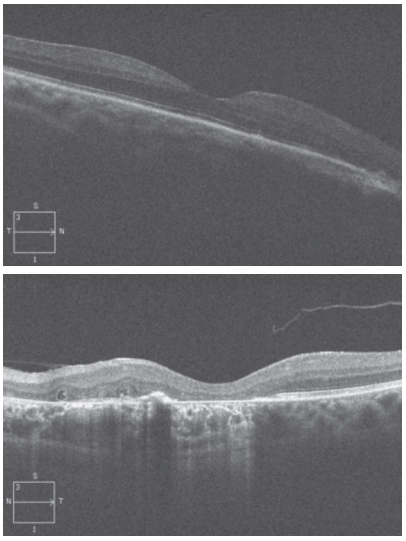

3, 4. Spectral-domain optical coherence tomography scan of the maculae (OD top, OS bottom). Note the marked difference between the right and left eye.

plete closure of the optic fissure during the fifth to seventh week of gestation. The incidence of improper closure ranges from 0.5 to 7.5 cases per 10,000 births, depending on the population studied.[1] Layers of the eye that can be affected include the iris, ciliary body and zonules, choroid, RPE, neurosensory retina and optic nerve.[1-3]

Colobomas have been reported in 3.2% to 11.2% of blind children worldwide.[1] Approximately 40% of posterior segment colobomas present unilaterally, while 60% present bilaterally.[1] Chorioretinal colobomas are typically located in the inferonasal quadrant and may extend to the optic nerve.[1-3]

During fetal eye development, incomplete optic fissure closure prevents proper growth of the neurosensory retina and RPE. The choroid also fails to form correctly, because its differentiation depends on the existence an intact RPE.[2,3] Thus, our patient exhibits a bare sclera without a clearly delineated retina or choroid.

Defects in the optic fissure closure also frequently cause iris coloboma, which was present in our patient's right eye. A complete iris coloboma represents a full-thickness defect involving the iris pigment epithelium (IPE) and stroma. When it extends all the way to the iris root, it appears as a "keyhole pupil." If the iris defect involves either the IPE or the stroma, the presentation is termed an incomplete iris coloboma.[2]

Colobomas are associated with a multitude of systemic conditions that result from chromosomal aberrations or genetic inheritance.[2] Also, patients with chorioretinal colobomas are 23% to 42% more likely to develop retinal detachments than healthy individuals.[3] Further, those with colobomas are at an elevated risk for choroidal neovascularization (CNV), which can precipitate serous macular detachments and subsequent scaring.

Our patient reported that she underwent a laser procedure in her left eye more than 10 years ago. But, was the laser indicated because she had developed CNV or because she had a retinal detachment? Because her eye care records were not available, it is difficult to know for sure. All we are certain about is that our clinical photographs revealed significantly more macular involvement in the left eye than in the right eye, and the SD-OCT scan showed marked RPE disruption and PIL loss OS.

A higher incidence of cataract development—including pigment clumping on the lens capsule, anterior and posterior polar cataracts, and subcapsular, cortical and total opacification—has been reported in coloboma patients.[2] Other ocular conditions associated with colobomas include visual field scotomas, amblyopia and nystagmus. Visual prognosis heavily depends on the extent of foveal and optic nerve involvement

Treatment for patients with chorioretinal colobomas includes correction of refractive error, low vision aids and proper management of associated systemic conditions. Individuals with iris colobomas can be prescribed cosmetic contact lenses. Urgently refer patients with retinal detachment or subretinal neovascularization for appropriate intervention.

We assumed that our patient's left eye had always exhibited better visual acuity than her right eye, until she developed macular problems and underwent laser treatment. Now, the vision is equally poor in both eyes. The reduced vision in her right eye can be attributed to the extent of the cataract. Because the right macula appears anatomically normal on SD-OCT, we believe that she has a good prognosis for improved visual acuity with cataract surgery. However, it's possible there may be an amblyopic complication, because the patient suggested that the vision in her right eye never was very good.

We discussed the options of undergoing cataract surgery OD; however, the patient elected not to have surgery at this time. We asked her to return in six months for a cataract consultation to determine whether she would benefit from surgical intervention. ■

Thanks to Henry Tran, fourth-year intern at UC Berkeley School of Optometry, for contributing this case.

1. Barnard S, Shneor E, Brauner J, et al. Bilateral chorioretinal coloboma discovered with ultra-wide field retinal imaging. J Optom. 2012 Mar;5(3):150-4.
2. Onwochei BC, Simon JW, Bateman JB, et al. Ocular colobomata. Surv Ophthalmol. 2000 Nov-Dec;45(3):175-94.
3. Pagon RA. Ocular coloboma. Surv Ophthalmol. 1981 Jan-Feb;25(4):223-36.

Jaime R. Falco, OD, is a graduate of the Indiana University School of Optometry. She practices in New Jersey.

Creating Opportunity: Switching Over-Wearers to Extended Contact Lens Wear

When prescribing contact lenses to a patient, it's our job as eye care professionals to determine each patient's needs, while taking into account their lifestyle. It's also important to know that almost one-third of contact lens users sleep in their lenses.[1] If your patients are wearing their lenses during naps or overnight, then a switch to extended wear is likely in order.

To identify patients who would benefit from the flexibility of extended wear lenses, find out how many hours each day they typically wear their current contact lenses, how often they remove them and how often they dispose of them. With this information in mind, consider the oxygen transmission and deposit resistance of available extended wear lenses to determine which is best for your patient.

Extended Wear Considerations

We all know how important oxygen is to the health of the cornea, so we must take into account the **oxygen transmission**, or Dk/t, of a contact lens when fitting our patients. Look for a lens with high oxygen transferability.

AIR OPTIX® NIGHT & DAY® AQUA contact lenses have the highest oxygen transmissibility of any available soft contact lens and are comfortable day after day.[2]

Another important factor to consider is **deposit resistance**. Even after a month of wear, AIR OPTIX® NIGHT & DAY® AQUA contact lenses have significantly lower lipid deposits than other competitive silicone hydrogel lenses worn for their manufacturer-recommended replacement period.[3,4*] Less deposits contribute to comfortable and healthy lens wear.[3,4]

Once oxygen transmission and deposit resistance have been considered, the next step is fitting the patient in a contact lens, such as the AIR OPTIX® NIGHT & DAY® AQUA contact lens. Approach this step in the same way you would any other contact lens: fit the patient, dispense the lens and schedule a follow-up visit.

If/when patients remove their contact lenses, instruct them to clean and disinfect them before reinsertion. Additionally, the use of rewetting drops, such as OPTI-FREE® PureMoist® Rewetting Drops, may play an integral part of contact lens habits for some patients by preventing deposit buildup.

Checking In

Follow your extended wear contact lens patients closely. Have them return every six months for routine exams to evaluate corneal health. These visits are a great way to ensure compliance with prescribed wearing schedules. They are also a good time to address contact lens hygiene.

At each follow-up visit, instruct the patient to sleep in their lenses the night before the appointment. When they're in your chair, inquire about comfort, vision and how they have used the lenses since you dispensed them.

Complete a gross ocular health assessment in natural light. Do the patient's eyes look clear or injected? Observe the contact lens itself under magnification, noting its centration, as well as movement on blink and eye movement. Is there lipid and/or protein deposition across the lens surface?

Use higher magnification to look for pseudoguttata and sub-epithelial infiltrates, which are an indication of edema and irritation. Perilimbal injection can be a sign that the lens is too tight or that there is not adequate oxygen exchange between the tear film and cornea. Are there signs of microbial keratitis? Always have the patient remove their contact lenses and use stain to check for corneal defects, which may be a sign of an ill-fitting lens.

Extended Wear Gratitude

With proper guidance and supervision, your patients can enjoy the flexibility of extended wear contact lenses. Open communication will foster compliance and build a good rapport between you and your patients. They and their eyes will thank you for it!

*Lipid deposit resistance: Compared to ACUVUE^ OASYS^, ACUVUE^ ADVANCE^, PureVision^, Biofinity^ and Avaira^ contact lenses. ^Trademarks are the property of their respective owners.

References: 1. Alcon market research, Fort Worth, TX, 2012. **2.** Based on the ratio of lens oxygen transmissibilities; Alcon data on file, 2009, 2010. **3.** Ex vivo measurement of lipid deposits on lenses worn daily wear through manufacturer-recommended replacement period; CLEAR CARE® Cleaning & Disinfecting Solution used for cleaning and disinfection; significance demonstrated at the 0.05 level; Alcon data on file, 2008. **4.** Nash W, Gabriel M, Mowrey-McKee M. A comparison of various silicone hydrogel lenses; lipid and protein deposition as a result of daily wear. *Optom Vis Sci.* 2010;87: E-abstract 105110.

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

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Important information for AIR OPTIX® NIGHT & DAY® AQUA (lotrafilcon A) contact lenses: Indicated for vision correction for daily wear (worn only while awake) or extended wear (worn while awake and asleep) for up to 30 nights. **Relevant Warnings:** A corneal ulcer may develop rapidly and cause eye pain, redness or blurry vision as it progresses. If left untreated, a scar, and in rare cases loss of vision,may result. The risk of serious problems is greater for extended wear vs. daily wear and smoking increases this risk. A one-year post-market study found 0.18% (18 out of 10,000) of wearers developed a severe corneal infection, with 0.04% (4 out of 10,000) of wearers experiencing a permanent reduction in vision by two or more rows of letters on an eye chart. **Relevant Precautions:** Not everyone can wear for 30 nights. Approximately 80% of wearers can wear the lenses for extended wear. About two-thirds of wearers achieve the full 30 nights continuous wear. **Side Effects:** In clinical trials, approximately 3-5% of wearers experience at least one episode of infiltrative keratitis, a localized inflammation of the cornea which may be accompanied by mild to severe pain and may require the use of antibiotic eye drops for up to one week. Other less serious side effects were conjunctivitis, lid irritation or lens discomfort including dryness,mild burning or stinging. **Contraindications:** Contact lenses should not be worn if you have: eye infection or inflammation (redness and/or swelling); eye disease, injury or dryness that interferes with contact lens wear; systemic disease that may be affected by or impact lens wear; certain allergic conditions or using certain medications (ex. some eye medications). **Additional Information:** Lenses should be replaced every month. If removed before then, lenses should be cleaned and disinfected before wearing again. Always follow the eye care professional's recommended lens wear, care and replacement schedule. Consult package insert for complete information, available without charge by calling **(800) 241-5999** or go to **myalcon.com**.

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MRSA Update: 2013

The highly resistant pathogen nearly sacked an entire NFL locker room last month. Just imagine what can it do to your patient base. **By Alan G. Kabat, OD, and Joseph W. Sowka, OD**

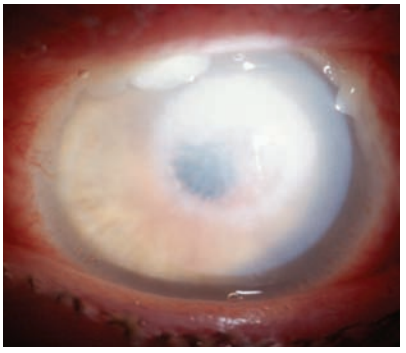
After a relative hiatus, methicillin-resistant *Staphylococcus aureus* (MRSA) is back in the news. In early October, three members of the Tampa Bay Buccaneers were diagnosed with skin infections that cultured positive for MRSA. League officials and the NFL Players Association were on high alert. A few media outlets even alleged that the upcoming game between the Buccaneers and the Philadelphia Eagles on October 13 could be postponed or canceled, before an independent physician's investigation ultimately cleared the team and the facility in Tampa.[1]

Outside of pro football, reports of MRSA outbreaks at schools from New Jersey to Michigan also have made recent headlines.[2,3]

Of course, the concern over MRSA is the pathogen's resistance—not only to methicillin, which is arguably an infrequently used drug, but also to many other mainstream antibiotics. For this reason, both major news outlets and laymen alike have begun to use the less specific but more descriptive moniker "multidrug-resistant" or "medicine-resistant" *Staph. aureus* when referring to MRSA. Images of purulent, necrotic skin lesions and reports of temporary closures of public facilities have fueled awareness of this health concern—occasionally bordering on paranoia.

MRSA in Eye Care

For eye care practitioners, MRSA's peak exposure came between 2007 and 2010. A variety of articles on the ocular implications of MRSA appeared in academic journals and trade publications during that time. For example, *Review* published an article entitled "Win the Battle Against MRSA" in February 2009, which discussed the alarming increase in MRSA prevalence during the previous years—including instances of MRSA-related conjunctivitis and post-LASIK keratitis.[4]



For ocular infections that appear unresponsive to conventional antibiotics, be sure to consider MRSA.

Results of the Ocular TRUST (Tracking Resistance in the US Today) study suggested that even some of that era's most efficacious ophthalmic antibiotics—the fluoroquinolones, including levofloxacin, gatifloxacin and moxifloxacin—might not be effective at treating MRSA infections, demonstrating up to 82% in vitro resistance.[5] Interestingly, the drug trimethoprim (available topically in the US only in combination with polymyxin B) emerged as the single most potent agent against MRSA, with just 5% of isolates exhibiting resistance.[5] Shockingly, tobramycin was the next most active drug, with up to 50% resistance.[5]

In an effort to remain diligent against resistant bacteria, culturing of infections and multidrug therapy became more common—especially in the management of bacterial keratitis. But, two facts kept the eye care community from being swept into a state of panic:

- The emergence and recognition of a far less virulent strain—"community-acquired" MRSA (CA-MRSA)—which was shown to be more prevalent than the historically ominous "hospital-acquired" (HA-MRSA).
- The notion that the vast majority of ocular MRSA infections were superficial and non-sight threatening, with nearly 80% of cases taking the form of blepharoconjunctivitis.[6]

ARMOR Study

The results of the ARMOR (Antibiotic Resistance Monitoring in Ocular Microorganisms) study, which continued the trend of tracking antibiotic susceptibility in ocular isolates, were published in 2011.[7] In that report, the authors found methicillin resistance in 39% of *S. aureus* isolates. More alarmingly, nearly 80% of these MRSA strains also were determined to be ciprofloxacin-resistant.[7]

However, ARMOR yielded some surprising data about one of the newer ophthalmic fluoroquinolones

References
1. Christensen MT, Blackie CA, Korb DR, et al. An evaluation of the performance of a novel lubricant eye drop. Poster D692 presented at: The Association for Research in Vision and Ophthalmology Annual Meeting; May 2-6, 2010; Fort Lauderdale, FL. **2.** Davitt WF, Bloomenstein M, Christensen M, et al. Efficacy in patients with dry eye after treatment with a new lubricant eye drop formulation. *J Ocul Pharmacol Ther.* 2010;26(4):347-353. **3.** Data on file, Alcon. **4.** Wojtowica JC., et al. Pilot, Prospective, Randomized, Double-masked, Placebo-controlled Clinical Trial of an Omega-3 Supplement for Dry Eye. *Cornea* 2011:30(3) 308-314. **5.** Geerling G., et al. The International Workshop on Meibomian Gland Dysfunction: Report of the Subcommittee on Management and Treatment of Meibomian Gland Dysfunction. IOVS 2011:52(4).

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that was not evaluated in the Ocular TRUST study—besifloxacin. It seems that the minimum inhibitory concentrations (MICs) were far lower for besifloxacin with regard to MRSA than for any other topical fluoroquinolones tested. Besifloxacin was found to be eight times more potent than moxifloxacin and 64 times more potent than ciprofloxacin against MRSA, based upon MIC_{90} values.[7]

A more recent study corroborates the findings from ARMOR, noting that besifloxacin's potency (based upon MIC_{90} values) was four to eight times greater than moxifloxacin and 16 to 32 times greater than ciprofloxacin for various fluoroquinolone-resistant strains of MRSA.[8] In fact, of the six drugs tested against besifloxacin (azithromycin, ciprofloxacin, gentamicin, moxifloxacin, trimethoprim and vancomycin), only vancomycin—the current "gold-standard" for treating MRSA—had consistently lower MICs.[8]

Other Published Reports

Several recently published retrospective, observational studies revealed some interesting trends regarding this pathogen. Researchers in Taiwan reviewed the charts of patients with culture-proven *S. aureus* ocular infections over a 10-year period (1999-2008).[9] Of the 519 individuals identified, 274 (52.8%) had MRSA; of these, 66.1% were CA-MRSA and 33.9% were HA-MRSA. However, the ratio of CA-MRSA to HA-MRSA was not stable.

In 2002, less than half of the cases (46.7%) were CA-MRSA, yet by 2008 nearly 89% were CA-MRSA. The most common infection caused by CA-MRSA was defined as "lid disorder" (i.e., cellulitis, lid abscess or hordeolum), followed by keratitis, conjunctivitis and lacrimal system disorder. For HA-MRSA, keratitis was most common (50.5% of cases), followed by lid disorder, conjunctivitis, wound infection and endophthalmitis.

Researchers studying a pediatric population in northern California identified 137 ocular and periocular infections between 2002 and 2009 involving culture-proven MRSA.[10] Similar to the Taiwanese study, more than half of the infections (58%) were classified as CA-MRSA. In addition, lid disorders were present in 44% of cases, followed closely by conjunctivitis (40%), and less commonly by dacryocystitis (11%) and brow abscess (3%). Interestingly, zero cases of keratitis were observed in this study.

An effort to identify new ophthalmic medications for the treatment of MRSA infections continues, but both the costs and regulatory processes associated with new drug development in the US are extreme. In Japan, a 1% formulation of vancomycin ophthalmic ointment was shown to be effective in treating fluoroquinolone-resistant ocular infections that were culture-positive for MRSA.[11]

In addition, topical chloramphenicol still shows great activity against MRSA.[12,13] Unfortunately, however, chloramphenicol has not been commercially available in the US since the early 1980s. For those doctors who wish to use them, both topical ophthalmic vancomycin and chloramphenicol may be obtained from a compounding pharmacist, such as Leiter's in San Jose, CA (www.leiterrx.com).

While MRSA remains an intimidating public health concern, optometrists needn't be fearful. First, only a very small minority of ocular infections in typical outpatient settings are caused by MRSA. Second, of these infections, an even smaller percentage will cause sight-threatening presentations like keratitis or endophthalmitis. Third, the majority of contemporary MRSA infections are community acquired—a strain that is highly susceptible to more commonly prescribed antibiotics, including fluoroquinolones such as besifloxacin. Finally, ocular infections that fail to respond to first-line antibiotics may be effectively treated in most cases with adjunctive agents, including topical polymyxin-B/trimethoprim, chloramphenicol and vancomycin. When in doubt, obtain cultures and manage the patient accordingly. ■

1. Wilson R. Eagles-Buccaneers game a go despite latest MRSA outbreak. CBSSports.com Available at: www.cbssports.com/nfl/eye-on-football/24072908/eagles-buccaneers-game-a-go-despite-latest-mrsa-outbreak. Accessed October 27, 2013.
2. Loder S. MRSA case identified at central elementary school in Wall. Asbury Park Press. Available at: www.app.com/article/20131008/NJNEWS15/310080070/MRSA-case-identified-Central-Elementary-School-Wall. Accessed October 27, 2013.
3. Stables T. Second case of MRSA reported at Northville High School. Detroit Free Press. Available at: www.freep.com/article/20130924/NEWS03/309240062/MRSA-case-Northville-High-School. Accessed October 27, 2013
4. Dunbar MT, Parker JS. Win the battle against MRSA. Rev Optom. 2009 Feb;146(2):69-74.
5. Asbell PA, Colby KA, Deng S, et al. Ocular TRUST: nationwide antimicrobial susceptibility patterns in ocular isolates. Am J Ophthalmol. 2008 Jun;145(6):951-8.
6. Solomon R, Donnenfeld ED, Perry HD, et al. Methicillin-resistant *Staphylococcus aureus* infectious keratitis following refractive surgery. Am J Ophthalmol 2007 Apr; 143(4):629-34.
7. Haas W, Pillar CM, Torres M, et al. Monitoring antibiotic resistance in ocular microorganisms: results from the Antibiotic Resistance Monitoring in Ocular Microorganisms (ARMOR) 2009 surveillance study. Am J Ophthalmol. 2011 Oct;152(4):567-74.
8. Miller D, Chang JS, Flynn HW, Alfonso EC. Comparative in vitro susceptibility of besifloxacin and seven comparators against ciprofloxacin- and methicillin-susceptible/nonsusceptible staphylococci. J Ocul Pharmacol Ther. 2013 Apr;29(3):339-44.
9. Hsiao CH, Chuang CC, Tan HY, et al. Methicillin-resistant *Staphylococcus aureus* ocular infection: a 10-year hospital-based study. Ophthalmology. 2012 Mar;119(3):522-7.
10. Amato M, Pershing S, Walvick M, Tanaka S. Trends in ophthalmic manifestations of methicillin-resistant *Staphylococcus aureus* (MRSA) in a northern California pediatric population. J AAPOS. 2013 Jun;17(3):243-7.
11. Sotozono C, Fukuda M, Ohishi M, et al. Vancomycin Ophthalmic Ointment 1% for methicillin-resistant *Staphylococcus aureus* or methicillin-resistant *Staphylococcus epidermidis* infections: a case series. BMJ Open. 2013 Jan 29;3(1). pii: e001206.
12. Elsahn AF, Yildiz EH, Jungkind DL, et al. In vitro susceptibility patterns of methicillin-resistant *Staphylococcus aureus* and coagulase-negative *Staphylococcus* corneal isolates to antibiotics. Cornea. 2010 Oct;29(10):1131-5.
13. Walvick MD, Amato M. Ophthalmic methicillin-resistant *Staphylococcus aureus* infections: sensitivity and resistance profiles of 234 isolates. J Community Health. 2011 Dec;36(6):1024-6.

Jetrea: Outcome Projections

Are we able to determine exactly which patients are more likely to experience symptom resolution following treatment? **By Diana L. Shechtman, OD, and Paul M. Karpecki, OD**

A 60-year-old white male returned to the clinic with a chief complaint of visual disturbances in his right eye. His ocular and medical histories were unremarkable.

Best-corrected visual acuity at distance measured 20/25 OU. Slit lamp evaluation was unremarkable, revealing only very mild brunescence of both crystalline lenses. With the exception of positive metamorphopsia in his right eye, all preliminary testing was within normal limits OU.

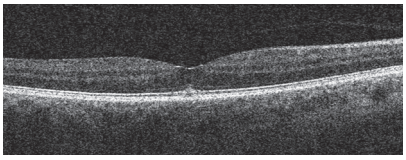
Dilated fundus examination revealed a small, cyst-like elevation OD. Spectral-domain optical coherence tomography (SD-OCT) confirmed the presence of vitreomacular traction OD that was associated with a small vitreomacular base attachment (*figure 1*).

Could this patient potentially benefit from a Jetrea (ocriplasmin, ThromboGenics) injection?

What is VMA?

Vitreous liquefaction results in the separation of the posterior vitreous cortex from the superficial retina. The resultant posterior vitreous detachment (PVD) may remain partially attached to the macula. In turn, residual attachment may lead to vitreomacular adhesion (VMA), which is associated with several maculopathies, including tears and holes.

Vitreomacular adhesion is characterized as an incomplete detachment of the posterior vitreous hyaloid with persistent adherence to the macula.[1] The natural course of VMA is unpredictable. Some cases self-resolve,



1. Would Jetrea be appropriate for this vitreomacular traction patient?

while others progress and eventually cause further structural damage. Many patients who present with VMA exhibit visual acuity disruption or vision loss.

The management of VMA typically is limited to close observation or surgery. Pars plana vitrectomy (PPV) still is regarded as the conventional treatment approach for patients with VMA. Although PPV is associated with resolution of the localized vitreomacular attachment, the procedure may yield numerous adverse effects, including cataract formation, infections and retinal detachment. Thus, PPV typically is reserved for individuals with progressive VMA or those with associated vision loss—which leaves a number of symptomatic patients with unmet needs.

Jetrea: An Alternative to PPV

In October 2012, Jetrea received FDA approval for the treatment of symptomatic VMA. The injection is comprised of microplasmin, an active protease derived from plasmin, which induces vitreous liquefaction and subsequent lysing of the posterior vitreous cortex from the vitreoretinal interface.[2,3]

Jetrea's approval was secured upon publication of clinical data from the Microplasmin for Intravitreous Injection-Traction Release without Surgical Treatment (MIVI-TRUST) study.[4-6] More than 600 subjects with VMA participated in the MIVI-TRUST study. Approximately two-thirds of the patients received a 125µg intravitreal microplasmin injection, and the remaining participants received a sham injection.

The study results indicated that 26.5% of the treated subjects exhibited VMA resolution, which was associated with a complete PVD. By comparison, just 10.1% of the sham treatment group achieved a complete PVD.[6] Further, twice as many patients in the treatment arm experienced improved visual acuity than those in the placebo group.

Additionally, the MIVI-TRUST study had an excellent overall safety record. Patients enrolled in the treatment group experienced only mild adverse effects, associated with localized injections, including floaters, photopsia and eye pain.[6]

A Forecast for Success?

Since its approval, Jetrea has been shown to effectively resolve VMA associated with a complete PVD. A recent publication described the initial clinical experience in a single eye center.[6] In this retrospective review, researchers administered intravitreal injections of Jetrea to 19 patients who exhibited a variety of clinical presentations secondary to VMA. The patients' ages ranged from 57 to 81 years.

After a mean follow-up of 56 days, approximately 40% of patients dem-

onstrated alleviation of the vitreoretinal traction, as well as a modest overall improvement in visual acuity.[6] Additionally, half of the patients who initially presented with an associated macular hole experienced complete closure following Jetrea injection.[6] It is important to reiterate that the aforementioned study was limited to just 19 patients.

Other studies have indicated that baseline features can predict the success of Jetrea injection.[7,8] For example, a retrospective analysis of patients who participated in the MIVI-TRUST study was presented at the 2012 Annual Meeting of the American Academy of Ophthalmology in Chicago.[8] More than 460 patients treated with Jetrea were evaluated. The positive independent baseline features related to VMA resolution included anatomical features, such as phakia, smaller VMA attachment diameter, presence of concomitant macular hole and absence of epiretinal membrane, as well as individual factors, such as age.[8]

Optimized patient outcomes following Jetrea injection may require a thorough clinical evaluation for pertinent baseline findings. Only then will you have a reasonable idea whether an individual's prognosis for VMA resolution and subsequent visual recovery is favorable. ■

Dr. Shechtman is a member of Thrombogenics' optometric advisory board. Neither she nor Dr. Karpecki have direct financial interest in any of the products mentioned.

1. Smiddy WE, Green WR, Michels RG, de la Cruz Z. Ultrastructural studies of vitreomacular traction syndrome. Am J Ophthalmol. 1989 Feb 15;107(2):177-85.
2. Stalmans P. A randomized, double-masked, clinical trial of microplasmin intravitreal injection for nonsurgical treatment of vitreomacular traction. Presented at the Annual Meeting of the American Society of Retinal Specialists. Palm Spring, Calif. December 2007.
3. Gandorfer A, Rohledder M, Sethi C, et al. Posterior vitreous detachment induced by microplasmin. Invest Ophthalmol Vis Sci. 2004 Feb;45(2):641-7.
4. Jumper J, Pakola S. The MIVI-007 trial. Phase III evaluation of single intravitreous injection of microplasmin or placebo for treatment of focal vitreomacular adhesion. Paper presented at the American Society of Retina Specialists; August 31, 2010; Vancouver, BC.
5. Packo K, Pakola S. The MIVI-006 trial. Phase III evaluation of single intravitreous injection of microplasmin or placebo for treatment of focal vitreomacular adhesion. Paper presented at the Annual Meeting of the American Society of Retina Specialists. Vancouver, BC. August, 2010.
6. Stalmans P, Benz MS, Gandorfer A. Enzymatic vitreolysis with ocriplasmin for vitreomacular traction and macular holes. N Engl J Med. 2012 Aug 16;367(7):606-15.
7. Kim BT. Initial outcome following intravitreal ocriplasmin for treatment of symptomatic vitreomacular adhesion. Ophthalmic Surg Lasers Imaging Retina. 2013 Jul-Aug;44(4):334-43.
8. Ray S. Baseline anatomic features predictive of pharmacologic vitreomacular adhesion resolution in the phase III ocriplasmin clinical trial program. Presented at the American Academy of Ophthalmology Retinal Subspecialty Day. Chicago. November, 2012.

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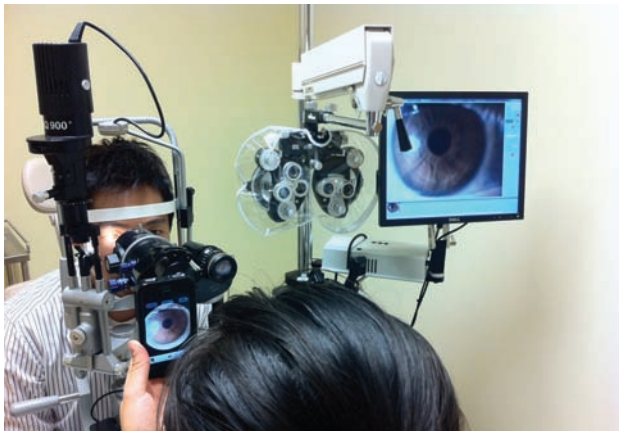

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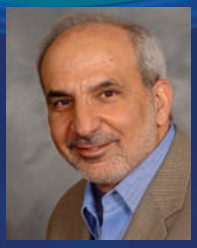

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I look forward to seeing you in Newport Beach!
Murray Fingeret, OD

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November 2013

■ **22-24.** *New Technology & Treatments East Coast.* Westin, Alexandria, Va. Hosted by: *Review of Optometry*. CE hours: 15. Program chair: Paul Karpecki, OD. Faculty: Derek Cunningham, OD; Douglas Devries, OD; Joseph Sowka, OD. Contact Lois DiDomenico at ReviewMeetings@Jobson.com or (866) 658-1772. Visit www.revoptom.com/conferences.

December 2013

■ **2-6.** *World Diabetes Congress.* Melbourne Convention and Exhibition Centre, Melbourne, Australia. Hosted by: International Diabetes Federation. For more information, email cmenet@jhmi.edu or call (305) 326-6110. Visit www.hopkinscme.edu.

■ **5-7.** *Johns Hopkins 26th Current Concepts in Ophthalmology.* WTurner Auditorium, Johns Hopkins University School of Medicine, Baltimore, Md. CE hours: 20. Hosted by: Johns Hopkins University School of Medicine. For more information, email wdc@idf.org. Visit www.worlddiabetescongress.org.

■ **7.** *Ophthalmic Imaging 2014: Optical Coherence Tomography Applications and Future Technology.* The Breakers, Palm Beach, Fla. Hosted by: Bascom Palmer Eye Institute. For more information, email bpeicme@med.miami.edu or call (305) 326-6110. Visit www.bascompalmer.org.

■ **7-8.** *30th Annual Cornea, Contact Lens & Contemporary Vision Care Symposium.* Westin Memorial City, Houston, Texas. Hosted by: University of Houston College of Optometry. CE hours: 16. For more information, email optce@uh.edu or visit http://ce.opt.uh.edu.

■ **8.** *VOSH of New England CE for Opticians & Paraoptometrics.* The New England College of Optometry, Boston. Hosted by: Volunteer Optometric Services to Humanity. For more information, email RhodyParas@gmail.com. Visit www.VOSH-ONE.org.

■ **8-9.** *Glaucoma Grand Rounds with Live Patients.* Marshall B. Ketchum University/SCCO, Fullerton, Calif. Hosted by: Marshall B. Ketchum University/SCCO. For more information, email ce@ketchum.edu. Visit www.ketchum.edu/ce.

■ **13-14.** *4th Annual West Coast Optometric Glaucoma Symposium.* Fairmont Newport Beach, Calif. Program Chair: Murray Fingeret, OD. Faculty: David Friedman, OD, I. Ben Gaddie, OD, Richard Madonna, OD, Tony Realini, MD, Leo Semes, OD, and Robert Weinreb, MD. Hosted by: *Review of Optometry*. CE hours: 12. For more information, contact Lois DiDomenico at ReviewMeetings@Jobson.com. Visit www.revoptom.com/conferences.

January 2014

■ **11.** *2014 Glaucoma Symposium.* Willows Lodge, Woodinville, Wash. Hosted by: Pacific University College of Optometry. CE hours: 7. Contact Marti Fredericks at frederim@pacificu.edu or (503) 352-2929. Visit www.pacificu.edu/optometry/ce.

■ **11-12.** *Eye Care Associates Annual Meeting and Continuing Education Program.* Williamsburg Hotel, Williamsburg, Va. Hosted by: Eye Care Associates. Presenter: Scot Morris, OD. CE hours: 12. Contact Linda Cavasos at ECA_linda@hotmail.com or (804) 356-5165. Non-members are welcome.

■ **16-19.** *New Technology & Treatments in Vision Care.* The Westin Resort & Casino, Aruba. Program Chair: Paul Karpecki, OD. Faculty: Jimmy Bartlett, OD, Ben Gaddie, OD, and Kimberly Reed, OD. Hosted by: *Review of Optometry*. CE hours: 14. For more information, contact Lois DiDomenico at ReviewMeetings@Jobson.com. Visit www.revoptom.com/conferences.

■ **18-20.** *Berkeley Practicum - 25th Annual.* DoubleTree Hotel, Berkeley Marina, Berkeley, Calif. Hosted by: University of California, Berkeley, School of Optometry. CE hours: 20. For more information, email optoCE@berkeley.edu. Visit http://optometry.berkeley.edu/ce/berkeley-practicum.

■ **19-25.** *2014 Island Eyes Conference.* Grand Wailea, Maui, Hawaii. Hosted by: Pacific University College of Optometry. For more information, contact Jeanne Oliver at jeanne@pacificu.edu or (503) 352-2740. Visit www.pacificu.edu/optometry/ce.

■ **24.** *2014 Winter CE.* PCLI, Pearl District, Portland, Ore. Hosted by: Oregon Optometric Physicians Association. CE hours: 8. For more information, email lynne@oregonoptometry.org. Visit www.oregonoptometry.org.

■ **30-February 3.** *Women of Optometry Spa Cruise.* Celebrity Constellation, Bahamas. Hosted by: AEA Cruises Optometric Cruise Seminars. For more information, email aeacruises@aol.com. Visit www.OptometricCruiseSeminears.com.

February 2014

■ **8-9.** *Mid Winter CE Meeting 2014.* New Orleans Marriott, New Orleans. Hosted by: Optometry Association of Louisiana. For more information, email optla@bellsouth.net. Visit www.optla.org.

■ **9-10.** *2014 Advocacy Boot Camp & Free CE.* Salem Conference Center/Grand Hotel, Salem, Ore. Hosted by: Oregon Optometric Physicians Association. For more information, email lynne@oregonoptometry.org. Visit www.oregonoptometry.org.

■ **14-16.** *53rd Annual Heart of America Contact Lens and Primary Care Congress.* Sheraton Kansas City Hotel at Crown Center, Kansas City, Mo. Hosted by: Heart of America Contact Lens Society. For more information, email registration@the-hoacls.org. Visit www.hoacls.org.

■ **27-March 1.** *2014 Winter Educational Symposium.* Huntley Lodge, Big Sky, Mont. Hosted by: Montana Optometric Association. Faculty: Blair Lonsberry, OD, Christopher Wolfe, OD. CE hours: 13. For more information, email sweingartner@rmsmanagement.com. Visit www.mteyes.com.

■ **28-March 1.** *2014 Third Party/Practice Management Seminar.* Eugene Hilton, Eugene, Ore. Hosted by: Oregon Optometric Physicians Association. For more information, email lynne@oregonoptometry.org. Visit www.oregonoptometry.org.

Meetings + Conferences

March 2014

■ **12-16.** *SECO International 2014.* Building A, Georgia World Congress Center, Atlanta. CE hours: 400+. Contact cweems@secostaff.com. Visit www.seco2014.com.

■ **22-23.** *Spring Conference.* Nova Southeastern University Ft. Myers Campus, Ft. Myers, Fla. Hosted by: Nova Southeastern University. Contact oceaa@nova.edu. Visit http://optometry.nova.edu/ce/index.html.

April 2014

■ **19-20.** *2014 MOS Primary Care Spring Symposium.* Cincinnati Marriott Northeast, Mason, Ohio. Hosted by: The MidWest Optometric Society and The Ohio State University College of Optometry. For more information, contact Marci at (513) 321-2020. Visit www.midwestoptometricsociety.com.

■ **24-27.** *Arkansas Optometric Association Spring Convention.* The Peabody, Little Rock, Ark. Hosted by: Arkansas Optometric Association. For more information, email aroa@arkansasoptometric.org. Visit www.arkansasoptometric.org.

May 2014

■ **2.** *Berkeley Glaucoma Day - 2nd Annual.* DoubleTree Hotel, Berkeley Marina, Berkeley, Calif. Hosted by: University of California, Berkeley, School of Optometry. For more information, email optoCE@berkeley.edu.

■ **2-3.** *Educational Meeting 2014.* Mission Inn, Howey-in-the-Hills, Fla. Hosted by: Florida Chapter of the American Academy of Optometry. Featured speakers: Leo Semes, OD, Albert Woods, OD, and Tim Underhill, OD. CE hours: 10. Contact Arthur T. Young, OD, at eyeguy4123@msn.com.

■ **3-4.** *Morgan Symposium - 29th Annual.* DoubleTree Hotel, Berkeley Marina, Berkeley, Calif. Hosted by: University of California, Berkeley, School of Optometry. For more information, email optoCE@berkeley.edu. Visit http://optometry.berkeley.edu/ce/morgan-symposium.

August 2014

■ **1-3.** *Annual Educational Retreat 2014.* South Seas Island Resort, Sanibel Island, Fla. Hosted by: South West Florida Optometric Association. Featured speakers: Ben Gaddie, OD, Carlo Pelino, OD, April Jasper, OD, and Ron Foreman, OD. CE hours: 18. Contact Brad Middaugh, OD, at swfoa@att.net or (239) 481-7799. Visit www.swfoa.com.

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The iStent: Small Wonder

A relatively simple addition to the cataract procedure allows surgeons to also lower IOP at the same time. **By Constance O. Okeke, MD, MSCE**

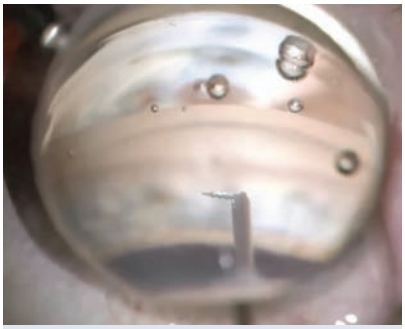
The iStent (Glaukos), one of the newer options for minimally invasive glaucoma surgery, has become increasingly popular for my glaucoma patients who concurrently suffer from visually significant cataracts. Unlike the Trabectome (Neomedix), which can be performed as a stand-alone procedure, the iStent is only approved for combined cataract and early to moderate open-angle glaucoma.

This 1mm titanium implant, which resembles a snorkel, is the smallest FDA-approved device to be put into the human body. Conceptually similar to a cardiac stent, the iStent serves as a bypass through the trabecular meshwork to improve aqueous outflow. Clinical results up to two years post-implantation show a 20% to 33% decrease in IOP from baseline.

This procedure is a great option for patients ready to have cataract surgery who also have early to moderate open-angle glaucoma. Ideal candidates are those already on one to three glaucoma drugs, whose IOP targets are in the mid-teen range, have compliance issues and/or want to decrease the burden of drops for managing their glaucoma.

My Approach

Prior to the cataract extraction, proper head positioning is performed and an adequate view of the angle anatomy with a gonio lens is confirmed. I will then make a 1.4mm temporal corneal incision with a 15-degree blade, then I fill the anterior chamber with viscoelastic.



Go to www.revoptom.com or scan the QR code at left to see video footage of the implantation procedure.

The iStent inserter is advanced across the anterior chamber and, with the magnified view of a gonioprism, the iStent is then implanted through the trabecular meshwork and secured into Schlemm's canal. There is typically an egress of heme from Schlemm's canal, indicating proper placement.

Once completed, I will proceed to my cataract extraction and IOL implantation. At the end of the surgery, the corneal wounds are hydrated for a watertight seal as would be performed in cataract surgery alone; typically, no sutures are necessary.

Pros and Cons

This procedure has several advantages. First, when compared to traditional glaucoma surgical procedures, it's minimally invasive, with a faster operative time, more rapid healing and fewer complications. There is no penetration or disturbance of the conjunctiva, allowing for future conventional glaucoma surgeries if needed. Since the site of surgery is ab interno, there is no astigmatic change, no bleb to cause ocular surface irritation or a chronic surgical site to pose a life-long risk of infection. Also, the procedure is contact lens wearer-friendly.

That said, this procedure does have some disadvantages. The iStent indication is limited to implantation in combination with cataract surgery, as opposed to a stand-alone procedure. Although the implant is very small, placing a foreign object into the eye does introduce the potential risk of intraoperative complications, e.g., if the device is malpositioned and the tip becomes occluded by iris or if the device becomes dislodged. Postoperatively, there can be IOP spikes and hyphema. Also, because it is a fairly new procedure, it is considered experimental and not currently covered by many commercial insurances, although it does have excellent Medicare coverage.

Preoperatively, candidates require a full glaucoma and cataract work up with ancillary testing (pachymetry, visual field, RNFL analysis, K readings, axial length, etc.). Blood thinners should be stopped preoperatively if possible. Post-op care is the same as traditional cataract surgery. Patients should be informed that their vision may be blurred for the first few days due to the mild bleeding during the surgery. ■

Dr. Okeke is a glaucoma specialist at Virginia Eye Consultants and an assistant professor at Eastern Virginia Medical School.

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Diagnostic **Quiz**

Too Much Progress?

By Andrew S. Gurwood, OD

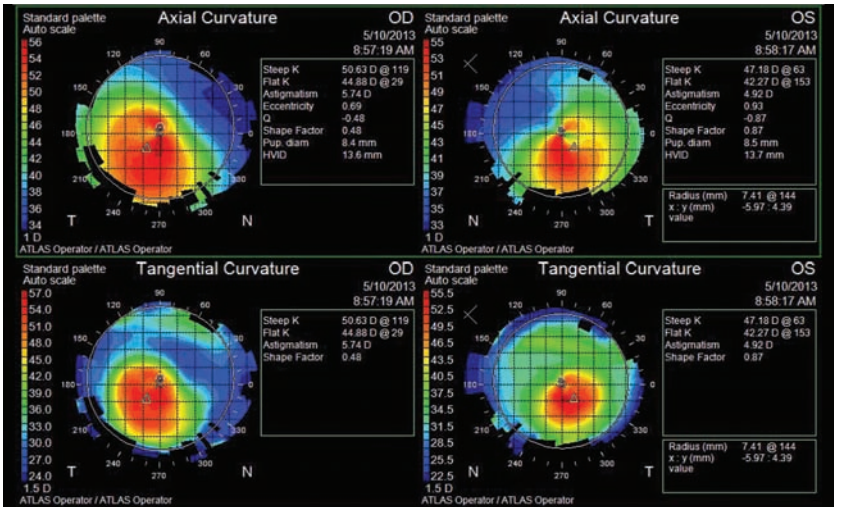
History

A 27-year-old white male reported to the office with a chief complaint of reduced vision in both eyes that had persisted for one month. Specifically, the patient explained that he noticed progressively worsening cloudiness and reduced visual clarity OU. His ocular and systemic histories were unremarkable. He reported no known allergies.

Diagnostic Data

His best-corrected entering visual acuity was 20/60 OD and 20/70 OS at distance and near (no improvement upon pinhole testing). His external examination was normal, with no evidence of afferent pupillary defect.

Slit-lamp examination of the anterior segment was normal, revealing no trace of iris neovascularization OU. We documented no peripheral pathologies in either eye. Intraocular pressure measured 15mm Hg OU.



Topography scan of our 27-year-old patient who complained of reduced vision OU.

The pertinent clinical findings are illustrated in the photograph.

Your Diagnosis

How would you approach this case? Does the patient require any additional tests? What is your diagnosis? How would you manage this patient? What is the likely prognosis?

To find out, please visit www.revoptom.com. Click on the cover icon for this month's issue, and then click "Diagnostic Quiz" under the table of contents. ■

Thanks to Chantel Garcia, OD, of Chevy Chase Md., and Todd Dimmick, OD, of Melbourne, Fla., for their contributions to this case.

Retina Quiz Answers *(from page 80):* 1) d; 2) c; 3) a; 4) b; 5) a.

Next Month in the Mag

December features our 15th Annual Diabetes Report.
Topics include:

- *An Ounce of Prevention: Nutritional Supplements for DR*
- *Current Medical and Surgical Treatments for DME*
- *How Does Telemedicine Help Improve Diabetes Care?*

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References: 1. Dumbleton KA, Richter D, Jones LW. Compliance with lens replacement and the interval between eye examinations. *Optom Vis Sci.* 2012;89 (E-abstract 120059). **2.** Dumbleton K, Woods C, Jones L, et al. Patient and practitioner compliance with silicone hydrogel and daily disposable lens replacement in the United States. *Eye & Contact Lens.* 2009;35(4):164-171. **3.** Yeung KK, Forister JFY, Forister EF, et al. Compliance with soft contact lens replacement schedules and associated contact lens–related ocular complications: The UCLA Contact Lens Study. *Optometry.* 2010; 81(11):598-607. **4.** Dumbleton K, Woods C, Jones L, et al. Comfort and Vision with Silicone Hydrogel Lenses: Effect of Compliance. *Optom Vis Sci.* 2010;87(6):421-425.

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