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US-LAS-220012 02/22

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HOW TO CAPITALIZE ON OPTOMETRIC SCOPE

This four-part series describes where things stand and the steps you should take to add new services.

This month: incisions and injections, p. 32
June: lasers • July: glaucoma • August: oral meds
INDICATION
Upneeq® (oxymetazoline hydrochloride ophthalmic solution), 0.1% is indicated for the treatment of acquired blepharoptosis in adults.

IMPORTANT SAFETY INFORMATION
WARNINGs AND PRECAUTIONS
• Ptosis may be associated with neurologic or orbital diseases such as stroke and/or cerebral aneurysm, Horner syndrome, myasthenia gravis, external ophthamoplegia, orbital infection and orbital masses. Consideration should be given to these conditions in the presence of acquired ptosis with decreased levator muscle function and/or other neurologic signs.
• Alpha-adrenergic agonists as a class may impact blood pressure. Advise Upneeq patients with cardiovascular disease, orthostatic hypotension, and/or uncontrolled hypertension or hypotension to seek medical care if their condition worsens.
• Use Upneeq with caution in patients with cerebral or coronary insufficiency or Sjögren’s syndrome. Advise patients to seek medical care if signs and symptoms of potentiation of vascular insufficiency develop.
• Upneeq may increase the risk of angle closure glaucoma in patients with untreated narrow-angle glaucoma. Advise patients to seek immediate medical care if signs and symptoms of acute narrow-angle glaucoma develop.
• Patients should not touch the tip of the single patient-use container to their eye or to any surface, in order to avoid eye injury or contamination of the solution.

ADVERSE REACTIONS
Adverse reactions that occurred in 1-5% of subjects treated with Upneeq were punctate keratitis, conjunctival hyperemia, dry eye, blurred vision, instillation site pain, eye irritation, and headache.

DRUG INTERACTIONS
• Alpha-adrenergic agonists, as a class, may impact blood pressure. Caution in using drugs such as beta blockers, anti-hypertensives, and/or cardiac glycosides is advised. Caution should also be exercised in patients receiving alpha adrenergic receptor antagonists such as in the treatment of cardiovascular disease, or benign prostatic hypertrophy.
• Caution is advised in patients taking monoamine oxidase inhibitors which can affect the metabolism and uptake of circulating amines.
The only FDA-approved prescription eyedrop proven to lift upper eyelids in adults with acquired blepharoptosis (low-lying lids)¹

After Upneeq—Hour 2

Images are of actual patients. Individual results may vary. Average upper eyelid lift with Upneeq in clinical trials was 1 mm.²


Now available to sell in your practice!* Sign up now at https://upneeq.rvlpharma.com/signup

*Some states may not participate.

To report SUSPECTED ADVERSE REACTIONS or product complaints, contact RVL Pharmaceuticals at 1-877-482-3788. You may also report SUSPECTED ADVERSE REACTIONS to the FDA at 1-800-FDA-1088 or www.fda.gov/medwatch.

Please see next page for Brief Summary of full Prescribing Information.
UPNEEQ® (oxymetazoline hydrochloride ophthalmic solution), 0.1%, for topical ophthalmic use

BRIEF SUMMARY: The following is a brief summary only; see full Prescribing Information at https://www.upneeq.com/Upneeq-Pi.pdf for complete information.

1 INDICATIONS AND USAGE
UPNEEQ is indicated for the treatment of acquired blepharoptosis in adults.

2 DOSAGE AND ADMINISTRATION
Contact lenses should be removed prior to instillation of UPNEEQ and may be reinserted 15 minutes following its administration. If more than one topical ophthalmic drug is being used, the drugs should be administered at least 15 minutes between applications.

4 CONTRAINDICATIONS
None.

5 WARNINGS AND PRECAUTIONS
5.1 Ptosis as Presenting Sign of Serious Neurologic Disease
Ptosis may be associated with neurologic or orbital diseases such as stroke and/or cerebral aneurysm, Horner syndrome, myasthenia gravis, external ophthalmoplegia, orbital infection and orbital masses. Consideration should be given to these conditions in the presence of ptosis with decreased levator muscle function and/or other neurologic signs.

5.2 Potential Impacts on Cardiovascular Disease
Alpha-adrenergic agonists may impact blood pressure. UPNEEQ should be used with caution in patients with severe or unstable cardiovascular disease, orthostatic hypotension, and uncontrolled hypertension or hypotension. Advise patients with cardiovascular disease, orthostatic hypotension, and/or uncontrolled hypertension/ hypotension to seek immediate medical care if their condition worsens.

5.3 Potentiation of Vascular Insufficiency
UPNEEQ should be used with caution in patients with cerebral or coronary insufficiency, or Sjögren’s syndrome. Advise patients to seek immediate medical care if signs and symptoms of potentiation of vascular insufficiency develop.

5.4 Risk of Angle Closure Glaucoma
UPNEEQ may increase the risk of angle closure glaucoma in patients with untreated narrow-angle glaucoma. Advise patients to seek immediate medical care if signs and symptoms of acute angle closure glaucoma develop.

5.5 Risk of Contamination
Patients should not touch the tip of the single patient-use container to their eye or to any surface, in order to avoid eye injury or contamination of the solution.

6 ADVERSE REACTIONS
6.1 Clinical Trials Experience
Because clinical trials are conducted under widely varying conditions, adverse reaction rates observed in the clinical trials of another drug and may not reflect the rates observed in practice. A total of 360 subjects with acquired blepharoptosis were treated with UPNEEQ once daily in each eye for at least 6 weeks in three controlled Phase 3 clinical trials, including 203 subjects treated with UPNEEQ for 6 weeks and 157 subjects treated with UPNEEQ for 12 weeks. Adverse reactions that occurred in 1-5% of subjects treated with UPNEEQ were punctate keratitis, conjunctival hyperemia, dry eye, blurred vision, instillation site pain, eye irritation, and headache.

7 DRUG INTERACTIONS
7.1 Anti-hypertensives/Cardiac Glycosides
Alpha-adrenergic agonists, as a class, may impact blood pressure. Caution in using drugs such as beta-blockers, anti-hypertensives, and/or cardiac glycosides is advised. Caution should also be exercised in patients receiving alpha adrenergic receptor antagonists such as in the treatment of cardiovascular disease, or benign prostatic hypertrophy.

7.2 Monoamine Oxidase Inhibitors
Caution is advised in patients taking MAO inhibitors which can affect the metabolism and uptake of circulating amines.

8 USE IN SPECIFIC POPULATIONS
8.1 Pregnancy
Risk Summary
There are no available data on UPNEEQ use in pregnant women to inform a drug-associated risk for major birth defects and miscarriage. In animal reproduction studies, there were no adverse developmental effects observed after oral administration of oxymetazoline hydrochloride in pregnant rats and rabbits at systemic exposures up to 7 and 278 times the maximum recommended human ophthalmic dose (MRHOD), respectively, based on dose comparison. [see Data]. The estimated background risks of major birth defects and miscarriage for the indicated population are unknown. All pregnancies have a background risk of birth defect, loss, or other adverse outcomes. In the U.S. general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2-4% and 15-20%, respectively.

Data
Animal Data
Effects on embryo-fetal development were evaluated in rats and rabbits following oral administration of oxymetazoline hydrochloride during the period of organogenesis. Oxymetazoline hydrochloride did not cause adverse effects to the fetus at oral doses up to 0.2 mg/kg/day in pregnant rats during the period of organogenesis (28 times the MRHOD, on a dose comparison basis). Oxymetazoline hydrochloride did not cause adverse effects to the fetus at oral doses up to 1 mg/kg/day in pregnant rabbits during the period of organogenesis (278 times the MRHOD, on a dose comparison basis). Maternal toxicity, including decreased maternal body weight, was produced at the high dose of 1 mg/kg/day in pregnant rabbits and was associated with findings of delayed skeletal ossification. In a rat prenatal and postnatal development study, oxymetazoline hydrochloride was orally administered to pregnant rats once daily from gestation day 6 through lactation day 20. Maternal toxicity was produced at the high dose of 0.2 mg/kg/day (28 times the MRHOD, on a dose comparison basis) in pregnant rats and was associated with an increase in pup mortality and reduced pup body weights. Delayed sexual maturation was noted at 0.1 mg/kg/day (14 times the MRHOD, on a dose comparison basis). Oxymetazoline hydrochloride did not have any adverse effects on fetal development at a dose of 0.05 mg/kg/day (7 times the MRHOD, on a dose comparison basis).

8.2 Lactation
Risk Summary
No clinical data are available to assess the effects of oxymetazoline on the quantity or rate of breast milk production, or to establish the level of oxymetazoline present in human breast milk post-dose. Oxymetazoline was detected in the milk of lactating rats. The developmental and health benefits of breastfeeding should be considered along with the mother’s clinical need for UPNEEQ and any potential adverse effects on the breastfed child from UPNEEQ.

8.4 Pediatric Use
Safety and effectiveness of UPNEEQ have not been established in pediatric patients under 13 years of age.

8.5 Geriatric Use
Three hundred and fifteen subjects aged 65 years and older received treatment with UPNEEQ (n = 216) or vehicle (n = 99) in clinical trials. No overall differences in safety or effectiveness were observed between subjects 65 years of age and older and younger subjects.

10 OVERDOSAGE
Accidental oral ingestion of topical intended solutions (including ophthalmic solutions and nasal sprays) containing imidazoline derivatives (e.g., oxymetazoline) in children has resulted in serious adverse events requiring hospitalization, including nausea, vomiting, lethargy, tachycardia, decreased respiration, Bradycardia, hypotension, hypertension, sedation, somnolence, mydriasis, stupor, hypothermia, drooling, and coma. Keep UPNEEQ out of reach of children.

PATIENT COUNSELING INFORMATION
Advise the patient to read the FDA-approved patient labeling [Instructions for Use].

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Glaucoma May Get the Stem Cell Treatment

This potentially revolutionizing therapy may offer protection and restoration to the trabecular meshwork.

Current glaucoma therapies are limited to altering the eye’s intraocular pressure (IOP), but a recent article proposes another possible therapy pathway: stem cells. Glaucomatous eyes have reduced cellularity in the trabecular meshwork, which has been linked to elevated IOP in mice. The authors wrote that repairing cellularity may improve aqueous outflow, prevent retinal ganglion cell apoptosis and prevent vision loss from elevated IOP. They proposed further investigation into the use of stem cells to not only replace but also proactively protect the trabecular meshwork cells. “That could revolutionize the management of glaucoma,” they wrote.

Trabecular meshwork stem cells were first discovered in 1989 in a study that also demonstrated that these resident stem cells can be stimulated to repopulate a small area of laser-damaged tissue in human post-mortem eyes. Subsequent studies on human eyes reported that the number of trabecular meshwork stem cells decreases with age and that this decrease is likely associated with diminished cell reproduction capacity. Other in vivo mouse model studies found that these stem cells can expand in vitro and preferentially integrate in vivo into the trabecular meshwork region to become functional after transplantation.

Native trabecular meshwork cells, adipose-derived and bone marrow-derived mesenchymal stem cells and induced pluripotent stem cells can all be differentiated into trabecular meshwork-like cells and have been successfully integrated into live mouse models to generate IOP homeostasis. So far, studies indicate these cells remain stable for extended periods of time without serious side effects.

The authors noted that a human clinical study should be the next step toward developing this novel treatment. While studying larger animals first would be ideal, they say there isn’t a good animal analog of trabecular meshwork changes that occur in humans with angle-closure glaucoma. Adipose-derived mesenchymal stem cells are the prime candidate for human trials, they argue. One advantage of these cells is that they’re autologous, which would decrease the risk of immune rejection. They’re also easily obtained through minimally invasive procedures and have a low risk of tumorigenesis.

“Transplantation of human stem cells to restore trabecular meshwork function in glaucomatous eyes is a potentially vision-saving, revolutionary treatment that could impact the lives of millions,” the team wrote in their paper on the work.


IN BRIEF

Can UV-Blocking Contacts Mitigate Presbyopia? Ultraviolet radiation (UVR) is recognized as a risk factor for cataracts, pterygia and other eye health concerns, but little is known about its effect on vision. So, researchers recruited 210 pre-presbyopic patients to examine the effects of long-term UV-blocking contact lenses on multiple factors. UVR autofluorescence of the conjunctiva was not significantly affected by the UVR-blocking contact lenses. Comparing amplitude of accommodation and the stimulus response curve didn’t show a significant difference between participants who wore full UVR-blocking vs. minimal UVR-blocking lenses for the past five years or more. However, the additional amplitude of those who had worn UVR-blocking lenses was +0.25D measured objectively at 5D of accommodative demand and +0.70D measured subjectively at the average amplitude of accommodation of around 7.5D of demand. The amplitude of accommodation measured by push-up or the maximum negative powered lens that distance targets could be resolved through without debilitating blur was lower in the Hong Kong patient cohort. “As the region with the highest UVR exposure of the cohorts examined in this study, this concurs with the high incidence of presbyopia occurring at younger ages that has been reported in countries with high levels of UVR,” the authors explained.

Acommodative latency was found to be shorter in those wearing full UVR-blocking contact lenses, suggesting UVR exposure can have an impact on presbyopia. The cohort from Houston had a shorter latency, faster speed and higher step size than several other regions.

In conclusion, blocking the transmission of UVR seems beneficial in maintaining the eyes ability to focus, suggesting presbyopia may be delayed in long-term UVR-blocking contact lens wearers. These lenses also provide protection to the critical limbal region.

Hair Loss Drug Ups Risk of MGD, Ocular Surface Issues

In an effort to characterize dry eye disease (DED) in patients taking finasteride, a potent targeted anti-androgenic medication, researchers recently found an association between usage of the drug and meibomian gland dysfunction (MGD), in addition to conjunctival and corneal abnormalities. They noted that androgen-sensitive meibomian glands may be altered by anti-androgen medications, especially finasteride, given its unique potency and targeted effects compared with other anti-androgens. The team presented their findings earlier this month at the 2022 ARVO conference in Denver.

The extended case series had a mean follow-up period of 55 months. It included a retrospective chart review of 116 DED patients on finasteride seen in the Scheie Eye Institute Dry Eye Clinic at the University of Pennsylvania from 2005 through 2021 (average age: 67.9, 95% male, 86% Caucasian). Patient demographics, diagnosis, prior treatment, questionnaire data and DED clinical exam outcomes were extracted. The researchers performed statistical analysis to assess clinical characteristics and Ocular Surface Disease Index (OSDI) scores among patients on varying doses of finasteride (23 patients were taking 1mg or 2.5mg, and 93 were taking 5mg).

When comparing exam findings during the initial and follow-up exams, the latter visit saw a significantly greater percentage of patients present with MGD (62.9% vs. 85.3%), conjunctival abnormalities (21.1% vs. 41.9%) and corneal abnormalities (26.3% vs. 40.5%). Mean OSDI score was 24.4 and slightly higher in patients taking 5mg of finasteride, though this was not statistically significant. Low-dose finasteride use was associated with a greater frequency of cyclosporine use at the first (26.1% vs 6.5%) and last exams (25% vs .3.4%). Otherwise, treatment modalities were no different between the low- and high-dose groups.

“To our knowledge, this represents the largest demographic study over 15 years of DED patients on finasteride,” the study authors concluded. “This study reinforces the importance of considering the long-term effects of finasteride use on DED as part of the systemic sequelae of androgen depletion and provides anticipatory guidance for patients and ophthalmologists.”


Study Highlights Unique Impact of Hormones on KCN

The multiple factors that can contribute to the onset and progression of keratoconus, including environment, genetics and hormonal imbalances, have been well established. However, questions remain regarding the pathobiology of the condition. In a recent study, researchers sought to establish the relationship between sex hormones and their receptors and the disease process of keratoconus. They presented their findings during the 2022 ARVO conference in Denver.

To determine the interaction between major androgens/estrogens and sex hormone receptors in healthy and keratoconus corneal stromal cells, the study authors used a 3D in vitro self-assembled extracellular matrix model. The in vivo analysis measured androgen/estrogen ELISA expression before and after corneal crosslinking (CXL) among patients with keratoconus.

The authors observed significant changes between healthy corneas and those with keratoconus, as well as between males and females in the tested sex hormone receptors. Estriol and estriol stimulation among healthy women revealed significant up-regulation of the androgen receptor, progesterone receptor and estrogen receptor beta compared with men. The data also showed higher expression of estrogen receptor alpha and estrogen receptor beta in women vs. males with keratoconus.

Following CXL, DHEA sulfate levels were found to be lower while estrone and estriol levels were higher. These in vivo findings indicate this treatment affects the corneal tissue and modulates hormonal levels in the bloodstream, according to the researchers.

“Our data suggests that the human cornea is a sex-dependent and a hormone-responsive tissue. We posit that keratoconus is a systemic disease, at least initially, and is heavily dependent on systemic and local hormone alterations,” the study authors concluded.


Disulfiram Could Improve Sight in RP

Inhibiting retinoic acid synthesis with this medication, a deterrent of alcohol abuse, improves behavioral image detection in vision-impaired mice.

Rod and cone photoreceptors degenerate in retinitis pigmentosa. Downstream neurons survive and undergo physiological changes, including accelerated spontaneous firing of retinal ganglion cells (RGCs). Retinoic acid is the molecular trigger of RGC hyperactivity, but whether this interferes with visual perception is unknown. Researchers recently found that retinoic acid-induced retinal hyperactivity was a major contributor to vision impairment in mice. They believe that inhibiting retinoic acid could lead to a new therapeutic strategy for mitigating vision loss that may be applicable across a wide range of photoreceptor degenerative disorders, regardless of the underlying etiology.

The team used a pharmacological approach to block retinoic acid signaling and discriminate the effects of decreased signal from increased noise. Indirect evidence strongly suggests retinoic acid-induced retinal hyperactivity contributes to human vision impairment. Direct evidence, however, is difficult to obtain because methods for detecting hyperactivity are invasive and therefore inappropriate for humans.

The researchers’ previous studies had shown that retinoic acid-induced hyperactivity is maladaptive, presenting background noise that obscures signals that are already attenuated by the loss of photoreceptors. Their current study found that this hyperactivity specifically impairs not only simple light detection but also higher-order visual capabilities, such as reliable detection of specific visual scenes.

To assess whether disulfiram can inhibit degeneration-dependent activation of the retinoic pathway, the researchers injected the eyes of rd10 mice with the RAR reporter virus early in degeneration. They continuously provided them with ad libitum regular food or food containing disulfiram (2mg/kg) for 20 to 30 days and imaged their retinas later in degeneration.

They found that inhibiting retinoic acid does not affect events in the outer retina, leaving events in the inner retina as the primary mechanism of retinoic acid-induced hyperactivity. The study’s results on vision-impaired mice revealed that disulfiram improves behavioral contrast sensitivity, sharpens cortical neuron representations of spatial orientation and increases the fidelity of responses to naturalistic scenes, all consistent with improved visual perception.

“Whether disulfiram will improve vision in humans remains to be seen, but the barriers to answering this question seem relatively low,” the researchers wrote in their paper. “If disulfiram shows efficacy, then it could be administered orally, but local ocular delivery involving a new drug formulation might ultimately be more appropriate for avoiding the undesired systemic consequences associated with alcohol consumption.”

“Vision restoration therapies are aimed, at least for now, at the small fraction of patients with end-stage photoreceptor degeneration, but treatments targeting the retinoic acid pathway may be relevant to the much larger patient population with low vision,” they concluded.  


IN BRIEF

Laser Scleral Microporation as Emerging Treatment for Presbyopia. Two surgeons presented data last month at the ASCRS 2022 conference in Washington, DC on an interesting new way to treat presbyopia by “uncross-linking” scleral fibers to create a more pliable structure that can be more responsive to contraction of the ciliary muscle. Called laser scleral microporation (LSM), the procedure uses an erbium YAG laser to create tiny pores within the sclera, which is treated in four quadrants (superotemporal, inferotemporal, supronasal and inferonasal). The resultant loosening of the sclera can re-establish some accommodative effect lost due to aging, explained Robert Ang, MD, and Mitchell Jackson, MD.

The treatment was able to reduce average add power needed to achieve reading acuity from 2.03D to 1.43D. Uncorrected near visual acuity improved from 20/63 to 20/32. As the effect is sparing of the visual axis, it does not compromise distance vision and it can be combined with other presbyopia interventions, both doctors noted. The procedure is in early development and numerous improvements are being pursued, the presenters explained, including faster treatment times and eye tracking/registration to allow retreatment.

Ang M. Early pilot study results of laser scleral microporation in presbyopic eyes. ASCRS 2022 Washington, DC.

Jackson M. Comparison of laser scleral microporation to current therapeutics in presbyopia. ASCRS 2022 Washington, DC.
Alabama Scope Bill Fails to Pass the House

The legislation would’ve allowed the state’s ODs to perform various in-office procedures. Advocates vow to retrench and try again. Meanwhile, Nebraska eyes a 2023 push of its own.

It’s been 27 years since Alabama has expanded the state’s optometric scope of practice—and things will stay that way for now after the defeat of a recent bill. Optometrists in 21 states are currently allowed to do more than those who practice in Alabama, including perform various types of ocular surgeries, lesion removal and administer injections. Eager to update the law to match the current education and training of optometrists, which has greatly evolved since the state’s last scope bill passed in 1995, the Alabama Optometric Association (ALOA), along with the State Government Relations Committee and the American Optometric Association, has been working for five years to try and pass a bill that better reflects the capabilities of today’s ODs.

In March, SB 120 passed the Senate with a vote of 17 to 12. The bill would allow optometrists with the proper training to perform several advanced procedures: YAG capsulotomy, laser peripheral iridotomy, selective laser trabeculoplasty (SLT), removal of chalazia or other skin lesions around the eyelid, corneal crosslinking and injections near the eye or within the most superficial layers. For residents of the 31 counties in Alabama where optometrists are the only eyecare providers, the bill would make these services more accessible and reduce the need for patients to travel to receive potentially vision-saving treatment.

Unfortunately, after moving forward to a public hearing before the House Health Committee, the bill did not pass. “The session ended, and we didn’t get a vote in the House because we ran out of time, which ultimately is because of the power of our opposition,” explains Caleb Gardner, OD, president of the ALOA. “There was opposition from medicine, ophthalmology and the medical association of the state of Alabama, who all fought really hard against this bill.”

Dr. Gardner says that although ODs and scope expansion advocates in the state have been making an increasing level of effort to advocate for SB 120, the momentum must continue to build to push for change before the bill is again put before the Senate.

“I think optometry just really woke up in Alabama toward the end of February when we decided that if we’re going to get this done, it was going to take our own boots on the ground; we can’t just farm this out to third parties like lobbyists, although they are an important part and we thank them for the work that they do,” says Dr. Gardner. “But, optometrists in Alabama have to get out, shake hands, make donations, work in campaigns and build relationships with their legislators if we’re ever going to get this done.”

Dr. Gardner says he is optimistic about the future of the bill, especially since several US states have recently been successful passing similar laws.

“Even though we lost this year, which did feel like a punch in the gut after all the work we put into it, we learned some lessons the hard way, and now we’re in a place where we’re communicating with each other and are really working hard and focused on getting this done,” he says. “We’d love to get it done next year, but we know that it could be a long battle. After this recent loss, I think there’s a lot of optometrists in Alabama who are in this fight for the long haul, which is great.”

The ALOA plans to resubmit the bill next year.

The Nebraska Optometric Association (NOA) introduced an initial request to the Department of Health and Human Services that would allow ODs in the state to perform SLT to treat glaucoma. The state formed a technical review committee to oversee the request, which held its first hearing on April 7th and plans to hold a second on June 7th. Presentations were heard from both the NOA and the opposition, and both answered questions from the committee. Janet Seehoff, executive director of the NOA, says they anticipate having the bill ready to introduce in January 2023.

“We really hope that this goes favorably for our members and so that Nebraskans can receive SLT treatment for glaucoma,” says Mrs. Seehoff. “There’s definitely a need for it, and this will be a great opportunity to enhance the scope of practice. It’s all about access to care and services, and this future bill would help a lot.”
Optometry’s Role in the Patient Journey

Gloria Chiu, OD, FAAO, FSLS
Associate Professor of Clinical Ophthalmology
USC Roski Eye Institute, USC Keck School of Medicine
Los Angeles

Keratoconus (KC) is a degenerative condition with onset in early adolescence. It is characterized by gradual thinning of the corneal stroma, causing a cone-shaped protrusion and worsening vision. As doctors of optometry, our top priority with these patients should be to manage their disease—and only secondarily to correct their vision.

A referral for corneal collagen cross-linking, which has been shown to halt progression in 92%-100% of cases,
may be able to preserve vision. As with any surgical procedure, there is the potential for complications and cross-linking may not be right for everyone. After treatment, patients will still need regular optometric care. Follow-up care is similar to that of any surgical procedure, there is the potential for complications.

In the U.S., when cross-linking is performed with the iLink™ platform (Glaukos), the only FDA-approved cross-linking system, it is generally covered by insurance for 96% of those with commercial insurance. In a recent simulation model, treatment with iLink™ was found to be highly cost effective, resulting in a 26% reduction in PKPs and patients spending 28 fewer years in the advanced stages of KC.

Young patients who can be treated early while their vision is still good have the most to gain.

That’s where optometrists’ role becomes so critical. Our awareness of early progressive KC signs and risk factors can be nothing short of life-changing, as doctors of optometry, our top priority with these patients should be to manage their disease—and only secondarily to correct their vision.

With Cross-Linking

- Cross-linking with the only FDA-approved iLink™ System can stop or slow progressive keratoconus.
- Early diagnosis and treatment are essential to preserve as much vision as possible.
- Optometrists are uniquely positioned to change lives and protect vision by identifying at-risk patients in the mild stages of the disease.

26% fewer PKPs
28 fewer years in late-stage KC

Advanced tomography/topography provides the most sensitive and accurate diagnostic information. However, there are a number of signs and symptoms that should heighten suspicion of KC and prompt further testing, either in the practice or by referral. These include myopic shift, rapidly changing vision, that won’t correct to 20/20 (with no other known reason), distorted mires on manual keratometry, and scissoring or an irregular retinoscopy reflex. Patients with a history of eye rubbing, connective tissue disease, Down syndrome, or a family history of KC are also at higher risk.

By promptly referring these patients for further testing and, if warranted, iLink™ cross-linking treatment, optometrists are uniquely positioned to protect and preserve patients’ vision over their entire lifetime.

REFERENCES:

INDICATIONS:
Photorexa Viscous (riboflavin 5’-phosphate in 20% dextran ophthalmic solution) and Photorexa (riboflavin 5’-phosphate ophthalmic solution) are indicated for use with the iLink System in corneal collagen cross-linking for the treatment of progressive keratoconus and corneal ectasia following refractive surgery.

IMPORTANT SAFETY INFORMATION
Corneal collagen cross-linking should not be performed on pregnant women.
Ultraviolet keratitis can occur. Patients should be monitored for resolution of epithelial defects. The most common ocular adverse reaction was corneal epithelial Iran. Other ocular side effects include photophobia, tearing, decreased visual acuity, dry eyes, corneal epithelial defect, conjunctival injection, and blurred or hazy vision.

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

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Learn more about iLink corneal cross-linking here
Current Vision Test for Licensure Penalizes Older Drivers

A recent study found acuity to be an inadequate predictor of motor vehicle collision that may be taking more people than necessary off the road.

It’s required by law that all drivers in the United States undergo vision screening prior to obtaining their license. However, researchers of a recent study argue that using this measurement of visual function to determine whether an individual is allowed to drive may cause more harm than good, especially for the senior population. The study found that while the number of motor vehicle collisions experienced by those with impaired visual acuity exceeded that of the general population, the effect was not significant enough to outweigh the negative impacts of involuntary driving cessation, including those on mental health and mobility.

The population-based sample consisted of 2,000 licensed drivers 70 and older residing in Alabama. During the baseline visit, the following measurements were performed on all participants: visual acuity, contrast and visual field sensitivity, the Useful Field of View test and the Motor-Free Visual Perception test. The cohort was then followed for up to four years for involvement in police-reported motor vehicle collisions. After the study period, the researchers determined the screening performance of each visual function in regard to motor vehicle collision occurrence by calculating values for area under the curve (AUC), sensitivity or specificity; in addition, they estimated rate ratios for the association between each visual function measure and motor vehicle collision.

Throughout the four-year follow-up period, 359 motor vehicle collisions occurred, and 16% of the cohort was involved in at least one collision. The researchers found that “less than 10% of the study participants had impaired visual acuity or contrast sensitivity, as defined by clinical cutpoints, and the prevalence of Useful Field of View impairment was slightly greater than 10%.” They also determined that none of the measurements of visual function exhibited adequate values for sensitivity or specificity, and AUC values were only about 0.5.

“InBrief

Study Confirms Validity of At-home Vision Tests. Though ODs have little good to say about online refraction tests from corporate entities that actively undermine the value of in-person care, the notion of moving some aspects of vision testing to the home is gaining traction in the COVID era.

A randomized comparative study investigated the validity of at-home tests for visual acuity (VA) measurement. A total of 218 participants with acuity of 20/200 or better were prospectively randomized to self-administer two of three at-home tests (printed chart, mobile phone app and website) within three days prior to their standard-of-care clinic visit. They then compared results of the at-home and in-office VA tests, and participants completed a survey to assess usability of the tests.

Mean in-office VA was 0.11 logMAR (Snellen equivalent 20/25) with no significant difference between the tests. The researchers also observed a mean difference (logMAR) between the at-home and in-office tests of -0.07 for the printed chart, -0.12 for the mobile app and -0.13 for the website test. The three at-home VA tests were comparable within one line in-office VA measurements; the study authors reported. The printed chart had the smallest mean difference and greatest correlation when compared with in-office acuity; however, no significant difference was noted among the three at-home tests.

While participants found the tests easy to use and showed interest in future at-home testing, overall feedback indicated that they didn’t want in-office acuity testing replaced by at-home methods due to accuracy concerns.

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Seasonal Allergic Conjunctivitis Can Trigger MG Changes

This study cohort often had multiple signs of tear film instability and higher rates of gland distortion and dropout.

Nearly two-thirds of seasonal allergic conjunctivitis patients in this study had meibomian gland dropout compared with roughly a quarter of controls.

**IN BRIEF**

**Pay More Attention to Photophobia, Study Argues.** Photophobia is associated with a number of different ocular and neurological conditions. However, the most common causes of abnormal sensitivity to light are still not well-understood. To better equip primary eye care providers, researchers recently initiated a retrospective chart review involving 147 patient records. The following data was collected: demographics, presenting symptoms, medical history, examination findings, assessment and plan. Photophobia was the chief complaint for 90.5% of patients. The researchers found that 10 men and three women linked their symptoms to a recent injury. Seven men and one woman attributed their photophobia to a workplace injury. The median age of presentation was 37 years, with the most frequent cause of photophobia being migraine headache (53.7%). Other causes were dry eye syndrome (36.1%), ocular trauma (8.2%), progressive supranuclear palsy (6.8%) and traumatic brain injury (4.1%). The researchers observed that a significant number of patients left the clinic without a documented cause for their photophobia (25.9%). This included 11.7% of adults and 69.4% of children. These findings indicate, according to the study authors, that eye care providers—particularly those who care for children—may not understand the most common causes of photophobia. As a result, they may not know what history questions to ask and what examination techniques to use. Photophobia affects patients of all ages, and many patients are left without a specific diagnosis, indicating a significant knowledge gap among ophthalmologists and optometrists evaluating these patients,” the study authors wrote. They are currently studying vision-related quality of life impact and developing a curriculum to help clinicians diagnose and treat photophobia in adults and children.

“We hope that a better understanding of the most common causes of photophobia, the pathophysiology of photophobia and the impact of photophobia on vision-related quality of life will help us better address the knowledge gap identified in this study,” the study authors concluded.


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Preservative-free lubricant drop formulations play an important clinical role, particularly pre- or post-eye surgery, in those who instill drops several times a day, or in those who should avoid preserved eyedrops for another reason. However, preservative-free options can be limited by the patient’s underlying type of dry eye. Furthermore, preservative-free formulations are often packaged as single-use vials, which can generate a lot of plastic waste and may be cumbersome for some patients to use. There is a need for an advanced preservative-free lubricant eyelid appropriate for many different underlying forms of dry eye, but packaged in an easy-to-use multidose bottle.

SYSTANE® COMPLETE MDPF is an exciting and welcome addition to our armamentarium of artificial tears, since it is appropriate for all major types of dry eye, and can also be instilled before and after contact lens wear—making it the “go to” artificial tear. Just 1 drop of SYSTANE® COMPLETE improves symptoms immediately, and for up to 8 hours. Another SYSTANE-family preservative-free drop, SYSTANE® HYDRATION MDPF, is available for aqueous deficient forms of dry eye in patients who need frequent hydration—and is particularly useful following oculary surgery to relieve dry eye symptoms. These preservative-free products employ multidose bottles to prevent backflow and contamination, thereby avoiding the need for wasteful single-use packaging.

SYSTANE® COMPLETE MDPF and SYSTANE® HYDRATION MDPF are built on the backbone of HP-Guar, which forms a polymer meshwork gel that helps retain active lubricants on the ocular surface and helps support hydration and protection against desiccation. In addition, SYSTANE® COMPLETE MDPF adds nano-sized lipid droplets, which provide better delivery and spread of the formulation to help fortify the lipid layer of the tear film, while SYSTANE® HYDRATION MDPF includes a second polymer, sodium hyaluronate—a naturally occurring hydrophilic moisture magnet with viscoelastic properties—which helps the active lubricants provide longer-lasting hydration.

With so many lubricant eyedrops available, it is essential to make recommendations to help patients purchase a product with the right formulation to address their dry eye needs. Recommend the SYSTANE® family of preservative-free drops with HP-Guar technology—SYSTANE® COMPLETE MDPF or SYSTANE® HYDRATION MDPF—when your patients need preservative-free dry eye relief.

*SYSTANE® COMPLETE vs. SYSTANE® BALANCE; SYSTANE® HYDRATION vs. SYSTANE® ULTRA Lubricant Eye Drops.

1. Not a rewetting drop.
2. Based on 0–10 visual analog scale, where 0 = “no symptoms at all” and 10 = “worst imaginable symptoms”; study examined SYSTANE® COMPLETE preserved formulation.
3. Vs. SYSTANE® ULTRA Lubricant Eye Drops: based on in vitro outcomes using SYSTANE® HYDRATION preserved formulation.

References:

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Tetracyclines May Up Pseudotumor Cerebri Risk

Pseudotumor cerebri (PTC) is a neurological disorder that typically manifests with ocular signs and symptoms such as increased intracranial pressure with normal brain parenchyma, absence of hydrocephalus, mass lesion and underlying infection or malignancy. Researchers recently compared the incidence of normal brain parenchyma, symptoms such as increased intracranial pressure with its cessation, “Our data are consistent with the hypothesis that tetracyclines may predispose patients to the development of PTC,” the authors wrote in their paper. “The data presented here demonstrate an association, but not being a clinical trial, do not confirm a cause and effect.”

Almost all tetracycline-induced PTC patients were women, possibly indicating that tetracycline antibiotics could be more likely to cause this type of PTC in patients with a gender-associated susceptibility. Although most of the affected patients were prescribed minocycline, it wasn’t possible for the team to determine whether this antibiotic is more likely to induce tetracycline-induced PTC compared with other antibiotics in this class.

The reason for the association between this class of antibiotics and PTC remains poorly understood, as does the pathophysiology of IIH.

Regardless of the disease’s underlying pathogenesis and the contribution by tetracycline antibiotics, the researchers believe that their data suggests that these medications put patients at increased risk for PTC development. They recommend that “physicians who prescribe these antibiotics consider educating their patients about this adverse reaction. Patients who are taking these antibiotics and have symptoms of increased intracranial pressure should be counseled to contact the prescribing physician for further advice.”

Erectile Dysfunction Drugs Can Cause Ocular Adverse Effects

Several case reports and small epidemiologic studies have quantified the risk of ocular adverse events associated with the use of phosphodiesterase type five inhibitors (PDE5Is). However, results have been conflicting, and epidemiologic data on the risk of serous retinal detachment (SRD) and retinal vascular occlusion (RVO) is not available.

This cohort study included data from 213,033 men who received PDE5Is at any time over a 15-year period. All four major drugs in this category—sildenafil, tadalafil, vardenafil and avanafil—were included. The case-control analysis included 278 cases of SRD, 628 of RVO and 240 of ION, as well as 4,584 controls (mean age=64.6).

Cohort members were followed up until the first diagnosis of SRD, RVO or ischemic optic neuropathy (ION) or termination of insurance coverage. For each case, four controls were matched by age and time of study entry. Risk for regular users of PDE5Is was compared with that of nonusers.

Patients with SRD, RVO and ION were more likely to have hypertension, diabetes, coronary artery disease and sleep apnea. The adjusted incidence rate ratio (IRR) for developing any of the three outcomes was 1.85 (15.5 cases per 10,000 person-years). The adjusted IRRs for each condition were as follows:

- SRD: 2.58 (3.8 cases per 10,000 person-years)
- RVO: 1.44 (8.5 cases per 10,000 person-years)
- ION: 2.02 (3.2 cases per 10,000 person-years)

“These findings suggest that regular users of PDE5Is might have an increased risk for SRD, RVO and ION,” the study authors concluded. “Regular users of PDE5Is need to be cognizant of ocular adverse events associated with these drugs and alert their physicians if they experience visual deficits.”

IN BRIEF

Dilating Drops May Affect Glaucoma Measurements. Pupillary dilation is important in conducting an ocular examination or performing intraocular surgery, but a recent study pointed out that mydriatic agents may impact glaucoma diagnostics by altering vascular density measurements.

The study included 20 eyes with primary open-angle glaucoma and 20 control eyes. Eyes underwent fundus imaging before and after instillation of topical 0.5% tropicamide and 2.5% phenylephrine, two commonly used topical mydriasis agents.

The researchers reported a statistically significant decrease in the foveal avascular zone area (from mean 0.29mm² to 0.25mm²) and the foveal avascular zone perimeter (from mean 2.27mm to 2.09mm), as seen on OCT-A after instillation. They noted that pre- and post-dilation optic nerve head perfusion and flux index were significantly lower in the glaucoma group than the controls.

“IT’s long been proposed that glaucomatous eyes have a significant vascular dysregulation and lower ocular perfusion than in normal subjects,” the study authors wrote in their paper. “Pupillary dilation with 0.5% tropicamide and 2.5% phenylephrine resulted in a statistically significant decrease in foveal avascular zone metrics in glaucoma eyes. This observation emphasizes the critical role of pupillary status in interpreting glaucomatous vascular alterations detected by OCT-A.”


Dementia-Prone Allele Linked to Faster Neuroretinal Thinning. Like primary open-angle glaucoma (POAG), diseases that bring on symptoms of dementia—including Alzheimer’s, frontotemporal dementia and Lewy body disease—result from progressive loss of neurons in the central nervous system, both generally and within the retina, though the nature of this association remains unclear. The most commonly investigated genetic parameter is apolipoprotein E (APOE), the principal genetic determinant of Alzheimer’s, Lewy body disease and all-cause dementia.

A recent study investigated the association between POAG and the genetic risk of dementia by investigating associations between the APOE E4 allele and structural markers of neuroretinal thinning relevant to glaucoma progression. The APOE E4 allele was associated with faster rates of macular ganglion cell/inner plexiform layer (mGCIPL) thinning, particularly in normal-tension glaucoma (NTG) eyes.

The study included eyes from participants with genotyping data from which APOE genotypes could be determined and then compared with an age- and race-matched normative cohort. Structural parameters of neuroretinal atrophy measured using SD-OCT were compared within the cohort on the basis of APOE E4 allele status.

Rates of mGCIPL thinning were faster in participants carrying one or more copies of the APOE E4 allele (β coefficient=−0.13μm/year), and this was strongest in eyes affected by NTG (β coefficient=−0.20μm/year). APOE E4 allele carriers were also more likely to be lost to follow-up and demonstrated a thinner average mGCIPL (70.9μm vs. 71.9μm) and pRNFL (77.6μm vs. 79.2μm) after a minimum of three years of monitoring. The researchers believe their results suggest the APOE E4 allele may be a risk factor for retinal ganglion cell degeneration in glaucoma.

The mechanisms by which mGCIPL thinning may occur in individuals carrying the APOE E4 allele remain unclear.

“As genome-wide association study data has not identified glaucoma-associated risk variants within the APOE gene, the relevance of APOE E4-associated mGCIPL thinning to glaucoma and its visual outcome remains uncertain,” the authors concluded. “Subsequent replication studies within separate cohorts will help to validate and elucidate the relationship between the APOE E4 allele and glaucoma.”


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Andrew S. Gurwood, OD
To treat ocular inflammation and pain following ophthalmic surgery or ocular itching associated with allergic conjunctivitis.

DEXTENZA KEEPS PATIENTS SATISFIED

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INDICATIONS
DEXTENZA is a corticosteroid indicated for:
- The treatment of ocular inflammation and pain following ophthalmic surgery.
- The treatment of ocular itching associated with allergic conjunctivitis.

IMPORTANT SAFETY INFORMATION

CONTRAINDICATIONS
DEXTENZA is contraindicated in patients with active corneal, conjunctival or canalicular infections, including epithelial herpes simplex keratitis (dendritic keratitis), vaccinia, varicella; mycobacterial infections; fungal diseases of the eye, and dacryocystitis.

WARNINGS AND PRECAUTIONS

Intraocular Pressure 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. Intraocular pressure should be monitored during treatment.

Bacterial Infections - Corticosteroids may suppress the host response and thus increase the hazard for secondary ocular infections. In acute purulent conditions, steroids may mask infection and enhance existing infection.

Viral Infections - 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 - 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.

Delayed Healing - Use of steroids after cataract surgery may delay healing and increase the incidence of bleb formation.

Other Potential Corticosteroid Complications - The initial prescription and renewal of the medication order of DEXTENZA 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. If signs and symptoms fail to improve after 2 days, the patient should be re-evaluated.

ADVERSE REACTIONS

Ocular Inflammation and Pain Following Ophthalmic Surgery
The most common ocular adverse reactions that occurred in patients treated with DEXTENZA were: anterior chamber inflammation including iritis and iridocyclitis (10%), intraocular pressure increased (6%), visual acuity reduced (2%), cystoid macular edema (1%), corneal edema (1%), eye pain (1%), and conjunctival hyperemia (1%). The most common non-ocular adverse reaction was headache (1%).

Itching Associated with Allergic Conjunctivitis
The most common ocular adverse reactions that occurred in patients treated with DEXTENZA were: intraocular pressure increased (3%), lacrimation increased (1%), eye discharge (1%), and visual acuity reduced (1%). The most common non-ocular adverse reaction was headache (1%).

Please see adjacent Brief Summary of full Prescribing Information.

*93% (187/201) DEXTENZA patients were satisfied with the insert in the Phase 3 Study for the treatment of ocular inflammation and pain following ophthalmic surgery.\textsuperscript{3}

*73.6% of physicians in Study 1, 76.4% in Study 2, and 79.6% in Study 3, for the treatment of ocular inflammation and pain following ophthalmic surgery, rated DEXTENZA as easy to insert.\textsuperscript{3}


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6.2 Ocular Inflammation and Pain Following Ophthalmic Surgery

Dextenza™ safety was studied in four randomized, vehicle-controlled studies (n = 567). The mean age of the population was 60 years (range 18 to 87 years), 58% were female, and 80% were white. Forty-seven percent had been iridic iritis and 30% had been iris neovascularization. The most common ocular adverse reactions that occurred in patients treated with DEXTENA were anterior chamber inflammation, including blepharitis (19%), posterior subcapsular cataract (19%), conjunctival hyperemia (10%), and ocular pain (10%).

The most common nonocular adverse reaction that occurred in patients treated with DEXTENA was headache (1%)

6.3 Ocular Inflammation Associated with Allergic Conjunctivitis

DEXTENA™ safety was studied in four randomized, vehicle-controlled studies (n = 154). The mean age of the population was 41 years (range 18 to 69 years), 55% were female and 61% were white. Fifty percent had been iridic iritis and 28% had been iris neovascularization. The most common ocular adverse reactions that occurred in patients treated with DEXTENA were anterior chamber inflammation, including blepharitis (19%), conjunctival hyperemia (10%), and ocular pain (10%).

6.4 USE IN SPECIFIC POPULATIONS

6.4.1 Pregnancy

Risk Summary

There are no adequate or well-controlled studies with DEXTENA in pregnant women to determine a drug-associated risk for major birth defects and miscarriage. In animal reproduction studies, administration of topical ocular dexamethasone in pregnant mice and rabbits during organogenesis produced embryonic lethality, fetal malformations, and increased fetal resorption.

6.4.2 Lactation

Systemically administered corticosteroids appear in human milk and could suppress growth and interfere with endogenous corticosteroid production, therefore the systemic concentration of dexamethasone following administration of DEXTENA in low (see Clinical Pharmacology (7.2)). There is no information regarding the presence of DEXTENA in human milk, the effects of the drug on the breastfed infant or the effects of the drug on milk production to interfere risk of DEXTENA to an infant during lactation.

The developmental and health benefits of breastfeeding should be considered along with the mother’s clinical need for DEXTENA and any potential adverse effects on the unanediated child from DEXTENA.

6.4.3 Pediatric Use

Safety and effectiveness in pediatric patients have not been established.

6.4.4 Geriatric Use

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

17 PATIENT COUNSELING INFORMATION

Advise patients to consult their eye care professional if pain, redness, or itching develops.

Ocular Therapeutics, Inc.
Redwood, MA 01230 USA
PP-US-DX-0360

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Recognize Shortcomings in Racial Categories

We should follow expert guidance and understand that race and ethnicity are social constructs that too often over-generalize.

A s the Director of Diversity, Equity, Inclusion and Belonging at SUNY College of Optometry, I had the opportunity to read the article, “The Role of Race and Ethnicity in Optometry” (January 2022) by Brian Chou, OD, and am inclined to respond. There are several misleading or inaccurate points mentioned, starting from the first sentence, which states, “While race and ethnicity are often used interchangeably, race has to do with biological and physical features which generally cannot be hidden…” and carries on from there.

The most recent AMA guidelines clearly state that race and ethnicity are social constructs without biological or scientific meaning. The Academy and the most up-to-date literature are clear on the fact that race is ill-defined, and often assumed by clinicians based on phenotype without any rigor. Scientists and clinicians are beginning to be aware that “race” has been a proxy for socioeconomic status and other social determinants of health in much of our analysis of data, and are working to reframe what it means in our profession.

With reference to a genetic basis for race-focused medicine, the field of epigenetics has shown that gene expression may also be affected by social determinants of health. Although there are important associations we use to help quickly categorize people based on “race,” we must start to recognize that there are many structures and factors behind those associations. Articles will continue to associate certain conditions with race but should also mention the other important factors to take into consideration. I do not think this was adequately done in Dr. Chou’s article.

The use of stereotypes of what the typical Asian or Black patient should or should not get screened for or the types of frames you should stock are inaccurate at best. The relationship between Black and Latinx patients and diabetes is rooted in sociological factors widely acknowledged to be present. This article lacks nuance and context.

As a widely read magazine in our profession, Review should be on top of the new interpretations of these categories. We cannot reinforce stereotypes; we have moved beyond these practices.

—Joy Harewood, OD
SUNY College of Optometry
New York City

From the Editor: We at the publication share your goal of helping the profession move away from simplistic and outdated modes of thinking about and interacting with patients.

The January issue’s theme, explored over the course of seven articles, was the importance of viewing the patient as an individual who comprises a unique set of traits derived from such varied sources as their genetic makeup, health status, socioeconomic experience, cultural/familial upbringing, sexual orientation and more. Dr. Chou’s assignment was to review racial and ethnic associations documented in the medical literature and widely used in practice, even if they do rely on generalizations and assumptions.

Either in that article or elsewhere in the issue, we should have acknowledged race as a social construct and the limitations that arise from it; the oversight lies with us on the editorial staff and not Dr. Chou, who wasn’t asked to delve into that aspect. He did also touch on the influence of socioeconomic factors and epigenetics in these associations, however.

In short, the aim of the issue was to help optometrists learn to view and relate to each patient as a unique individual. It was an ambitious goal and I don’t doubt we could have included more nuance in a number of cases. We look forward to continued exploration of these newer and more challenging topics to help ODs improve their clinical care and cross-cultural fluency.

Rethinking Comanagement

In the April issue’s letters section, Dr. Don Stover wrote, “I generally don’t make money on post-op (comanaged cataract) visits. Wouldn’t it be nice if cataract surgery was one fee and the post-op care was another fee? This might support better post-op care.”
This was a hypothesis of mine and was also promulgated by a legal expert in one of our trade papers back in 2017. So, I floated the idea to several of my comanagement referral docs, but they liked the status quo. One of my busiest referrals said no, because he liked to be a more direct part of the surgical care through the Medicare comanagement billing process. I was surprised by this. To me, the OD/MD (or DO) doctor’s behavior and the care rendered would be identical. Only the billing codes would be different, and they would be simpler.

I still think Dr. Stover’s intuitive idea is good and workable. It seems simpler and more transparent for the patient to return to the referral optometrist’s office and for that doctor to bill under the E&M codes or the eye codes, just like for any other patient. Indeed, when a surgeon has an emergency or takes ill, the surgeon’s non-comanaged patients are often seen by an unrelated ophthalmologist, who is then allowed to reasonably bill for their services. The bills are reasonable because the visits are brief, and extensive testing is not needed.

—John Maher, MD
Torrance, CA
Instructor at Ketchum University
School of Optometry, Anaheim

Tech Training Needed

I have a few questions for the colleges of optometry and other educational institutions all across America. How many have certified programs to train people to be an optometric assistant?

In my 46 years’ experience as an optometrist, I would say it is difficult if not impossible to find an employee who has any basic eyecare knowledge regarding optics, eye anatomy and the fundamentals of eyeglasses.

Are there no technical colleges that consider a one- to two-year program to teach basic principles of optics and eye care to prepare someone to become a valuable part of the healthcare system? Is the AOA involved in any way to remedy the need for this training?

I see ads by small colleges in my state offering training to be a medical office assistant, pharmacy technician, phlebotomy technician, nurse (of various levels), radiology tech and even massage therapist—but training in eye care is left out. Why? Who is responsible for this lack of important education?

Every employee that I have in my office has been partially or completely trained by me and my experienced optician even has done most of her training herself or by me. I am lucky to have many experienced and competent assistants and technicians. I would like to have more.

The optometry schools or technical colleges need to address this lack of qualified people to work in optometric practices. It has gotten even worse since the pandemic.

—R. Thomas McHugh, OD
Morehead, KY

Hold the Line on Eye Exams

I have noticed that many commercial and private practices have become increasingly apathetic about patient care and dilation.

If we are held to the same standards as medicine (ophthalmology), why are we not informing patients who do not want dilation that their optometrist won’t examine them if the patient does not allow them to not do their job?

Non-dilated photos are not an acceptable alternative. Widefield imaging is not an acceptable alternative. We are responsible to the patient regarding their eye health when they walk through the door. Widefield imaging is an asset, but it misses the boat when the superior and inferior retina cannot be seen and the doctor does not make an effort to view these areas adequately.

I agree that most patients only want what their vision plan will pay for—eye glasses and contact lenses. The doctor is the guardian of their eye health and, in many instances, their general health.

I propose that it is time to stop this foolishness. Vision care plans need to change their reimbursement schedules. I feel $40 is reasonable for a refraction. (Consider what ophthalmologists charge, and note that the refraction is done by a technician in many cases.) However, that is not reasonable for a full, dilated examination.

All patients—especially children—deserve the most comprehensive treatment upon initial presentation. Would one consider that examining a child under dilation is of utmost importance? Most cannot report their issues well enough to the examining doctor.

Maybe it is time to turn away a patient who will not let us do our job. We as optometrists are afraid to “rattle the cage” of our patients! If we want additional privileges such as minor noninvasive surgeries, the time has come for us to act like the professionals we are supposed to be and fight back against inadequate eye care. Whether you practice in Florida or Oklahoma, whether you do or do not belong to the state association, your profession is at a significant crossroads. Let’s do our job. Make our profession the guardian at the gate. Do not let a patient dictate to you what is right or wrong.

—Russell J. Raye, OD
West Palm Beach, FL

I am lucky to have many experienced and competent assistants and technicians. I would like to have more.
All Over the Map

Optometric scope of practice remains a patchwork of laws that change the parameters of care haphazardly from state to state.

This month, we kick off a four-part series on newer optometric privileges conferred through legislative action and how ODs in those states can position themselves to add any such procedures they feel are a good fit. Throughout the series, you’ll hear directly from optometrists who have already conquered both the clinical and logistical challenges these new procedures pose.

For the first article, we visually depicted the breadth of optometric scope in several key categories of care using a series of maps (see pages 34-35). Encouragingly, the maps show a high degree of uniformity in optometric privileges for at least the most basic medical eyecare rights: use of diagnostic drops and most garden variety pharmaceutical agents, including glaucoma drugs. Every colored-in state on those maps represents untold hours of lobbying effort and hassle that your colleagues and predecessors had to endure to make it happen. We all owe them a debt of gratitude for their chutzpah.

Still, exceptions and caveats abound:

• All US optometrists can finally prescribe glaucoma meds—but three states still withhold oral drugs in this category.
• ODs in 41 states have the right to inject some medical therapies—but almost half can only do so for patients experiencing anaphylaxis.
• Controlled substances can be prescribed in 47 states—but the state-by-state list of approved drugs would turn that nice, uniform map into a checkerboard pattern if we added all the variance by schedule category.

• Naturally, the more hands-on procedures like minor laser surgery and removal of eyelid lumps and bumps are still hotly contested by ophthalmology, as these are the current front lines of the scope battles.

Optometry’s legislative advocates have the wind at their backs right now, as numerous successes over the past few years can attest. Still, the medical lobby remains formidable, recently quashing a bill in Alabama.

Even with momentum going for it, optometry will have to continue to make the same arguments over and over. It’s frustrating and, frankly, embarrassing. The way you practice optometry shouldn’t be subject to how the political winds are blowing in your state capitols.

For the states pursuing expanded scope, it’s encouraging to see the push for “as-taught” laws that would encompass many elements of practice in one shot (those that match the current curricula in optometry colleges). Continued success with this type of bill would obviate the need to go back to the legislature for every new responsibility optometrists seek to be granted. I hope such an approach becomes the new norm in scope expansion efforts. The mantra should be, “If it’s learned, it’s earned.”

The last of the TPA laws (giving ODs basic medication prescribing rights) was passed in 1998—before everyone currently enrolling in optometry college was born. For at least a generation, bright young people have pursued optometry with an understanding that medical care is part and parcel of it.

Let’s deliver on that expectation for their sake and the betterment of all.
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Clinical Pearls in DED

Follow these steps to build a successful dry eye practice.

It probably doesn’t come as a surprise that our profession writes more prescriptions for dry eye disease (DED) than any other condition and that the vast majority of dedicated dry eye clinics are run by optometrists. Having worked in this field for more than 25 years, during most of which I ran a dry eye clinic, I want to share insights to help save you a few years in developing a successful and rewarding dry eye practice.

Where to Start?
It’s important to have the base to apply your skills. The first piece of equipment I’d recommend purchasing is a slit lamp imaging system. This technology helps you recall the specific staining from an exam that happened three months prior, is a great educational tool and can increase efficiency, as patients are able to quickly understand what you are diagnosing and managing.

Next, you’ll need an instrument for expressing the meibomian glands, such as a Mastrota Meibomian Gland Paddle (Ocusoft), Collins Meibomian Expressor Forceps (Collins) or the Meibomian Gland Evaluator (Johnson & Johnson). In addition, NaFl dye strips and a yellow Watten #15 filter are essential tools that allow you to see staining of the cornea and the conjunctiva without the need for lissamine green.

Expression is Essential
Imagine deciding to manage glaucoma but refusing to look at the optic nerve. It doesn’t make much sense, but that’s essentially what’s happening if a doctor managing DED doesn’t express the meibomian glands. About 86% of all DED has a meibomian gland dysfunction (MGD) component. It takes seconds to do; you simply look at the lower eyelid central to nasal meibomian glands and assess the quality of meibum you express.

DED could be optometry’s greatest opportunity, and it starts with your knowledge to simplify the disease and diagnosis.

Eyelids are Important
Besides MGD, blepharitis is a significant contributor to DED. Examination of the eyelids will uncover Demodex colonnades, bacterial biofilm, telangiectatic blood vessels indicative of ocular rosacea and thickened eyelids pointing to chronicity—all which help determine how to best treat this form of DED. Morning symptoms are critical and the usual culprit is inadequate overnight eyelid closure.

Make Diagnosis Easy
The TFOS DEWS II algorithm is actually an easy and effective way to diagnose DED. Begin by looking at risk factors, ensure you have symptoms documented through a questionnaire or the patient’s history and confirm with signs such as ocular surface staining or tear break-up time. Once you’ve made the diagnosis, you need to determine the subtype.

Abnormal meibomian gland expression will confirm an evaporative form. Normal expression with a very thin tear meniscus indicates an aqueous-deficient DED.

Treat Each Subtype Differently
Although it’s likely that inflammation is present in all forms of dry eye, evaporative DED requires managing obstructed meibomian glands using hydrating compresses and in-office treatments. Aqueous-deficient DED requires managing mucin deficiency (vitamin A) and aqueous deficiency requires increasing the tear volume (punctal occlusion). For inadequate overnight lid closure, consider lid seals (SleepTite/SleepRite is one example).

Patient Education
Having the knowledge to effectively manage DED is important, but without properly educating the patient, success is unlikely. I’ve seen patients confuse medication dosage, use ointments instead of prescription drops twice a day and complain about blurred vision. I’ve also seen patients discontinue treatment; many times they were lost because they couldn’t get oriented as to which structure on the eye we were managing. An education tool worth considering is a platform called Rendia, which features patient-friendly animations, an image library and patient point-of-view options.

DED could be optometry’s greatest opportunity, and it starts with your knowledge to simplify the disease and diagnosis. It requires easy but specific treatments for each subtype, meibomian gland expression and a thorough eyelid examination. That’s when things get fun and exciting—when you start seeing patients who failed many times experiencing relief and satisfaction in the care of your hands. ■
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Demands of the Job

Start acting like a business owner or you may not have a business to own.

There are a few things you should be doing to better set yourself up for success. For starters, let’s get your schedule under control. As if…

Back in the day, which I can officially say at my age, all was right with the world of eye care. We did what we did, the patient ordered new glasses every year or so and then they wrote a check for what they owed us. We recalled the patient for their yearly exam, and most of the time the cycle started again.

Then along came practice consultants. Now, I really don’t have a grudge against them. I love many, if not all, of them. I attended every lecture at every meeting and sat in the front row for giants like Harriet Stein, Richard Kattouf, Neil Gailmard, Gary Gerber and too many others to name here. I always tried to glean at least one new idea at each lecture, and that helped me become a success, no doubt.

One idea that came up over and over again was the concept of preappointing. I would dare to guess that nearly 100% of private practice optometrists have applied this concept one way or another into their practice. It works. It keeps your book full over time.

To keep the math easy (for me), let’s say you schedule 10 comprehensive examinations each day. You then preappoint these 10 patients. For the sake of argument, let’s say that three people actually keep their preappointment. Now, you only have seven slots left to fill. The next year, typically the same three will be faithful and show up because they are used to the idea. Maybe two more from the other seven will decide to keep their planned appointment, so now you only have five slots to fill. And so on…

That’s all well and good, but not all of them will need or want new glasses unless there is a notable change, which happens less often as the patient ages. And, unless you can fit in more patients per day, there becomes fewer spots for new patients and patients who have seen a change or broken their glasses, etc.

If you are a solo practitioner, or maybe have a partner in the same boat, your net income per patient can slowly drop. At that point, doctors often start to doubt the efficacy of preappointing.

Now, bear with me. This may not be a typically funny Chairside, but it is important. With today’s software, you can track which patients need to see you every single year due to eye health concerns, rapid changes in prescription, contact lens refill needs and so forth. These patients should be preappointed yearly, or even more often. But does a family of five emmetropes with no health concerns need to see you yearly? I don’t think so.

There is nothing unethical about determining the best recommended appointment frequency for each patient. Makes sense for them. They have other things to do. Makes sense for your practice, too. Staying in business requires that you use your time wisely.

What if a patient wants to use their yearly exam benefit? No problem. They’ll call you and you can work them in, but it’s perfectly OK not to blow up your day with five emmetropes.

There is an argument that preappointing leads to more no-shows. Doctors who wisely preappoint do not find that to be the rule, just the exception. Yes, you may lose a couple patients from time to time, but if you listen to those practice consultants and preappoint properly, that will not be a major concern.

Quit apologizing for being a business owner or you may not have a business to own someday. My grandmother told me when I was around nine years old that if I read the Bible from front to back I would automatically go to Heaven someday. I’m not sure that’s how it works, but that year I read it through three times just in case. I can tell you with some assurance that there is nowhere in the Bible that says you have to see healthy, visually stable patients every single year. Not the best use of your talents, and that is in the Bible. Look it up!

About Dr. Vickers

Dr. Vickers received his optometry degree from the Pennsylvania College of Optometry in 1979 and was clinical director at Vision Associates in St. Albans, WV, for 36 years. He is now in private practice in Dallas, where he continues to practice full-scope optometry. He has no financial interests to disclose.
From the experts

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Answered by Dr. Mile Brujic, OD, FAAO

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RP Prognostication

Genetic testing can provide patients better perspective on how to handle this heritable disease.

Q A patient presents to me for the first time with a classic case of retinitis pigmentosa (RP). I know there is no treatment, but in what other ways can I help counsel this patient?

A RP is one of the most common inherited retinal diseases (IRD). “No treatment is currently available, so the key to patient care lies in management,” says Himakshi Bhatt, OD, an ocular disease resident at Omni Eye Services of Atlanta. “This is where genetic testing comes into play.”

Genetic information can provide insight to inheritance patterns, severity and ultimately disease prognosis. All this information together can help the doctor provide optimal patient care.

Inheritance Outcomes

RP is a group of inherited disorders that results in the degradation of the rod (and eventually cone) photoreceptors. The classic presentation includes the triad of bone spicules, arteriolar narrowing and waxy optic disc pallor. Additionally, posterior subcapsular cataracts, epiretinal membranes and cystoid macular edema can also be present in some cases. Common symptoms include nyctalopia, reduced visual acuity (VA), peripheral visual field loss and, in later stages, photopsia.

Over 50 genes are affected in the disease process, with the most common mutations affecting phototransduction in rods, the retinoid cycle and photoreceptor structure. Commonly affected genes include PRFP31 and RHO for autosomal-dominant inheritance, ABCA4 and USH2A for autosomal recessive inheritance and RPRGR for X-linked inheritance.

The severity and outcome of RP greatly depends on inheritance. Autosomal dominant accounts for about 15% of all RP and is the least severe in presentation. Onset is gradual; the average best-corrected VA is 20/30 for someone under 30 years old. Autosomal recessive RP, the most common variant, has a poorer visual prognosis. Patients usually experience severely diminished vision early in life. X-linked is the rarest form and the most severe. Usually only males are affected, and VA is typically worse than 20/200.

Plan and Manage

Though it may seem daunting, genetic testing is readily available and accessible for patients with RP. For example, Invitae (through Spark Therapeutics) offers free genetic testing for IRDs (www.invirac.com/en/idyourird). Additional testing resources are available with the Foundation Fighting Blindness’s My Retina Tracker Program through Blueprint Genetics. Saliva, blood or buccal samples are taken in-office using a pre-ordered collection kit. The specimen is then shipped to a company-specific lab and results come back in a few weeks.

Once mutation and inheritance patterns are discerned, treatment and management of your patient can begin. The only known genetic treatment currently available for RP is for mutations in the RPE65 gene; all other types require mindful management.

“Being diagnosed with an incurable disease is a harsh reality for many to cope with,” Dr. Bhatt says. “This information can empower the patient and allow them to come to terms with their diagnosis.”

Genetic testing is critical to family planning, especially disease severity and inheritance. Knowing the specific mutation can also be valuable when it comes to future treatment options.

“New clinical trials and experimental gene therapies are always on the horizon, and knowing a patient’s specific mutation can open the door to these opportunities,” Dr. Bhatt says.

Knowing how severe the final disease state will be or how quickly it will progress provides both the patient and doctor crucial information. “Patients have a way to take their disease in their own hands and no longer fear the unknown,” Dr. Bhatt notes. “Testing can also help the provider find the best resources and provide their patient better counsel.”

It is key to emphasize that the disease is not the patient’s fault and that, as a team, you and the patient will take on the challenge together.


Dr. Ajamian is the center director of Omni Eye Services of Atlanta. He currently serves as general chairman of the education committee for SECO International and is vice president of the Georgia State Board of Optometry. He has no financial interests to disclose.
Relieving Allergy Itch with Convenience and Comfort

By Andrew D. Pucker, OD, PhD
Assistant Professor, Department of Optometry & Vision Science, University of Alabama at Birmingham

Allergens, such as pollen, ragweed, and animal dander, can produce ocular symptoms of itch in as much as 40% of Americans. Only about 10% of patients with ocular allergies (OA) seek medical care, suggestive of a tendency to self-treat. With anti-allergy OTC sales being 10-fold greater than prescription sales, many patients are approaching pharmacy shelves without a clear doctor recommendation or understanding of which drop might best meet their needs.

While antihistamines and mast cell stabilizers are both effective at relieving symptoms of OA itch, and in some cases signs of conjunctival redness, dual-acting agents, including olopatadine (Pataday® products) and ketotifen (Zaditor®, Alaway®), have combined mast cell stabilizer and antihistamine effects and have been shown to provide better symptom control. Furthermore, among the dual-acting agents available in the United States (US), only three products require once-daily dosing: Pataday Once Daily Relief (olopatadine 0.2%, 16-hour relief), Pataday Once Daily Relief Extra Strength (olopatadine 0.7%, 24-hour relief), and Lastacaft (alcaftadine 0.25%, 16-hour relief). For comparison, the available topical antihistamines (e.g., pheniramine) and mast cell stabilizers (e.g., cromolyn sodium 0.2%) in the US typically require 4 times daily dosing, while most dual acting agents, including ketotifen, require 2-3 times daily dosing. These differences can be important for patients who are busy or polymedicated and have a hard time remembering when to take their medications.

In addition to dosing frequency, topical anti-allergy drops can also differ in their comfort upon application, a characteristic that is driven by how closely the pH of the drug matches the ocular surface. For example, formulations that contain ketotifen and pheniramine maleate have an acidic pH between approximately 4.4 to 5.8. For reference, the average pH of a normal tear film is approximately 7.5, which is closer to the approximate 7.0 pH of olopatadine drugs. This difference in ocular comfort was exhibited in two different studies comparing comfort upon application of Pataday Extra Strength to Alaway (ketotifen 0.025%; Bausch & Lomb, Inc.) or to Visine Allergy Eye Relief Multi-Action (pheniramine maleate 0.3%/naphazoline HCl 0.025%; Johnson & Johnson Consumer, Inc.). Participants in each study felt that Pataday was more comfortable upon application compared to Alaway (N=161; p<0.001) or Visine Allergy (N=161; p<0.003). In fact, more participants preferred or strongly preferred Pataday Extra Strength over Alaway with respect to overall comfort (64.2% vs. 20.8%), burning (64.8% vs. 15.7%), and stinging (66.7% vs. 17.0%) upon application (Figure 1). Similarly, more participants preferred or strongly preferred Pataday Extra Strength over Visine Allergy with respect to overall comfort (61.8% vs. 21.0%), burning (60.2% vs. 15.8%), and stinging (60.1% vs. 19.0%) upon application (Figure 2).

In conclusion, dual-acting agents effectively relieve ocular allergy itch, but Pataday Extra Strength is conveniently available OTC, provides 24-hour ocular allergy relief, and was shown to be more comfortable upon application than two other allergy drops.

References

BRINGING INCISIONS AND INJECTIONS TO YOUR CLINIC

This article—the first of a four-part series on optometric scope expansion—discusses how to incorporate these services into your practice flow.

BY CATLIN NALLEY
CONTRIBUTING EDITOR

Optometrists typically know more, and are capable of doing more, than their state licensure will allow, a source of frustration for many and a setback to the efficient delivery of care in United States. Fortunately, especially in the last several years, the laws have been catching up. Multiple states have passed bills to allow more ODs than ever to practice to the full extent of their training and ability, and the momentum is clearly building.

Over the next four months, we’ll be digging into some of the newer optometric capabilities with advice from those who already have mastered the ins and outs.

Two practice privileges that a growing number of ODs in the country can embrace are (1) administering certain intralesional injections and (2) performing minor in-office procedures such as removal of lesions in and around the eye. Whether your state already allows you to perform these procedures, notes Jackie Burress, OD, of Oklahoma, one of the earliest states to get on board with optometric scope expansion. However, for optometric physicians who are more seasoned in the field and did not receive this training as part of their education, additional certification or training courses may be obligatory. Specific requirements will vary from state to state, so it’s important to check with the board of optometry in your state before offering these procedures at your practice.

Adding Services: The Logistics

Once a state expands its optometric scope of practice, there are many important considerations for practice owners to keep in mind when offering a new service to patients. The first—and arguably the most important—factor to consider is whether additional certification or education is required by that particular state’s law.

When offering lesion removal and injections, optometrists who have graduated within the last decade or two have often received the necessary training in school to conduct these procedures, notes Jackie Burress, OD, of Oklahoma, one of the earliest states to get on board with optometric scope expansion. However, for optometric physicians who are more seasoned in the field and did not receive this training as part of their education, additional certification or training courses may be obligatory. Specific requirements will vary from state to state, so it’s important to check with the board of optometry in your state before offering these procedures at your practice.

For optometrists who may not legally be required to undergo additional training but nevertheless want to refresh or enhance their clinical skills, shadowing a colleague who is already engaged in the service is a good way...
to start. Hands-on CE courses can also be helpful—not only to develop skills but also to better understand the tools as well as the practical components needed to expand clinical services.

Procedure set-up does take time, which could prove challenging in a busy practice. For this reason, Dr. Burress recommends dedicating them to a specific day. “This allows you to focus all of your attention on the procedures instead of fitting them in around standard appointments, which is more efficient and ensures optimal patient care,” she says.

Having the right tools at your disposal is also important (see “Prepping Your Clinic for Incisions and Injections,” on page 39, for a recommended list); however, don’t get caught up in the misconception that starting surgical procedures requires a huge financial investment, urges Richard Castillo, OD, DO, associate dean at Northeastern State University of Oklahoma (NSUOK) College of Optometry and a fierce advocate for optometric scope expansion. “Invest in yourself and your knowledge base,” he says. “Remember, you already bring a lot to the table. Your technical skillset and clinical understanding are what will help you successfully integrate these procedures into practice.” Dr. Castillo’s dual degrees in ophthalmology and optometry give him unique insights into the gaps between the two professions and how best to reconcile them.

For biopsies, you will need to work with your local lab to determine which preparations it will accept, according to Rodney Bendure, OD, another NSUOK optometrist. Upon request, the lab should provide the necessary specimen containers and requisition forms.

Billing and appropriate documentation is another logistical aspect of lesion removal and injections that ODs will have to adapt to in practice. Histopathological evaluation of lesions will be an additional cost to the patient, so it’s important to be transparent and let them know what to expect to avoid pained surprise. Dr. Bendure uses the phrase “abundance of caution” when discussing the need for labs or referrals with patients, particularly those who may be hesitant.

Knowing and vocalizing the pros and cons of the various options will help patients feel more secure in your care, especially while these services are still being introduced to your practice.

Clinical Pearls for Incisions and Injections

Lesion removal and anterior segment injections encompass a number of different procedures, including intradermal injection for anesthesia, incision and curettage of chalazion and snip excisions, just to name a few. It is important to consult with your state board to determine which specific procedures are allowed under your state’s optometry laws.

As with any procedure, the clinical work begins with obtaining a thorough medical history and informed consent from the patient, explains Dr. Burress. This history should include past or present medical conditions, drugs and latex allergies and current medications, including both prescription and OTC.

Dr. Burress recommends paying close attention to anticoagulants, such as aspirin, NSAIDs, warfarin, heparin, dipyridamole and clopidogrel, since they can increase the risk of bleeding and prolong healing. Consulting with the patient’s primary care provider could help you decide if it is safe to temporarily stop the anticoagulant for lesion removal.

HOW TO COPE WITH YOUR NEW SCOPE

The optometric profession is currently in the midst of a new wave of expanded scope of practice legislation, both proposed and enacted, with many bills aimed at bringing “hands-on” procedures like lesion removal and minor laser surgery to optometry. Others seek to plug the remaining holes in optometric pharmaceutical prescribing rights, notably in oral medication use.

Most recently, Virginia passed legislation enabling its ODs to perform three types of laser surgery—YAG capsulotomy, laser peripheral iridotomy and selective laser trabeculoplasty—while similar efforts in Alabama were stymied by opposition. Though the fight for expanded scope of practice is far from over, ODs can use this growing momentum to enhance not only their own practices but also the profession and eye care at large.

“I have witnessed optometry evolve from a material and retail-based profession to a healthcare service-based profession,” notes Dr. Castillo. “The transformation began in the 1970s when optometry started administering eye drops to screen for disease, and since then, the profession has become the largest provider of primary eyecare services in the nation. Today, we have nine states with statutory laser authority and almost 20 states with some level of surgical procedure authority. This progress is only going to continue,” he says.

To help you better understand the new and emerging practice privileges, we are publishing a series of four articles that delve into the various categories of scope expansion, offering clinical best practices and discussing the logistics of adding each service. This first article highlights incisions and injections: where to start when integrating these procedures, what tools are needed and how to achieve great outcomes. The remaining three articles in this scope expansion series, which will appear across our next several issues, will include guides to laser surgery, glaucoma treatment and prescribing oral medications.

If you practice in a state where you’re already able to offer these services to your patients, this series will provide you with a refresh on the basics of each procedure and give you advice on bettering your practice flow. If you practice in a region where expansion efforts are still underway, each of these four articles will offer information on what you should know and can do to help prepare you and your staff for when it comes time to incorporate these new and exciting services into your clinic.
Prior to a procedure, Dr. Bendure makes sure to check patient vitals. “I had a young, healthy female in my chair about 12 years ago,” he recalls. “She wanted a few skin tags removed around her eyelids. I injected the areas to be treated with Xylocaine with epinephrine.” She was doing fine until he massaged the skin to disperse the medication.

“Apparently, I was too aggressive with the digital massage—he had a vasovagal response, turned pale green and passed out,” he continues. “Turns out getting her legs and feet elevated and putting a fan on her was all she needed.” Checking a patient’s vitals beforehand is always a good idea to help predict whether there is a possibility of complications during care that may perhaps be unrelated to the procedure itself.

When Corri Collins, OD, of Lexington, KY, sees a patient for lesion removal, she always takes a pre-op photo to allow for accurate documentation. This allows patients to have a clear, visual comparison of what their eye looked like before and after the procedure.

“The majority of lesions I find myself removing are stubborn, irritating skin tags,” says Dr. Collins. “These small papillomas typically make their home in the creases of the eyelids where most patients find it to be uncomfortable or irritating.” She also adds that lesion size and location can help you determine if a local anesthetic is necessary.

“I typically do not inject local anesthetic if the papilloma is small or very close to the lid margin,” Dr. Collins explains. “This is just personal preference due to the pain involved with the injection being the same, if not more, than what is endured with the removal alone.”

In cases where local anesthetic is warranted or preferred by the patient, it can be helpful to mark the lesion before injecting to ensure the original borders, according to Dr. Collins. “You will be inserting the needle laterally at 5-10 degrees with the bevel up and aspirate to ensure correct location,” she explains. Then, after injecting 0.5mL to 1mL of anesthetic, gently massage the area and wait five minutes for the medication to take effect.
One stick is best—so inject a portion of the anesthetic (lidocaine, for instance) and, without pulling the needle out of the skin, back it up a bit, then push forward in another direction,” advises Dr. Bendure. “Do this a few times until you have infiltrated the entire area beneath the lesion and then remove the needle.”

After creating a sterile environment and positioning the necessary equipment close by (a sterile betadine swab, sterile gloves and erythromycin ointment), Dr. Collins says she usually removes these lesions outside of the slit lamp using a headband magnifier. She finds that this method allows for a much larger range of motion while maintaining the same level of clarity.

Dr. Collins takes the following steps for the procedure of removing a lesion around the eye:
1. Wash hands thoroughly and put on sterile gloves.
2. The sterile betadine swab is applied to the lesion and the surrounding area—starting at the lesion and circling out.
3. Once dried, take the tissue forceps (she uses the Adson brand) to pull the lesion away from the skin to

The left image shows granulomatous material extruding from the palpebral conjunctival lesion upon incision. On the right, curettage of the chalazion is expelling the material.
LESION REMOVAL: BEST PRACTICES TO REMEMBER

First and foremost, it is important to have a clear understanding of the different types of “lumps and bumps” and the characteristics of skin lesions that imply benign, malignant or uncertain, notes Dr. Bendure.

The standard of care in all 50 states dictates lesions with risk of malignancy be tentatively diagnosed as cancerous and biopsied, notes Dr. Castillo. Most states prohibit ODs from removing a cancerous growth; therefore, referral to an ophthalmic surgeon for excision and biopsy to rule out malignancy is necessary in those cases.

Another key component is anatomy. While ODs have been taught this information, Dr. Bendure urges them to brush up on their knowledge before initiating these procedures in their clinic. “For instance, in the case of triamcinolone injection for a chalazion, you want to make sure you don’t cause a central retinal artery occlusion—that really is a possibility,” he says. There are anastomoses between the superficial vessels and the ophthalmic artery, he explains.

“If you happen to inject directly into a vessel, you could easily overwhelm the pressure gradient, push the steroid suspension retrograde into the ophthalmic artery and cause blindness,” he adds. “So, you should always pull back on the plunger to check for a flash of blood and ensure you aren’t going to inject into a vessel.”

Other best practices:
- Be prepared to treat emergencies that may arise, including working with EMS if needed in extreme cases.
- Westcott scissors are Dr. Bendure’s go-to for most skin tags, but tweezers and a scalpel also work well.
- Radiosurgical units create extremely clean cuts and have the ability to coagulate with the turn of a dial. For eyelid margin lesions, Dr. Bendure has had fantastic aesthetic results, but reminds ODs to use a scleral shell.
- Purchase a vacuum to suck up the tissue plume created with the radiosurgical unit—you don’t want to breathe in viral papilloma particles. (A certified HEPA-filtered tissue smoke evacuator is an OSHA requirement.)
- The Atlas of Primary Eyecare Procedures is a useful resource for ODs performing these procedures.

get the best view of the base of the lesion. Then, use the Westcott tenotomy scissors to cut the lesion at its base.

4. If a biopsy is warranted, place the specimen in the container, fill out the appropriate paperwork and send it to the practice’s local lab.

THE DON'TS OF LESION REMOVAL

Knowing what not to do is just as valuable as knowing what to do. Here are a few missteps to avoid:
- Do not inject Kenalog into darker pigmented patients.
- Never use radiosurgical devices on patients with any electronic implanted devices.
- If you are planning to biopsy a specific lesion, do not use radiosurgery to remove it because the lab is not able to perform a biopsy on tissue that has been subjected to the types of reactive changes RF causes in the tissue.
- Do not inject or cut into a suspected cancerous lesion.

“Usually there is very minimal bleeding involved in these procedures, thus there is very little clean-up to the affected area,” says Dr. Collins. “Lastly, I apply erythromycin ointment to the affected area and prescribe the patient a 3.5g tube to continue to use BID until I see them back for their post-op, which is usually one week later.”

When removing lesions, it is important to consider how deep you need to go, according to Dr. Bendure. Is it a pedunculated squamous papilloma, for instance, which will likely be a simple snip? Or is it a sessile nevus, which would be better treated with radiosurgical excision to provide a better aesthetic appearance after healing?

Hidrocystoma, also known as a sudoriferous cyst, is another type of lesion Dr. Collins frequently sees in patients at her practice. These lesions can be easily lanced and drained in the office. In most cases, she uses a scalpel blade to open the cyst and then drains the fluid while holding gauze pads to the area to assist with clean-up.

“On some occasions, you will need to use the Westcott scissors to remove additional skin that could be present once the fluid is drained,” she said. “Lastly, you will apply erythromycin ointment to the affected area, prescribe it BID to the area and evaluate it at the post-op visit one week later.”

For chalazion removal, Dr. Collins prefers to err on the side of caution and makes sure the patient has been using heat masks twice a day for at least three months before considering removal or intralesional injections.

“When determining intralesional injection (Kenalog) vs. incision and curettage, there are a few things you need to consider,” she notes. “The steroid injection is only about 75% to...
Year-round control for VKC\textsuperscript{1}

The first and only topical cyclosporine FDA-approved to treat vernal keratoconjunctivitis (VKC) in children and adults\textsuperscript{1}

Reduction in itching and keratitis scores as early as month \textsuperscript{1}

Established 12-month safety profile with low rates of mild-to-moderate adverse events\textsuperscript{1,3}

ADVERSE REACTIONS
The most common adverse reactions reported in greater than 5% of patients were eye pain (12%) and eye pruritus (8%), which were usually transitory and occurred during instillation.

REFERENCES:

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**Verkazia**
cyclosporine ophthalmic emulsion 0.1%

**BRIEF SUMMARY OF PRESCRIBING INFORMATION**

**INDICATIONS AND USAGE**
Verkazia ophthalmic emulsion (0.1% (1mg/mL) cyclosporine) is indicated for the treatment of vernal keratoconjunctivitis (VKC) in children and adults.

**GENERAL Dosing INFORMATION**
Contact lenses should be removed before applying Verkazia and may be reinserted 15 minutes after administration.

If a dose is missed, treatment should be continued as normal, at the next scheduled administration.

If more than one topical ophthalmic product is being used, administer the eye drops at least 10 minutes apart to avoid diluting products. Administer Verkazia 10 minutes prior to using any eye ointment, gel or other viscous eye drops.

**DOSE AND ADMINISTRATION**
Instill one drop of Verkazia, 4 times daily (morning, noon, afternoon, and evening) into each affected eye.

Treatment can be discontinued after signs and symptoms are resolved and can be reinitiated if there is a recurrence.

**CONTRAINDICATIONS**
None.

**WARNINGS AND PRECAUTIONS**

**Potential for Eye Injury and Contamination**
To avoid the potential for eye injury or contamination, advise patients not to touch the vial tip to the eye or other surfaces.

**ADVERSE EVENTS**

Table 1: Adverse Reactions Reported in ≥ 1% of Patients Receiving Verkazia

<table>
<thead>
<tr>
<th>Eye Disorders</th>
<th>(N=135)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Eye pain+a</td>
<td>12%</td>
</tr>
<tr>
<td>Eye pruritusb</td>
<td>8%</td>
</tr>
<tr>
<td>Ocular discomfortc</td>
<td>6%</td>
</tr>
<tr>
<td>Visual acuity reduced</td>
<td>5%</td>
</tr>
<tr>
<td>Ocular hyperemia</td>
<td>4%</td>
</tr>
<tr>
<td>Systemic</td>
<td></td>
</tr>
<tr>
<td>Cough</td>
<td>5%</td>
</tr>
<tr>
<td>Headache</td>
<td>4%</td>
</tr>
<tr>
<td>Upper respiratory tract infection</td>
<td>2%</td>
</tr>
</tbody>
</table>

a Including eye pain and instillation site pain
b Including eye pruritus and instillation site pruritus
c Including foreign body sensation and ocular discomfort

**USE IN SPECIFIC POPULATIONS**

**Pregnancy**

**Risk Summary**
There are no adequate and well-controlled studies of Verkazia administration in pregnant women to inform a drug-associated risk. Oral administration of cyclosporine to pregnant rats or rabbits did not produce teratogenicity at clinically relevant doses [see Data].

**Data**

**Animal Data**

Oral administration of cyclosporine oral solution (USP) to pregnant rats or rabbits was teratogenic at maternally toxic doses of 30 mg/kg/day in rats and 100 mg/kg/day in rabbits, as indicated by increased pre- and postnatal mortality, reduced fetal weight and skeletal retardations. These doses (normalized to body weight) were approximately 320 and 2150 times higher than the daily maximum recommended human ophthalmic dose (MRHOD) of 0.015 mg/kg/day, respectively.

No adverse embryofetal effects were observed in rats or rabbits receiving cyclosporine during organogenesis at oral doses up to 17 mg/kg/day or 30 mg/kg/day, respectively (approximately 185 and 650 times higher than the MRHOD, respectively).

An oral dose of 45 mg/kg/day cyclosporine (approximately 485 times higher than MRHOD) administered to rats from Day 15 of pregnancy until Day 21 postpartum produced maternal toxicity and an increase in postnatal mortality in offspring. No adverse effects in mothers or offspring were observed at oral doses of up to 15 mg/kg/day (160 times greater than MRHOD).

**Pediatric Use**

Verkazia’s safety and effectiveness has been established in patients from 4 through 18 years of age.

**NONCLINICAL TOXICOLOGY**

**Carcinogenesis, Mutagenesis, Impairment of Fertility**

**Carcinogenesis**
Systemic carcinogenicity studies were carried out in male and female mice and rats. In the 78-week oral (diet) mouse study, at doses of 1, 4, and 16 mg/kg/day, evidence of a statistically significant trend was found for lymphocytic lymphomas in females, and the incidence of hepatocellular carcinomas in mid-dose males significantly exceeded the control value. The low dose in mice is approximately 5 times greater than MRHOD.

In the 24-month oral (diet) rat study, conducted at 0.5, 2, and 8 mg/kg/day, pancreatic islet cell adenomas significantly exceeded the control rate in the low dose level. The hepatocellular carcinomas and pancreatic islet cell adenomas were not dose related. The low dose in rats is approximately 5 times greater than MRHOD.

**Mutagenesis**
In genetic toxicity tests, cyclosporine has not been found to be mutagenic/genotoxic in the Ames Test, the V79-HGPR Test, the micronucleus test in mice and Chinese hamsters, the chromosome-aberration tests in Chinese hamster bone-marrow, the mouse dominant lethal assay, and the DNA-repair test in sperm from treated mice. Cyclosporine was positive in an in vitro sister chromatid exchange (SCE) assay using human lymphocytes.

**Impairment of Fertility**

Oral administration of cyclosporine to rats for 12 weeks (male) and 2 weeks (female) prior to mating produced no adverse effects on fertility at doses up to 15 mg/kg/day (160 times higher than MRHOD).

**CLINICAL STUDIES**

The safety and efficacy of Verkazia for the treatment of VKC was evaluated in two randomized, multi-center, double-masked, vehicle-controlled, clinical trials (VEKTIS Study; NCT01751126 and NOVATIVE Study; NCT00328653).

A total of 168 and 118 patients were enrolled in the VEKTIS and NOVATIVE studies for the efficacy analyses, respectively. Patients’ age ranged from 4 through 17 years (mean age 9 years) in VEKTIS and 4 through 21 years (mean age 9 years) in NOVATIVE, with most patients being between 4 and 11 years of age (76% in VEKTIS and 80% in NOVATIVE) and male (79% in VEKTIS and 81% in NOVATIVE). Most of the patients had both limbal and tarsal forms of VKC (65% in VEKTIS and 74% in NOVATIVE). In both studies, patients had experienced VKC for a mean of 3 years prior to enrollment and all patients had a history of at least one recurrence of VKC in the year prior to study entry.

**STORAGE AND HANDLING**

Do not freeze Verkazia. Store at 20°C to 25°C (68°F to 77°F). After opening the aluminum pouch, the single-dose vial should be kept in the pouch to protect from light and avoid evaporation. Any opened individual single-dose vial with any remaining emulsion should be discarded immediately after use.
90% effective with 25% of patients needing a second injection, whereas incision and curettage is typically over 90% effective.”

Another consideration is skin color. If the patient has darker pigmented skin, Kenalog could cause lightening of the tissue; for that reason, it’s typically contraindicated in this patient population, says Dr. Collins.

Just like any procedure, performing intraliesional injection begins by establishing a sterile environment—with properly sanitized or disposable tools—followed by application of the betadine to the affected area and then either external or internal injection. “If you administer an injection externally, this will require you to inject tangentially to the globe; internal injections will require a clamp to evert the lid to inject,” explains Dr. Collins. “You will be injecting 0.2-0.4cc of 10-20mg/mL, applying gentle pressure afterwards and advising the patient to use erythromycin ointment BID for one week.”

Incision and curettage require a clamp to evert the lid, a scalpel to create a vertical incision (about 2-3mm away from the lid margin) and involve a curette to remove the internal contents, she outlines. “Lastly, forceps/Wescott scissors will be used to remove the fibrotic capsule to ensure it does not return. Once again, apply gentle pressure and prescribe erythromycin ointment BID for one week.”

Although the procedures described above are among the most common, gaining incision and injection privileges opens up broad new vistas that require the OD to recognize their capabilities—and their limitations. Be sure to have a protocol in place for appropriate referral of cases beyond your wheelhouse, as well as time in your schedule to continually work on building your skills and educating yourself on safety and best practices.

**PREPPING YOUR CLINIC FOR INCISIONS AND INJECTIONS**

Successful incorporation of new procedures depends, in part, on having the necessary tools at your disposal. For instance, it is important to have specific procedure consent forms as well as pathology vials and forms, according to Dr. Collins. To offer lesion removal and injections, the initial set-up shouldn’t break the bank. Tools to have on hand include:

- Specimen containers
- Sterile betadine swabs
- Sterile towels
- Eye patches/pads
- 4x4 gauze pads
- 1” paper tape
- Syringe/needles (typically ½ to 1 inch with 25-27 gauge)
- Adson tissue forceps
- Scalpel (No. 3 or 4) with blades (11 or 15)
- Sharps container
- Chalazion clamps with curettes
- Westcott scissors
- Headband magnifier
- Anterior segment camera
- Local anesthetic (1% lidocaine with epinephrine 1:100,000 and 8.4% bicarb)
- Kenalog (10-40mg/mL) or triamcinolone
- Ointments (preferably erythromycin)
- High-temperature cautery
- Autoclave with sterilization packs

Depending on the types of lesions ODs at your practice are planning to remove, a radiosurgical unit may be a beneficial addition to your clinic. Another consideration is whether to invest in reusable or disposable tools. Dr. Bendure brings up the point that advantages can be seen with either option as you compare initial costs vs. the time required to clean and sanitize surgical instruments. Ultimately, he notes, it’s up to the optometrist to determine what works best for their individual practice and the patients they care for.

**Looking Ahead**

As the current wave of scope expansion continues to gain momentum across the country, ODs are in the perfect position to take advantage of this progress for the benefit of their patients, practices and profession. By practicing to the fullest extent of their scope, optometrists are able to provide their patients with the highest level of care possible.

“As primary eye care providers we have the responsibility to give our patients the best access to timely, comprehensive care,” notes Dr. Burress. “And so, if it is within our scope to provide additional services that can save our patients time and money, we need to. This is especially important in rural areas that may have limited facilities close by. The more we can do in-office to meet our patients’ needs and improve the quality and convenience of their care, the better.”

Optometrists who currently don’t have the ability to perform these procedures in their state have a key role to play in changing that. Get involved with your professional organizations and help raise awareness among the community and legislators. “Building a relationship with your state representatives is crucial,” says Dr. Castillo. “Become a resource for legislators and participate in the grassroots efforts in your state.” In order for the voice of optometry to overtake that of the opposition, those who work directly in the field must be active advocates for expansion laws.

For those ODs whose scope of practice has expanded and are considering adding a new service, Dr. Collins encourages them to take the leap. “Our profession has fought to expand our scope to meet the same level as our education and training, so get out there and capitalize on the opportunities given to us,” she says. “By integrating this into your practice, you will be providing top-tier optometric care and will be able to continue giving your patients the level of care they deserve.”
Be proactive in asking patients questions and understand the risks they certainly face.

Optometrists are the frontline workers in eye care and should be the first source patients turn to for reliable and accurate information about eye health and vision. We also should be providing patient education before problems arise or questions are asked. Finally, we should help patients recognize the circumstances under which they should contact us and help them understand what could happen.

Certainly, the information we give is broadly contextual—we educate aging patients about cataracts, we educate diabetic patients about retinopathy—so who would you preemptively educate about visual hallucinations? How do you frame a conversation around them? How often do you talk to your patients about visual hallucinations in general, especially when they didn’t bring it up? My guess would be “not enough.”

A major area where visual hallucination becomes relevant is in the context of neurodegenerative diseases on the dementia spectrum, all of which involve irreversible and progressive neuronal loss. Here, we’ll focus on visual hallucinations in the context of common dementia spectrum disorders.

Classification and Causes
Visual hallucinations are visual perceptions that occur without a corresponding visual stimulus; they occur due to neural activity without visual input. They can be simple (e.g., photopsias, lines, dots, shapes or checkerboard patterns) or complex (formed images, e.g., people, animals, objects). There are even more minor forms of visual hallucinations such as a sensation or perception of a presence (e.g., a person or animal standing behind them), a passage (e.g., a the sensation of a dog passing by) or an illusion (e.g., an actual object being seen as another object for a time, like a book momentarily appearing to be a bird). Minor visual hallucinations are transitory, and other hallucination episodes are typically short-lived; complex visual hallucinations usually last less than five minutes, can be static or kinetic and can occur any time throughout the day; most patients, even those with dementia, maintain understanding that these sightings are in fact hallucinations.

Eyecare providers should be well-versed on Charles Bonnet syndrome (CBS), which involves complex visual hallucinations in cognitively sound individuals in the context of acquired visual impairment, but many are far less familiar with hallucinations in other settings.

Visual hallucinations in schizophrenia or other psychiatric disorders and in hallucinogen-induced states seem straightforward enough; but these stereotypical hallucinations—such as geometric patterns (e.g., checkerboard, cobwebs, tunnel, spiral) that reduplicate and/or change in size/shape or in object composition—also occur in non-psychiatric conditions such as epilepsy or narcolepsy, due to tumors or strokes involving the visual pathway, brainstem or thalamus, and even in normal individuals just before falling asleep.
While the exact mechanisms of the dysfunctional visual information processing that produces visual hallucinations still eludes researchers, several areas along the visual pathway—spanning from the outer retina and optic nerve to the frontal, parietal and temporal cortices—have all been implicated.\(^7\) Irritation to any of these areas may be to blame for visual hallucinations, but the type of irritation can vary from photoreceptor dysfunction to inflammation or ischemia, compression, medications, recreational drugs or migraines, among others, depending on the visual hallucination-provoking disorder.\(^6\)

In CBS, visual hallucinations have been attributed to a “release phenomenon” that occurs from deafferentation of the cerebral cortex’s visual association areas after acquired visual impairment causes defective visual input.\(^6\) While the precise source of the irritation leading to visual hallucination in the dementia spectrum is not well-defined, it is understood to be different than the release phenomenon in CBS. Much work remains to fully understand the pathophysiology of visual hallucinations in neurodegenerative disorders.

CBS should be touched on with every visually impaired patient since visual hallucinations in CBS occur in about 11% of people with severe vision loss, but don’t miss another broad demographic of patients at even higher risk: those on the dementia spectrum.\(^9\)

### Dementia Spectrum

The most common dementias include Alzheimer’s disease (AD), Parkinson’s disease with dementia (PDD) and dementia with Lewy bodies (DLB); classification of these diseases is very complex but largely boils down to which proteins are misfolded. Amyloid-β extracellular plaques and hyperphosphorylated tau proteins causing intracellular neurofibrillary tangles (NFT) are characteristic of AD, whereas PDD and DLB demonstrate α-synuclein deposition in Lewy bodies and neurites.\(^1\)

Clinically, patients with AD typically have a form of cognitive impairment whose domains include memory, language and perceptual processing deficits.\(^1\) Parkinsonian motor dysfunction comprises typical features of Parkinson’s disease (PD) such as rigidity, bradykinesia, gait impairment and rest tremor.\(^10\) When cognitive function has become impaired enough that it affects social, occupational or basic activities of daily living, the criteria has been met to diagnose dementia.\(^10\) The prevalence of dementia in PD is up to 78%; mortality follows the dementia diagnosis by about four years, on average.\(^9,11\)

Clinical features of PDD and DLB overlap and include cognitive difficulties chiefly involving attention, executive dysfunction, memory impairment and visuospatial abnormalities in the context of the parkinsonian motor dysfunction.\(^10\) PDD and DLB are differentiated from each other by the timing of whether parkinsonism or dementia develop first: those with parkinsonism who develop dementia less than one year after motor symptoms have PDD, whereas DLB includes those who develop dementia before parkinsonism or who develop dementia and parkinsonism within one year of each other.\(^1,10\)

These patients—our patients on the dementia spectrum—need to hear from you about visual hallucinations. This phenomenon has been reported in up to 25% of those with AD.\(^12\) In early stages of AD, minor visual hallucinations are the much more prevalent type to occur, and they may begin quite early in the disease process; other visual hallucination forms are not likely in early AD but are associated with moderate AD and more severe AD dementia.\(^4\)

In patients with PD, visual hallucinations are reported in about 16% to 40%—more so in those with PDD where they’re seen in up to 65%.\(^3,13\) Minor hallucinations are the most frequent hallucinatory symptom in PD.\(^4\) Interestingly, these minor visual hallucinations can also be experienced by patients—up to 30% of them—months to even several years before they develop any motor symptoms of PD.\(^4\) The main predictive factor for having visual hallucinations in treated PD patients is cognitive impairment; others include older age, duration of disease, depressive symptoms, sleep-wake cycle disturbances and more severely affected motor status.\(^3,15\) In PDD and DLB, complex hallucinations have been associated with increasing density and the distribution of Lewy bodies.

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**Table 1. Visual Hallucination Types**

<table>
<thead>
<tr>
<th>Type</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor</td>
<td>Perception of a person/animal standing behind/nearby</td>
</tr>
<tr>
<td>Presence</td>
<td>Passage</td>
</tr>
<tr>
<td>Illusion</td>
<td>One object briefly looking like another object</td>
</tr>
<tr>
<td>Simple</td>
<td>Photopsias, lines, dots, shapes, checkerboard</td>
</tr>
<tr>
<td>Complex</td>
<td>Formed images (people, animals, objects)</td>
</tr>
</tbody>
</table>

One minor visual hallucination—illusion—involves the patient transiently seeing one object as another, such as a book for a bird.
and NFTs in the temporal cortex in particular.16

Not surprisingly, complex visual hallucinations tend to worsen with time, both regarding frequency and severity, and are unfortunately a risk factor for dementia and a higher rate of mortality.17-19 Visual hallucinations are overwhelmingly common in DLB, where they occur in up to 80% of patients.20 In fact, recurrent complex visual hallucinations are one core diagnostic criteria for DLB and, along with early dementia, are a typical presenting feature of the disease.10 While illusions are also common in DBL, they are less specific than the complex hallucinations that are diagnostically helpful.10

**Patient Inquiry**

Visual hallucinations are under-reported by patients, likely for many reasons. Minor ones are often quickly dismissed by patients and are often not reported at all, largely because they may not be particularly bothersome. On the other hand, some patients may be afraid of stigma or have concern for cognitive decline when they experience a hallucination, so they may not share these symptoms with their healthcare providers. Because visual hallucinations can be quite complex and very well-formed, while surprisingly sometimes perceived as pleasant, they can also be very distressing to patients.

In one study of patients with minor visual hallucinations, they had been occurring for a mean duration of nearly one year and were not mentioned by the patients until they were explicitly asked.3 Other studies have similarly demonstrated that these patients do not volunteer experiencing them unless they’re prompted by leading questions or a direct inquiry.21 The bottom line is that we should be directly asking our at-risk patients—if a patient is reporting these hallucinations, recommend a further workup.2

**Case One**

An 80-year-old man presented, in part due to “floaters.” On further questioning about what they looked like, these were not vitreous floaters as I had expected; what he described as “floaters” was the sensation of a full-sized and -shaped person passing by on the right side (passage visual hallucination). They had been occurring about once per month over the past year.

He had no previous diagnosis of any form of neurodegenerative process. He denied tremors and couldn’t comment on gait changes such as shuffling, reduced arm swinging and rigidity because he couldn’t walk much due to other health issues. He denied any noticeable changes in cognition. His eye exam was non-contributory. His primary care physician was consulted and the patient was scheduled for an evaluation of his motor function, reflexes and cognition to evaluate for a correlating diagnosis; early PD would be highly suspected and early AD would also be a consideration.

**Takeaways:** (1) Ask good clarifying history questions to elicit what the patient is really trying to tell you—ask them to describe in detail what they are communicating. (2) Minor visual hallucinations can precede motor symptoms in PD and can present early in AD—if a patient is reporting these hallucinations, recommend a further workup.

**Discussion.** While more formal interview templates are available regarding visual hallucinations, such as the North-East Visual Hallucinations Interview, eyecare clinicians can start with simple probing questions to classify any problem as relevant, such as onset, frequency, intensity and associated features; however, consider also asking about the complexity of the hallucination, and any associated thoughts, emotions and behaviors.2

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**Table 2. Visual Hallucinations and Neuro Diseases**

<table>
<thead>
<tr>
<th>Characteristic findings</th>
<th>Alzheimer’s Disease</th>
<th>Parkinson’s Disease</th>
<th>Parkinson’s Dementia</th>
<th>Dementia with Lewy Bodies</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Frequency of patients who have VH</strong></td>
<td>Up to 25%</td>
<td>16% to 40%</td>
<td>65%</td>
<td>Up to 80%</td>
</tr>
<tr>
<td><strong>Predominant VH type</strong></td>
<td>Minor VH forms in early AD; other VH forms in later AD stages</td>
<td>Minor VH</td>
<td>Complex</td>
<td></td>
</tr>
<tr>
<td><strong>Temporal development and key features of VH</strong></td>
<td>Minor VH may occur at the beginning of early AD stages</td>
<td>Up to 30% may have minor VH months to years prior to motor symptoms</td>
<td>Complex VH are a typical early presenting feature of DLB</td>
<td></td>
</tr>
</tbody>
</table>
Neurotrophic keratitis is a degenerative disease that warrants immediate attention.

OXERVATE is the first FDA-approved pharmacologic treatment that targets the root pathogenesis of neurotrophic keratitis (NK).

Cenegermin-bkbj, the active ingredient in FDA-approved OXERVATE, is structurally identical to the human nerve growth factor (NGF) protein made in ocular tissues.

Endogenous NGF is a protein involved in the differentiation and maintenance of neurons and is believed to support corneal integrity through three mechanisms (in preclinical models): corneal innervation, tear secretion, and epithelial cell growth.

In clinical studies, with a single 8-week course of therapy:

- Up to 72% of patients with NK achieved complete corneal healing.
- 80% of patients who achieved complete corneal healing remained completely healed at 1 year (REPARO trial).

OXERVATE is a recombinant human nerve growth factor indicated for the treatment of neurotrophic keratitis.

Important Safety Information

WARNINGS AND PRECAUTIONS

Patients should remove contact lenses before applying OXERVATE and wait 15 minutes after instillation of the dose before reinsertion.

ADVERSE REACTIONS

The most common adverse reaction in clinical trials that occurred more frequently with OXERVATE was eye pain (16% of patients). Other adverse reactions included corneal deposits, foreign body sensation, ocular hyperemia, ocular inflammation, and increase in tears (1%-10% of patients).

Please see additional Important Safety Information on accompanying page and full Prescribing Information, including patient information, at OXERVATE.com/prescribing-information.

References:

2. OXERVATE (cenegermin-bkbj) ophthalmic solution 0.002% (20 mcg/mL) [US package insert]. Boston, MA. Dompé U.S. Inc.; 2019.
Brief Summary of Safety
Consult the full Prescribing Information for complete product information.

INDICATIONS AND USAGE
OXERVATE™ (cenegermin-bkbj) ophthalmic solution 0.002% is indicated for the treatment of neurotrophic keratitis.

DOSE AND ADMINISTRATION
Contact lenses should be removed before applying OXERVATE and may be reinserted 15 minutes after administration.
If a dose is missed, treatment should be continued as normal, at the next scheduled administration.
If more than one topical ophthalmic product is being used, administer the eye drops at least 15 minutes apart to avoid diluting products. Administer OXERVATE 15 minutes prior to using any eye ointment, gel or other viscous eye drops.

Recommended Dosage and Dose Administration
Instill one drop of OXERVATE in the affected eye(s), 6 times a day at 2-hour intervals for eight weeks.

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 rates in the clinical studies of another drug and may not reflect the rates observed in practice.
In two clinical trials of patients with neurotrophic keratitis, a total of 101 patients received cenegermin-bkbj eye drops at 20 mcg/mL at a frequency of 6 times daily in the affected eye(s) for a duration of 8 weeks. The mean age of the population was 61 to 65 years of age (18 to 95). The majority of the treated patients were female (61%). The most common adverse reaction was eye pain following instillation which was reported in approximately 16% of patients. Other adverse reactions occurring in 1-10% of OXERVATE patients and more frequently than in the vehicle-treated patients included corneal deposits, foreign body sensation, ocular hyperemia, ocular inflammation and tearing.

USE IN SPECIFIC POPULATIONS

Pregnancy
Risk Summary There are no data from the use of OXERVATE in pregnant women to inform any drug associated risks.
Administration of cenegermin-bkbj to pregnant rats or rabbits during the period of organogenesis did not produce adverse fetal effects at clinically relevant doses. In a pre- and postnatal development study, administration of cenegermin-bkbj to pregnant rats throughout gestation and lactation did not produce adverse effects in offspring at clinically relevant doses.

Animal Data
In embryofetal development studies, daily subcutaneous administration of cenegermin-bkbj to pregnant rats and rabbits throughout the period of organogenesis produced a slight increase in post-implantation loss at doses greater than or equal to 42 mcg/kg/day (267 times the MRHOD). A no observed adverse effect level (NOAEL) was not established for post-implantation loss in either species.

In rats, hydrocephaly and ureter anomalies were each observed in one fetus at 267 mcg/kg/day (1709 times the MRHOD). In rabbits, cardiovascular malformations, including ventricular and atrial septal defects, enlarged heart and aortic arch dilation were each observed in one fetus at 83 mcg/kg/day (534 times the MRHOD). No fetal malformations were observed in rats and rabbits at doses of 133 mcg/kg/day and 42 mcg/kg/day, respectively. In a pre- and postnatal development study, daily subcutaneous administration of cenegermin-bkbj to pregnant rats during the period of organogenesis and lactation did not affect parturition and was not associated with adverse toxicity in offspring at doses up to 267 mcg/kg/day. In parental rats and rabbits, an immunogenic response to cenegermin-bkbj was observed. Given that cenegermin-bkbj is a heterologous protein in animals, this response may not be relevant to humans.

Lactation
There are no data on the presence of OXERVATE in human milk, the effects on breastfed infant, or the effects on milk production. The developmental and health benefits of breastfeeding should be considered, along with the mother's clinical need for OXERVATE, and any potential adverse effects on the breastfed infant from OXERVATE.

Pediatric Use
The safety and effectiveness of OXERVATE have been established in the pediatric population. Use of OXERVATE in this population is supported by evidence from adequate and well-controlled trials of OXERVATE in adults with additional safety data in pediatric patients from 2 years of age and older [see Clinical Studies (14)].

Geriatric Use
Of the total number of subjects in clinical studies of OXERVATE, 43.5 % were 65 years old and over. No overall differences in safety or effectiveness were observed between elderly and younger adult patients.

NONCLINICAL TOXICOLOGY
Carcinogenesis and Mutagenesis Animal studies have not been conducted to determine the carcinogenic and mutagenic potential of cenegermin-bkbj.

Impairment of fertility Daily subcutaneous administration of cenegermin-bkbj to male and female rats for at least 14 days prior to mating, and at least 18 days post-coitum had no effect on fertility parameters in male or female rats at doses up to 267 mcg/kg/day (1709 times the MRHOD). In general toxicology studies, subcutaneous and ocul administration of cenegermin-bkbj in females was associated with ovarian findings including persistent estrus, ovarian follicular cysts, atrophy/reduction of corpora lutea, and changes in ovarian weight at doses greater than or equal to 19 mcg/kg/day (119 times the MRHOD).

In embryofetal development studies, daily subcutaneous administration of cenegermin-bkbj to pregnant rats and rabbits throughout the period of organogenesis produced a slight increase in post-implantation loss at doses greater than or equal to 42 mcg/kg/day (267 times the MRHOD). A no observed adverse effect level (NOAEL) was not established for post-implantation loss in either species.
Being empathetic to the patient’s experience by attentively listening and explaining what is occurring may provide emotional relief to the patient that there likely is a physiologic reason in addition to pointing them to additional help.

**Case Two**

A 74-year-old male presented for a comprehensive exam. He had a history of treated PD, diagnosed 11 years prior, which was managed by neurology. When I asked him directly about visual hallucinations, he endorsed them. They had first started three years ago after an increase in Sinemet (carbidopa/levodopa, Merck) dosage, where he described thinking someone was sitting at a picnic table across the street but would then realize it was a garbage can (illusion). It occurred about weekly at first. He had told his neurologist about it at the time, and amantadine was started; the hallucinations, he endorsed them. They occurred about weekly at first. He had told his neurologist about it at the time, and amantadine was started; the hallucinations were then only occasional.

However, in the past nine to 10 months prior to seeing me, he was seeing formed shapes and animals (complex visual hallucination) along with a more constant palinopsia that was noticeably worsening in complexity and frequency. He had seen two local optometrists in his hometown specifically regarding this but wasn’t given any insight as to what was happening, so he wasn’t even going to mention it. He also had developed worsening intense nightmares that were causing him to thrash quite violently in his sleep. I discussed the hallucination in the context of PD with him and his wife and consulted with his neurologist who decreased his Sinemet dosage.

Initially, he did feel the change helped with lessening the frequency of the hallucination during the day; however, months later they were again worsening and had progressed to very frequent, more complex and very troublesome. He also noticed more illusions: “I can turn the chair into a bear or the computer screen into a hat.” Because of this, he stopped driving. Additionally, his sleep symptoms were continuing to worsen, so much so that he feared for his wife’s safety.

Amantadine was then stopped by his neurologist. Six months later, his daytime visual hallucinations had improved, but he would still occasionally misinterpret shadows as people and see illusions out of his window, such as park benches. Overall, this was a welcomed improvement. Meanwhile, however, his sleep symptoms had become more violent and severe. Next, mirtazapine was stopped, melatonin was increased and an updated consult with Sleep Medicine was ordered due to the REM sleep behavior disorder. This change in medication did further improve his daytime visual hallucinations, and perhaps lessened the frequency but not intensity of his RBD. By the next six-month interval with neurology, he was demonstrating increased irritability, anger, frustration and confusion in the evenings. Donepezil was added, and continued management is ongoing.

**Takeaways:** (1) He asked two eye doctors about his visual hallucinations and wasn’t given an answer—don’t be that doctor. (2) He didn’t volunteer to me that he had experienced hallucinations but told me all about them when I asked—so, ask! (3) Visual hallucinations can be very troublesome to patients, both emotionally and functionally—they led this patient to stop driving. (4) Medication changes can help, but it’s tricky to balance motor function symptoms, hallucinations, REM sleep behavior disorder and more—be sure to direct these patients to neurology for medication management and share salient information such as details and duration of patient-reported symptoms and relevant exam findings. (5) Complex visual hallucinations tend to worsen, and are a risk factor for dementia—this case developed functional changes in mood and mental status about two years after the onset of worsening complex visual hallucinations.

**Discussion.** How I tend to approach this clinically in patients with known AD, PD, PDD or DLB is first by offering basic information about visual hallucinations in these conditions, then asking if they have experienced the phenomenon. It might sound something like this:

“**I see that you have Parkinson’s.** Interestingly, a high percentage of these patients eventually develop what’s called visual hallucinations, which means seeing or perceiving things that aren’t actually there. Sometimes these are more shadow-like shapes or patterns in the vision, or sometimes even just a sensation or feeling like someone is standing near you or passing by you, but isn’t really there; however, sometimes they can become quite complex and realistic, like animals or people. There are medications available that may help if these develop. Have you ever experienced anything like this?”

You might just be surprised by what you hear, and how often you hear it.

**Case Three**

A 74-year-old male presented who had a history of symptoms including mild tremors, urinary incontinence, gait instability and cognitive impairment. Two years prior, after neuropsychological testing, neurology felt these symptoms were likely independent with multifactorial etiologies, not indicative of a neurodegenerative process at the time; however, about one year later, he developed visual hallucinations.
In Patients With Diabetic Eye Disease (DR and DME),

HELPING TO PROTECT VISION STARTS WITH YOU

IF YOU SEE OR SUSPECT DIABETIC RETINOPATHY

EDUCATE PATIENTS¹
• Your early and frequent discussions about progression of disease, timely referral, and potential treatment options can empower patients¹

REFER APPROPRIATE PATIENTS¹
• The AOA recommends referring patients with severe NPDR and PDR within 2 to 4 weeks, and patients with higher-risk PDR with or without macular edema within 24 to 48 hours¹

IMPORTANT SAFETY INFORMATION

CONTRAINDICATIONS
• EYLEA is contraindicated in patients with ocular or periocular infections, active intraocular inflammation, or known hypersensitivity to aflibercept or to any of the excipients in EYLEA.

WARNINGS AND PRECAUTIONS
• Intravitreal injections, including those with EYLEA, have been associated with endophthalmitis and retinal detachments. Proper aseptic injection technique must always be used when administering EYLEA. Patients should be instructed to report any symptoms suggestive of endophthalmitis or retinal detachment without delay and should be managed appropriately. Intraocular inflammation has been reported with the use of EYLEA.
• Acute increases in intraocular pressure have been seen within 60 minutes of intravitreal injection, including with EYLEA. Sustained increases in intraocular pressure have also been reported after repeated intravitreal dosing with VEGF inhibitors. Intraocular pressure and the perfusion of the optic nerve head should be monitored and managed appropriately.
• There is a potential risk of arterial thromboembolic events (ATEs) following intravitreal use of VEGF inhibitors, including EYLEA. ATEs are defined as nonfatal stroke, nonfatal myocardial infarction, or vascular death (including deaths of unknown cause). The incidence of reported thromboembolic events in wet AMD studies during the first year was 1.8% (32 out of 1824) in the combined group of patients treated with EYLEA compared with 1.5% (9 out of 595) in patients treated with ranibizumab; through 96 weeks, the incidence was 3.3% (60 out of 1824) in the EYLEA group compared with 3.2% (19 out of 595) in the ranibizumab group. The incidence in the DME studies from baseline to week 52 was 3.3% (19 out of 578) in the combined group of patients treated with EYLEA compared with 2.8% (8 out of 287) in the control group; from baseline to week 100, the incidence was 6.4% (37 out of 578) in the combined group of patients treated with EYLEA compared with 4.2% (12 out of 287) in the control group. There were no reported thromboembolic events in the patients treated with EYLEA in the first six months of the RVO studies.

Please see Important Safety Information throughout and Brief Summary of the full Prescribing Information on the following page.
The more you know about anti-VEGF agents and other potential treatments for DR, the better you can help inform your patients. Find out more by visiting diabeticretinaldisease.com.

ADVERSE REACTIONS

• Serious adverse reactions related to the injection procedure have occurred in <0.1% of intravitreal injections with EYLEA including endophthalmitis and retinal detachment.

• The most common adverse reactions (≥5%) reported in patients receiving EYLEA were conjunctival hemorrhage, eye pain, cataract, vitreous detachment, vitreous floaters, and intraocular pressure increased.

• Patients may experience temporary visual disturbances after an intravitreal injection with EYLEA and the associated eye examinations. Advise patients not to drive or use machinery until visual function has recovered sufficiently.

INDICATIONS

EYLEA® (aflibercept) Injection 2 mg (0.05 mL) is indicated for the treatment of patients with Neovascular (Wet) Age-related Macular Degeneration (AMD), Macular Edema following Retinal Vein Occlusion (RVO), Diabetic Macular Edema (DME), and Diabetic Retinopathy (DR).

anti-VEGF, anti-vascular endothelial growth factor; AOA, American Optometric Association; NPDR, nonproliferative diabetic retinopathy; PDR, proliferative diabetic retinopathy.

**Table 2: Most Common Adverse Reactions (≥1%) in RVO Studies**

<table>
<thead>
<tr>
<th>Adverse Reactions</th>
<th>EYLEA (N=142)</th>
<th>Control (N=92)</th>
<th>CRVO (N=184)</th>
<th>BRVO (N=312)</th>
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</thead>
<tbody>
<tr>
<td>Cataract</td>
<td>11%</td>
<td>11%</td>
<td>11%</td>
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<tr>
<td>Blurred vision</td>
<td>10%</td>
<td>10%</td>
<td>11%</td>
<td>10%</td>
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<tr>
<td>Intracocular pressure increased</td>
<td>9%</td>
<td>8%</td>
<td>10%</td>
<td>9%</td>
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<tr>
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<td>6%</td>
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<tr>
<td>Vitreous detach</td>
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<td>5%</td>
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<tr>
<td>Intraocular inflam</td>
<td>3%</td>
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<tr>
<td>Infection site pain</td>
<td>1%</td>
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<tr>
<td>Retinal detachment</td>
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<tr>
<td>Corneal edema</td>
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<tr>
<td>Hypersensitivity</td>
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<tr>
<td>Injection site pain</td>
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<tr>
<td>Retinal detachment</td>
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</tbody>
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**Table 3: Most Common Adverse Reactions (≥1%) in DME Studies**

<table>
<thead>
<tr>
<th>Adverse Reactions</th>
<th>EYLEA (N=92)</th>
<th>Control (N=218)</th>
<th>Baseline to Week 52</th>
<th>Baseline to Week 100</th>
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</thead>
<tbody>
<tr>
<td>Cataract</td>
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<td>11%</td>
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<tr>
<td>Blurred vision</td>
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<tr>
<td>Intracocular pressure increased</td>
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<tr>
<td>Cataract</td>
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<td>Vitreous detach</td>
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<td>Infection site pain</td>
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<tr>
<td>Retinal detachment</td>
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**Table 1: Most Common Adverse Reactions (≥1%) in Wet AMD Studies**

<table>
<thead>
<tr>
<th>Adverse Reactions</th>
<th>EYLEA (N=1824)</th>
<th>Baseline to Week 52</th>
<th>Baseline to Week 100</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cataract</td>
<td>12%</td>
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<tr>
<td>Retinal detachment</td>
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**6.2 Pregnancy**

Risk Summary

Adverse and well-controlled studies with EYLEA have not been conducted in pregnant women. Aflibercept produced adverse embryofetal effects in rabbits and rats. Embryo-fetal development may be impaired at doses > 0.1 mg/kg (6.6x the systemic exposure of aflibercept) in rats. In rabbits, embryo-fetal development was impaired at doses > 0.1 mg/kg. In rats, embryo-fetal development was impaired at doses > 0.1 mg/kg. The systemic exposure of aflibercept in pregnant women is not known.

Adverse effects observed in rabbits included postimplantation loss, delay in vascular development, and fetal malformations. These effects occurred at doses of 0.1 mg/kg or higher. Aflibercept also produced fetal malformations in rabbits at doses of 0.1 mg/kg or higher. Aflibercept produced fetal malformations in rabbits and rats at doses of 0.1 mg/kg or higher. Aflibercept produced fetal malformations in rabbits and rats at doses of 0.1 mg/kg or higher. The systemic exposure of aflibercept in pregnant women is not known.

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**8.2 Lactation**

Aflibercept is not recommended for use during breastfeeding. Data are insufficient to determine if aflibercept is excreted into breastmilk in humans. The milk-to-plasma ratio of aflibercept in humans is not known. The safety and effectiveness of aflibercept in breastfed infants are not known.

**8.3 Female and Male Reproductive Potential**

Contraception

Patients with reproductive potential are advised to use effective contraception prior to the initial dose, during treatment, and for at least 5 months after the last intravitreal injection of EYLEA.

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**9.2 Antidotes**

There is no specific antidote for aflibercept in human milk. The effects of aflibercept on the breastfed infant are not known.

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**11INDICATIONS AND USAGE**

EYLEA is a vascular endothelial growth factor (VEGF) inhibitor indicated for the treatment of patients with:

- Neovascular (Wet) Age-Related Macular Degeneration (AMD), Macular Edema Following Retinal Vein Occlusion (RVO), Diabetic Macular Edema (DME), Diabetic Retinopathy (DR).

**2.2 PRECAUTIONS**

Neovascular (Wet) Age-Related Macular Degeneration (AMD): The data described below reflect exposure to EYLEA in 218 patients treated with the 2-mg dose in 2 double-masked, controlled clinical studies (COPERNICUS and GALILEO) for 6 months and from week 52 to baseline 100.

- **Thromboembolic events**: The incidence in wet AMD studies during the first year was 1.8% (32 out of 1824) in the combined group of patients treated with aflibercept compared with 1.5% (6 out of 419) in patients treated with placebo throughout 66 weeks. The incidence in the DME studies (from baseline to week 52 was 1.5% (9 out of 601) in the combined group of patients treated with aflibercept with 2.1% (8 of 387) in the control group. There were no reported thromboembolic events in the patients treated with EYLEA in the first six months of the RVO studies.

- **Increase in intraocular pressure**: The data described below reflect exposure to EYLEA in 1824 patients with wet AMD, DME, RVO, and DR, including those with EYLEA, have been associated with endophthalmitis and retinal detachments (see Adverse Reactions, 6.1). Proper aseptic injection technique must always be used when administering EYLEA.

- **Hypersensitivity**: There are potential risks of anaphylaxis, serum sickness reaction, urticaria, angioedema, and interstitial nephritis. The following potentially serious adverse reactions are described elsewhere in the labeling:
  - **Corneal edema**: 1% (18 out of 1824) in the EYLEA group compared with 1% (1 out of 595) in the ranibizumab group. The incidence in the DME studies (from baseline to week 52 was 1% (19 out of 574) in the combined group of patients treated with aflibercept with 1% (3 of 574) in the control group. There were no reported thromboembolic events in the patients treated with EYLEA in the first six months of the RVO studies.

**2.5 Therapeutic Effectiveness**

- **Increase in intraocular pressure**: The data described below reflect exposure to EYLEA in 578 patients treated with the 2-mg dose, in 2 double-masked, controlled clinical studies (XVIII and XVII) for 24 months (with active control in year 1).

- **Corneal edema**: 1% (18 out of 1824) in the EYLEA group compared with 1% (1 out of 595) in the ranibizumab group. The incidence in the DME studies (from baseline to week 52 was 1% (9 out of 574) in the combined group of patients treated with aflibercept with 2.1% (8 of 387) in the control group. There were no reported thromboembolic events in the patients treated with EYLEA in the first six months of the RVO studies.

**4.1 Ocular or Periocular Infections**

EYLEA is contraindicated in patients with known hypersensitivity to aflibercept or any of the excipients in EYLEA. Patients should be instructed to report any symptoms suggestive of endophthalmitis or retinal detachment without delay and should be managed appropriately (see Patient Counseling Information (7.3)).

**4.3 Hypersensitivity**

Adverse and well-controlled studies with EYLEA have not been conducted in pregnant women. Aflibercept produced adverse embryofetal effects in rabbits and rats. Embryo-fetal development may be impaired at doses > 0.1 mg/kg (6.6x the systemic exposure of aflibercept) in rats. In rabbits, embryo-fetal development was impaired at doses > 0.1 mg/kg. The systemic exposure of aflibercept in pregnant women is not known.
Complex hallucinations involve formed images and can occur any time throughout the day.

These initially presented only upon awakening when he’d see spiders on the nearby wall. He even would get out of bed and try to hit them before realizing they were not there. They only happened in that setting and would last about 60 to 90 seconds.

At that point, with relatively early development of complex visual hallucinations, his symptom constellation became particularly concerning for DLB so carbipoda/levodopa was started. I saw him about a year later, and when I inquired about his hallucinations, he said he had been seeing “like a mouse or a squirrel in my house. I went after it and got it into the corner, but it wasn’t even there. I see mice and stuff like that, and it’s not there at all. Sometimes I see a spider that is not even there.” The squirrels and mice were full-sized and very realistic appearing, and the spiders were the diameter of a cup. Because he saw them so often, he was no longer reacting to them. He continues to follow with neurology for treatment, and response to various medication classes varies from patient to patient, and depending on its cause. Dopamine replacement medications may precipitate or exacerbate hallucinations, but dose adjustments or medication class changes can often help.

Various abnormalities on office-based tests such as electroretinogram (ERG), visual evoked potential (VEP) and optical coherence tomography (OCT) have been demonstrated in certain subsets of this population, but these abnormalities have not yet proven to be diagnostic or specific to the dementia spectrum, so are of limited utility—and are not routinely recommended as of now in dementia spectrum patients. In addition to a comprehensive dilated eye exam, ERG, VEP, OCT and visual field testing may be relevant for evaluation to clues that may point to or help rule out other sources of visual hallucinations.

**Takeaways:**

Optometrists should be asking about symptoms of visual hallucinations and educating all patients on the dementia spectrum about the possibility. Preemptively educating patients about this possibility can soothe a lot of surprise and fear if and when they do develop and lets them know that treatments do exist. I would challenge you to ask—and educate—every patient (and/or their caregivers) who has a relevant medical history concerning visual hallucinations.
It goes without saying that having the right diagnostic tools in your office is important to treat dry eye, but there’s something else that’s just as critical to ensuring a successful outcome for all of your patients: communication. If they don’t fully “hear” what we say, they’ll fail to understand and commit to treat their condition. Understanding chronicity and the patient commitment to themselves is necessary for any treatment to be effective. Considering that only about 12% of adults in the United States have good health literacy, we have to be very intentional about how we communicate.

What exactly is health literacy? It’s the patient’s ability to collect and understand information on their health status so they can make the best decisions for their unique situation.

Since dry eye is highly prevalent and a chronic disease, this article will share how I present concepts of dry eye, build ocular surface health literacy and convey the responsibilities of the patient in a way that encourages adherence to my therapeutic plan.

Dr. McGee carefully communicates with her patient as they create a plan and discuss the steps that have to be taken to combat dry eye.

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**About the author**

**Dr. McGee** is founder and owner of BeSpoke Vision, a boutique private practice that offers patients a wide range of optometric care via its dry eye center, specialty contact lens clinic and aesthetics suite. She is also an adjunct assistant professor at the Northeastern State University College of Optometry and on faculty at the Oklahoma Medical Research Foundation at its Sjögren’s clinic. She is a Fellow of the American Academy of Optometry, a Diplomate of the American Board of Optometry and is past president of the Oklahoma Association of Optometric Physicians. Dr. McGee consults for Allergan, Kala Pharmaceuticals and Novartis Pharmaceuticals.
Communication is Key
As author Stephen Covey once said, “Begin with the end in mind.” The first step is to figure out what you want to accomplish with your dry eye patients. Developing a system for communication is very important. It’s not just what you say but how you say it. Ask yourself the following questions:

- Do I have a communication system?
- If so, where are the gaps?
- What’s working?
- More importantly, what’s not working?

I have found the key to communication in our office is consistently working on the same language delivered in a way that the patient wants the information. Words matter, delivery matters and known processes are vital; a breakdown anywhere along that chain diminishes your return on investment.

Imagine a patient hearing different words used by different team members: one person says dry eye, another says ocular surface disease and someone else says unstable tear film. How confused would the patient be when they left the office?

Remember, it’s not just you as the doctor delivering messaging. Every touchpoint in the office (and prior to the patient entering the office) is an opportunity to communicate. As you consider that, ask yourself these questions:

- Does my team understand the importance of dry eye?
- Do they know the consequences?
- Do they have the willingness to participate?

Education Roadmap
I cannot overstate how important beginning the education process with your team first dictates how successful you will be when educating your patients.

In my office, we created a roadmap of the patient journey to determine where we needed to talk about dry eye. Once that was completed, we discussed and practiced what would be said and by whom.

First, we started with our digital footprint. We developed a wealth of information on our website for patients visiting us online before they came into the office, and we also direct patients back to the website if they need more information after their visit.

Next, our director of first impressions checks in the patient with a personalized greeting and a lifestyle questionnaire which includes sections specifically driven to gather symptoms of dry eye and educate the patient. When the patient is handed this form, our staff member also lets them know how prevalent and under-diagnosed dry eye is and why it’s so important they answer honestly.

Next stop on the roadmap is the technician. I have invested in supertechs in my office, meaning the technician that works up the patient also scribes for me with the patient. I like this system because anything that occurs during the workup doesn’t get lost in translation once I come into the exam, and I believe there is better continuity of care with this system. My technicians educate our patients every step of the way, explaining every diagnostic tool, what it is and why we perform it.

The way they ask questions to the patient is also key. How we phrase the questions can either expand the conversation or shut it down. Try to ask the questions so that “fine,” “yes” or “no” are not available answers. An example is, “Do you experience x, y or z?” The answer that is too easily given is yes, no or maybe. If the patient does answer yes, you can certainly expand on that with follow-ups like, “Tell me more,” “When does that occur?” or “What have you done about it?”

What happens if they answer no? You’ve effectively shut that conversation down. If you change that question with just one word, it makes a subtle difference: “When do you experience x, y and z?” The patient is going to be required to think about when that does happen. Maybe they only experience eyes that burn periodically or vision that fluctuates toward the end of the day. Once they elucidate their particular experience, everything that you talk about is driven toward helping that pain point.

When you become the person solving your patients’ symptoms, the conversation becomes two-sided. If we don’t do the legwork up to this point to find out what the patients’ pain points really are, all we do is try to convince someone to adhere to solu-
tions for a problem they don’t even recognize they have. We have all had that experience in the chair with a patient who clearly has signs of dry eye, but because we never tied it to them personally—giving them the why and how it’s effecting their typical day—those conversations lead to frustration for both the doctor and the patient.

During examinations, I rely heavily on diagnostic tools to help me educate each patient. My tech workups help me expand upon the patient’s chief complaint and how I can best help them achieve an optimized vision and ocular surface plan. We use standing orders when a patient answers two or more symptom questions to perform MMP-9 and tear osmolarity testing; this is all performed before I walk into the room.

The refraction is a key component to not only helping patients achieve their best vision possible but also gives us many clues to their personality type as well as keeping your ears open for symptoms of dry eye. I’m listening for things like, “Wait, let me blink. Now it’s clearer.” That is a direct clue there is a problem that needs to be addressed. Explain to the patient why that blink is so important and remind them how their vision cleared when they blink. If we educate along the way, this helps the patient retain more information as well as save precious chair time.

Personality Profiles

Why do I care what type of personality my patient has? My goal is to truly connect with each patient, and to do that efficiently I lean on tools such as the DISC personality test. I have found that when I engage my listening skills and communicate with patients in the way they want to be communicated with, they feel heard, understood and are more likely to adhere to our dry eye plan because we’ve worked through it together.

The way in which I educate each patient is different even though the content is the same. The tools I use to educate also cover all personality types so that there is something there for everyone and I can further customize it to each patient.

To simplify DISC, think of it this way: there are four types and most people have one strong tendency followed by a second. We each exhibit all four types at different times, but leaning into one may require more energy for that person. Think about the introvert at a party: they can be sociable, but may find the experience to be draining, and they will need to recharge before being at their best again. Each letter of the acronym stands for a personality; let’s review a simplified version:

- **D** (dominance) individuals are doers and they want information quickly without a lot of detail. They are the patients during the refraction that answer before you even explain what you want done, and answers are clear and concise.

- **I** (influence) people are those who like to talk, are often the life of the party and they are the patient that is still talking to you as you place the phoropter in front of their face. Typically, you can barely get a question in as they chat.

- **S** (steadiness) types are your “feelers.” They don’t like change and are very careful about the decisions they make. They will also use “feeling” language; listen hard for those cues. Often, behind the phoropter it comes out as, “I don’t want to choose, this is so hard. I feel like I failed this test.”

- **C** (conscientiousness)—the thinkers. These are the patients that need all of the information before making an informed decision. They may ask questions like, “Should I be looking at the O or the H? Should I choose the letters that are clearer or the ones that are easier to see?”

Based on the patient’s personality type, I then communicate towards that. As I move through the rest of the exam using meibography, photography, vital dye (lissamine green and sodium fluorescein), functionality of meibomian glands as well as ocular surface, I use what I’ve learned about the patient to explain as I go and educate.
When Blepharitis/MGD Strikes, STOP FLARES FAST

• >50% reduction in symptoms of blepharitis/blepharoconjunctivitis in 1 week of dosing. No IOP spikes reported during first week of treatment.a
• Greater bactericidal activity—more effective at killing MRSA than TobraDex® (>99.9% kill rate vs 0%)2
• Delivers 12.5× higher tobramycin concentration in ocular tissue compared to TobraDex2

Indications and Usage
For steroid responsive inflammatory ocular conditions of the palpebral and bulbar conjunctiva, cornea, and anterior segment of the globe and chronic anterior uveitis, corneal injury from chemical, radiation or thermal burns, or penetration of foreign bodies for which a corticosteroid is indicated and where the risk of superficial bacterial ocular infection is high or where there is an expectation that potentially dangerous numbers of bacteria will be present in the eye.

Important Safety Information
CONTRAINDICATIONS:
Most viral disease 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. Hypersensitivity to any components of the medication.

WARNINGS & PRECAUTIONS:
• IOP increase – Prolonged use may result in glaucoma with damage to the optic nerve, defects in visual acuity and fields of vision. IOP should be monitored.
• Aminoglycoside sensitivity – Sensitivity to topicaly applied aminoglycosides may occur.
• Cataracts – Posterior subcapsular cataract formation may occur.
• Delayed healing – May delay healing and increase the incidence of bleb formation. Perforations of the cornea or sclera have occurred. Slit lamp biomicroscopy, and fluorescein staining should be conducted.
• Bacterial infections – May suppress host response and increase 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 – Use with history of herpes simplex requires great caution. The course and severity of many viral infections of the eye (including herpes simplex) may be exacerbated.
• Fungal infections – Fungal infections of the cornea may occur and should be considered in any persistent corneal ulceration.
• Use with systemic aminoglycosides – Total serum concentration of tobramycin should be monitored.

ADVERSE REACTIONS:
The most frequent adverse reactions (<4%) to topical ocular tobramycin are hypersensitivity and localized ocular toxicity, including eye pain, eyelid pruritus, eyelid edema, and conjunctival hyperemia. The reactions due to the steroid component are increased intraocular pressure with possible development of glaucoma, and infrequent optic nerve disorder, subcapsular cataract, and impaired healing.

The development of secondary infection has occurred. Fungal infections of the cornea may occur. Secondary bacterial ocular infection following suppression of host responses also occurs. Non-ocular adverse events (0.5% to 1%) included headache and increased blood pressure. Please see Brief Summary of full Prescribing Information on the adjacent page.

a Randomized, investigator-masked, active-controlled, parallel-group trial conducted at 7 private practice clinical sites in the United States with 122 adult patients who had moderate to severe blepharitis/blepharoconjunctivitis.

TOBRADEX® ST (tobramycin/dexamethasone ophthalmic suspension) 0.3%/0.05%

Brief Summary

This Brief Summary does not include all the information needed to use TOBRADEX ST safely and effectively. Please see Full Prescribing Information for TOBRADEX ST at MyTobraDexST.com.

INDICATIONS AND USAGE

TOBRADEX ST is a topical antibiotic and corticosteroid combination for steroid-responsive inflammatory ocular conditions for which a corticosteroid is indicated and where superficial bacterial ocular infection or a risk of bacterial ocular infection exists.

Ocular steroids are indicated in inflammatory conditions of the palpebral and bulbar conjunctiva, cornea and anterior segment of the globe where the inherent risk of steroid use in certain infective conjunctivitides is accepted to obtain a diminution in edema and inflammation. They are also indicated in chronic anterior uveitis and corneal injury from chemical, radiation or thermal burns, or penetration of foreign bodies.

The use of a combination drug with an anti-infective component is indicated where the risk of superficial ocular infection is high or where there is an expectation that potentially dangerous numbers of bacteria will be present in the eye.

DOSAGE AND ADMINISTRATION

Recommended Dosing: Instill one drop into the conjunctival sac(s) every four to six hours. During the initial 24 to 48 hours, dosage may be increased to one drop every 2 hours. Frequency should be decreased gradually as warranted by improvement in clinical signs. Care should be taken not to discontinue therapy prematurely.

CONTRAINDICATIONS

Nonbacterial Etiology: TOBRADEX ST is contraindicated in most 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.

Hypersensitivity: Hypersensitivity to any component of the medication.

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. IOP should be monitored.

Aminoglycoside sensitivity: Sensitivity to topically applied aminoglycosides may occur.

Cataracts: May result in posterior subcapsular cataract formation.

Delayed healing: May delay healing and increase the incidence of bleb formation after cataract surgery. In those diseases causing thinning of the cornea or sclera, perforations have been known to occur with the use of topical steroids.

Bacterial infections: 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: Treatment in 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 with long-term use. Fungal invasion must be considered in any persistent corneal ulceration.

Use with systemic aminoglycosides: Use with systemic aminoglycoside antibiotics requires monitoring for total serum concentration of tobramycin.

ADVERSE REACTIONS

The most frequent adverse reactions to topical ocular tobramycin (TOBREX®) are hypersensitivity and localized ocular toxicity, including eye pain, eyelids pruritis, eyelid edema, and conjunctival hyperemia. These reactions occur in less than 4% of patients. Similar reactions may occur with the topical use of other aminoglycoside antibiotics.

Non-ocular adverse events occurring at an incidence of 0.5% to 1% included headache and increased blood pressure.

The reactions due to the steroid component are: increased intraocular pressure (IOP) with possible development of glaucoma, and infrequent optic nerve disorder; subcapsular cataract, and impaired healing.

Secondary Infection: The development of secondary infection has occurred. Fungal infections of the cornea are particularly prone to develop with long-term use. Fungal invasion must be considered in any persistent corneal ulceration. Secondary bacterial ocular infection following suppression of host responses also occurs.

USE IN SPECIFIC POPULATIONS

Pregnancy and Nursing Mothers

There are no adequate and well controlled studies in pregnant women. TOBRADEX® ST ophthalmic suspension should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus. Caution should be exercised when TOBRADEX® ST is administered to a nursing woman.

Pediatric Use: Safety and effectiveness in pediatric patients below the age of 2 years have not been established.

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

Rx Only

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All of these details matter to that patient. The words you choose, your body language and the “how” of your communication, along with the actual information, together make up the patient experience. In order for the patient to hear your dry eye education and what you want them to learn, you have to do it in way that is meaningful to them.

If you’re thinking this sounds like a lot of work, it is. It’s also worth the investment and will greatly improve your patients’ experience and the outcome.

Managing Dry Eye Properly

Once the exam is complete, I give patients written information to take home. This includes a handout with clear photos and explanations of our therapeutic options, with everything from visual hygiene, home therapy (warm compresses, lid seals), medications (Xiidra, Restasis, Cequa) and in-office procedures (LipiView, iLux, TearCare). I simply check what that patient is going to do between now and the next time I see them.

For a new dry eye patient, I am careful to explain what to expect. Dry eye is a chronic disease that we will manage together; we will start with step therapy and follow up in four weeks to see if we need to add additional therapies or if the patient is fully managed. It’s important to follow up—I never let a dry eye patient go longer than six months, even when well-managed.

Before leaving the room, I am careful to go through what prescriptions I write (not recommendations—remove that word from your patient dialogues) and ask, “Do you have any questions for me? Did we accomplish everything you wanted to achieve?” Then, my scribe takes over, walking the patient through more detail and answering any other questions that may arise. They finish with tying everything back to the “why.”

For myself and the other doctors that work in my practice, we have a standard protocol based on what level of dry eye disease the patient has. We have four levels of disease and we all are using our diagnostic tools and therapeutics in the same way, with the same language. This is very important for continuity of care and I want our patients to have the same experience no matter which doctor they see.

Takeaways

When you first start putting these kinds of systems into place, it can daunting, but layering education throughout the entire patient experience and empowering your team to build the systems with you are what make this doable. It may feel clunky and uncomfortable, but that’s when you know you’re doing the right thing. Eventually, you will become unconsciously competent and create your system.

Effectively educating our patients and our team will give patients the control to take better care of themselves. Communication is a lifelong skill that we all must be intentional about and continue to improve upon to give our patients, practices and profession every opportunity for success.

HOW TO USE DRY EYE QUESTIONNAIRES IN YOUR PRACTICE

These handy tools can help you better understand patients’ symptoms to guide a diagnosis and formulate treatment.

By Leanne Spiegle, Associate Editor

Busy doctors and distracted patients don’t exactly relish the thought of adding one more step to an optometric visit, but the notion of screening patients for dry eye with a survey tool has merit, experts say. Asking patients to devote a bit of forethought to the state of their ocular surface comfort before their exam can elicit conversations that might not otherwise occur, allowing you to identify some cases that would have gone unaddressed. And when managing a condition as multifactorial as dry eye, keeping a record of when patients feel better or worse helps to identify possible triggers, narrow down the list of potential diagnoses and evaluate response to treatment.

That’s where dry eye questionnaires come in. Since the mid-1980s, when the first symptom survey—the McMonnies questionnaire—was developed, various others have been created and validated as practical screening tools for dry eye disease (DED). This article will explore how to best implement such questionnaires into your practice and walks you through the pros, cons and clinical indications of the various surveys used today to assess this complex condition.

Why and When Should You Use Questionnaires?

When a patient comes to your practice complaining of eye dryness, the actual culprit could be one of many possibilities. Having the ability to know the basic information about the case—such as symptom severity, frequency, pain level and potential triggers—even before the person sits down in your chair is incredibly valuable and can help steer your clinical evaluation in the right direction.

Despite worries that surveys might slow down office flow, “dry eye questionnaires are actually huge time-saving tools,” says dry eye guru Paul Karpecki, OD, of Lexington, KY. “Patients can fill them out online before they come into the office, and the score can be transferred into your electronic medical records. There’s a lot of value in implementing something that doesn’t require staff to administer. That helps increase your efficiencies and diagnostic capabilities.”
In addition to having patients complete the questionnaire beforehand, Dr. Karpecki asks them two questions once they enter the room: what is their worst symptom, and when is it worse? “First, I’ll glance at the score, and if that indicates the patient may have DED, I’ll go through the completed questionnaire and see what it says. Then, I’ll ask those two key questions. Now, I have the information I need to pinpoint which kind of dry eye—or alternative condition—I might be dealing with, and I can go ahead with the examination and diagnosis.”

Another option is to have the patient fill out the questionnaire as they sit in the waiting room, which is what Pam Theriot, OD, of Shreveport, LA, does at her practice. “I can see pros and cons to distributing the survey in either of these ways. If the patient completes it at home, they wouldn’t be able to ask a question or get help if they got stuck on or didn’t understand something. Also, it fills up the time when they would otherwise just be sitting in the waiting room.”

Repeating the survey at subsequent visits allows you to quantify how the patient is feeling and responding to treatment. “The biggest benefit of questionnaires is that most of them provide you and the patient with a number that you can use to keep track of what level of improvement is occurring over time,” says Dr. Karpecki. “For example, if a patient scores a 15 on the Standard Patient Evaluation of Eye Dryness (SPEED) test, and when they return they score an 8, we know they are at least headed in the right direction.”

Dr. Theriot adds that patients are usually very number-oriented. “Not all of them are, but often they’re very interested in knowing if they’re making progress. I can tell them if they look better, but the questionnaires help them figure out if they feel better.”

Lastly, Dr. Karpecki notes that some patients who wear contact lenses may not provide truthful responses when asked in the exam room to describe their symptoms for fear of having to give up their lenses. “Most patients tend to be more honest about symptoms on a questionnaire, which is less intimidating than face-to-face questioning and can help you address the issue in a way that allows them to also keep their lenses.”

When Aren’t Questionnaires All That Helpful?
Subjective tests can inform doctors on factors of a condition that can’t be observed during a physical exam, such as the level of pain a patient is experiencing or disruption it is causing in their life; however, the tests are not fool-proof, and in some circumstances, the results can be misleading.

For example, take a neurotrophic patient who has been dealing with dry eye for many years and no longer experiences bothersome symptoms due to the gradual downregulation of ocular nerves that has occurred. Though this patient’s questionnaire would likely suggest they don’t have dry eye, they may actually show signs of disease upon examination. Relying heavily on a questionnaire as clinical evidence without factoring in the physical findings would fail to detect disease in some patients such as those with nerve damage, which, according to Dr. Karpecki, happens more often than it should.

“Dry eye is one of the rare diseases where signs and symptoms don’t correlate,” says Dr. Karpecki. “If you look at macular degeneration, the worse the disease, the more vision loss the patient has. In glaucoma, the worse the disease, the more peripheral vision loss that is present. But in some cases of dry eye, as it progresses the patient could actually experience fewer symptoms. For these individuals, having them complete surveys about how their eyes feel doesn’t help us a lot in terms of severity. Most people and researchers think a high score on symptoms equates to more severe dry eye, but many times, low scores can still occur with severe disease.”

Dr. Theriot also notes that patients with disdain for paperwork who are simply not interested in answering the questions could give untruthful responses and produce a false positive or negative result on the test. Questionnaires that include too many questions could have the same effect and deter honest and thorough completion, which jeopardizes the accuracy of the score. At the same time, as Joseph Shovlin, OD, of Scranton, PA, points out, there may also be a downside to surveys that contain too few questions. “If a busy practice does not allow for lengthy surveys, a discordance between what the clinician feels is important and what the patient is experiencing or trying to convey may allow for patient symptoms to go untreated,” says Dr. Shovlin.

Another point, made by Dr. Sicks, is that sometimes not every item on
the questionnaire will apply to each patient. “One question on the Ocular Surface Disease Index (OSDI), for instance, asks about driving at night and another asks about using an ATM,” she says. “Not every patient drives and not every patient uses an ATM, so they might answer those questions ‘no, it’s not bothering me any of the time,’ which will pull their score down so that the dry eye looks to be less severe.” It is important to note, however, that most questionnaires, including the OSDI, do offer an “N/A” option for situations like these.

Dr. Sicks adds that this dilemma is commonly seen with younger patients, as most questionnaires tend to have questions geared toward adults. “It’s actually hard to administer these tests for kids, because [using the previous example from the OSDI], they don’t drive at night or work with an ATM. So, is the OSDI really validated for kids? Technically not,” she points out.

Andrew Pucker, OD, PhD—formerly of UAB School of Optometry before a recent move to industry—says that 90% of the patients he sees currently are children and that he personally would choose not to distribute these questionnaires to those under 10 years old. “They usually aren’t able to explain to you what’s going on,” says Dr. Pucker. “Instead, you could ask basic questions about individual symptoms—such as burning, dryness, foreign body sensation, itching, watering—to help you determine a diagnosis.” However, Dr. Pucker notes that in these cases with young patients, you miss out on the value of surveys that allow you to track progression.

In addition, as COVID-19 has dramatically changed many people’s everyday routines, Dr. Sicks notes that “people’s answers to questions about habits or activities might be skewed or different than they were a year or two ago.”

One final consideration of questionnaires is their potential to lead to overdiagnosis of dry eye.

“It’s important to not get bogged down into thinking that all symptoms that sound like dry eye including those picked up by surveys are truly dry eye, especially when there is no symptomatic relief with seemingly appropriate treatments,” Dr. Shovlin explains. “Suggesting patients have dry eye may be one of our worst mistakes when only a few signs and/or symptoms point in that direction. There are days where everyone coming into the office feels they have ‘dry eyes.’” He notes that when a patient shows no improvement, other differential diagnoses should be considered, such as conjunctivochalasis, environmental irritative conjunctivitis or even ocular misalignment, to name a few.

In any of the cases above, questionnaires may not be as valuable or reliable of a tool in dry eye assessment. Dr. Theriot emphasizes that “you have to rely more on what you’re seeing than on what they’re feeling.” Still, for many patients, questionnaires are a useful tool and can play an important role in clinical decision-making, she says.

### How Do You Choose Which Test To Distribute?

There are a number of research-backed tests that can be administered to patients with dry eye. Generally, patients, as well as physicians, want something that takes little time to complete, is easy to understand and will provide them with a numbered score or categorization to gauge the severity of symptoms. To make a good selection for your patients, Dr. Shovlin says that “clinicians have to decide why they find these questionnaires valuable, as well as how to implement these validated tools into their practice in order not to be disruptive to patient flow.”

For Dr. Pucker, efficiency is key. “The shorter the survey and the fewer response options, the better,” he says. “For one, people get survey fatigue and really don’t like long surveys.”

Secondly, he says, “It’s better to have fewer options—for example, mild, moderate and severe—as opposed to having 10 shades of grey. If you make the options more black and white, you’ll get better responses because mild, moderate or severe responses are slightly less subjective.”

![Dry eye surveys can inform you about factors such as frequency and severity of patients’ symptoms, which you wouldn’t know simply by looking at their eyes.](image)

Depending on how customizable your EMR system is, this may be an ideal place to store patients’ questionnaire scores from each visit.

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**STORING THE DATA**

Keeping a dated record of patients’ scores from each dry eye questionnaire can help you detect signs of improvement or symptom progression, as well as determine their response to a certain treatment. No matter how you decide to administer the surveys, whether that be virtually, on paper or face-to-face, you should record at least the patient’s score—or better yet, a scanned image of the entire survey—into your EMR or another data collection system, which may depend on the customization of the EMR at your practice, says Dr. Sicks.

“We use a NextGen system and have built a grid specifically for ocular surface disease, which includes a section where you can input the OSDI score and the date, and it keeps track over time,” she notes. “Another way to do it would be to put the survey score in the impression part of your impression and plan.” Whichever method you choose to store the data, be sure that it is easy to access and shown chronologically for easy comparison of scores over time.”

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Selecting a test that asks patients how symptoms are affecting their day-to-day life can give you insight into the severity of the condition and how aggressively to treat it. A recent review of 24 different dry eye questionnaires concluded that the following six address health-related quality of life and were recommended by the study’s researchers for patient evaluation: OSDI, Impact of Dry Eye in Everyday Life, Dry Eye-Related Quality-of-Life Score, University of North Carolina Dry Eye Management Scale, Dry Eye-Related Quality of Life and the 25-Item National Eye Institute Visual Function Questionnaire.1

The list of questionnaires used in clinical practice settings might look a little different. Below are some of the tests that optometrists use today to assess the growing population of dry eye patients.

**Standard Patient Evaluation of Eye Dryness (SPEED)**

One widely used questionnaire is the SPEED test (developed by TearScience, now a part of Johnson & Johnson Vision), which is brief and easily allows patients and physicians to observe progress or changes in eye dryness and symptoms over time. Divided into four sections, the questionnaire touches on symptom timing, frequency and severity and then provides a numbered score between zero and 28, with zero indicating lack of symptoms.

The symptoms assessed in the SPEED test include dryness, grittiness, scratchiness, irritation, burning, watering, soreness and eye fatigue.2 The first section asks about the presence of these symptoms and how recently they began, and the second asks about the frequency of the symptoms. The third section asks patients to report the severity of each symptom, and the final section questions patients on whether and how often they use eye drops for lubrication.

A study that looked at the SPEED questionnaire’s ability to detect dry eye found it to be a repeatable and valid instrument for the measurement of symptoms.3 It also determined that the test scores were significantly correlated to ocular surface staining and clinical measures of meibomian gland function, including meibomian gland score and meibomian glands yielding liquid secretion score.3

Dr. Pucker, who participated in a Rasch analysis of the SPEED questionnaire, says the test showed positive results and accuracy in screening for symptoms. “The metrics of the test are good,” he says. “It’s mostly a unidimensional device with meaningful questions that aren’t redundant, so it’s very specific for detecting dry eye.”

Dr. Karpecki explains that on the SPEED test, “anything above a six is considered positive, but really anything over eight is going to be very conclusive for DED.” He notes that for most of his patients, the questions on SPEED offer the information necessary to specify which type of dry eye could be present.

Dr. Theriot says that she distributes the SPEED test to every patient who comes into her office for a dry eye assessment and repeats it every time they come back. She offers two reasons for why she also prefers this test over many of the others.

First, “to have a number to give to the patient at each visit to let them know whether they’re improving,” says Dr. Theriot, and secondly because of its ability to distinguish between the different types of dry eye. It questions patients on more specific symptoms than many other tests, which helps point to the presence of a particular condition. For example, based on her clinical experience, Dr. Theriot suggests that “if a patient reports burning and watering, it’s more likely to indicate evaporative dry eye, whereas if they are experiencing dryness, scratchiness or grittiness, that might indicate aqueous-deficient dry eye,” she says. “If they report eye fatigue, it could be because the patient needs to have an adjustment made to their glasses or contact lens prescription power or has ocular misalignment.”

**Ocular Surface Disease Index (OSDI)**

Another common survey is the OSDI (Allergan), frequently used as a reliable method of dry eye assessment and quantification in optometric research.
CEQUA is engineered to deliver
cyclosporine (CsA) where it’s needed most\(^1\,^2\)

**NCELL Technology:**
- **Encapsulates** CsA\(^1\)
- **Penetrates** the aqueous layer\(^1\)
- **Delivers** medicine to the ocular tissue\(^1\,^3\)

**INDICATIONS AND USAGE**
CEQUA\(^\text{TM}\) (cyclosporine ophthalmic solution) 0.09% is a calcineurin inhibitor immunosuppressant indicated to increase tear production in patients with keratoconjunctivitis sicca (dry eye).

**IMPORTANT SAFETY INFORMATION**
**WARNINGS AND PRECAUTIONS**
**Potential for Eye Injury and Contamination:** To avoid the potential for eye injury and contamination, advise patients not to touch the vial tip to the eye or other surfaces.

**Use with Contact Lenses:** CEQUA should not be administered while wearing contact lenses. If contact lenses are worn, they should be removed prior to administration of the solution. Lenses may be reinserted 15 minutes following administration of CEQUA ophthalmic solution.

**ADVERSE REACTIONS**
The most common adverse reactions reported in greater than 5% of patients were pain on instillation of drops (22%) and conjunctival hyperemia (6%). Other adverse reactions reported in 1% to 5% of patients were blepharitis, eye irritation, headache, and urinary tract infection.

Please see brief summary of Full Prescribing Information on the following page.

**References:**
Brief Summary of Prescribing Information for
CEQUA™ (cyclosporine ophthalmic solution) 0.09%,
for topical ophthalmic use

CEQUA™ (cyclosporine ophthalmic solution) 0.09%
See package insert for Full Prescribing Information.

INDICATIONS AND USAGE
CEQUA ophthalmic solution is a calcineurin inhibitor immunosuppressant indicated to increase tear production in patients with keratoconjunctivitis sicca (dry eye).

CONTRAINDICATIONS
None.

WARNINGS AND PRECAUTIONS
Potential for Eye Injury and Contamination
To avoid the potential for eye injury and contamination, advise patients not to touch the vial tip to the eye or other surfaces.

Use with Contact Lenses
CEQUA should not be administered while wearing contact lenses. If contact lenses are worn, they should be removed prior to administration of the solution. Lenses may be reinserted 15 minutes following administration of CEQUA ophthalmic solution.

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

In clinical trials, 769 patients received at least 1 dose of cyclosporine ophthalmic solution. The majority of the treated patients were female (83%). The most common adverse reactions reported in greater than 5% of patients were pain on instillation of drops (22%) and conjunctival hyperemia (6%). Other adverse reactions reported in 1% to 5% of patients were blepharitis, eye irritation, headache, and urinary tract infection.

USE IN SPECIFIC POPULATIONS
Pregnancy
Risk Summary
There are no adequate and well-controlled studies of CEQUA administration in pregnant women to inform a drug-associated risk. Oral administration of cyclosporine to pregnant rats or rabbits did not produce teratogenicity at clinically relevant doses.

Data
Animal Data
Oral administration of cyclosporine oral solution (USP) to pregnant rats or rabbits was teratogenic at maternally toxic doses of 30 mg/kg/day in rats and 100 mg/kg/day in rabbits, as indicated by increased pre- and postnatal mortality, reduced fetal weight, and skeletal retardations. These doses (normalized to body weight) were approximately 3200 and 21,000 times higher than the maximum recommended human ophthalmic dose (MRHOD) of 1.5 mcg/kg/day, respectively. No adverse embryofetal effects were observed in rats or rabbits receiving cyclosporine during organogenesis at oral doses up to 17 mg/kg/day or 30 mg/kg/day, respectively (approximately 1800 and 6400 times higher than the MRHOD, respectively).

An oral dose of 45 mg/kg/day cyclosporine (approximately 4800 times higher than MRHOD) administered to rats from Day 15 of pregnancy until Day 21 postpartum produced maternal toxicity and an increase in postnatal mortality in offspring. No adverse effects in dams or offspring were observed at oral doses up to 15 mg/kg/day (approximately 1600 times greater than the MRHOD).

Lactation
Risk Summary
Cyclosporine blood concentrations are low following topical ocular administration of CEQUA. There is no information regarding the presence of cyclosporine in human milk following topical administration or on the effects of CEQUA on breastfed infants and milk production. Administration of oral cyclosporine to rats during lactation did not produce adverse effects in offspring at clinically relevant doses. The developmental and health benefits of breastfeeding should be considered along with the mother’s clinical need for CEQUA and any potential adverse effects on the breastfed child from cyclosporine.

Pediatric Use
The safety and efficacy of CEQUA ophthalmic solution have not been established in pediatric patients below the age of 18.

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

PATIENT COUNSELING INFORMATION
Handling the Vial
Advise patients to not allow the tip of the vial to touch the eye or any surface, as this may contaminate the solution. Advise patients also not to touch the vial tip to their eye to avoid the potential for injury to the eye.

Use with Contact Lenses
CEQUA should not be administered while wearing contact lenses. Patients with decreased tear production typically should not wear contact lenses. Advise patients that if contact lenses are worn, they should be removed prior to the administration of the solution. Lenses may be reinserted 15 minutes following administration of CEQUA ophthalmic solution.

Administration
Advise patients that the solution from one individual single-use vial is to be used immediately after opening for administration to one or both eyes, and the remaining contents should be discarded immediately after administration.

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PLR-00020 2018
and clinical trials. The 12-item survey questions respondents on three categories relating to dry eye: ocular symptoms, vision-related function and environmental triggers. Patients then rate their responses based on the frequency of the occurrence over the last week from zero to four, with zero indicating “none of the time” and four indicating “all of the time.”

The OSDI produces a quantifiable score between 0 and 100, with higher numbers suggesting more severe disease. A normal score for patients without dry eye would be 12 or below, while a score of 13 to 22 represents moderate disease, 23 to 32 represents moderate disease and patients with a score over 33 are characterized as having severe dry eye.2

Studies have shown that OSDI has good specificity (0.83) and moderate sensitivity (0.60) when differentiating between patients with and without DED.2

“The OSDI is very multi-dimensional,” explains Dr. Pucker, who researched the validity of the questionnaire in another analysis. “It tests symptoms, environment and then tasks, so it’s closer to an overall quality of life measurement than many others and screens patients for more than just dry eye,” he notes.

In addition, Dr. Theriot says that along with the SPEED questionnaire, she distributes the OSDI survey at a patient’s first dry eye evaluation. “One of the beautiful things about these questionnaires is that they have been scientifically proven over large patient populations to truly indicate dry eye, but also, in the case of the OSDI, they can give a subset of the severity of the disease,” she says. “That’s why I like to give this questionnaire to patients at the initial exam to be able to gauge where they are on the spectrum of mild, moderate or severe disease.”

Dry Eye Questionnaire (DEQ-5)
A condensed version of the original 21-item DEQ, this one measures symptom severity over the last month. The test contains only five questions, making it one of the quickest to complete and grade. Though it’s much newer and contains half the questions of the OSDI, a recent study comparing the performance of both tests found that the total scores of each were significantly correlated.4 The study reported the reliability of DEQ-5 and OSDI to be 0.92 and 0.82, respectively, and concluded that the DEQ-5 can provide a valid measurement of dry eye symptoms.

The survey asks patients to rate the severity of eye discomfort, dryness and wateriness each from 0 to 4, with 0 indicating “never” and 4 indicating “constantly.” The test-taker is then asked about the intensity of the symptom, with a score of 0 meaning it is not intense at all, and a score of 5 meaning...
it is very intense. The total score is a number between 0 and 22.

One unique advantage of the DEQ-5 is its ability to differentiate between Sjögren’s syndrome and non-Sjögren’s dry eye. A score above 6 suggests DED and a score ≥12 suggests Sjögren’s syndrome.1

“We use the DEQ-5 on occasion in our practice and have had good success with it,” says Dr. Karpecki. “The reason why we don’t rely on it more is that the SPEED test is just the one we use most routinely and it’s become habitual, but the DEQ-5 is still a great option.”

**Dry Eye-Related Quality-of-Life Score (DEQS)**

Originally developed in Japan, the DEQS is one that focuses more specifically on patient quality of life. The survey consists of 15 items and was developed to assess symptoms and their effect on daily living throughout the previous week. It asks patients to rate the frequency and severity of various ocular symptoms on a scale of 0 to 4 from “not at all” to “always” and “not at all” to “very much.”

The first six questions focus on ocular symptoms, while the other nine focus on how the patient’s daily life has been affected. It questions patients on things like light sensitivity and difficulty using screens, whether their work is being impacted and whether they are feeling depressed as a result of their symptoms. A quality-of-life score ranging from 0 to 100 is then calculated with the cutoff value for DED being 15 points. A psychometric analysis showed that the test has good internal consistency, test-retest reliability, discriminant validity and responsiveness to change.5

**Symptom Assessment Questionnaire in Dry Eye (SANDE)**

This is among the shortest of the tests, containing only two questions presented on a visual analog scale. Patients

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**The DEQS Questionnaire is similar to the DEQ and DEQ-5, although it incorporates more questions about a patient’s quality of life.**

---

**The McMonnies Questionnaire** is the oldest of the surveys. It’s also incorporated into the Keratograph 5M.
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rate the frequency and severity of ocular dryness or irritation by placing an “X” on a line between “rarely/mild” and “all the time/very severe.” In a study that compared this questionnaire with the OSDI, researchers found that SANDE showed a significant correlation and minor differences in scores compared with the OSDI and indicated that the test was short, quick and reliable.6

“Visual analog scales like SANDE are super useful in practice and can help you very effectively see the progression over time,” notes Dr. Pucker. “It’s a very short and simple test that has good metrics, and it’s validated, but I don’t see it used often enough in practice.”

McMonnies Dry Eye Questionnaire
Developed in 1986 by Charles McMonnies, this one is among the earliest screening tools for DED. The 12-question test asks patients to describe the frequency and severity of various symptoms, habits and coexisting conditions associated with dry eye by selecting one of several options listed for each item. The results produce a score between 0 and 25, with a score of 14.5 or higher indicating DED.1

Despite having been around the longest, the McMonnies has been shown to have poor internal consistency and inadequately studied validity and reliability.1 Sensitivity of the test has been reported to be between 87% and 98% and specificity between 87% and 97%.2 Authors of a Rasch analysis on the test’s validity had two major concerns. “First, there is no standardized scoring protocol. Second, there is uncertainty about whether the questionnaire can be used to grade disease severity,” they wrote.2 For these reasons, it’s not typically the top choice for use in optometry practices today.

However, in conjunction with other screening tools, this survey can still be useful in patient assessment. Dr. Sicks points out one particular advantage of using this test.

“The McMonnies questionnaire is actually incorporated into the Keratograph 5M,” says Dr. Sicks. “If you have the device, you can run through the entire dry eye analysis. It goes through all of the questions while the patient is sitting there, so you can ask them for their responses face-to-face.”

Impact of Dry Eye on Everyday Life (IDEEL)
This comprehensive questionnaire, developed by Alcon, includes 57 items and three separate modules, covering questions on dry eye symptoms, impact on daily life and satisfaction with treatment effectiveness and treatment-related inconvenience. Though the test may take longer than others for patients to fill out and physicians to grade, it could offer useful insight into the severity of your patient’s condition, the burden that the disease is placing on them and their satisfaction with the care they are receiving. Results from a psychometric analysis done to develop and validate IDEEL indicated that

The IDEEL Questionnaire is three pages and 57 questions long. CLDEQ-8 is well-suited to assessing dry eye in contact lens wearers.
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Equinox Low Level Light Therapy (LLLT)
Non-invasive and pain-free application for periorbital inflammation

Phoenix Meibography Workstation with Topography
Thorough dry eye assessments in addition to corneal topography measurements

EPI-C Plus IPL+LLLT
The only device with both IPL and LLLT technology, providing both periocular and direct application

This device is FDA cleared for dermatological use
the test met the criteria for item discriminant validity, internal consistency reliability, test-retest reliability and floor/ceiling effects. It’s important to note that in order to distribute this survey to patients in your practice, you will have to purchase it from Alcon with a price tag of a few thousand dollars.

### Contact Lens Dry Eye Questionnaire-8 (CLDEQ-8)

Certain dry eye questionnaires are specifically designed for contact lens wearers, such as the CLDEQ-8. This survey—currently property of Indiana University—includes five questions that ask patients about eye discomfort, eye dryness, changeable or blurry vision and how often the patient has to close their eyes or remove their lenses to relieve the bothersome symptoms.

“I’ll use the CLDEQ-8 whenever I’m suspecting that a patient is unhappy with their contact lenses so I can quantify how unhappy they are,” says Dr. Pucker. “When it’s a score of 12 or more, that suggests you should make some kind of change, such as in wear schedule, lens material or contact solution.”

A study comparing SPEED with the CLDEQ-8 found that scores of both were associated with self-reported dry eye in contact lens wearers, suggesting that either test could be used to assess this subset of dry eye patients. The SPEED questionnaire was shown to outperform the CLDEQ-8 in one area particularly: the former was able to quantify multiple symptoms while the latter quantified only those of dry eye.

### University of North Carolina Dry Eye Management Scale (UNC DEMS)

This single-item questionnaire, copyrighted by the University of North Carolina, asks patients to circle the number between 1 and 10 that best describes how bothersome their dry eye symptoms have been over the previous week. The survey also has an optional section at the bottom where patients can write anything they want or sensitivity to light. We want to know not just your dry eye symptoms but also how your symptoms have affected your daily life and the things you want to do.

Please circle the number (1-10) that best describes your dry eye symptoms and the overall effect on your daily life over the past week.

1. My symptoms are not a problem.
2. My dry eye does not affect my daily life at all.
3. My symptoms are mild and easily tolerable.
5. My dry eye sometimes affected my daily life and I sometimes have difficulty doing activities like reading or watching TV.
6. My dry eye often affected my daily life and I have difficulty doing activities like working on a computer or focusing.
7. My dry eye has greatly worsened my daily life and I am unable to do activities like driving.
8. My dry eye is very severe and I need immediate medical care.
9. My dry eye symptoms are so severe that I can quantify how unhappy they are,” says Dr. Pucker. “When it’s a score of 12 or more, that suggests you should make some kind of change, such as in wear schedule, lens material or contact solution.”

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Ease into Next-Level Dry Eye Care

Take your practice from beginner to advanced with these steps.

How often do you find yourself with a patient in your chair with an exhaustive list of dry eye symptoms, not knowing where to begin? It can be overwhelming for both you and the patient, which is why it’s imperative to have proper knowledge of dry eye causes and treatments in your diagnostic toolkit. After all, as eyecare professionals, it’s our job to produce happy patients.

Dry eye disease (DED) is a multifactorial condition that can complicate treatment; we must first determine the underlying causes and then marry them with treatment options that make sense for the patient’s lifestyle, budget and expectations. Do symptoms arise from too much screen time, an undiagnosed systemic disease or a medication they failed to list on their paperwork? Does this patient simply need prescription drops or do they require placement of an amniotic membrane or thermal pulsation device treatments? The list of symptoms is as long as the available treatments.

Our aim in this article is to help you incorporate dry eye treatment into your practice while graduating your management from basic to advanced, without having to purchase expensive equipment. In the end, you will have happier patients while also increasing your practice revenue.

Adding Dry Eye to Your Practice
The Tear Film and Ocular Surface Society Dry Eye Workshop II (TFOS DEWS II) report provides evidence-based rationale for diagnosis and treatment and gives those new to DED a more organized approach. The TFOS DEWS II diagnostic methodology report provides a comprehensive review of tests to be used for diagnosis, monitoring and to guide treatment. Coupled with the Management and Therapy report, the collective work ensures the most targeted therapy and monitoring plan.

Because you are treating a condition that requires more chair time and different billing practices, don’t try to fit it all into one visit; have them return for a follow-up when they need additional care. If the patient originally presented for routine care using their vision plan, they will need to return for a separate visit for the additional testing to be billed through their insurance.

Get to Know Your Patients
Make sure you’ve gathered comprehensive information from your patient. Are their symptoms occupational, whether it’s too much computer time or working in harsh environmental conditions? Do they have other symptoms such as dry mouth or eye pain, or have they...
had recent bloodwork to rule out autoimmune conditions? They could also be taking certain oral medications, which may interfere with goblet cells, meibomian glands and ocular surfaces of the conjunctiva and cornea (Table 1). Is your patient on topical glaucoma medications? A study found these induced meibomian gland dysfunction (MGD) and were associated with a 50% incidence of dry eye.

Thoroughly getting to know your patient helps involve them in their treatment, understand how their daily routine contributes to their discomfort and allows you to find the best regimen to improve their condition.

**Education is Key**
Using diagnostics helps add a greater level of understanding of these patients. Showing or explaining their results allows them to be more accepting to your treatment recommendations. This could be done with your phone at the slit lamp or you could invest in a corneal topographer with keratograph that allows you to evaluate meibography, non-invasive tear break-up time (TBUT) and tear meniscus height (Figure 1). When patients are shown these images, they typically understand what is happening on the ocular surface and it allows them to be part of their own dry eye treatment journey.

**Treatment Regimen**
The next step is determining what treatments are best for your patients, which range from beginner to intermediate to advanced.

![Fig. 2. Tyrvaya is the first FDA-approved nasal spray to treat DED.](image)

**Tier 1 (Beginner)**
- **Prescription eye drops.** These include cyclosporine (Restasis [0.05%], Allergan), Cequa (0.9%, [Sun Pharmaceuticals]), Klarity-C (0.1%) and lifitegrast (Xiidra, Novartis).
- **Ointments.** These include Refresh PM, Systane Nighttime, erythromycin and GenTeal Tears.
- **Warm compresses.** A popular option is the Bruder Moist Heat Eye Compress.
- **Lid scrubs/cleansers.** These include Avenova, Ocusoft, We Love Eyes, Zoeular, Optase and Cliradex.
- **Tea tree eye cleansers.** These include Cliradex, We Love Eyes and Eye Eco.

**Tier 2 (Intermediate)**
- **Steroids.** These include loteprednol (Eysuvis [0.25%], Kala Pharmaceuticals), Lotemax SM (0.38%, Bausch + Lomb) and Alrex (0.2%, Bausch + Lomb).
- **Nasal spray.** There’s now a treatment called Tyrvaya (varenicline, Oyster Point Pharmaceuticals).
- **Eye seals/sleep masks.** Options include Eye Eco and Sleep Tite.

Start basic with a slit lamp and begin assessing the lids and lashes where you first see ocular surface inflammation. Approximately 20% of patients have ocular findings before dermatologic evidence of rosacea, (which will be further discussed in Tier 3). Warm compresses and lid scrubs are easy treatments that patients can add to their daily routine.

A significant number have Demodex infestation, including about 45%
of patients with blepharitis, 84% of patients 60 and older and 100% of patients over the age of 70.\textsuperscript{4,5} Patients with rosacea have nine times the average rate of infestation.\textsuperscript{6} Keep in mind that inflamed eyelid margins and mechanical irritation of the lids are not always present.

Another thing to look out for is nocturnal lagophthalmos, the inability to close the eyelids while sleeping. We always ask patients if their dryness worse is the morning. If so, we consider overnight therapies such as ointment or eye seals from Eye Eco.

Tyrvaya, the first FDA-approved nasal spray for the treatment of DED, activates the trigeminal parasympathetic pathway, resulting in improved basal tear film production (Figure 2). A study showed that, at week four, 47% of patients improved their Schirmer’s score by equal to or more than 10mm from baseline, compared with 14% and 28% of vehicle-treated patients, respectively.\textsuperscript{7}

Inflammation plays a significant and central role in the pathogenesis of dry eye.\textsuperscript{8} Steroids can be our friend for a short-term therapy, including Eysuvis, which is the first steroid to be FDA-approved for dry eye flare-ups.

The hardest part about treating patients is setting expectations. Often they feel like we should be able to fix 50 years of dry eye with a few drops for a few weeks. However, a study showed that lifitegrast demonstrated significant improvement in patient’s signs and symptoms who suffered from inflammatory MGD.\textsuperscript{9}

Prescribing cyclosporine or lifitegrast won’t create an overnight fix, though. Inform your patients that dry eye is a war, a chronic progressive disease and that these drops, most of the time, require long-term commitment.

Make it convenient for your patients by selling products like warm compresses, lid scrubs/cleansers, ointments or artificial tears in your office. Stock brands you believe in and think are the best fit for your patients; specifying specific brands and products increase patient buy-in and compliance.

**TIER 2 (INTERMEDIATE)**

- **Amniotic membranes.** Options include the cryopreserved Prokera (Bio’oTissue), as well as several dehydrated membranes (e.g., BioDOptix, Integra Lifesciences; AmbioDisk, Katena; AcellFX, Akorn).
- **Therapeutic meibomian gland expression.** Mastrota Meibomian Gland Paddle (Medi Instruments), Collins Meibomian Gland Forceps (Sigma Pharmaceuticals) and Meibomian Gland Evaluator (Johnson & Johnson).
- **Microexfoliation devices.** (BlephEx).
- **Punctal plugs.**
  - Temporary occlusion. These include Vera180 (Lacrivera) and Soft Plug Extended Duration (Oasis Medical).
  - Permanent occlusion. These include SmartPlug (Medennium) and FormFit (Oasis Medical).
  - Surgical closure. This includes cautzerization, punctal plug su-turing and canalicul ligation.

You can get a jump start on treating the ocular surface with amniotic membranes. In a dry eye study with 160 participants, 95% said cryopreserved amniotic membranes healed their...
When it comes to ocular surface inflammation associated with dry eye disease,

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97% of ocular surface inflammation was resolved or improved with FLAREX vs 89% with Pred Forte.¹

<table>
<thead>
<tr>
<th>Head-to-head with FML:</th>
<th>Head-to-head with Pred Forte:</th>
<th>In the FDA pivotal clinical evaluation:</th>
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<tr>
<td><strong>FLAREX</strong> was significantly more effective in the resolution of external non-infectious inflammatory conditions of the eye (P=0.03)¹</td>
<td><strong>FLAREX</strong> had comparable, non-inferiority efficacy in the treatment of external non-infectious inflammatory conditions of the eye¹</td>
<td>No reported adverse events in any treatment group when evaluated versus Pred Forte and FML¹</td>
</tr>
</tbody>
</table>

**DISPENSE AS WRITTEN. THERE IS NO GENERIC EQUIVALENT OF FLAREX. BE SURE TO PRESCRIBE IT BY NAME.**

**INDICATIONS AND USAGE**

**FLAREX** (fluorometholone acetate ophthalmic suspension) is indicated for use in the treatment of steroid-responsive inflammatory conditions of the palpebral and bulbar conjunctiva, cornea, and anterior segment of the eye.

**IMPORTANT SAFETY INFORMATION**

ADVERSE REACTIONS: Glaucoma with optic nerve damage, visual acuity and field defects, cataract formation, secondary ocular infection following suppression of host response, and perforation of the globe may occur.

Please see the Full Prescribing Information on the next page.


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FLAREX (fluorometholone acetate ophthalmic suspension) 0.1%
Brief Summary

INDICATIONS AND USAGE
FLAREX (fluorometholone acetate ophthalmic suspension) is indicated for use in the treatment of steroid-responsive inflammatory conditions of the palpebral and bulbar conjunctiva, cornea, and anterior segment of the eye.

DOSAGE AND ADMINISTRATION
Shake Well Before Using. One to two drops instilled into the conjunctival sac(s) four times daily. During the initial 24 to 48 hours, the dosage may be safely increased to two drops every two hours. If no improvement after two weeks, consult physician. Care should be taken not to discontinue therapy prematurely.

CONTRAINdications
Contraindicated in acute superficial herpes simplex keratitis, vaccinia, varicella, and most other viral diseases of the cornea and conjunctiva; mycobacterial infection of the eye; fungal diseases; acute purulent untreated infections, which like other diseases caused by microorganisms, may be masked or enhanced by the presence of the steroid; and in those persons who have known hypersensitivity to any component of this preparation.

WARNINGS AND PRECAUTIONS
Topical Ophthalmic Use Only
For topical ophthalmic use only. Not for injection.

Intraocular Pressure Increase
Prolonged use may result in glaucoma, damage to the optic nerve, and defects in visual acuity and visual field. It is advisable that the intraocular pressure be checked frequently.

Cataracts
Use of corticosteroids may result in cataract formation.

Delayed Healing
Topical ophthalmic corticosteroids may slow corneal wound healing. In those diseases causing thinning of the cornea or sclera, perforation has been known to occur with chronic use of topical steroids.

Viral Infections
Use in the treatment of herpes simplex infection requires great caution.

Bacterial Infections
Use of corticosteroids may suppress the host response and thus aid in the establishment of secondary ocular infections. Acute purulent infections of the eye may be masked or exacerbated by the presence of steroid medication.

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.

Contamination
Do not touch dropper tip to any surface, as this may contaminate the suspension.

Contact Lens Wear
Contact lenses should be removed during instillation of FLAREX but may be reinserted after 15 minutes.

Temporarily Blurred Vision
Vision may be temporarily blurred following dosing with FLAREX. Care should be exercised in operating machinery or driving a motor vehicle.

ADVERSE REACTIONS
Clinical Trials Experience
Glaucoma with optic nerve damage, visual acuity and field defects, cataract formation, secondary ocular infection following suppression of host response, and perforation of the globe may occur.

Postmarketing Experience
The following reaction has been identified during postmarketing use of FLAREX in clinical practice. Because reactions are reported voluntarily from a population of unknown size, estimates of frequency cannot be made. The reaction, which has been chosen for inclusion due to either its seriousness, frequency of reporting, possible causal connection to FLAREX, or a combination of these factors, includes dysgeusia.

USE IN SPECIFIC POPULATIONS
Pregnancy
Fluorometholone has been shown to be embryocidal and teratogenic in rabbits when administered at low multiples of the human ocular dose. Fluorometholone was applied ocularily to rabbits daily on days 6-18 of gestation, and dose-related fetal loss and fetal abnormalities including cleft palate, deformed rib cage, anomalous limbs, and neural abnormalities, such as encephalocoele, craniorachischisis, and spina bifida, were observed. There are no adequate and well-controlled studies of fluorometholone in pregnant women, and it is not known whether fluorometholone can cause fetal harm when administered to a pregnant woman. Fluorometholone should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.

Lactation
Systemically administered corticosteroids appear in human milk and could suppress growth, interfere with endogenous corticosteroid production, or cause other untoward effects. It is not known whether topical administration of corticosteroids could result in sufficient systemic absorption to produce detectable quantities in human milk. Because many drugs are excreted in human milk, caution should be exercised when FLAREX is administered to a nursing woman.

Pediatric Use
Safety and effectiveness in pediatric patients have not been established.

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

NONCLINICAL TOXICOLOGY
Carcinogenesis, Mutagenesis, Impairment of Fertility
No studies have been conducted in animals or in humans to evaluate the possibility of these effects with fluorometholone.

PATIENT COUNSELING INFORMATION
Risk of Contamination
Do not touch dropper tip to any surface, as this may contaminate the suspension.

Use with Contact Lenses
The preservative in FLAREX, benzalkonium chloride, may be absorbed by soft contact lenses. Contact lenses should be removed during instillation of FLAREX but may be reinserted 15 minutes after instillation.

Temporarily Blurred Vision
Patients should be advised that their vision may be temporarily blurred following dosing with FLAREX. Care should be exercised in operating machinery or driving a motor vehicle.

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eye and 81% said it improved their vision.10 Usually, amniotic membranes are used clinically one eye at a time since they obscure vision. Prokera Clear heals the cornea and maintains visual acuity with the inclusion of a clear central aperture. Additionally, consider that if you find the cornea to be moderately to severely dry, it may require you to use more than one membrane treatment.

To help keep tears on the surface longer, consider using punctal plugs, which block the openings to the drainage ducts to improve ocular surface tear retention.

It’s been shown that hyperkeratinization of the meibomian gland duct is a primary cause of MGD; once the ducts are obstructed, the glands themselves atrophy (Figure 4).11 Historically, doctors have first tried therapeutic expression of the glands to increase quality and promote healthy meibum production. This could be attempted with a topical anesthetic and an expressor, such as the Mastrota Meibomian Gland Paddle.

Blepharoexfoliation is a painless procedure performed in-office that cleans the eyelids margins, removing bacteria and biofilm (Figure 5).12 BlephEx has been shown to improve eyelid health: increasing TBUT, reducing inflammation and enhancing meibomian gland function.12 It is also a reasonable clinical approach for use on noncompliant MGD patients. We could consider doing therapeutic expression and/or BlephEx with a thermal treatment, which brings us to our advanced level.

**TIER 3 (ADVANCED)**

- **Thermal pulsation devices.** These include TearCare (Sight Sciences), LipiFlow (Johnson & Johnson Vision), Systane iLux (Alcon), Thermoflo (MiBo Medical Group) and EyeXpress (Holbar Medical Products).
- **Intense Pulse Light Therapy (IPL).** These include Lumenis Optima IPL (Lumenis) and LacyrtStim IPL (Quantel Medical).
- **Low-level Light Therapy (LLLT).** These include Eye-Light (Espanione Group) and Equinox LLLT (Marco).
- **Radio Frequency energy application.** A device called TempSure (Cynosure) enables this.
- **Scleral lenses.** These create a temporary reservoir for medication and lubricants and include DigiForm (TruForm Optics and Contamac), Onefit (Blanchard Contact Lenses), Boston IV (Bausch + Lomb) and PROSE (BostonSight).

We have arrived at the point of adding equipment to your practice to truly designate ourselves as a comprehensive dry eye clinic. When advancing into Tier 3 treatment options, consider the increased financial commitment for both your practice and patients. While some treatment options can be billable with correct diagnosis, many are not. Before purchasing new equipment, it’s important to study the cost, typical reimbursement or out-of-pocket costs for the patient, as well as proper diagnosis requirements. Once you have the whole picture, it’s easier to decide whether your clinic will benefit from adding extra equipment and procedures.

Warm compress care at home can be challenging for patients to keep the glands heated up for a sufficient amount of time and at the right temperature. New technology has created the opportunity for thermal pulsation devices to make this less challenging. (Figure 6). These wearable eyelid paddles provide targeted and adjustable thermal energy and pressure to the meibomian glands. The Olympia clinical trial data for TearCare showed a statistically significant improvement in both TBUT and meibomian gland secretion score, as well as a statistically significant decrease in Ocular Surface Disease Index score.13

Another newer technology is LLLT, which uses specially designed LED light to gently apply periorbital heat to the eyelids to treat MGD, blepharitis, chalazia and *Demodex*. Treatment consists of four consecutive applications, which last 15 minutes; the sessions are separated by 48 to 72 hours. It’s been shown that LLLT increases the amount of tear

---

Fig. 6. In-office procedures to heat and express the meibomian glands are gaining favor. From left to right: LipiFlow, iLux and TearCare.
Radio frequency energy application is a non-invasive treatment that stimulates collagen production by delivering high frequency electrical currents, which generates heat to the surface of the skin. The heat promotes not only improvement in skin tone but also reduces inflammation around the eye and improves lipid expressions into the tears. It only takes around 10 to 20 minutes to complete.

IPL has been used in dermatology for several years as a treatment for rosacea and now has been incorporated into eye doctor’s offices to treat ocular rosacea (Figure 7). The light emitted causes blood cells in the abnormal telangiectasias to absorb the light, coagulate and close the blood vessels. Rosacea is a condition where these abnormal blood vessels secrete inflammatory mediators over time that damage the meibomian glands. Ultrasound gel is applied to the face from tragus to tragus, including the nose. Complete two full passes across the ultrasound gel and then you can then express the patient’s upper and lower glands. The protocol calls for four visits repeated about every 30 days. After these initial treatments are completed, the patient can then return for maintenance in the future when they become more symptomatic.

Let’s Get Down to Business
When deciding to bring any new dry eye treatment into your office, it’s important to consider the cost of acquisition and return on investment. Another thing to consider is adding marketing and advertising to acquire dry eye patients. Questions to ask:

• Do you have a page on your website dedicated to dry eye treatments?
• Do you use email marketing to target your dry eye patients, letting them know about the latest treatments?
• What systems are you using to make sure your patients are returning for their follow-up visits?
• Do you offer financing for non-billable treatments, and do you have someone in your office who goes over pricing? It’s critical to have someone in your clinic who can explain the potential out-of-pocket expense for patients, depending on their insurance plan’s allowables and deductibles.
• Do you have a system to follow-up if they don’t sign up for anything?

All of these, if done well, can lead to a profitable dry eye practice, regardless of the treatments that you have in your office.

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Dry eye management requires a positive attitude. Many of my patients come to me thinking they have tried everything under the sun and are about to give up and accept that pain and suffering is their only option. There are many factors that can cause their problems and trying to fix them all might not be practical, but if you take the time to treat the things within your control, it can be the most rewarding time spent with someone in your chair.

Once you bring your patients relief, they can end up being some of the most grateful people leaving your practice, eventually referring their friends and family. Become a dry eye hero—your patients will thank you!

Takeaways

Never stop learning! Technologies and treatments are always improving and keeping up with these advancements is what sets you apart from your peers. There are ample continuing education courses on DED as well as workshops conducted by leaders in the dry eye landscape.

Remind yourself and your patient that you can’t throw the kitchen sink at DED all at once. Start with a few treatment options and get your patient into a routine. Then, reassess their new daily symptoms and see what needs to be added or removed. Not every treatment works for everyone—don’t be afraid to change it up. Remind them that DED is never “cured” forever; you are managing their symptoms and preventing them from becoming more severe.

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LIT-OTC-Ad-Jobson Rev0 04/2022
Dry eye is one of the most common ocular issues an optometrist will encounter in their practice. The classic risk factors for ocular surface dryness have been well discussed and documented for over a decade, thanks in part to the oft-quoted body of evidence-based papers reported by the Tear Film and Ocular Surface Society (TFOS) DEWS I and DEWS II reports.\(^1,2\)

Older age, female sex, history of ocular surgery, contact lens wear and comorbid systemic disease are well-known culprits of ocular surface dryness. The classic dry eye patient is still women over the age of 50. While some risk factors cannot be changed, newer investigations are seeking ways to prevent ocular surface dryness from being compounded by preventable lifestyle risk factors. TFOS is currently investigating these modifiable risks, which will be discussed in the group’s upcoming workshop, “A Lifestyle Epidemic: Ocular Surface Disease.”\(^3\)

The picture of ocular surface dryness is changing and becoming more inclusive of broader patient types, including younger individuals. This article seeks to highlight four lifestyle risk factors that may be present for both classic and non-classic patients alike. The vicious cycle of chronic ocular surface dryness can be initiated by regular ocular surface irritation. The daily lifestyle habits described in this article all lend themselves to habitual ocular irritation.

**Risk Factor #1: Cosmetics**

The most common eye cosmetics in the marketplace continue to be mascara and eyeliner, followed by eyebrow makeup and eyeshadow.\(^4\) And thanks to the Zoom effect, we are aware of our appearances now more than ever before.\(^5\) Never before have individuals had to work and socialize with a virtual mirror in place. Multiple surveys have indicated increased interest in improving the physical appearance of the eyes through both cosmetics (skincare/makeup), cosmetic enhancements and surgical means.\(^5,8\)

Sadly, consumers have been led to trust marketing terms that have no specific regulation or definition in the

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**About the author**

Dr. Doll spent 15 years in academia and now practices at Sunset Eye Clinic in Beaverton, OR, where she is the director of ocular surface care services. She also serves on the American Academy of Optometry Anterior Segment Section leadership team and is a member of the Intrepid Eye Society and the Tear Film and Ocular Surface Society. She has a passion for lecturing, writing and conducting research on ocular surface dryness and eye beauty. Dr. Doll receives fees from Dompé, Oyster Point, Science-Based Health, Kala, Cynosure and Sun Pharma.
United States cosmetics and makeup marketplace. The following terms are not currently standardized in the United States: hypoallergenic, clinically tested, doctor recommended, natural and pH balanced. With no standards, health benefits cannot be verified. In fact, only 11 ingredients have been banned from cosmetics in this country compared with the nearly 1,300 substances banned in the European Union. The burden currently lies with the consumer to read the ingredients listed on product packaging to determine cosmetic safety.

With multiple scientific and lay terms for individual cosmetic ingredients, this task can be particularly daunting. The eyecare provider can be helpful in educating patients about the most common eye cosmetic irritants and offering credible resources. It should be noted that interactions between individual ingredients and the impact of layering cosmetics have not been well documented or investigated. This is an area that needs further study.

There are a number of cosmetic ingredients that can be considered ocular surface offenders, and it is important that patients be made aware of the associated risks. Before purchasing an eye cosmetic, recheck the packaging for known allergies and irritants. Manufacturers can change ingredients in cosmetics without warning. Fragrance as an ingredient can be particularly tricky, as they are considered proprietary and their exact composition is not required to be listed. A healthier option for ocular cosmetics can be to choose fragrance-free products. Preservatives are helpful to prevent bacterial growth in cosmetics but can also kill off the natural and healthy flora responsible for maintaining proper lipid barrier function of the skin on the eyelids. Choosing cosmetics with more frequent replacement and lower levels of preservatives is a better balance vs. cosmetics with multiple harsh preservatives.

Other, less eye-irritating cosmetic swap-outs can be encouraged. One example would be to choose a one-ingredient oil (argan or jojoba oil) as an eye makeup remover instead of a 14-ingredient oil-free option packed with multiple preservatives, dyes and fragrances. Colorful cosmetics should also be used in moderation. A general rule to follow: the more colorful, the higher the potential for causing eye irritation. It’s better to stick with neutral tones of brown and taupe vs.
blues, pinks and purples. It’s also a much healthier idea to avoid placing pigmented products over the top of the meibomian glands, as they can contain waxes and irritating pigments. Tight-lining or water-lining with eyeliner should be moved a few centimeters away from the gland openings.

The addition of ocular cosmetic enhancements has compounded the potential for ocular surface irritation. The growing trend of false eyelashes is dominating the eye beauty market. Eyelashes are not simply beauty adornments but rather serve the very specific anatomical function of diverting debris from the ocular surface. The ideal eyelash length determined to be helpful in mammals (animals and humans alike) is one-third the eye width. Altering this ratio could result in a wind tunnel effect, funneling allergens, dust and debris right to the ocular surface. Before healthcare providers consider capitalizing on this trend, careful thought should be given to anatomical function. When considering options for safer cosmetic lash and lid enhancement, the healthiest choices are temporary, removable and applied by experienced and licensed aestheticians. Generally, beauty enhancements requiring licensure should not be DIY.

Most people do not discard cosmetics appropriately, and cosmetics can become contaminated with skin flora. Thirty percent of single-user mascaras are contaminated with overgrowth of bacteria at the three-month mark. For this reason, all liquid cosmetics should be replaced at least every three months. Powders are also not immune to bacterial growth and should be replaced every four to six months.

Additionally, cleaning applicators is very important to avoid overgrowth of micro-organisms and invasion from non-native species, including fungus. Infected cosmetic tools present a risk for soft tissue infections if the epidermis is not intact. Makeup sponges harbor the most bacteria due

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**TABLE 1. COSMETIC INGREDIENT RESOURCES**

<table>
<thead>
<tr>
<th>Websites for Ingredient Checking</th>
<th>Phone Apps for Ingredient Checking</th>
</tr>
</thead>
<tbody>
<tr>
<td>ewg.org/skindeep/</td>
<td>Think Dirty Makeup App</td>
</tr>
<tr>
<td>clearya.com</td>
<td>Ingredio Beta App</td>
</tr>
<tr>
<td>m.checkcosmetics.net</td>
<td>Ingred App</td>
</tr>
</tbody>
</table>

**TABLE 2. POTENTIAL COSMETIC OCULAR OFFENDERS**

<table>
<thead>
<tr>
<th>Cosmetic Ocular Offenders</th>
<th>Common Names</th>
</tr>
</thead>
</table>
| Fragrances                | • Fragrances can be proprietary, so there may not be a listed name other than “fragrance”  
• The suffix -ol is common in products promoted as “natural” or “organic” (e.g., citronellol, geraniol and linalool) and can cause contact dermatitis |
| Preservatives             | • Parabens: butylparaben, ethylparaben, methylparaben, propylparaben  
• Formaldehides: ureas, quaternium-15, sodium hydroxymethylglycinate, DMDM hydantoin, bronopol (2-bromo-2-nitropropane-1,3-diol), 5-bromo-5-nitro-1,3-dioxane  
• Combination of ethylhexylglycerin and phenoxyethanol: the bactericidal action of this combination is potentiated, making them much stronger together  
• Benzalkonium chloride (BAK): if a patient has allergies to eyepads, look for this in cosmetics too |
| Pigments                  | Undiagnosed metal allergies can result in chronic irritation. Potential sources: iron oxides, titanium dioxide, copper, aluminum, ultramarine blue/violet/pink, manganese violet, carmine, chromium oxide, iron blue, bismuth oxychloride |
| Lash Growth Serums        | Prostaglandin-based serums can exacerbate ocular surface inflammation. May include: isopropyl cloprostenate, ethylcloprostenolomide, methylamido dihydro noralfaprostal, 17-phenyl trinor prostaglandin E serinol amide |

**TABLE 3. SAFER ALTERNATIVES**

<table>
<thead>
<tr>
<th>Category</th>
<th>Better Choices</th>
</tr>
</thead>
</table>
| Pigments | • Browns and taupe shades instead of bright colors  
• Never place pigmented products over the top of meibomian glands |
| Fragrances | • Fragrance-free options instead of undisclosed fragrances |
| Preservatives | • Frequent replacement cosmetics (three to six months)  
• Either ethylhexylglycerin or phenoxyethanol |
| Removers | • Simple oils: jojoba, argan  
• Micellar removers without fragrances or preservatives |
to their large surface area and ability to hold moisture. Weekly cleaning of cosmetic applicator tools (e.g., brushes, sponges) with most types of soaps or alcohol-based cleansers has been shown to be adequate in reducing microbial levels of *Staphylococcus* and *Streptococcus* species on cosmetic applicators.74 All cleaned brushes ideally should be stored in cool, dry locations.

**Risk Factor #2: Vaping**

The origination of the e-cigarette/vaping module came from a good place: the desire to deliver nicotine without the harmful effects from the carcinogenic ingredients in classic tobacco cigarettes. The original devices were even made to look like classic cigarettes. However, they have evolved over time to look less like a cigarette and to be more discreet; some even look like pens, AirPod cases or USB flash drives. Regardless of technology, all vaping mods have a basic construction: a metallic coil is immersed in vaping fluid containing the substance of choice, most commonly nicotine (cannabinoids are also common).75-77 A battery sends an electric current through the coil, resulting in heating and vaporization of the juice, which is then inhaled. The strength of the e-cigarette/vape battery (lithium-ion) output is what determines the amount of nicotine and vapor that is produced with every inhale and exhale.

Sadly, while these devices are arguably less harmful than tobacco cigarettes, they are not without health risks. Like cosmetics, there is poor regulation of the over 80 known ingredients in vaping juice. The most common juices have nicotine solubilized in propylene glycol or glycerin. Nicotine alone in water vapor feels very harsh, resulting in a peppery sensation on the back of the throat. Unfortunately, vaping juice solvents have been associated with a lung condition mimicking pneumonia, known as EVALI (e-cigarette or vaping-associated lung injury).78-80 The heated metallic coils can also leach metals into the vaping juice, resulting in metal deposition in the lungs. These known toxic and carcinogenic ingredients, when exhaled, can also make their way to the ocular surface. Vaping has been positively associated with disrupting the lipid layer of the tear film, causing ocular surface dryness.81-87 Reduction in noninvasive corneal tear breakup time and tear breakup time has been associated with vaping. Higher voltage with more chemical release has been correlated with worsening symptoms, Shirmer score and tear stability.81-87

In addition to the impact on the tear film, there lies the potential for severe vision loss with improper modification of vaping mods. Batteries that are improperly combined with combustion units to create higher levels of delivered nicotine (or other substances) could result in device explosion. There are documented cases of explosive foreign bodies, including metallic shrapnel imbedding in the ocular tissues.88-90 Patients need to be reminded of this risk and to never combine non-approved device components.

The eyecare provider should be very specific when taking case history. It is important to ask about vaping in addition to smoking because patients may not identify vaping and smoking as the same act. In the early days of vaping modules, the marketing was very clearly aimed at a younger population, using candy flavors, bright colors and young models in marketing. Since the appearance of vaping devices in the mid-2010s, many states have adopted laws mandating that vaping device and juice companies eliminate colorful packaging and flavoring that would appeal to minors. Unfortunately, these laws may have come too late. A survey in 2021 indicated that 11.3% of high school students (1.72 million)
and 2.8% of middle school students (320,000) reported current e-cigarette use. Since 2014, e-cigarettes/vaping modules have been the most common nicotine delivery option for teens and young adults. These groups should be questioned about vaping as the potential for early nicotine abuse exists. Smoking is often not associated with the fruity flavors delivered in vapors. Roughly 85% of middle school and high school students will choose flavored options for vaping, with fruit flavors being the most popular option across all demographics. In addition to educating patients on the ocular risks associated with vaping, optometrists should also be prepared to provide resources to help individuals who are interested in cessation.

**Risk Factor #3: Screen Time**

Even the most robust tear film cannot fight the evaporative stress induced by excessive screen time. The actual amount of screen time associated with inducing dryness is shockingly low. Research revealed a correlation of as little as two hours of screen time daily with dry eye. A study of young adult computer users demonstrated statistically significant poorer symptomology correlated with increased screen use. The average adult in the United States spends around three to four hours daily on their smartphone, personal computer and other digital activities. Evaporative stress occurs due to a lack of protective blinking during digital device use. Multiple studies have demonstrated that the regular resting blink rate of 17 to 23 blinks per minute is reduced to between 3.6 to 10 blinks per minute when on screens. Eyes simply are not being covered enough during screen

| TABLE 4. EYE COSMETIC BEST PRACTICES |
|-------------------------------|-----------------|-----------------|
| **Lash Enhancement** | **Better Practices** | **Better Marketing** |
| False Lashes | - Use for special occasions instead of daily | - Natural Lengths |
| | - Use partial lashes/wisps, natural lengths | - Wisps |
| | - Do not reuse | - Accent |
| Lash Extensions | - Use for special occasions instead of daily | - Esthetician/cosmetology license |
| | - Use partial fill, natural lengths | - Reference list |
| | - Use a licensed and experienced esthetician | - Education and products for cleaning lashes |
| | - Clean daily with hypochlorous acid (oil-based cleaners will loosen bonds) or lash cleaners | |
| Adhesives used in Application of False Lashes/Eyelash Extensions and Double Eyelid Tape | - Consider formaldehyde-free and latex-free options | - Formaldehyde-free |
| | - Consider oxymetazoline hydrochloride ophthalmic solution 0.1% for ptosis instead of daily eyelid gluing | - Latex-free |
| Lash Serums | - Use prostaglandin-free options that have peptides or short chains of amino acids, the building blocks of proteins: myristoyl pentapeptide-12/-16/-17, myristoyl octapeptide-1, copper tripeptide-1 | - Prostaglandin-free |
| | - Drug-free | |
| Tattooed/Permanent Eyeliner | - Do not repeat due to positive association with meibomian gland dysfunction and gland atrophy | - Esthetician/cosmetology license |
| | - Use healthier eyeliner as a better choice | - Separate permanent makeup artist certification |
| | | - Eyelid-specific pigments |
| | | - Reference list |
| Lash Perms/Lifts/Tints | - Use for special occasions instead of regular treatments | - Esthetician/cosmetology license |
| | - Go to an experienced, professional esthetician and never DIY | - Reference list |
| | - Patch-test for sensitivity | - Sensitive eye options |
| | - Avoid if allergic to hair dye or perming solution (the ingredients are identical for lashes and hair) | |
| | - Use healthier mascara as a better choice | |
time. Lack of blinking has also been positively associated with meibomian gland dysfunction and dry eye.99-103 The mechanism by which protective meibum is secreted onto the lid margin to be incorporated into the tears requires a complete blink. The muscles of Riolan (termination of the orbicularis oculi in the eyelid) contract with the complete blink, releasing meibum from the terminal ducts of the meibomian glands.104 The oil is then picked up by the upper eyelid and spread across the surface of the eye for incorporation in the tear film.104 Incomplete blinking equates to no meibum in the tear film, gland obstruction and inflammatory sequelae.

The combination of exposure coupled with inadequate volumes of meibum is a recipe for evaporative dry eye. Regular breaks and complete blinking can help to combat screen-associated dryness. There are a variety of free or inexpensive apps that can be installed onto both computers and smartphones that remind users to take healthy breaks and blink completely. Other workspace dry eye practices include humidifiers, air vent deflectors and moisture chamber/wind-blocking eyewear.

Even our younger patients are at risk, with children from eight to 12 years old spending four to six hours a day on screens, and teens facing up to nine hours of daily exposure.105 The American Academy of Child and Adolescent Psychology recommends all children take frequent breaks and stop all screen activity 30 to 60 minutes prior to going to sleep at night.104

### Risk Factor #4: Sleep Issues
Screen-induced sleep perturbations, in addition to primary sleep disorders and medication-induced sleep problems, can also be major risk factors for dryness. Primary sleep disorders have been associated with a cycle of ocular surface damage and dry eye disease symptoms.106,107 Sleep disorders have been shown to lead to “decreased aqueous tear secretion, increased corneal epithelial cell defects, corneal sensitivity and apoptosis and induced squamous metaplasia of the corneal epithelium in animal models.107” There is normal diurnal variation in tear secretion, and this balance is interrupted by poor sleep.108 Obstructive sleep apnea (OSA) not only disrupts normal sleep but is also associated with decreased blood supply to the eye. A lack of normal blood supply leads to hypoxia and inflammation, with subsequent ocular surface damage.109 OSA is also associated with floppy eyelid syndrome, which could cause further nighttime irritation.110

The case history can illuminate whether patients have sleep risk fac-

### TABLE 5. HARMFUL INGREDIENTS IN VAPING

<table>
<thead>
<tr>
<th>Vapor Additive</th>
<th>Examples</th>
<th>Toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carbonyl Compounds</td>
<td>Formaldehyde, acetaldehyde, acrolein</td>
<td>Cytotoxic, carcinogenic, irritant, pulmonary emphysema, dermatitis</td>
</tr>
<tr>
<td>Volatile Organic Compounds</td>
<td>Benzene, toluene, aniline</td>
<td>Carcinogenic, hematotoxic, neurotoxic, irritant</td>
</tr>
<tr>
<td>Heavy Metals</td>
<td>Cadmium, lead, mercury, arsenic</td>
<td>Carcinogenic, nephrotoxic, neurotoxic, hematotoxic</td>
</tr>
<tr>
<td>Other Metals</td>
<td>Nickel, tin, chromium, manganese</td>
<td>Lung irritant</td>
</tr>
<tr>
<td>Vitamins</td>
<td>Vitamin E</td>
<td>Identified in association with EVALI</td>
</tr>
<tr>
<td>Tobacco-Specific Nitrosamines</td>
<td>NNK, NNK</td>
<td>Carcinogenic</td>
</tr>
<tr>
<td>Flavors</td>
<td>Unknown substances as they are considered proprietary</td>
<td>Unknown</td>
</tr>
</tbody>
</table>

### TABLE 6. RESOURCES FOR VAPING CESSATION

<table>
<thead>
<tr>
<th>Websites</th>
<th>Apps</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.drugwatch.com/e-cigarettes/how-to-quit-vaping/">www.drugwatch.com/e-cigarettes/how-to-quit-vaping/</a></td>
<td>Quit Start</td>
</tr>
<tr>
<td>truthinitiative.org/thisisquitting</td>
<td>NoVape—Crush Cravings</td>
</tr>
<tr>
<td>smokefree.gov/tools-tips/text-programs</td>
<td>Quash</td>
</tr>
<tr>
<td><a href="http://www.becomeanex.org/the-day-you-quit/">www.becomeanex.org/the-day-you-quit/</a></td>
<td></td>
</tr>
</tbody>
</table>
Digital resources are available to help guide eyecare practitioners and all patient types on healthier lifestyle options that promote and protect ocular surface health. It is important that optometrists are aware of modifiable risk factors of dry eye and how to best educate and support their patients.

Takeaways
Excessive screen time, vaping/e-cigarette use, unhealthy eye cosmetics/enhancements and poor sleep can lead to daily chronic ocular irritation. These ocular surface dryness risk factors are primarily identifiable through a patient case history. Without attention to the lifestyle contributions to dry eye, the disease cannot be effectively treated.


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1. Which patient age demographic is currently most at risk for dry eye according to the latest data by TFOS DEWS II?
   b. Women 30-40.
   c. Men >60.
   d. Women >50.

2. Which cosmetic labeling term is regulated by the United States government?
   a. Clinically proven.
   b. pH balanced.
   c. Hypoallergenic.
   d. None of the above.

3. Which cosmetic ingredient category is proprietary and does not have to disclose its exact ingredients?
   a. Preservatives.
   b. Fragrances.
   c. Pigments.
   d. Solvents.

4. Which is the ideal healthy lash length to help divert debris from the ocular surface?
   a. Lashes that are two-thirds eye width.
   b. Lashes that are one-half eye width.
   c. Lashes that are one-third eye width.
   d. All lash lengths are healthy lengths.

5. Which component of a vaping module is responsible for the amount of nicotine in the inhaled vapor?
   a. Coil.
   b. Battery.
   c. Mouthpiece.
   d. E-liquid or juice.

6. Vaping has been associated with which ocular surface finding?
   a. Reduced tear breakup time.
   b. Central corneal staining.
   c. Conjunctival injection.
   d. Corneal infiltrates.

7. Which epithelial toxic preservative is found in both cosmetics and vaping e-juice?
   a. Formaldehyde.
   b. BAK.
   c. Phenoxethanol.
   d. Ethylhexylglycerin.

8. Which percentage of high school-aged teens indicated they were currently vaping in a 2021 survey?
   a. 2.8%.
   b. 5.6%.
   c. 11.3%.
   d. 21.2%.

9. Research indicates that dry eye is associated with a minimum of how many hours of screen time?
   a. 1 hour.
   b. 2 hours.
   c. 4 hours.
   d. 6 hours.

10. Which is true of blinking with digital device use?
    a. The blink rate drops from 17 to 23 blinks per minute down to between 3.6 to 10 blinks per minute.
    b. The blink rate increases to 20 to 32 blinks per minute up from between 5.7 to 15 blinks per minute.
    c. Blinks become approximately 30% incomplete.
    d. The blink is completely eliminated.

11. Which anatomical action releases meibum from the meibomian glands?
    a. Switching from primary to up-gaze.
    b. A complete blink.
    c. Reflex lacrimal tearing.
    d. Saccades.

12. A 2020 survey of United States children indicated that teens experience how many hours of daily screen time (smartphone, computer, television, tablets and other devices)?
    a. 5 hours.
    b. 7 hours.
    c. 9 hours.
    d. 11 hours.

13. Reduced sleep led to which corneal change in animal models?
    a. Corneal epithelial cell defects.
    b. Corneal cell apoptosis.
    c. Squamous metaplasia of the corneal epithelium.
    d. All of the above.

14. Which sleep disorder is associated with reduced blood flow to the eye?
    a. OSA.
    b. Primary insomnia.
    c. Blue light-induced sleep disorder.
    d. Nocturnal lagophthalmos.

15. Which in-office tool is helpful in the diagnosis of nocturnal lagophthalmos?
    a. PD ruler.
    b. Penlight/transilluminator.
    c. Occluder.
    d. Pinhole occluder.

16. When should screen time be stopped prior to sleep, according to the American Academy of Child and Adolescent Psychology?
    a. 30-60 minutes prior to sleep.
    b. 60-90 minutes prior to sleep.
    c. 2-3 hours prior to sleep.
    d. 4-5 hours prior to sleep.

17. Which lid hygiene ingredient is least likely to damage the glue bond for eyelash extensions?
    a. Hypochlorous acid.
    b. Tea tree oil.
    c. Jojoba oil.
    d. Argan oil.

18. How often should mascara be replaced to avoid bacterial contamination in a single user?
    a. 1 month.
    b. 3 months.
    c. 6 months.
    d. 1 year.

19. EVALI has been linked to which ingredient(s) in vaping liquid/juice?
    a. Solvents.
    b. Vitamin E.
    c. Flavors.
    d. Both a and b.

20. Which of the following is a prostaglandin analog ingredient found in OTC eyelash growth serums?
    a. Myristoyl pentapeptide-12/-16/-17.
    b. Myristoyl octapeptide-1.
    c. Copper tripeptide-1.
    d. Isopropyl cloprostenate.
### Examination Answer Sheet

**Four Hidden Lifestyle Risks Associated with Dry Eye**

**Valid for credit through May 15, 2025**

**Online:** This exam can be taken online at [revieweducationgroup.com](http://revieweducationgroup.com). Upon passing the exam, you can view your results immediately and download a real-time CE certificate. You can also view your test history at any time from the website.

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

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#### Answers to CE exam:

<table>
<thead>
<tr>
<th>#</th>
<th>Answer</th>
<th>Question</th>
<th>Score</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>A</td>
<td>Rate how well the activity supported your achievement of these learning objectives. 1=Poor, 2=Fair, 3=Neutral, 4=Good, 5=Excellent</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>A</td>
<td>Recognize the different factors that contribute to dry eye disease.</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>A</td>
<td>Explain how a patient's lifestyle can exacerbate the condition.</td>
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<td>4</td>
<td>A</td>
<td>Educate patients on changes that can help reduce the expression of DED.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>A</td>
<td>Communicate effectively to patients about dry eye disease.</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>A</td>
<td>Based upon your participation in this activity, do you intend to change your practice behavior? (Choose only one of the following options.)</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>A</td>
<td>I do plan to implement changes in my practice based on the information presented.</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>A</td>
<td>My current practice has been reinforced by the information presented.</td>
<td></td>
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<tr>
<td>9</td>
<td>A</td>
<td>I need more information before I will change my practice.</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>A</td>
<td>Thinking about how your participation in this activity will influence your patient care, how many of your patients are likely to benefit? (please use a number):</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>A</td>
<td>If you plan to change your practice behavior, what type of changes do you plan to implement? (Check all that apply.)</td>
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<tr>
<td>12</td>
<td>A</td>
<td>Apply latest guidelines</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>A</td>
<td>Change in diagnostic methods</td>
<td></td>
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<tr>
<td>14</td>
<td>A</td>
<td>Choice of management approach</td>
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<tr>
<td>15</td>
<td>A</td>
<td>Change in current practice for referral</td>
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<td>16</td>
<td>A</td>
<td>Change in vision correction offerings</td>
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<td>17</td>
<td>A</td>
<td>More active monitoring and counseling</td>
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<td>18</td>
<td>A</td>
<td>Change in differential diagnosis</td>
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<td>19</td>
<td>A</td>
<td>Other, please specify:</td>
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<tr>
<td>20</td>
<td>A</td>
<td>26. How confident are you that you will be able to make your intended changes?</td>
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<td>21</td>
<td>A</td>
<td>Very confident</td>
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<td>22</td>
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<td>Unsure</td>
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<td>24</td>
<td>A</td>
<td>Not confident</td>
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<td>25</td>
<td>A</td>
<td>Which of the following do you anticipate will be the primary barrier to implementing these changes?</td>
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<td>26</td>
<td>A</td>
<td>Formulary restrictions</td>
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<td>27</td>
<td>A</td>
<td>Insurance/financial issues</td>
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<td>28</td>
<td>A</td>
<td>Patient adherence/compliance</td>
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<td>29</td>
<td>A</td>
<td>Time constraints</td>
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<td>30</td>
<td>A</td>
<td>Lack of interprofessional team support</td>
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<tr>
<td>31</td>
<td>A</td>
<td>Other, please specify:</td>
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<tr>
<td>32</td>
<td>A</td>
<td>Treatment related adverse events</td>
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<tr>
<td>33</td>
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#### Post-activity evaluation questions:

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

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**Rate the quality of the material provided:**

1=Strongly disagree, 2=Somewhat disagree, 3=Neutral, 4=Somewhat agree, 5=Strongly agree

- **31. The content was evidence-based.** | 1 2 3 4 5 |
- **32. The content was balanced and free of bias.** | 1 2 3 4 5 |
- **33. The presentation was clear and effective.** | 1 2 3 4 5 |

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

**Signature**

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Is UV exposure in corneal cross-linking (CXL) a contraindication if the patient has a known history of herpes simplex keratitis (HSK)? “CXL has become an essential tool in preventing progression of corneal steepening in individuals with corneal ectasia, such as keratoconus,” say Sara Stockwell, OD, and Mitch Ibach, OD, of Vance Thompson Vision. The procedure is performed by anesthetizing the cornea, debriding the central 8mm to 9mm, instilling a riboflavin solution, exposing the eye to UV-A light and inserting a bandage contact lens.

Drs. Stockwell and Ibach note that while the goal of CXL is to prevent further progression of ectasia, many patients experience an improvement in corneal curvature as well, which can lead to improved best-corrected visual acuity. They add that CXL is safe and effective when performed correctly; however, as with any ocular surgery, there are complications and adverse effects that can occur, including corneal haze, infection (bacterial/fungal/viral), ectasia progression, best-corrected vision loss, dryness and photophobia.

CXL Contraindications
Some clinicians are leery of recommending CXL to patients with a history of herpes viral infection due to the risk of developing HSK postoperatively, according to Drs. Stockwell and Ibach. There have been reports of HSK infections post-CXL even in individuals with no prior history of HSK. It is suspected that exposure to UV-A during the procedure leads to reactivation of the latent herpes simplex virus and subsequent corneal infection, which can occur after any ocular laser surgery likely as a result of stress and/or damage to the corneal nerves. In such cases, individuals who were treated appropriately with oral antivirals were not left with any long-term visual or ocular complications, demonstrating the importance of timely postoperative examination to monitor for potential complications.

Despite the risk of developing HSK after CXL, a history of HSK is not always a contraindication for CXL, note Drs. Stockwell and Ibach. If a patient is in need of CXL and has a history of HSK or herpes zoster virus, the doctor duo suggests treating them prophylactically with oral antivirals one month before and six months after the procedure in order to prevent recurrence. They typically prescribe valacyclovir 500mg QD to BID or acyclovir 400mg BID. However, if a patient has an active HSK infection, CXL should be postponed until the infection has completely cleared.

The doctors say that, ultimately, the decision to perform CXL should not be hindered by a history of HSK unless a patient has an active infection. The patient and physician should weigh the risks and benefits together to make the best decision. It’s important to remember that HSK can typically be treated effectively and without any serious complications if diagnosed in a timely manner. Oral antivirals, which are the most common treatment option for HSK, are safe to use in most healthy individuals.

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Neovascularization: A Small Solution to a Big Problem

Quick identification and effective treatment of proliferative retinal disease is necessary for optimal outcomes.

Proliferative retinal diseases are one of the leading causes of vision loss worldwide. Many treatments are aimed at reversing these conditions and preserving visual function. However, in order to do so, timely diagnosis and management is vital. As complications can be severe, more effective therapeutic solutions are continuously being evaluated.

It is important that the eyecare practitioner be able to accurately identify these treatable proliferative processes as early as possible. As such, understanding how and why they arise is crucial.

Normal Blood Supply

Proliferative retinal diseases are generally classified as either causing retinal or choroidal neovascularization. In order to understand their mechanisms, it is first necessary to distinguish normal retinal angiogenesis and blood supply. As we already know, for vision to occur, light needs to reach the photoreceptors. Because of this, the outer retina is largely avascular, as blood vessels would prohibit image formation if located immediately in front of the photoreceptors. Instead, the entire retina is nourished by a dual blood supply: blood vessels within the inner retinal layers and the choroid.

The vasculature of the inner retina is located far enough anteriorly to the photoreceptors that light is able to navigate around it. This system is made up of deep and superficial capillary beds that are responsible for nourishing the inner two thirds of the retina. By contrast, the outer one third of the retina is supplied by the choroidal vasculature.

These two distinct blood supplies are separated by the retinal pigmented epithelium. Because of this dual supply, neovascularization in proliferative disease processes can arise either from the primary inner vasculature—termed retinal neovascularization—or the vasculature in the choroid, called choroidal (or subretinal) neovascularization. In either case, these new vessels invade areas where vessels are not normally present.

Protective Measures

Neovascularization is a protective mechanism that many tissues throughout the body have in response to injury. For example, wound repair in the skin involves the formation of new blood vessels to compensate for those that have been damaged. In the retina, disease processes that cause damage to normal retinal vasculature, leading to ischemia and retinal nonperfusion, typically stimulate the growth of neovascularization.

A key contributor that has been heavily studied in this process is vascular endothelial growth factor (VEGF). While normally present in healthy eyes, VEGF is highly expressed in proliferative disease, triggering the growth of neovascularization. When photoreceptors and neurons are deprived of oxygen and nutrients that are usually supplied by healthy vessels, the resultant hypoxia triggers VEGF release. VEGF is known to stimulate and mediate vasculogenesis, endothelial cell migration and tube formation.

Severe neovascularization with hemorrhage and fibrous proliferation in diabetic retinopathy, leading to tractional retinal detachment.

About Dr. Labib

Dr. Labib graduated from Pennsylvania College of Optometry, where she now works as an associate professor. She completed her residency in primary care/ocular disease and is a fellow of the American Academy of Optometry and a diplomat in the Comprehensive Eye Care section. She has no financial interests to disclose.
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Retinal Neovascularization

Although these new blood vessels are formed to compensate for a lack of oxygen and nutrients, instead of repairing the problem they exacerbate it. This is attributed to the differences in the structure of neovascularization as compared with normal, healthy retinal vasculature.

Unlike regular retinal vessels, neovascularization is composed of thin-caliber vessels that lack tight junctions. One may recall that tight junctions of the retinal vasculature are a key feature, comprising one of the blood/retinal barriers. As such, these new blood vessels are very prone to leakage and exude plasma into the nearby tissue and vitreous. This causes the vitreous gel to degenerate, contract and collapse, ultimately leading to devastating visual complications such as vitreous hemorrhages and tractional retinal detachment. Common etiologies that give rise to proliferative retinal disease include diabetic retinopathy, retinopathy of prematurity, retinal vein occlusion, sickle cell or other hemoglobinopathies and Eales disease.

To identify retinal neovascularization, key features on fundus exam help distinguish it from normal retinal vasculature. Besides the smaller and thinner caliber—appearing as fine tufts or fronds—retinal neovascularization is often accompanied by connective or fibrotic tissues that increase in intensity over time. It may appear near the disc (NVD) or elsewhere (NVE), growing either superficially toward the vitreous or down beneath the retina.

Because of the architecture of retinal neovascularization, fluorescein angiography (FA) shows leakage of dye from these vessels into the extravascular space. Another distinct feature on FA: the neovascular vessels are often located adjacent to areas of poor capillary perfusion to compensate for this pathology.

A newer noninvasive method in the works to identify NVE and NVD is OCT angiography (OCT-A). Studies suggest en face OCT-A may visualize these abnormal growths as exuberant vascular proliferation or intense growth of small blood vessels located at the margin of new blood vessels, indicating active proliferation.

Besides the smaller and thinner caliber—appearing as fine tufts or fronds—retinal neovascularization is often accompanied by connective or fibrotic tissues that increase in intensity over time.

Subretinal Neovascularization

The other piece of the dual blood supply, the outer choroid, is also a site of neovascularization. This is known as subretinal neovascularization, which suggests the new blood vessels grow beneath the retina in the subretinal sensory space.

Subretinal neovascularization can be further subdivided into two categories, depending on the origin of these vessels. The first is retinal angiomatous proliferation, which arises from the deep capillary plexus of the inner retinal vasculature before making its way through the outer retina and into the subretinal space. Choroidal neovascularization, on the other hand, arises from the actual choroidal blood vessels, penetrating Bruch’s membrane and ending in the subretinal space. Regardless of subtype or origin, both forms of subretinal neovascularization are complications of wet (exudative) age-related macular degeneration, among other, less common diseases.

On retinal examination, subretinal neovascularization appears as a greenish or grayish lesion, which may or may not be associated with retinal hemorrhages, exudate or edema. Leakage is also present on FA. Using OCT-A, subretinal neovascularization can be seen as a “seafan” or vascular complex within the outer retina, which is otherwise devoid of blood vessels. These complexes are often located in areas where there is less than optimal perfusion.

Treatment

Since we understand how and why neovascularization arises, we are able to identify primary therapeutic targets. The mainstay of treatment for several decades has been the use of panretinal photocoagulation. This laser therapy aims to destroy areas in the peripheral retina in the hopes of diminishing VEGF release, thereby regressing neovascularization. Though effective, it is not without side effects, such as reduced peripheral vision, loss of night vision, pain, blur and macular edema.

Anti-VEGF agents are also available through intravitreal injection, again attempting to retard the stimulus of neovascularization. Currently available anti-VEGF drugs include pegaptanib, bevacizumab, ranibizumab, afibercept, brolucizumab and faricimab, along with some biosimilars.

As we continue to research stimuli for neovascular formation, therapeutic targets are more easily identifiable. However, one thing is for certain: identifying these conditions quickly and accurately is critical in ensuring the best treatment outcome.

References:

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A NEW WAY TO EXPERIENCE REVIEW OF OPTOMETRY

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A 37-year-old Hispanic male presented to the emergency department with complaints of blurred vision in his left eye for six months. He reported that his vision had drastically worsened over the preceding week. He denied any active pain or inflammation in his eye, though he did note an episode of photophobia and redness that had occurred in the weeks leading up to his rapid vision decline.

The patient's entering visual acuities were 20/20 in the right eye and counting fingers at three feet in the left. His intraocular pressures were 17mm Hg OD and 16mm Hg OS, and there was no afferent pupillary defect. The slit lamp and fundus examinations of the right eye were unremarkable. The conjunctiva of the left eye was white and quiet without foreign body presence. The cornea was diffusely hazy with subtle stromal thickening throughout the central region. There were numerous large epithelial bullae but no infiltrate or keratic precipitates (KPs) (Figure 1). The anterior chamber was deep and formed, and there were no appreciable cells or hypopyon. The dilated fundus examination of the left eye was grossly normal. Additional imaging was completed with anterior segment OCT (Figure 2).

A thorough review of the patient's personal and family ophthalmic history was taken. The patient denied any contact lens wear, prior ophthalmic surgery or ocular trauma. He was not taking any oral or topical ophthalmic medications, but he did endorse a history of perioral cold sores. He denied knowledge of any family history of ocular disorders or surgery.

**Differential Dive**

In cases such as this one, it is helpful to review common causes of corneal edema. First, consider the possibility of a degenerative disorder of the cornea. Fuchs’ endothelial dystrophy is the most common endothelial disorder. These patients are typically older and experience a gradual decline in their vision bilaterally.1 The condition causes accelerated loss of endothelial cells over a patient’s lifespan, at a rate which may lead to pathologic characteristics. Clinical exam reveals the presence of endothelial guttae, stromal thickening and epithelial bullae in advanced cases. As mentioned before, our patient did not have any history of such disorders.

Specular microscopy was completed to evaluate the endothelial health of the asymptomatic eye (Figure 3). The cell count was within normal limits for his age, and the cells were mostly hexagonal as one would expect in a healthy eye. The central cornea was slightly thin at 514μm, eliminating the possibility of subclinical edema. Other endothelial disorders that can cause corneal edema include posterior polymorphous dystrophy (PPMD), congenital hereditary endothelial dystrophy (CHED) and iridocorneal endothelial (ICE) syndrome. In our patient, there were no clinical signs of any abnormalities of the contralateral eye, ruling out PPMD and CHED. ICE syndrome typically presents as a unilateral condition, but it is associated with iris atrophy and elevated intraocular pressure, two features not seen in our patient.

Corneal edema can also present secondary to ocular trauma and surgery. Pseudophakic bullous keratopathy (PBK) occurs after cataract surgery and leads to irreversible corneal swelling due to loss of endothelial cells during surgery. Though the overall chances of developing this condition are low, factors that lead to an increased risk of PBK include pre-existing endothelial compromise, increased phacoemulsification energy, combined anterior vitrectomy, direct endothelial damage from surgical instruments and anterior chamber intraocular lens placement.2

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**Fig. 1.** Slit lamp examination on direct (A) and retro (B) illumination reveals large, scattered epithelial bullae with mild corneal haze. Note the quiet conjunctiva (A).
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LESS DARKNESS, more light
Ocular trauma can cause refractory corneal edema, particularly when there is direct damage to the endothelium or a rupture in Descemet’s membrane. It is also common to see temporary corneal swelling in cases of corneal abrasions, but this typically resolves as soon as the epithelial defect closes. Our patient denied any ocular surgery or trauma, ruling out these etiologies.

Corneal edema can also result from infectious keratitis. Associated clinical findings include the presence of an infiltrate, epithelial defect, redness, photophobia and anterior chamber inflammation. In our patient, there was no infiltrate, defect or inflammation present, ruling out microbial keratitis.

Viral infections such as herpes simplex virus (HSV) can also cause corneal edema. Herpetic keratitis is most clearly recognized when epithelial involvement (e.g., a dendrite) is present. The absence of dendrites, however, does not exclude a viral infection. HSV may manifest as stromal keratitis or endotheliitis. Stromal HSV often presents with corneal edema, haze and deep corneal neovascularization. Herpetic endotheliitis typically presents with a red, photophobic eye that has keratic precipitates underlying the area of stromal edema. In many cases, the KPs may be difficult to visualize initially due to corneal clouding.3

So, What’s the Deal?
Our patient’s clinical presentation was unique in that he had significant epithelial bullae but in an otherwise white and quiet eye. He reported an episode of redness and photophobia that preceded his visit to the emergency department, but those symptoms had resolved by the time he sought care. Given the patient’s age, unilaterality and prior history of cold sores, a suspected diagnosis of herpes simplex endotheliitis was made. The patient was started on valacyclovir 500mg three times daily, sodium chloride drops four to six times daily and preservative-free artificial tears four times daily.

At a five-day follow-up, his vision had improved to 20/150. At that time, prednisolone acetate was added four times daily. One month after his initial presentation, the patient’s corneal edema had completely resolved, and his vision was 20/30 without correction. He was tapered off the topical corticosteroids, and the valacyclovir was discontinued. Despite lacking classic findings of herpetic keratitis, the exam and course of improvement supported a herpetic component.

Similar cases have been reported, including a 62-year-old female who presented with unilateral corneal edema and epithelial bullae but lacked anterior chamber inflammation, KPs or elevated intraocular pressure. Topical steroids alone did not improve the clinical findings. The patient therefore underwent an aqueous tap confirming HSV and went on to receive successful treatment with topical corticosteroids and oral antivirals.4

Another case involved a 60-year-old male with unilateral corneal edema and bullae in an otherwise quiet eye. There were no KPs or anterior chamber cells, but intraocular pressure was elevated in the affected eye at the initial visit. At follow-up, he was noted to have developed epithelial dendrites, and corneal cultures were positive for HSV.5

A third case of corneal bullae from viral endotheliitis in a quiet eye revealed cytomegalovirus as the causative agent, further illustrating that not all disease processes present with classic findings.6

Take-home Message
This column highlights the diverse clinical manifestations possible with herpes simplex keratitis. When faced with a divergent clinical picture, it is helpful to think logically through the differential diagnoses. Many etiologies can be ruled out, leaving the practitioner with a narrower list of suspects to work through.

In this case specifically, the patient was treated empirically given the known history of HSV and the larger clinical picture. He continues to be monitored for recurrence but was doing well at the most recent follow-up. ■

References
OVERVIEW


The Intrepid Eye Society is a group of emerging thought-leaders in optometry looking to promote excellence and growth in our field through innovation and implementation. We’ll discuss future medical therapeutics, diagnostics, practice development, research and development, and collaborative care.

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NEW TECH

Next-gen Self-tonometer Cleared by FDA

In-office tonometry readings only show you a brief snapshot of a patient’s intraocular pressure (IOP), which varies considerably throughout the day and night. With the increased interest in self-tonometers such as iCare Home, it’s now possible to document a patient’s IOP readings around the clock without requiring them to travel to the office. The newest incarnation, called iCare Home2, allows IOP measurements to be taken while a patient is sitting or lying down, making it more accessible and user-friendly than the previous model, according to a company press release.

As with the original iCare Home, the new model uses cloud-based software called iCare Clinic to store IOP data that eyecare professionals can access 24/7 to help make appropriate treatment and management decisions. The company also notes that patients can review and monitor their own measurements using a mobile app called Patient2, which allows data to be saved from the tonometer to the patient’s smartphone via Bluetooth.

iCare says its latest handheld self-tonometer enables remote IOP monitoring during a time when the need for virtual healthcare is increasing and may also provide valuable clinical data that’s otherwise unobtainable through periodic in-person appointments.

New Camera Adapter for BQ 900 Slit Lamp

Slit-lamp biomicroscopy is a fundamental diagnostic tool essential to daily practice. While examining patients’ eyes helps you make clinical decisions in the moment, digitally documenting your findings can help with tracking progression and informing long-term treatment and management. One new slit lamp camera attachment from Haag-Streit designed for this purpose—the Imaging Module 910 for the BQ 900 slit lamp—can capture sharp clinical images during an exam with the click of a button, according to developers.

The module can be used in one of two ways: “stand alone” mode, which allows images to be stored directly in the EMR system, or “EyeSuite” mode, which enables features such as image editing through custom software the company provides. For the best image quality and illumination possible, the device includes smart features such as auto-exposure mode and automatic aperture control, a press release from Haag-Streit explains. The company adds that an image selection algorithm filters and chooses the best images.

Alcon Updates its MGD Thermal Pulsation System

Warming the eyelids and applying pressure to express the glands has long been a popular treatment for meibomian gland dysfunction—a leading contributor to dry eye—using either home remedies or newer in-office procedures. Alcon recently released an updated model of its meibomian gland expression device, called Systane iLux2, and says this version can customize heat and compression settings to give the doctor more control over the intervention. Alcon says the iLux2 can treat both eyes in eight to 12 minutes total.

The device also now includes a camera that captures photos and videos of the procedure and its effects on the meibomian glands, the company says, in hopes of improving patient adherence with medical recommendations and overall satisfaction with your care. Immediately after treatment, you can show the patient the affected areas of their eyelids and the changes that took place during the treatment.

THERAPEUTICS

Topical Immunomodulator FDA-approved for VKC

Vernal keratoconjunctivitis (VKC) is uncomfortable to its young patients and can damage the ocular surface if left untreated. A variety of steroids and antihistamines are typically prescribed to manage the rare condition. A new, recently approved therapeutic—Verkazia—is a cyclosporine 0.1% emulsion that blocks release of pro-inflammatory cytokines, thereby suppressing the immune system and reducing inflammation, manufacturer Santen says.
New Technologies & Treatments in Eye Care

IN-PERSON EVENTS

REGISTER NOW

SEPTEMBER 9–11, 2022
SAN ANTONIO, TEXAS

NOVEMBER 11–13, 2022
ORLANDO, FLORIDA

LETTER FROM THE CHAIR

Dear Colleagues,

I am thrilled to welcome you to our New Technologies & Treatments in Eye Care conference series - in person for 2022!

NT&T continues to serve as a forum to gain clinical pearls and insights that we know you’re going to face in clinical practice routinely and regularly, but even some of the rarer forms of cases and presentations so that the next time you see it, you’ll have a new sense of understanding and ability to manage it effectively.

We strive to continually offer educational sessions that will strengthen the practical and clinical skills you need to improve the overall quality, efficacy and patient care in your clinic.

Join our renowned faculty live as they share their expertise on glaucoma, retinal disease, ocular surface disease and much more.

I look forward to seeing you in person for this engaging and innovative experience!

Sincerely,

Paul M. Karpecki, OD, FAAO
Kentucky Eye Institute
Lexington, Kentucky
Chief Clinical Editor
Review of Optometry

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Clinical trials of Verkazia demonstrated improvements in corneal inflammation (keratitis score) and ocular itching, a press release explained. The company also noted that the most common side effects, occurring in more than 5% of patients and typically during instillation, were eye pain (12%) and eye itch (8%).

In addition to providing VKC patients with symptomatic relief, Verkazia may also mitigate their chance of developing vision-threatening complications such as shield ulcers, according to Santen.

**CONTACT LENSES**

**BostonSight Scleral Campaign for Patient Education**

You may be getting more patient inquiries about scleral contact lenses with the launch of a new marketing campaign last month, which intends to provide accessible materials to educate more patients on scleral lenses. Called the BostonSight Scleral campaign, its goal is to help increase patients’ awareness of the potential benefits of this modality. Through various handouts available via its website, the company offers information and resources on topics such as “What is a scleral lens?”, “Anatomy of a scleral lens” and a “Healthy Lens Habits Guide.” The three conditions that scleral lenses are commonly used to treat that the campaign will focus on are dry eye disease, keratoconus and post-LASIK ectasia.

BostonSight wrote in a press release that its campaign aims to help promote confident decision-making by equipping patients with the knowledge they need to select a lens that meets their needs. The company also notes that its educational materials may encourage more patients to strike up a conversation about scleral lenses with their eyecare provider.

**Six Lens Designs Added to Eye Surface Profiler**

Since the launch of a recent software update—called Prime 6.1—the Eye Surface Profiler (ESP) from Eaglet Eye now features over 60 lens algorithms and works with over 25 labs to ensure a wide range of lens designs are available to fit patients’ specific needs. Lens designs that may be fit with the newest ESP model include scleral, ortho-K, hybrid, soft and corneal gas permeable. The additional algorithms that are now incorporated into the ESP software will allow you to offer more of your patients a customizable fit from the comfort of your clinic, the company notes.
Join Review Education Group and MedscapeLIVE! this December for the West Coast Optometric Glaucoma Symposium (WCOGS) and Retina Update 2022. The conferences will be co-located at the Hilton La Jolla Torrey Pines in La Jolla, California. Attendees are encouraged to participate in both symposia to greatly enhance their learning experience.

**WEST COAST OPTOMETRIC GLAUCOMA SYMPOSIUM**

**DECEMBER 9–10, 2022**
**LA JOLLA, CALIFORNIA**

Program Co-chairs:
Mohammad Rafieetary, OD, FAAO; Steven Ferrucci, OD, FAAO

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WCOGS is a 2-day biannual symposium designed to provide optometrists with exposure to current thinking on evolving standards of care, state-of-the-art technology and breaking research that will guide current and future glaucoma care in the optometric setting. Incorporating cases, clinical pearls, and discussion sessions, the program will maximize the opportunity for participant/faculty engagement.

**RETINA UPDATE 2022**

**DECEMBER 10–11, 2022**
**LA JOLLA, CALIFORNIA**

Program Co-chairs:
Murray Fingeret, OD, FAAO; Robert N. Weinreb, MD

**EARN UP TO 12 CE CREDITS***

Retina Update 2022 will help ensure that primary practitioners consider all relevant research so they can practice in an effective and appropriate manner. The program will offer specific direction and practical advice on how to detect and manage a broad range of retinal disease and promote improved retinal health.

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A 52-year-old African American female reported for an annual eye exam. Her chief complaint was difficulty with reading. She indicated she had an oculan history of medullated nerve fibers in the right eye diagnosed by another practitioner many years ago. She also indicated she had a family history of glaucoma (grandmother). Her systemic history was significant for hypertension, for which she was properly medicated. She denied allergies of any kind.

**Clinical Findings**

Her best-corrected entering visual acuities were 20/20 OU at distance and near. Her external examination was normal with no evidence of color deficiency, brightness loss, field abnormality or afferent pupillary defect. Refraction was negligible, with improvement at near with a small increase in add power. Biomicroscopy uncovered normal and healthy anterior segment tissues with Goldmann applanation tonometry measuring 19mm Hg OU.

Her dilated funduscopic exam was within normal limits; the photograph below, from old records, demonstrates the “medullated nerve fibers” seen by the previous practitioner. Her cup-to-disc ratios were slightly asymmetric, measuring 0.4/0.4 OD and 0.4/0.55 OS.

**For More Information**

Additional testing included requesting the previous records and obtaining visual fields, OCT and photos to establish a baseline in case she was considered to be a borderline glaucoma suspect based upon the asymmetric C/D ratio and family history. Measurement of central corneal thickness (pachymetry) to understand the relative conversion risk to treatable glaucoma and gonioscopy to understand angle status is also recommended.

**Your Diagnosis**

What would be your diagnosis in this case? What is the patient’s likely prognosis? To find out, please read the online version of this article at [www.reviewofoptometry.com](http://www.reviewofoptometry.com).

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**History Lesson**

*How to proceed when a patient’s report of their medical status doesn’t match your clinical assessment.*

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### History Lesson

**By Andrew S. Gurwood, OD**

**Diagnostic Quiz**

Examination and diagnostic findings in our patient. How to these correspond to her history and chief complaint?

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**NEXT MONTH IN THE MAG**

In June, we present our annual retina report. Articles will include:

- Is It Time to Add Genetic Testing for Retinal Diseases?
- Dry AMD: New Meds and Methods are Gaining Ground on GA
- Wet AMD: Search for Early Signals of Conversion
- Keep Alert and Aggressive in Diabetic Retinopathy Comanagement
- ORS Annual Case Report Contest Winners

Also in this issue:

- Bandage Contact Lens Dos and Don’ts
- Scope Expansion Series: Should You Add Laser Procedures?

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Dr. Gurwood is a professor of clinical sciences at The Eye Institute of the Pennsylvania College of Optometry at Salus University. He is a co-chief of Primary Care Suite 3. He is attending medical staff in the department of ophthalmology at Albert Einstein Medical Center, Philadelphia. He has no financial interests to disclose.
When it comes to myopia control in children who are 8-12 years of age at the initiation of treatment,

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