

# REVIEW<sup>®</sup> of OPTOMETRY

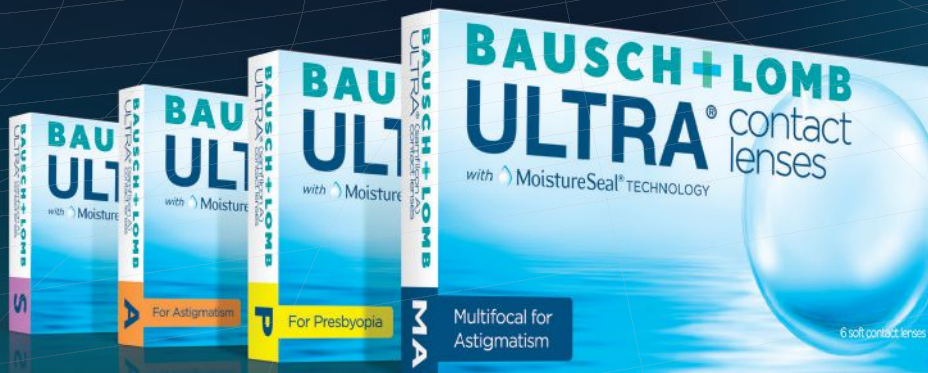
August 15, 2022 • [reviewofoptometry.com](http://reviewofoptometry.com)

Leadership in clinical care

SCOPE EXPANSION  
**PRESCRIBE  
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## INNOVATION RUNS IN THE FAMILY

The widest range of lenses for immediate in-office fittings,\*  
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MoistureSeal<sup>®</sup> Technology  
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EARN 2 CE CREDITS: How to Assess and Manage Nystagmus and Vertigo, p. 64

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46th Annual **CONTACT LENS REPORT**

## ZOOM IN ON CONTACT LENSES

*We go deep on the designs, discussions  
and decisions that lead to success.*

Deciphering Contact Lens Terminology, *p. 38*

Which Factors Matter in Lens Selection?, *p. 46*

Multifocals: Seven Steps to Success, *p. 52*

Surface Treatments and Designs  
that Improve Comfort, *p. 56*





**VYZULTA**

(latanoprostene  
bunod ophthalmic  
solution), 0.024%

# THE HORSEPOWER YOU NEED TO LOWER IOP

**Powerful IOP reduction with excellent tolerability<sup>1,2</sup>**

VYZULTA delivered **up to 9.1 mmHg mean IOP reduction** from baseline in pivotal trials.<sup>1,2\*</sup>

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\*Pivotal study designs: Two Phase 3, randomized, multicenter, parallel-group studies, APOLLO and LUNAR, evaluating noninferiority of once-daily VYZULTA vs twice-daily timolol maleate 0.5% in patients with open-angle glaucoma or ocular hypertension. Primary endpoint was IOP measured at 9 assessment time points in study eye. APOLLO (VYZULTA, n=284; timolol, n=133) and LUNAR (VYZULTA, n=278; timolol, n=136).<sup>2,3</sup>

## INDICATION

VYZULTA® (latanoprostene bunod ophthalmic solution), 0.024% is indicated for the reduction of intraocular pressure (IOP) in patients with open-angle glaucoma or ocular hypertension.

## IMPORTANT SAFETY INFORMATION

- Increased pigmentation of the iris and periorbital tissue (eyelid) can occur. Iris pigmentation is likely to be permanent
- Gradual changes to eyelashes, including increased length, increased thickness, and number of eyelashes, may occur. These changes are usually reversible upon treatment discontinuation
- Use with caution in patients with a history of intraocular inflammation (iritis/uveitis). VYZULTA should generally not be used in patients with active intraocular inflammation
- Macular edema, including cystoid macular edema, has been reported during treatment with prostaglandin analogs. Use with caution in aphakic patients, in pseudophakic patients with a torn posterior lens capsule, or in patients with known risk factors for macular edema
- There have been reports of bacterial keratitis associated with the use of multiple-dose containers of topical ophthalmic products that were inadvertently contaminated by patients
- Contact lenses should be removed prior to the administration of VYZULTA and may be reinserted 15 minutes after administration
- Most common ocular adverse reactions with incidence  $\geq 2\%$  are conjunctival hyperemia (6%), eye irritation (4%), eye pain (3%), and instillation site pain (2%)

For more information, please see Brief Summary of full Prescribing Information on adjacent page.

**References:** 1. VYZULTA Prescribing Information. Bausch & Lomb Incorporated. 2. Weinreb RN, Scassellati Sforzolini B, Vittitow J, Liebmann J. Latanoprostene bunod 0.024% versus timolol maleate 0.5% in subjects with open-angle glaucoma or ocular hypertension: the APOLLO study. *Ophthalmology*. 2016;123(5):965-973. 3. Medeiros FA, Martin KR, Peace J, Scassellati Sforzolini B, Vittitow JL, Weinreb RN. Comparison of latanoprostene bunod 0.024% and timolol maleate 0.5% in open-angle glaucoma or ocular hypertension: the LUNAR study. *Am J Ophthalmol*. 2016;168:250-259.

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## BRIEF SUMMARY OF PRESCRIBING INFORMATION

This Brief Summary does not include all the information needed to use VYZULTA safely and effectively. See full Prescribing Information for VYZULTA.

### VYZULTA® (latanoprostene bunod ophthalmic solution), 0.024%, for topical ophthalmic use.

Initial U.S. Approval: 2017

#### 1 INDICATIONS AND USAGE

VYZULTA® (latanoprostene bunod ophthalmic solution) 0.024% is indicated for the reduction of intraocular pressure (IOP) in patients with open-angle glaucoma or ocular hypertension.

#### 4 CONTRAINDICATIONS

None

#### 5 WARNINGS AND PRECAUTIONS

##### 5.1 Pigmentation

VYZULTA® (latanoprostene bunod ophthalmic solution), 0.024% may cause changes to pigmented tissues. The most frequently reported changes with prostaglandin analogs have been increased pigmentation of the iris and periorbital tissue (eyelid).

Pigmentation is expected to increase as long as latanoprostene bunod ophthalmic solution is administered. The pigmentation change is due to increased melanin content in the melanocytes rather than to an increase in the number of melanocytes. After discontinuation of VYZULTA, pigmentation of the iris is likely to be permanent, while pigmentation of the periorbital tissue and eyelash changes are likely to be reversible in most patients. Patients who receive prostaglandin analogs, including VYZULTA, should be informed of the possibility of increased pigmentation, including permanent changes. The long-term effects of increased pigmentation are not known.

Iris color change may not be noticeable for several months to years. Typically, the brown pigmentation around the pupil spreads concentrically towards the periphery of the iris and the entire iris or parts of the iris become more brownish. Neither nevi nor freckles of the iris appear to be affected by treatment. While treatment with VYZULTA® (latanoprostene bunod ophthalmic solution), 0.024% can be continued in patients who develop noticeably increased iris pigmentation, these patients should be examined regularly [see Patient Counseling Information (17) in full Prescribing Information].

##### 5.2 Eyelash Changes

VYZULTA may gradually change eyelashes and vellus hair in the treated eye. These changes include increased length, thickness, and the number of lashes or hairs. Eyelash changes are usually reversible upon discontinuation of treatment.

##### 5.3 Intraocular Inflammation

VYZULTA should be used with caution in patients with a history of intraocular inflammation (iritis/uveitis) and should generally not be used in patients with active intraocular inflammation as it may exacerbate this condition.

##### 5.4 Macular Edema

Macular edema, including cystoid macular edema, has been reported during treatment with prostaglandin analogs. VYZULTA should be used with caution in aphakic patients, in pseudophakic patients with a torn posterior lens capsule, or in patients with known risk factors for macular edema.

##### 5.5 Bacterial Keratitis

There have been reports of bacterial keratitis associated with the use of multiple-dose containers of topical ophthalmic products. These containers had been inadvertently contaminated by patients who, in most cases, had a concurrent corneal disease or a disruption of the ocular epithelial surface.

##### 5.6 Use with Contact Lens

Contact lenses should be removed prior to the administration of VYZULTA because this product contains benzalkonium chloride. Lenses may be reinserted 15 minutes after administration.

#### 6 ADVERSE REACTIONS

The following adverse reactions are described in the Warnings and Precautions section: pigmentation (5.1), eyelash changes (5.2), intraocular inflammation (5.3), macular edema (5.4), bacterial keratitis (5.5), use with contact lens (5.6).

##### 6.1 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.

VYZULTA was evaluated in 811 patients in 2 controlled clinical trials of up to 12 months duration. The most common ocular adverse reactions observed in patients treated with latanoprostene bunod were: conjunctival hyperemia (6%), eye irritation (4%), eye pain (3%), and instillation site pain (2%). Approximately 0.6% of patients discontinued therapy due to ocular adverse reactions including ocular hyperemia, conjunctival irritation, eye irritation, eye pain, conjunctival edema, vision blurred, punctate keratitis and foreign body sensation.

#### 8 USE IN SPECIFIC POPULATIONS

##### 8.1 Pregnancy

###### Risk Summary

There are no available human data for the use of VYZULTA during pregnancy to inform any drug associated risks.

Latanoprostene bunod has caused miscarriages, abortion, and fetal harm in rabbits. Latanoprostene bunod was shown to be abortifacient and teratogenic when administered intravenously (IV) to pregnant rabbits at exposures  $\geq$  0.28 times the clinical dose. Doses  $\geq$  20  $\mu\text{g}/\text{kg}/\text{day}$  (23 times the clinical dose) produced 100% embryofetal lethality. Structural abnormalities observed in rabbit fetuses included anomalies of the great vessels and aortic arch vessels, domed head, sternebral and vertebral skeletal anomalies, limb hyperextension

and malrotation, abdominal distension and edema. Latanoprostene bunod was not teratogenic in the rat when administered IV at 150  $\text{mcg}/\text{kg}/\text{day}$  (87 times the clinical dose) [see Data].

The background risk of major birth defects and miscarriage for the indicated population is unknown. However, the background risk in the U.S. general population of major birth defects is 2 to 4%, and of miscarriage is 15 to 20%, of clinically recognized pregnancies.

###### Data

###### Animal Data

Embryofetal studies were conducted in pregnant rabbits administered latanoprostene bunod daily by intravenous injection on gestation days 7 through 19, to target the period of organogenesis. The doses administered ranged from 0.24 to 80  $\text{mcg}/\text{kg}/\text{day}$ . Abortion occurred at doses  $\geq$  0.24  $\text{mcg}/\text{kg}/\text{day}$  latanoprostene bunod (0.28 times the clinical dose, on a body surface area basis, assuming 100% absorption). Embryofetal lethality (resorption) was increased in latanoprostene bunod treatment groups, as evidenced by increases in early resorptions at doses  $\geq$  0.24  $\text{mcg}/\text{kg}/\text{day}$  and late resorptions at doses  $\geq$  6  $\text{mcg}/\text{kg}/\text{day}$  (approximately 7 times the clinical dose). No fetuses survived in any rabbit pregnancy at doses of 20  $\text{mcg}/\text{kg}/\text{day}$  (23 times the clinical dose) or greater. Latanoprostene bunod produced structural abnormalities at doses  $\geq$  0.24  $\text{mcg}/\text{kg}/\text{day}$  (0.28 times the clinical dose). Malformations included anomalies of sternum, coarctation of the aorta with pulmonary trunk dilation, retroesophageal subclavian artery with absent brachiocephalic artery, domed head, forepaw hyperextension and hindlimb malrotation, abdominal distention/edema, and missing/fused caudal vertebrae.

An embryofetal study was conducted in pregnant rats administered latanoprostene bunod daily by intravenous injection on gestation days 7 through 17, to target the period of organogenesis. The doses administered ranged from 150 to 1500  $\text{mcg}/\text{kg}/\text{day}$ . Maternal toxicity was produced at 1500  $\text{mcg}/\text{kg}/\text{day}$  (870 times the clinical dose, on a body surface area basis, assuming 100% absorption), as evidenced by reduced maternal weight gain. Embryofetal lethality (resorption and fetal death) and structural anomalies were produced at doses  $\geq$  300  $\text{mcg}/\text{kg}/\text{day}$  (174 times the clinical dose). Malformations included anomalies of the sternum, domed head, forepaw hyperextension and hindlimb malrotation, vertebral anomalies and delayed ossification of distal limb bones. A no observed adverse effect level (NOAEL) was established at 150  $\text{mcg}/\text{kg}/\text{day}$  (87 times the clinical dose) in this study.

##### 8.2 Lactation

###### Risk Summary

There are no data on the presence of VYZULTA in human milk, the effects on the 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 VYZULTA, and any potential adverse effects on the breastfed infant from VYZULTA.

##### 8.4 Pediatric Use

Use in pediatric patients aged 16 years and younger is not recommended because of potential safety concerns related to increased pigmentation following long-term chronic use.

##### 8.5 Geriatric Use

No overall clinical differences in safety or effectiveness have been observed between elderly and other adult patients.

#### 13 NONCLINICAL TOXICOLOGY

##### 13.1 Carcinogenesis, Mutagenesis, Impairment of Fertility

Latanoprostene bunod was not mutagenic in bacteria and did not induce micronuclei formation in the *in vivo* rat bone marrow micronucleus assay. Chromosomal aberrations were observed *in vitro* with human lymphocytes in the absence of metabolic activation.

Latanoprostene bunod has not been tested for carcinogenic activity in long-term animal studies. Latanoprost acid is a main metabolite of latanoprostene bunod. Exposure of rats and mice to latanoprost acid, resulting from oral dosing with latanoprost in lifetime rodent bioassays, was not carcinogenic.

Fertility studies have not been conducted with latanoprostene bunod. The potential to impact fertility can be partially characterized by exposure to latanoprost acid, a common metabolite of both latanoprostene bunod and latanoprost. Latanoprost acid has not been found to have any effect on male or female fertility in animal studies.

##### 13.2 Animal Toxicology and/or Pharmacology

A 9-month toxicology study administered topical ocular doses of latanoprostene bunod to one eye of cynomolgus monkeys: control (vehicle only), one drop of 0.024% bid, one drop of 0.04% bid and two drops of 0.04% per dose, bid. The systemic exposures are equivalent to 4.2-fold, 7.9-fold, and 13.5-fold the clinical dose, respectively, on a body surface area basis (assuming 100% absorption). Microscopic evaluation of the lungs after 9 months observed pleural/subpleural chronic fibrosis/inflammation in the 0.04% dose male groups, with increasing incidence and severity compared to controls. Lung toxicity was not observed at the 0.024% dose.

U.S. Patent Numbers: 7,273,946; 7,629,345; 7,910,767; 8,058,467.

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## California Scope Bill Advances Through Senate

*The legislation would permit ODs to perform three laser surgeries, remove lid lesions, give injections and do corneal crosslinking. Backers say rigorous training requirements might mollify detractors.*

Optometrists and their advocates across the country have been working tirelessly to pass legislation that will expand the profession's scope of practice to align with current optometric training and education. Efforts have paid off in several states over the last few years, the most recent win being in Colorado in June, when the state became the 10th to allow ODs to perform certain laser procedures and other office-based minor surgeries. This spring, Virginia also passed such a law.

This scope expansion wave is far from over; another state—the third largest in the country, with the highest number of employed optometrists—is aiming to make its way onto the list: California.

The Golden State's scope bill, AB 2236, would allow its nearly 7,000 optometrists—with the proper certification—to perform the following:

- Three laser procedures: SLT for treating glaucoma, peripheral iridotomy for the prophylactic treatment of angle-closure glaucoma and posterior capsulotomy secondary to cataract surgery.

- Lesion removal: skin tags, cysts and other non-cancerous lesions.

- Injections to treat eye conditions (subcutaneous, intramuscular, subconjunctival and intralesional drug delivery).

- Corneal collagen crosslinking.

On June 27, the bill passed the Senate Business and Professions Committee with a nine-to-one vote. On August 1, it was heard in Senate Appropriations and will now go to the full Senate for a vote.

Kristine Shultz, executive director of the California Optometric Association (COA), says, "All optometric colleges say their curricula currently cover the teaching of ophthalmic procedures and their graduates are trained to perform these therapies." ODs who graduated before these procedures were included in the curriculum will have to complete several certification requirements before taking advantage of practice privileges under the new law—but they're not the only ones. Newer graduates will also require further training.

"This bill adds additional training that includes procedures on live humans in an attempt to address the opposition's concerns," Mrs. Shultz explains. "The proposed training required for this certification includes a three-step process," as follows:

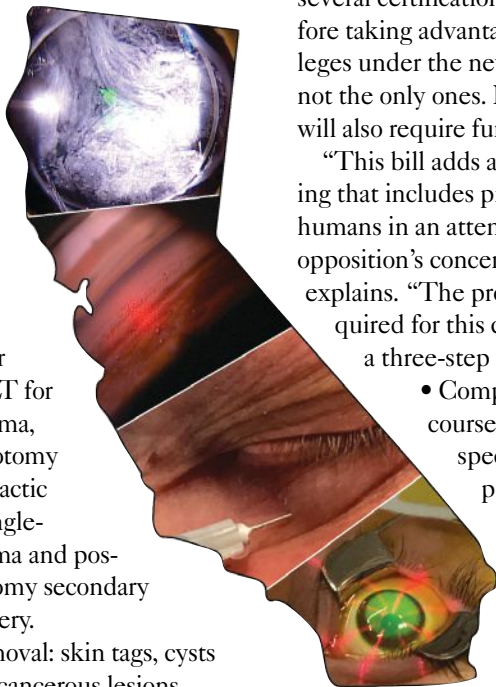
- Completion of a 32-hour course that requires a specified amount of practice in performing the procedures on simulated eyes.

- Passage of the national board's Laser and Surgical Procedure Examination.

- Completion of additional training to include direct experience with "as many live human patients as needed to ensure competency," Mrs. Shultz says. "This could be done via clinical rotations or a preceptorship administered by an accredited optometry college." The bill requires each optometrist to complete at least 29 procedures on live humans to become certified.

Amanda Dexter, OD, president of the COA, says, "This legislation is needed so that patients will have increased access to quality eye care. In some California counties, Medicaid patients must wait months to see an ophthalmologist," she points out. "Optometrists already provide 81% of the eye care under California's Medicaid program. ODs are located in almost every county in California and are well situated to bridge the provider gap for these eye conditions that are becoming more common as our population ages."

Texas, Florida and Pennsylvania follow California in the list of US states with the most optometrists; still, when weighed against any one of these individually, the state of California employs more than two times as many ODs. If voted into law, California's scope bill would act as an influential precedent for the safety and value of optometric scope expansion in other US states. ◀



**If the bill is passed, ODs in California will be able to perform a number of procedures, including capsulotomy, SLT, peripheral iridotomy, injection, collagen crosslinking and lesion incision/excision.**



# Could Skipping Breakfast Lower AMD Risk?

Researchers found that this form of intermittent fasting significantly reduced disease incidence. Lower obesity rates and decreased oxidative stress may be why.

A recent health trend, intermittent fasting, was shown to be associated with a reduced risk of age-related macular degeneration (AMD) in a new study done on an elderly Korean population. Compared with participants who ate breakfast, those who skipped the meal had a decreased risk of AMD, a finding especially evident in individuals who were younger than 70, obese and/or of urban residence.

Skipping breakfast is one type of intermittent fasting regarded as time-restricted feeding (an eight- to 12-hour “feeding window” and 12 to 16 hours of fasting), as nothing is eaten between dinner and lunch the next day. To determine how adopting this dietary change could potentially influence AMD risk, the researchers looked at survey data on meal frequency as well as fundus photography of 4,504 subjects over the age of 55. The cohort was divided into two groups based on weekly breakfast consumption: intermittent fasting (nearly zero times per week) and non-fasting (five to seven times per week).

AMD was identified in roughly one in four participants in the study, with a prevalence of 14.2% in the intermittent fasting group and 25.6% in the non-fasting group. The intermittent

fasting group had a lower AMD risk compared with the non-fasting group (odds ratio: 0.41). In addition, those who were younger than 70, obese or lived in an urban location had a decreased risk with odds ratios of 0.36, 0.67 and 0.44, respectively. Two additional risk factors for AMD were older age (odds ratio: 1.06) and higher serum HDL-C level (odds ratio: 1.01).

The reasons are still being investigated as to why intermittent fasting seems to have a neuroprotective effect on the retina, though it has been demonstrated by *in vivo* and *in vitro* models. The researchers speculate that because obesity was shown to be a risk factor for AMD in this study, the reduction of overall daily food intake by cutting out breakfast may be one explanation for why this lifestyle change seems to aid in disease protection.

“The intermittent fasting group consumed lower daily calories, carbohydrates, proteins and dietary supplements such as N-3 fatty acid, vitamin A and beta-carotene than the non-fasting group,” they pointed out in their paper on the study. They also explained, “Intermittent fasting increases circulating ketone levels, which have a variety of favorable aspects including amelioration of oxidative stress and inflammatory



Photo: NEI

**Ketone production during intermittent fasting can ameliorate inflammatory processes and may reduce AMD risk.**

processes. Thus, the benefit of intermittent fasting on AMD risk might be more prominent in individuals with more systemic inflammation due to obesity than in individuals of normal weight.”

After adjusting for confounding factors, the data showed that skipping breakfast five to seven days a week reduced the risk of AMD. “This population-based study suggested important evidence to adapt time-restricted feeding using breakfast-skipping as a clinical strategy to modulate the development and prognosis of AMD,” the researchers concluded. ◀

Choi EY, Kim M, Lee CS, et al. Intermittent fasting is associated with a decreased risk of age-related macular degeneration. *Am J Ophthalmol*. June 22, 2022. [Epub ahead of print].

## IN BRIEF

### ■ MiSight Responders Demonstrate Choroidal Thickening.

Myopia involves many anatomic changes to the eye, one of which is choroidal thinning, which has been associated with axial eye growth. Choroidal thickening, on the other hand, may indicate a slowing of myopia progression. Researchers recently examined the influence of MiSight

(CooperVision) contact lens wear on choroidal changes and found that some patients demonstrated choroidal thickening with these myopia-controlling lenses.

A total of 41 myopic children were fitted with MiSight contact lenses and 33 children received single-vision spectacles. The researchers measured subfoveal choroidal thickness and choroidal thickness 1mm and 3mm temporal and nasal to the fovea on OCT

and followed the children for two years. Patients wearing MiSight were grouped as responders if they exhibited an axial length change <0.22mm/per year or were non-responders.

The researchers reported that **there weren't any differences in choroidal thickness changes between patients wearing MiSight or spectacles after two years.**

MiSight responders and non-responders demonstrated

differences in choroidal thickness, with responders showing relative choroidal thickening in the first year. **This could mean that choroidal thickness is a predictor of the effectiveness of MiSight in myopia treatment,**” the researchers wrote in their paper.

Prieto-Garrido FL, Villa-Collar C, Hernandez-Verdejo JL, et al. Changes in the choroidal thickness of children wearing MiSight to control myopia. *J Clin Med*. 2022;11:3833.

# Metformin Could Potentially Lower AMD Risk

Another category of diabetes drug, sulfonylureas, may have a similar protective effect.

New research suggests that metformin, a drug often prescribed to treat patients with insulin-resistant diabetes, may potentially have another clinical indication: reducing the risk of age-related macular degeneration (AMD). The study's findings were recently presented at the American Society of Retina Specialists 2022 annual meeting in New York City.

The study analyzed data from more than 600,000 people, 312,404 who were newly diagnosed with AMD at the time and 312,376 who had no disease and acted as controls. Multivariate and adjusted regression models were used to evaluate patient data over a two-year period and determine the relationship between AMD development and the use of certain medications, including metformin, insulin, sulfonylureas and glitazones.

Analysis revealed that patients taking metformin over a two-year period were approximately 5% less likely to develop AMD (odds ratio: 0.94). Interestingly, those who were prescribed a lower dose of metformin had the lowest risk, which may be attributed to the fact that patients taking larger doses of the drug are more likely to have poorly controlled

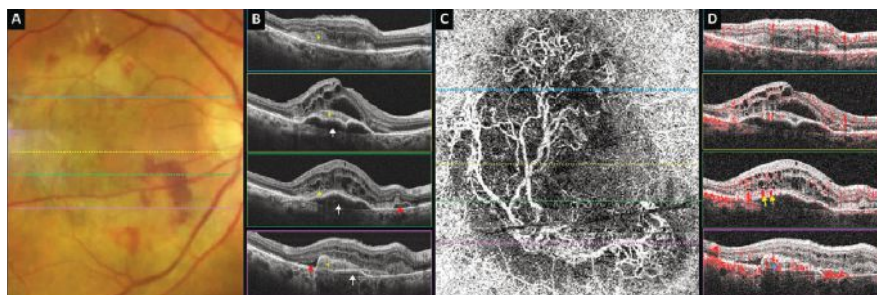


Photo: Carolyn Malcher, OD

Patients were approximately 5% less likely to develop AMD after two years of therapy.

diabetes, although this reasoning is mere speculation.

Metformin wasn't the only drug to show an association with lower risk of AMD development; patients on insulin therapy also had a reduced risk of the disease (odds ratio: 0.92). However, a recent article on the study published online by *Medscape* notes that this medication likely won't be prescribed to treat AMD in the future due to concerns such as hypoglycemia and the requirement of injections.

Sulfonylureas, another group of medications to treat type 2 diabetes, also seemed to reduce AMD risk (odds ratio: 0.94).

On the other hand, several diabetes drugs analyzed in the study appeared to increase the risk of AMD. These medications included exenatide, sitagliptin and pramlintide (odds ratio: 1.08).

Dimitra Skondra, MD, PhD, associate professor of ophthalmology at the University of Chicago and one of the researchers of the study, said in her interview with *Medscape*, "How great will it be if we can give metformin to our patients when they start developing AMD and lower the disease burden over the years?" She also mentioned that metformin is being studied for dementia, cancer and stroke. "I'm also giving metformin to mice using different models of macular degeneration, and I'm seeing an effect there," Dr. Skondra added.

Clinical trials are still needed to confirm the association of metformin and sulfonylureas with reduced AMD risk, but the promising data from this large study certainly warrants continued investigation. ◀

Harrison L. Metformin shows potential to prevent macular degeneration. *Medscape*. [www.medscape.com/viewarticle/977440?src=](http://www.medscape.com/viewarticle/977440?src=). Published July 18, 2022. Accessed July 22, 2022.

## IN BRIEF

### ■ Patient Personality Plays Role in Presbyopic Correction Outcomes.

A recent study in the *Journal of Cataract and Refractive Surgery* exploring the impact of a patient's demeanor on satisfaction rates in pseudophakic presbyopic correction found that **this factor plays a significant role in the perceived results following premium surgery, specifically between male and female patients.**

This prospective, comparative study evaluated 120 cataract patients (60 men, 60 women). The

researchers consulted with each participant, explaining the benefits and the drawbacks of bilateral trifocal correction, which was offered at no extra cost.

Patient personality was evaluated by a survey instrument called the Traits Personality Questionnaire 5, which measures an individual's propensity toward neuroticism, extraversion, agreeableness, conscientiousness and openness to experience. Data modeling identified the contributions of personality traits in the preoperative decision process and post-op satisfaction.

Of the total participants, 68% (24 men, 57 women) selected premium correction. **In men, low neuroticism and high extraversion were the primary personality contributors for this decision. In women, all personality traits contributed to the selection process.** Women were more demanding regarding postoperative distance acuity expectations (0.1 vs 0.2 logMAR) when determining their level of satisfaction. **For both men and women, openness to experience, conscientiousness and extraversion were primary contributors for optimal satisfaction rates.**

"To our knowledge, this is the first study to report on the impact of personality on the decision process for selecting premium presbyopic surgery and on the postoperative satisfaction," the study authors concluded in their paper. "We are confident that our study outcomes will contribute to the body of knowledge and assist cataract surgeons in their pursuit for optimal outcomes in presbyopic corrections."

Ntonti P, Bakirtzis M, Delibasis K, et al. Impact of personality on the decision process and on the satisfaction rates in pseudophakic presbyopic corrections. *J Cataract Refract Surg*. July 21, 2022. [Epub ahead of print].



# THE DANGER CAN BE HARD TO SEE. LOOK CLOSER.

For patients with Graves' disease (GD), Thyroid Eye Disease (TED) may be hiding in plain sight.<sup>1,2</sup>

Up to 50% of patients with GD may develop TED, a separate and distinct disease which can progress if left untreated.

Look out for the early signs and symptoms<sup>3-7</sup>:

- Proptosis<sup>1</sup>
- Diplopia<sup>3</sup>
- Dry eyes<sup>8-11</sup>
- Sensitivity to light<sup>12</sup>
- Grittiness<sup>8-11</sup>
- Pain or pressure behind the eyes<sup>1,13</sup>

If you identify new or changing signs or symptoms, consult with an eye doctor who specializes in TED right away.<sup>1,14</sup>



Visit [TEDImpact.com](https://www.tedimpact.com) to find a TED specialist or contact a Horizon Representative at 1-855-950-2076.

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## Two-thirds of Patients Have Skin Reactions to Eye Drops

*Active ingredients, especially aminoglycoside antibiotics, were the main cause.*

Although oral meds have a role in many ocular conditions, the lifeblood of medical eyecare is topical therapy. Unfortunately, quite a lot of those drops cause skin reactions in patients, it seems. A recent study, which sought to characterize patients with suspected allergic contact dermatitis caused by topical ophthalmic medications, confirmed that most sufferers are of older age and that antibiotics figure prominently in the relationship.

Retrospective data was collected from 65 patients with suspected allergic contact dermatitis of the eyelids caused by topical ophthalmic medications; they were patch tested using a series of topical drugs and excipients (*i.e.*, drug vehicles, preservatives and other inactive agents), including betaxolol and timolol 5%. Frequently used ophthalmic medications as well

as the patient's own products were also patch tested in most patients.

The researchers found that positive patch tests to ophthalmic medications occurred in 68% of patients, with 102 positive reactions. Of those reactions, 55% were associated with active ingredients, especially aminoglycoside antibiotics (26.5% of cases) and excipients (23.5%). The authors concluded that this study also raises awareness of the sensitization to beta-blockers, as 21.6% of skin reactions occurred from use of topical products “as is” (*i.e.*, rather than testing specific elements of the formula in isolation) and most of these results were found with topical beta-blockers.

“Testing with patients’ own products may be useful when no commercialized allergens are available or to circumvent the low sensitivity of the patch testing for some suspected in-



Photo: Getty Images

**Patients who develop allergic contact dermatitis from eye drops are more likely to be of older age, study finds.**

gredients, but multicenter studies to find standardized patch test material for testing anti-glaucoma eye drops is a real unmet need,” they wrote in their paper for the journal *Contact Dermatitis*. ◀

Alves PB, Figueiredo AC, Codeço C, et al. A closer look at allergic contact dermatitis caused by topical ophthalmic medications. *Contact Dermatitis*. June 17, 2022. [Epub ahead of print].

## Preclinical Dry Eye More Common Than We Think

*Greater diligence during routine exams, including use of the OSDI survey, may identify more cases.*

Optometrists and ophthalmologists routinely assess tear film characteristics and meibomian gland health for abnormalities to either or both—the traditional calling cards of dry eye. However, these changes also yield insights into subjects with preclinical dry eye, and more diligence there could help identify incipient cases more often. A recent study compared tear film and meibomian gland changes in patients with dry eye symptoms but no signs with controls, as defined by the Ocular Surface Disease Index (OSDI) score.

A total of 150 subjects were enrolled in this prospective cross-sectional study. All participants completed the OSDI questionnaire and the Computer Vision Syndrome questionnaire.

Tear film tests such as noninvasive breakup time, tear meniscus height, lipid layer pattern, Schirmer’s test and corneal staining were performed. Images were captured from both the upper and the lower eyelids to study meibomian gland morphology. Tear meniscus height, meibomian gland length, thickness, loss and tortuosity were measured. Subjects were differentiated into two groups—preclinical dry eye patients or controls—based on an OSDI threshold score of at least 13.

Among the subjects, 43.6% were categorized as preclinical dry eye and 56.4% as controls. In the preclinical dry eye group, a significant reduction in noninvasive tear breakup time and meibomian gland length of the lower lid was found when compared with controls. Tear meniscus height,

Schirmer’s test and meibomian gland width did not vary among both groups. Similarly, meibomian gland loss and tortuosity score were higher in the preclinical dry eye group but did not show any statistical significance.

The majority of young patients presenting for their regular eye examination may have preclinical dry eye based on their OSDI score. Hence, it is important to administer the OSDI questionnaire and perform noninvasive tests and imaging of the meibomian glands as part of the routine ocular evaluation, the study authors concluded in their paper. ◀

Fatima A, Vadla P, Konda N. Changes in the tear film and meibomian gland morphology between preclinical dry eye and normal subjects represented by ocular surface disease index scores. *Exp Eye Res*. July 14, 2022. [Epub ahead of print].



# Cycloplegic Refraction Remains Most Precise in Kids

Though some non-cycloplegic approaches may be useful in certain patients, the gold standard approach still produces the best results overall, study finds.

Cycloplegic agents are useful when refracting young children because they reduce fluctuations in the ciliary muscle, enabling the provider to obtain more accurate measurements. Though cycloplegic refraction is considered the gold standard, the use of eye drops is sometimes distressing for young children, and many parents refuse cycloplegia because of stinging and other ocular side effects. Non-cycloplegic refraction is an alternative option.

Researchers recently conducted a systematic review and meta-analysis to determine the level of diagnostic agreement between the two testing modalities. They found that while some non-cycloplegic approaches are useful, the gold standard approach remains the most accurate.

Ten studies (totaling 2,724 participants) met inclusion criteria for the meta-analysis. When the researchers compared non-cycloplegic

Plusoptix and cycloplegic autorefraction, they found that the test for overall effect wasn't significant. The pooled mean difference was  $-0.08D$  with a prediction interval of  $-1.72D$  to  $+1.56D$ . "At less than  $0.25D$ , this indicates marginal overestimation of myopia and underestimation of hyperopia under non-cycloplegic conditions," they noted in their paper. "The results suggest that the non-cycloplegic Plusoptix is an accurate method of examining refractive error."

The researchers also found a significant difference when com-

paring cycloplegic refraction with non-cycloplegic autorefraction with a Retinomax (Righton) and a Canon autorefractor. The Retinomax's negative mean effect size, for example, produced overestimates of myopia under non-cycloplegic conditions, making this an inaccurate method for measuring refractive error under these conditions. The Canon autorefractor had similar results.

Overall, cycloplegic refraction proved the most accurate approach for children 12 and younger. For those with low to moderate levels of hyperopia, the non-cycloplegic

Plusoptix autorefractor was most useful; however, this approach can't be substituted for a measurement that includes the use of cycloplegic drops. "Cycloplegic refraction is still recommended to ensure diagnostic accuracy in children younger than 12 years of age," the authors concluded. ◀

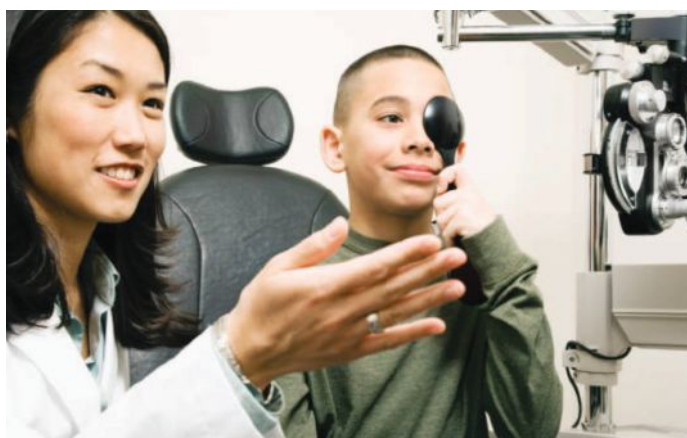


Photo: Getty Images

**The study found non-cycloplegic autorefraction often overestimates myopic refractive error, thus arguing for testing under dilation.**

Wilson S, Ctori I, Shah R, et al. Systemic review and meta-analysis on the agreement of non-cycloplegic and cycloplegic refraction in children. *Ophthalmic Physiol Opt.* August 1, 2022. [Epub ahead of print].

## IN BRIEF

■ **Black Glaucoma Patients Experience Earlier, and Worse, Vision Loss.** With the help of artificial intelligence modeling, researchers were able to identify 14 archetypes of regional visual field loss patterns in patients of different ethnicities with primary open-angle glaucoma (POAG). They found that **Black patients had a higher POAG risk with early central and advanced visual field loss.**

In the prospective study, the researchers followed 209,036 patients from a trio of nursing and health professional studies

from the 1980s to 2019. Patients were  $\geq 40$  years of age and free of glaucoma. The researchers confirmed incident POAG with reproducible visual field loss in 1,946 patients using medical records. They obtained total deviation information from the earliest reliable glaucomatous visual field for each affected eye ( $n=2,564$ ) and applied machine learning analysis to identify optimal solutions or "archetypes" for regional visual field loss patterns.

Fourteen archetypes were identified, representing four advanced loss patterns, nine early loss patterns and one with no visual field loss. The researchers

reported in their paper that, **"Compared with non-Hispanic white patients, Black participants had a higher risk of early visual field loss archetypes and even higher risk for advanced loss archetypes."**

They observed no differences for Asians and Hispanic white patients; however, **Hispanic white patients had a significantly higher risk of POAG with paracentral defects and advanced superior loss.** They found that **Black patients had a significantly higher risk for all advanced-loss archetypes and for three early-loss patterns, including paracentral defects.**

"Archetype analyses were able to identify and quantify major specific regional patterns of visual field loss," the article for *Translational Vision Science & Technology* further explained. **"The subtyping of glaucoma using machine learning-based approaches and identifying unique risk factors may help researchers fine-tune and improve the discovery of POAG risk factors."**

Kang JH, Wang M, Frueh L, et al. Cohort study of race/ethnicity and incident primary open-angle glaucoma characterized by autonomously determined visual field loss patterns. *Transl Vis Sci Technol.* 2022;11(7):21.

# Even Small Financial Incentives Influence Rx Habits

*Reported receipt of any non-research support from pharmaceutical manufacturers, regardless of amount, was associated with an almost doubled probability of a prostaglandin drug Rx.*

Many doctors interact with and have positive perceptions of pharmaceutical sales representatives, and from them, physicians often receive “transfers of value” (including meals, travel fees, speaking fees and gifts, all discrete from research support) as well as information about branded drugs and their use. A recent review in *JAMA Ophthalmology* determined that recipients of such largesse within eyecare were more likely to prescribe branded prostaglandin analogs, even though the transfer of value median was relatively low at \$65.

The retrospective cohort analysis used a 20% nationally representative sample of 2018 Medicare Part D claims and industry transfers of value reported to the Open Payments program. The Open Payments program requires manufacturers of drugs, medical devices and medical supplies to report their payments and transfers of value to the Centers for Medicare & Medicaid Services.

The researchers noted a total of 20,612 ophthalmologists and 5,426 optometrists (29% female, 71% male) prescribed prostaglandin analog eye drops. Of these two groups, 37% were reported to have received transfers of value from manufacturers of branded prostaglandin analogs in 2018, totaling \$5,060,346. The median reported transfers of value was \$65. Multivari-



Photo: Getty Images

**Given the relatively low amounts involved, these findings might be attributable to doctors' greater awareness of and comfort with newer meds after industry detailing.**

able logistic regression showed that the predicted probability of primarily prescribing branded prostaglandin analogs among prescribers who reported receiving no transfers of value was 13%. This figure increased to 20% among prescribers receiving transfers of value. There was a dose response association, such that the top 10% of transfers of value recipients had a 29% probability of preferential branded use.

“Reported transfers of value from pharmaceutical companies have been associated with greater use of branded anti-VEGF agents by ophthalmologists, but payment under the Medicare Part B buy-and-bill model includes a financial incentive to choose costlier agents, potentially confounding analyses of pharmaceutical transfers of value and prescribing patterns,” the researchers wrote in

their paper. “High rates of branded prostaglandin analog prescribing may pose a cost burden to patients that affects adherence and worsens outcomes.”

While the researchers could not determine the motivations of clinicians who frequently prescribe branded prostaglandin analogs or the reason why they prescribe patients a such a medication, reported receipt of industry transfers of value does seem to be an important factor associated with branded prostaglandin analog use. The dose response association suggested that the magnitude of transfers of value matters, but the relatively low value of typical reported transfer of value suggests monetary gain is not the sole or even primary driver of this association.

“Still, for optometrists and ophthalmologists who care for patients with glaucoma, the results of this study suggest a need to revisit policies and attitudes regarding industry interaction,” the researchers concluded.”

The paper also noted that even educational activities that did not include transfers of value, as in industry-sponsored continuing education events, have been associated with higher branded drug use. ◀

Nguyen AM, Anderson KE, Anderson G, Johnson TV. Association between open payments-reported industry transfers of value and prostaglandin analog prescribing in the US. *JAMA Ophthalmol.* July 28, 2022. [Epub ahead of print].

## IN BRIEF

■ **Dry Eye, Allergic Conjunctivitis Often Occur Together.** Dry eye (DE) and allergic conjunctivitis (AC) have many similarities, from shared pathogenesis and symptoms to risk factors and impact on quality of life. Considering this overlap, researchers recently investigated the **prevalence of comorbid**

**DE and AC in a systematic review** and found that **the two diseases commonly coexist and should be managed accordingly.**

The review included nine articles with a total of 7,254 patients. The researchers reported the following individual comorbidity incidences:

- DE among AC patients: 0.9% to 97.5%

- AC among DE patients: 6.2% to 38%

Additionally, a one-group meta-analysis using a random effects model found that **nearly half of AC patients had DE and almost 20% of DE patients had comorbid AC.**

The authors recommended **careful screening for the counterpart disease and treatment for patients with these conditions to**

**improve long-term outcomes and prevent chronic ocular damage in susceptible populations.** This should be “followed by appropriate modification of treatment regimens to minimize the exacerbation of AC and DE,” they wrote in their paper.

Akasaki Y, Inomata T, Sung J, et al. Prevalence of comorbidity between dry eye and allergic conjunctivitis: a systematic review and meta-analysis. *J Clin Med.* 2022;11:3643.

# Risk Factors for Chalazia-induced Astigmatism Found

Location, size and number of masses matter. Researchers suggest prompt treatment to preserve VA.

**C**halazia are painful inflammatory events that often obscure vision as the eyelid swells. They may also induce some degree of astigmatism in children from pressure on the cornea. A recent study evaluated young children's refractive status with chalazia and found different characteristics to be risk factors for astigmatism.

The study included 398 patients (ranging in age from six months to six years old) divided into a chalazion group (n=491 eyes) and a control group (n=305 eyes). They found that the incidence, type, astigmatism and refractive mean in the chalazion group significantly differed from the control group.

In affected eyes, here's how various characteristics affected the results.

- **Incidence:** The middle-upper eyelid was 50% (the highest) and the medial-upper eyelid was 42%.



Photo: Joseph Sowka, OD

**Prompt invasive treatment is warranted if conservative efforts fail, researchers say.**

- **Type:** There were more medium (54.5%) and large (54.7%) chalazia than in the control group (27.2%).

- **Astigmatism:** With multiple chalazia, the astigmatism incidence with two masses was 56%. The difference wasn't significant in chalazia with  $\geq 3$  masses. "Astigmatism vector analysis can intuitively show the differences between groups," the researchers noted in their paper. "The results are the same as refractive astigmatism."

- **Refractive mean:** Patients with medial-upper, middle-upper and

medial-lower lid lesions showed higher refractive error than controls. The 3-5mm and >5mm groups were higher than controls and the <3mm group. The >5mm group was higher than the 3-5mm group. The researchers pointed out that this suggests "the risk of astigmatism was higher when the size of the masses was >5mm."

They concluded that chalazia in children can easily lead to astigmatism, particularly against-the-rule and oblique forms. The following risk factors were identified: chalazia in the middle-upper eyelid, those  $\geq 3$ mm in size and multiple chalazia (especially two masses). "Prompt invasive treatment is recommended if conservative treatment is ineffective to avoid harm to visual acuity due to chalazion-induced astigmatism," they noted. ◀

Ouyang L, Chen X, Pi L, et al. Multivariate analysis of the effect of chalazia on astigmatism in children. *BMC Ophthalmol.* July 17, 2022. [Epub ahead of print].

# Flomax Still Tops List of IFIS Risk Factors

An updated review notes that other influencers include male gender and history of hypertension.

**A**dequate pupil dilation during cataract surgery is critical in reducing risk of intraoperative complications and optimizing surgical outcomes. One condition known to complicate phaco procedures is intraoperative floppy iris syndrome (IFIS), which can easily turn a vision-saving surgery into one that's visually devastating.

One or all of the following may occur intraoperatively in patients with IFIS, depending on the condition's severity:

1. A floppy iris stroma that billows and ripples from phaco fluid currents.
2. An iris stroma prone to prolapse through the incisions.
3. Progressive intraoperative miosis independent of the use of mydriatic agents.

A 2011 meta-analysis investigating predisposing factors for IFIS found that these include tamsulosin, other  $\alpha 1$ -ARAs (e.g., alfuzosin, terazosin, doxazosin, prazosin), hypertension and diabetes. To follow-up on these findings, researchers recently performed a systematic review and meta-analysis on 38 studies on floppy iris, iris hypotony, iris tear or iris prolapse from the last decade. IFIS development was characterized as the presence of any of the three noted signs during cataract surgery.

The factors found to predispose patients to IFIS were male gender (odds ratio: 4.25), hypertension (OR=1.55), tamsulosin (OR: 31.06), finasteride (OR:4.60), benzodiazepines (OR: 2.88) and antipsychotics intake (OR: 6.91). Patients with a decreased pre-op

dilated pupil diameter also had a higher risk of IFIS.

"Tamsulosin remains to date the major predisposing IFIS factor," the researchers noted in their paper. "This strong correlation is explained by the high affinity of tamsulosin with the  $\alpha 1A$  and  $\alpha 1D$  adrenergic receptors, which is 10-times higher than any other  $\alpha 1$ -ARAs. This may be why other  $\alpha 1$ -ARAs didn't correlate with IFIS," they wrote.

The researchers recommend completing a risk assessment prior to cataract surgery to determine if a patient has factors predisposing them to IFIS. ◀

Christou CD, Esagian SM, Ziakas N, et al. Factors predisposing to intraoperative floppy iris syndrome (IFIS): An updated systematic review and meta-analysis. *J Cataract Refract Surg.* July 20, 2022. [Epub ahead of print].





## KERATOCONUS and CROSS-LINKING

# 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

### KEY TAKEAWAYS

- 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.

**K**eratoconus (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<sup>1</sup>, may be able to preserve vision. As

it becomes a debilitating disease that affects every aspect of their lives. Worsening KC severity is associated with significant declines in reading, mobility, and emotional well-being quality of life (QoL) scores.<sup>3</sup> The impact on QoL can be even greater than that of retinal diseases and can be felt even when one eye still has good vision<sup>4</sup> so it is important that patients get help as early as possible.

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.<sup>5</sup> Young patients who can be treated

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 astigmatism, 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:

1. Koller T et al. J Cataract Refract Surg 2009;35:1358.
2. Davidson AE et al. Eye (Lond) 2014;28:189.
3. Tan JCK, et al. Cornea 2019;38:600.
4. Kandel H, et al. Clin Exp Ophthalmol 2022;Epub ahead of print.
5. Lindstrom RL et al. J Med Econ 2021;24:410.
6. American Academy of Ophthalmology Preferred Practice Pattern, Corneal Ectasia, 2018

### INDICATIONS

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

### IMPORTANT SAFETY INFORMATION

Corneal collagen cross-linking should not be performed on pregnant women.

Ulcerative keratitis can occur. Patients should be monitored for resolution of epithelial defects. The most common ocular adverse reaction was corneal opacity (haze). Other ocular side effects include punctate keratitis, corneal striae, dry eye, corneal epithelium defect, eye pain, light sensitivity, reduced visual acuity, and blurred vision.

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

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

## With Cross-Linking<sup>5</sup>

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

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 required for PRK. However, there is no global period, so each follow-up visit is charged as a regular exam.

Without cross-linking treatment, progressive KC typically continues to worsen until around age 40 (and sometimes longer), with 10%-20% of cases requiring a penetrating keratoplasty (PKP).<sup>2</sup> When patients reach the advanced stages of keratoconus,

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 for that young myope in our chair. There is no need to wait until a patient has lost vision or has slit lamp signs (e.g., thinning or striae) to refer for a more in-depth KC evaluation. It is standard of care to intervene with cross-linking upon detection of progression.<sup>6</sup>

SCAN WITH PHONE

Learn more about iLink corneal cross-linking here



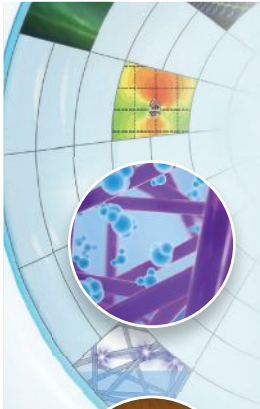
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# FEATURES

REVIEW OF OPTOMETRY • Vol. 159, No. 8 • AUGUST 15, 2022

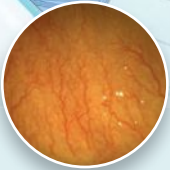


46th Annual **CONTACT LENS REPORT**

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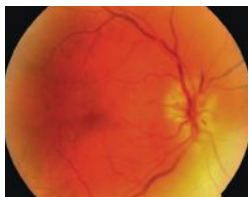
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# DEPARTMENTS

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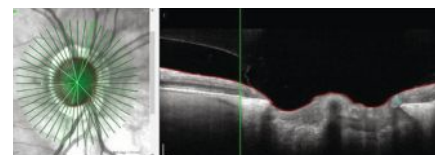
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Blood suddenly appears in a patient's anterior chamber. What could have caused it? How serious is the condition?

*Andrew S. Gurwood, OD*





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BY JACK PERSICO  
EDITOR-IN-CHIEF  
**OUTLOOK**

## “...Then You Win”

*Optometry's tenacity in fighting for its future is paying off, with a thriving profession looking to solidify its gains.*

A quote often misattributed to Mahatma Gandhi nicely sums up the state of optometry right now: “First they ignore you, then they laugh at you, then they fight you, then you win.” That’s been the trajectory of the optometry profession within the larger healthcare system ever since it started to see a role for itself beyond the world of glasses. Much of this ambition was met with derision from members of the medical establishment at first. Then they stopped laughing and dug in for a protracted fight.

But optometry has been in phase 4 a lot lately, with plenty of wins to tout. We’ve talked at length in these pages about the successes of the latest scope expansion effort, adding Virginia and Colorado to the roster of laser states this year alone, while California tees up its own potentially game-changing lasers-and-lesions bill. These successes become self-perpetuating over time: more states are sure to follow.

The public is taking notice, too. In a recent analysis that gave a nice little PR jolt to optometry, the profession was ranked #2 on a list of the top 20 careers of 2022 by the job board Indeed. The site ranked careers by the amount of job postings they’ve received for positions with salaries above \$75,000; admittedly, a pretty narrow metric. Still, it’s interesting that four of the top 10 careers were in healthcare (registered nurse, optometrist, pharmacist, nurse practitioner)—and none required an MD degree.

This embrace of healthcare beyond the walled garden of organized medicine will only continue. The next bit of good news will likely come from the Dept. of Veterans Affairs, which is

about to announce a more robust role for optometry as part of something called the Federal Supremacy Project, an effort by the agency to improve delivery of care in the VA system by empowering its non-MD healthcare providers to take on more responsibility. The VA is going to propose granting rights to optometrists in its system that would supercede the laws of the state in which they practice. This will be yet more validation that properly trained ODs can and should work to the full extent of their training. Expect it to make waves and, if successful, become another peg in future arguments for legislative scope expansion.

The profession also continues to graduate record numbers of new ODs, a fact that brings with it some hand-wringing about declining admissions standards. While it’s true that the average OAT score among students accepted to optometry schools has declined a bit—from 324 in 2010 to 309 in 2021, according to ASCO—there hasn’t been a corresponding increase in the number of students who wash out. The percentage leaving their program has remained steady over the last 15 years: 1.6% of the student body in the 2006-07 school year and 1.5% in 2020-21. Further, poor academic performance as the reason for such departures actually declined over the same period, from 63% to 47% of cases. Finally, the NBEO ultimate pass rate was 92.5% in 2021, which speaks well of the academic resilience of today’s students.

Add it all up and you’ve got more ODs doing more things in more places. But as I’ve said before, now it’s time to deliver. No one wants these wins to become hollow victories. ■





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# LETTERS TO THE EDITOR

Feedback and ideas from the optometric community.

## Why the “Eye Exam” Needs to Die

*This outdated phrase sets the wrong expectations of our skills among patients—and us, too.*

BY RANDALL THOMAS, OD, MPH, RON MELTON, OD, AND PATRICK VOLLMER, OD

**W**hile eye “exams” have been part of the vernacular of patient visits over the decades, we believe the time has now come to abandon this very limiting, antiquated terminology.

As technology and the Internet continue to evolve, optometric dispensary revenues will continue to be reduced. To wit, we have a friend who just recently obtained four pair of single-vision glasses from Zenni Optical for about \$125. These types of consumer-focused deals will become more common going forward and will negatively impact optometric and ophthalmological optical services, as well as that of stand-alone optical stores. No OD needs to be reminded of what retailers like Warby Parker and 1-800-CONTACTS have done to the profits from sales of optical goods. Furthermore, optometrists need to be aware that ophthalmic technicians and opticians are eagerly pursuing training in refraction techniques as they—like us, we must admit—pursue an expansion of their professional scope.

What does all this have to do with the eye “exam”? If we want to maintain our traditional standard of living, we need to portray ourselves as more than just “exam” providers, for many reasons, including our optical revenues being at risk. A major way to do this is to let the public know we do more—a lot more—than just eye “exams.”

We suggest two key ways to do this: First, immediately stop referring out patients for medical eye care to surgeons if it is within your purview. They don’t want to see these patients, but they do so to keep your goodwill for the surgical referrals you also make!

“**Since most people who present to you are likely there for traditional eye exams, they passively assume that is what you do. While this assumption is logical, it is incorrect.**”

Second, immediately start to tell every one of your patients that, in addition to routine eye care, you provide comprehensive medical eye services. Most people still think optometrists only “examine” eyes for glasses and contacts, and that if you have an eye problem, you need to see an ophthalmologist. It is important that the public learns more about what we actually do, and you are the best one to explain it to them!

Since most people who present to you are likely there for traditional eye exams, they passively assume that is what you do. While this assumption is logical, it is incorrect. Tell each of your patients, “If you ever have any eye or vision problem, call me first!”

We have seen hundreds of new patients over the years who have trichiasis, vitreous detachments, dry eye, blepharitis, ocular allergy and a wide variety of red eyes (including a huge number of subconjunctival hemorrhages); the list goes on and on. We notice that most have nice eyeglasses and are a new patient to us because they felt they needed to see an ophthalmologist but were worked into our schedules. Again, eye surgeons have little or no passion for seeing patients with these routine medical eye problems. We always ask these patients for the name of their previous eye doctor; almost invariably, they give us the name of their optometrist, whom they hold in high regard.

In trying to always advocate for our profession, we tell these patients that their optometrist could have provided care for their current problem. The patient’s typical answer is, “Oh, no! They just do eye exams.” This is an erroneous supposition that needs to be corrected immediately. If we genuinely care for our patients, it is our duty to let them know that we are comprehensive eye doctors. If we do not promote our services, no one else will.

Do note that while *routine eye examinations* are a significant portion of *comprehensive eye care*, the two terms are not exclusively synonymous!

For example, it is increasingly common for companies that tout “telehealth” services to claim such efforts provide a comprehensive eye exam. They do no such thing, even when administered in person by a technician while an OD observes remotely. Unless that tech knows their way around a condensing lens, an ophthalmoscope and any number of other instruments, the patient is not receiving comprehensive care. If people want to take advantage of remote medical services, that’s their right, but they should only

## SHARE YOUR THOUGHTS

Letters are welcome. Write to:  
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*Submissions may be edited for length,  
content or clarity.*

patients to take. They listen to me but most probably just continue to eat and drink the same.

Good, sustainable, long-term health requires effort and attention, from doctors and patients alike.

—*Edward Soss, OD*  
*San Francisco*

## Clearing Up Hallucinations

■ I appreciated the article “Visual Hallucinations in the Dementia Spectrum” in the May 2022 issue. In the past, I have had patients complain about visual hallucinations, and I now feel better equipped with some of the science and research explained in the article.

—*Katrina Tomsen, OD*  
*Norfolk, NE*

## An Injection of Facts

■ I am a neurointerventionalist and director of two comprehensive stroke programs. I recently came across a news story in your publication from late last year entitled, “CRAO Rare But Possible After Cosmetic Procedure.” The article describes a case report of a patient who experienced ophthalmic artery occlusion following a cosmetic dermal filler injection to the glabellar region.

The doctor’s explanation of how it could have happened—injection into the anterior communicating artery—is impossible and wrong. The likely mechanism by which this could happen is injection into the veins and the patient, by bad luck, having a patent foramen ovale (right to left shunt). Injection into the artery would never get into the cerebral circulation or the ophthalmic artery.

—*Reza Malek, MD*  
*San Jose, CA*

To comment on these discussions, or start your own, write to [editor@reviewofoptometry.com](mailto:editor@reviewofoptometry.com).

do so with a clear understanding that they are sacrificing thoroughness for convenience.

Fortunately, we noted with some relief that the American Optometric Association recently began using the phrase “all patients deserve comprehensive eye care” in its most recent public education outreach (the current campaign geared toward video game enthusiasts). That’s a step in the right direction—let’s all be sure to stay on message, too.

To end with a cautionary tale, be aware of a recent incident we learned of at a hospital emergency department. An ophthalmologist taking call in the emergency department over the weekend filed a complaint against five optometrists. She indicated she was called in on five patients under different optometrists’ care with mundane concerns such as renewal of medications, contact lens issues and similar run-of-the-mill stuff. All the optometrists in question had voicemail messages instructing their patients, “If you have an eye emergency, go to the nearest ER.” The ophthalmologist filed a complaint to the Board alleging these optometrists were not taking care of their patients. The Board addressed this with an immediate call to action that the ODs should take call for their practices and answer their patients’ inquiries.

Such incidents do a disservice to the public and the medical community. It’s time for us to stop being reactive to circumstances like those discussed throughout this missive and instead take control of our own destinies, as individuals and as a profession.

*Drs. Thomas, Melton and Vollmer all practice in North Carolina and have been tireless advocates for optometric adoption of comprehensive eye care in their lectures and publications, including the annual supplement *Clinical Perspectives on Patient Care*, published this month.*

## Don’t Overlook Diet

■ It seems that every article I read concerns eye diseases and what drug to use on them. Too little attention is given to the patient’s physical condition, their medical history, the drugs they are presently using or even their age. These all play a huge role. I also like to know the diet of the patient. Jack LaLanne—the guru who advocated for Americans to take control of their health through a good diet and regular exercise—always stressed the effects of a person’s diet on their physical and mental health.

I like to know the reason for a patient’s eye conditions, and that includes their history of diet and exercise (if any). In other words, I want to know the cause of their condition rather than just how to treat it with a drug.

I ask my patients what they eat for breakfast, lunch and dinner. When what they describe amounts to a junk food diet, I tell them to do their best to stop the coffee, soda, alcohol and processed foods, and just eat mostly fruits, green veggies, fish and whole grains.

Of course, I realize that patients want a quick fix. Likewise, most doctors are only interested in treating the problems rather than finding the cause of it. So, doctors never seem to ask the patient what they eat or drink—or even care.

I heard a lecture recently where the MD said he tried all these different drugs, which didn’t improve the condition, and he didn’t know what to do now. I asked him about the patient’s diet and he said that’s a good question but he doesn’t do that.

I am 82 years old, still in practice, take no drugs, follow my own advice—and am in great health. I tell my patients to do what I do. Healthy, organic food is the medicine I tell my





BY PAUL M. KARPECKI, OD  
CHIEF CLINICAL EDITOR

## THROUGH MY EYES

# Myopia Matters

*As this population grows, maybe your clinical toolbox should, too.*

**F**inding a “subspecialty” in optometry can enhance your practice life. One big area of focus right now, but in ample need of more doctors, is myopia management. Let’s take a look at how you can make it a successful part of your practice.

## Why Get Involved?

Myopia management is a high unmet need; it’s predicted that myopia will be the leading cause of permanent blindness in the world by 2050. In the United States alone, over 42% of the population between ages five and 19 is myopic, a number that continues to increase as people spend more time on digital devices and less time outdoors.<sup>1</sup>

Many parents believe that reducing their children’s myopia will simply allow them to wear thinner glasses. But, when they’re informed that the primary purpose of intervention is to prevent diseases caused by axial length growth, such as a ninefold greater risk of retinal detachment and a 3.3-times greater risk of glaucoma and cataracts, there is often instant motivation for pursuing options for treatment.<sup>2-4</sup> You can help children avoid such conditions in the future by managing their myopia now.

## Ideal Candidates

An objective approach to finding ideal candidates for myopia intervention is through cycloplegic refraction. The following indicates a significant risk of high myopia development:<sup>5</sup>

- age six: refraction of +0.75D or less
- ages seven and eight: any refraction of +0.50D or less

- ages nine and 10: anything less than or equal to +0.25D
- age 11: at plano or myopic

## A Simple Approach

To get started, have a way to monitor progression via refraction and axial length measurements, as well as treatment options. For monitoring, I suggest starting with refraction alone, and as your practice expands, consider investing in axial length devices ranging from ultrasounds (DGH Technology) to highly repeatable, precise devices that don’t touch the eye, such as the Lenstar (Haag-Streit). There are also advanced devices such as the Myopia Master (Oculus) with multiple useful features including corneal curvature, risk calculators, pupil measurement and axial length.

“**Myopia management is a high unmet need; it’s predicted that myopia will be the leading cause of permanent blindness in the world by 2050.**”

Regarding treatments, offer a range of options that project myopic defocus onto the peripheral retina. This could include contact lenses (MiSight) and/or ortho-K lenses, spectacles (Stellest) and atropine drops. Know the concentration of atropine drops and find an established, reliable compounding pharmacy such as ImprimisRx, Ocular Science or Primera. A child that is too young for contact lens wear would benefit from atropine drops while a

moderate-to-low myope who is older could benefit from ortho-K lenses.

## Environmental Suggestions

While we need treatments to slow myopia progression, we must also recommend evidence-based solutions. For example, children who are outdoors for 1.5 hours per day or 11 hours per week experience 54% less myopia progression. Near work increases progression, so recommending that myopes limit their digital device use may have multiple benefits.<sup>6</sup> Much of this information can be provided through patient education materials.

## Expected Progression

A myopic Caucasian child is expected to progress by 0.55D per year; anything less is considered to be a success, but rates do vary based on ethnicity and gender. For example, Asian children progress at 0.82D per year and females progress slightly more than males per year at 0.09D. Most children stabilize around age 16, although mild progression beyond this time is possible.

Myopia management has real benefits and a significant patient population in need of slowing the progression from blinding complications. Depending on your practice setting and what motivates you, this area of expertise may be worth considering. ■

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About  
Dr. Karpecki

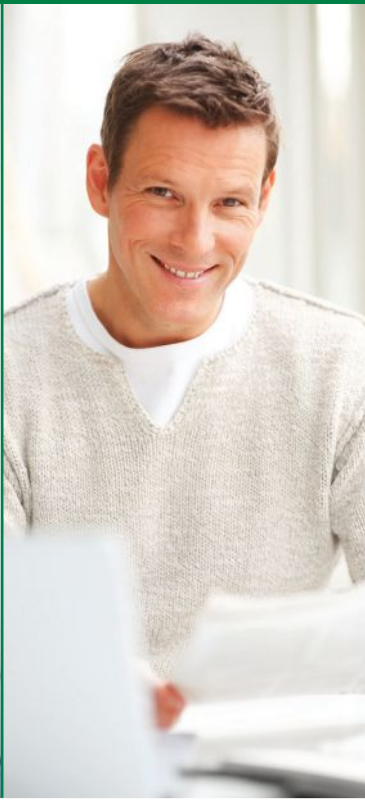
**Dr. Karpecki** is the director of Cornea and External Disease for Kentucky Eye Institute, associate professor at KYCO and medical director for Keplr Vision and the Dry Eye Institutes of Kentucky and Indiana. He is also chair of the New Technologies & Treatments conferences. He consults for a wide array of ophthalmic clients, including ones discussed in this article. Dr. Karpecki’s full disclosure list can be found in the online version of this article at [www.reviewofoptometry.com](http://www.reviewofoptometry.com).

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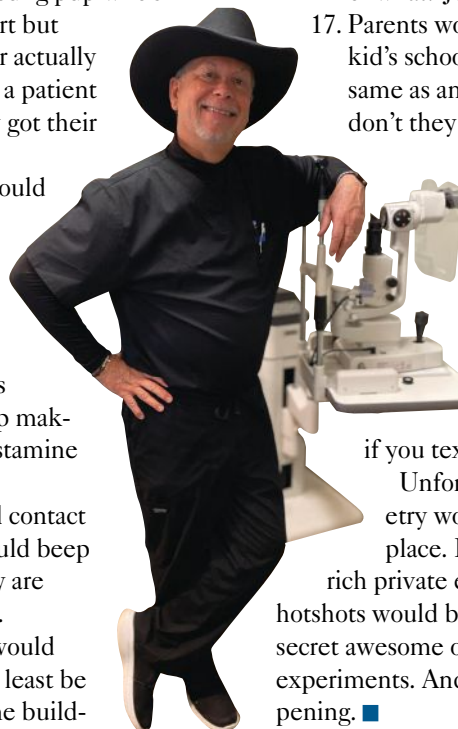
# If Optometry Were a Perfect Place

*Unfortunately, it's not. But we can dream, right?*

**H**ave you ever watched the nightly news and just hit the mute button and wished the world was a perfect place? I do it all the time, especially when they interrupt sports to tell me what Machine Gun Kelly or Prince Harry said to Piers Morgan about the Kardashians. Too bad the world's not a perfect place. Neither is the optometry world at that. But what if it was? Here's what I imagine it would look like:

1. Bacterial conjunctivitis would be caused by no-showing.
2. The curse of emmetropia would be lifted in favor of universal myopia.
3. Computer screens would only be visible if the eye doctor gave a refill code each year.
4. Retinal tears would only be allowed on Monday mornings.
5. Yearly glasses plus sunglasses would be required by federal statute.
6. The United States Senate would be crawling with optometrists, not lawyers who aren't good enough at law to stick with it.
7. Every state board of optometry would send a representative to a big national meeting where they have to choose between expanding the scope of every state's optometry law or facing a ticked off Mike Tyson in a 10x10 cage match. In case somebody were to make the wrong

- choice, I'll have you know my son is an oral surgeon. Just give me a call, or, better yet, send a text since you probably can't talk after Iron Mike knocked your jaw into the blue bayou.
8. When you have survived 40 years of private practice, your license would automatically renew at no charge because, let's face it, at that point you aren't going to use any new technologies anyway, and you don't want to waste what little life you have left in a CE hall in some nondescript hotel somewhere listening to some young pup who's really smart but hasn't ever actually examined a patient since they got their degree.
9. Snellen would have stopped at 20/30.
10. Pharmaceutical companies would stop making antihistamine eye drops.
11. Multifocal contact lenses would beep when they are inside out.
12. A doctor would need to at least be in the same build-



ing as the patient for the patient to call it an eye examination. If that doesn't work, how about the doctor needs to be in the same state at the very least.

13. Contact lenses would require a written prescription, not a picture of a patient's cousin's old lenses to buy new ones.
14. If a patient has problems with the new prescription they got from somewhere other than your office, they would realize that they deserve the best technology for their eyesight and that you can provide it.
15. Your children and grandchildren would not have friends who have a swollen eyelid on a Sunday.
16. We would call ourselves "doctor" without having to clarify what kind of doctor every time. Even Jill Biden is called "doctor" for goodness' sake! Doctor of what? Joe?
17. Parents would know that their kid's school screening is not the same as an eye exam. I mean, don't they understand how

critically important good eyesight is for watching four hours of stuff on TikTok every day?

18. Not an optometry thing, but cellphones would smell like a skunk if you text while driving.

Unfortunately, the optometry world is not a perfect place. If it was, then some rich private equity company hotshots would buy my DNA for their secret awesome optometrist cloning experiments. And I don't see that happening. ■

**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.



# Outsourced Marketing

## Knowing When and Why to Invest in a Marketing Agency



**Brian Woolf, OD**  
Woolf Eye Lab  
Pasadena, Md.

To run a successful practice, eye care professionals must balance many moving parts and areas of the business competing for their attention. Often, it is helpful to outsource some of these responsibilities to help lighten the load—including marketing. By leveraging experts who have extensive knowledge and experience in engaging current and prospective patients, eye care professionals can free up time to focus on the areas of practice in which they are trained to excel. Brian Woolf, owner of Woolf Eye Lab in Pasadena, Md., shares why he made the decision to invest in a marketing agency and the ways the partnership has benefitted his practice.

### **Marketing can be essential to the success of a practice. What has been your approach, and why did you ultimately decide to partner with a marketing agency?**

As an optometrist and practice owner, I found myself juggling the many moving parts that come with operating a successful business. With the various practice management responsibilities, from enhancing the patient experience to staff development—and everything in between—it became too much for one person to do alone. In 2020, with the impact of the COVID-19 pandemic, we saw a need to promote our practice more than ever. We decided to turn to the experts by finding a marketing agency that could help us amplify our efforts beyond traditional word-of-mouth marketing.

### **How did you find your marketing partner?**

Our approach was simple. We searched online for advertising and marketing agencies in our area and narrowed it down based on who had experience in health care and could best meet the needs of the practice.

### **What have been the benefits of working with a marketing agency?**

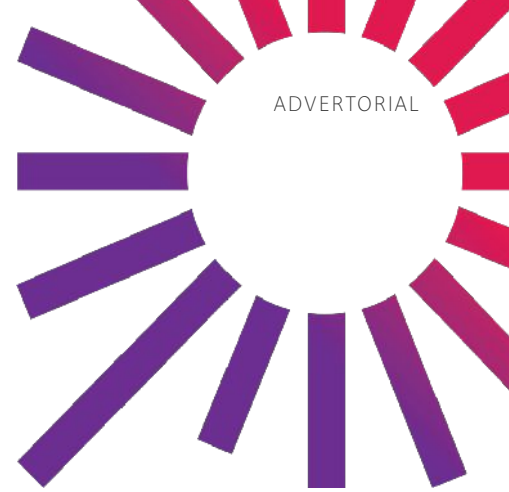
The biggest and most obvious benefit is that it takes some work off my plate. Hiring a marketing partner has allowed me to focus more of my time on what I do best, which is providing eye care. Our marketing team takes care of all our social media, direct marketing, and advertising. They provide us with regular performance reports for our various campaigns, as well as valuable recommendations based on industry trends. They can identify what marketing methods are most effective for our practice, what platforms resonate most with our patients, and more.

### **What have you learned from working with marketing experts?**

Return on investment is key, and I'm results driven, so it admittedly took me a while to understand that the results of our marketing efforts wouldn't be instantaneous. It's important to take the time to learn what works in marketing to your target audiences. Once you have that figured out, you'll see the results of your marketing efforts take shape over time.

### **What has been one of your greatest marketing success stories?**

Knowing that a growing segment of the population has presbyopia, we developed a marketing campaign to encourage patients 40 years and older to consider switching to multifocal contact lenses. With the help of our marketing team, we created branded e-coupons that were distributed through an email campaign. As a result, we did see an influx of patients coming into our office with their coupons and interested in learning more about multifocal lens options.



## **Top 3 Benefits of Working with a Marketing Agency:**

- 1 Expert Supervision.** Marketing agencies have a skillset that most eye care professionals don't. They understand the best ways to reach different target audiences and can provide proven methods and creative ideas for generating results for a practice.
- 2 Consistent, Quality Content.** While eye care professional's day is dedicated to eye care, marketing professionals spend their days marketing. They work consistently and efficiently to develop compelling, high-quality content on a regular basis.
- 3 Divide and Conquer.** Turning over marketing efforts to the experts allows a practice owner to be more focused, efficient, and effective in their own day-to-day work.



EDITED BY JOSEPH P. SHOVLIN, OD

# In the Clear

*Current evidence suggests the possibility of prion transmission is relatively low and should not rule out affected patients from donating blood.*

**Q** **Should corneal graft patients donate blood? Is there any risk of prion transmission from the donor to the recipient?**

**A** “Prion diseases are a class of rare and fatal disorders that can be acquired or inherited,” says Mahnia Madan, OD, of Vancouver, British Columbia. She notes that the most common form of prion disease is Creutzfeldt-Jakob disease (CJD), which causes neurodegeneration, motor dysfunction, dementia and eventually death within one year.

Eighty-five percent of CJD cases are sporadic, 11% are inherited and 4% are acquired. The latter has mainly been documented in the United Kingdom due to contact with contaminated meat products or exposure to infected tissue during a medical procedure, such as pituitary growth factor administration, blood transfusion, dura mater allograft and corneal transplantation.<sup>1,2</sup>

## Discussion

With more than 30,000 corneal transplants performed in the United

States each year, a statistical analysis estimated the risk of prion transmission to be extremely low at only 0.045 cases per year.<sup>3</sup>

When it comes to CJD transmission, current evidence supports that sporadic CJD is not transmitted by blood transfusion while acquired cases can be. Identified occurrences in the United Kingdom have been linked to consumption of meat products contaminated with prions (mad cow disease).

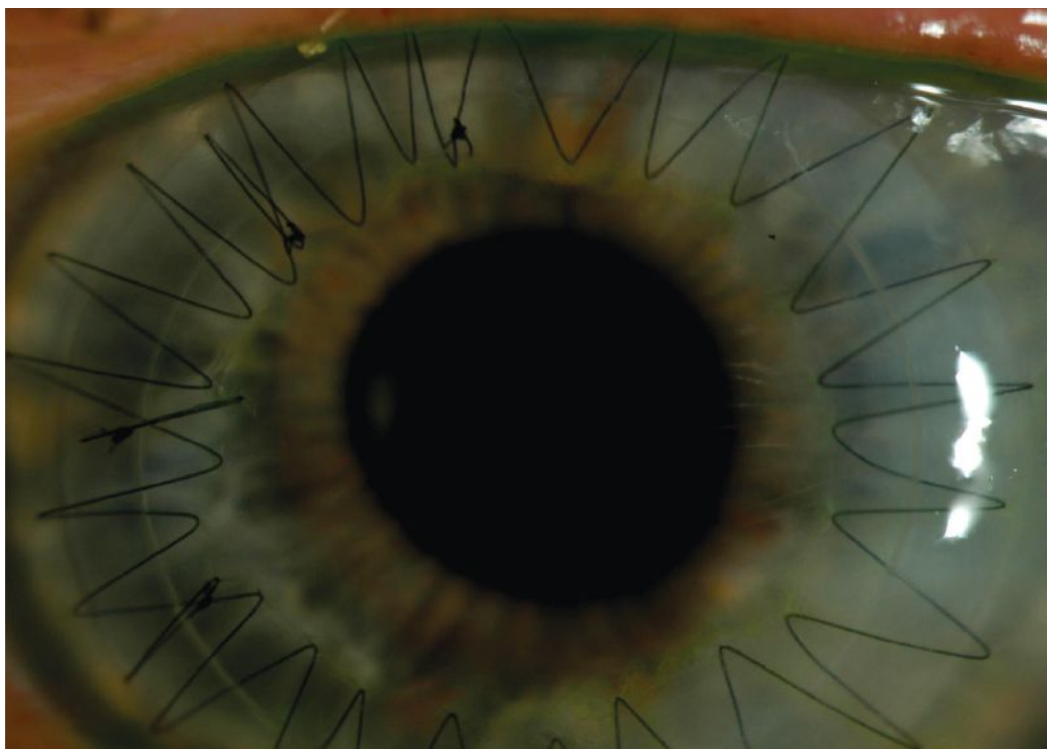
In 1999, several countries implemented a series of precautionary measures which included a ban on the use of United Kingdom-sourced plasma to produce immunoglobulin products. However, this ban was re-evaluated and lifted in 2021.

With the impositions of the Eye Bank Association of America’s medical standards and the FDA’s disease prevention and donor selection criteria, the risk of CJD transmission is considered negligible and should not disqualify affected patients from donating blood. ■

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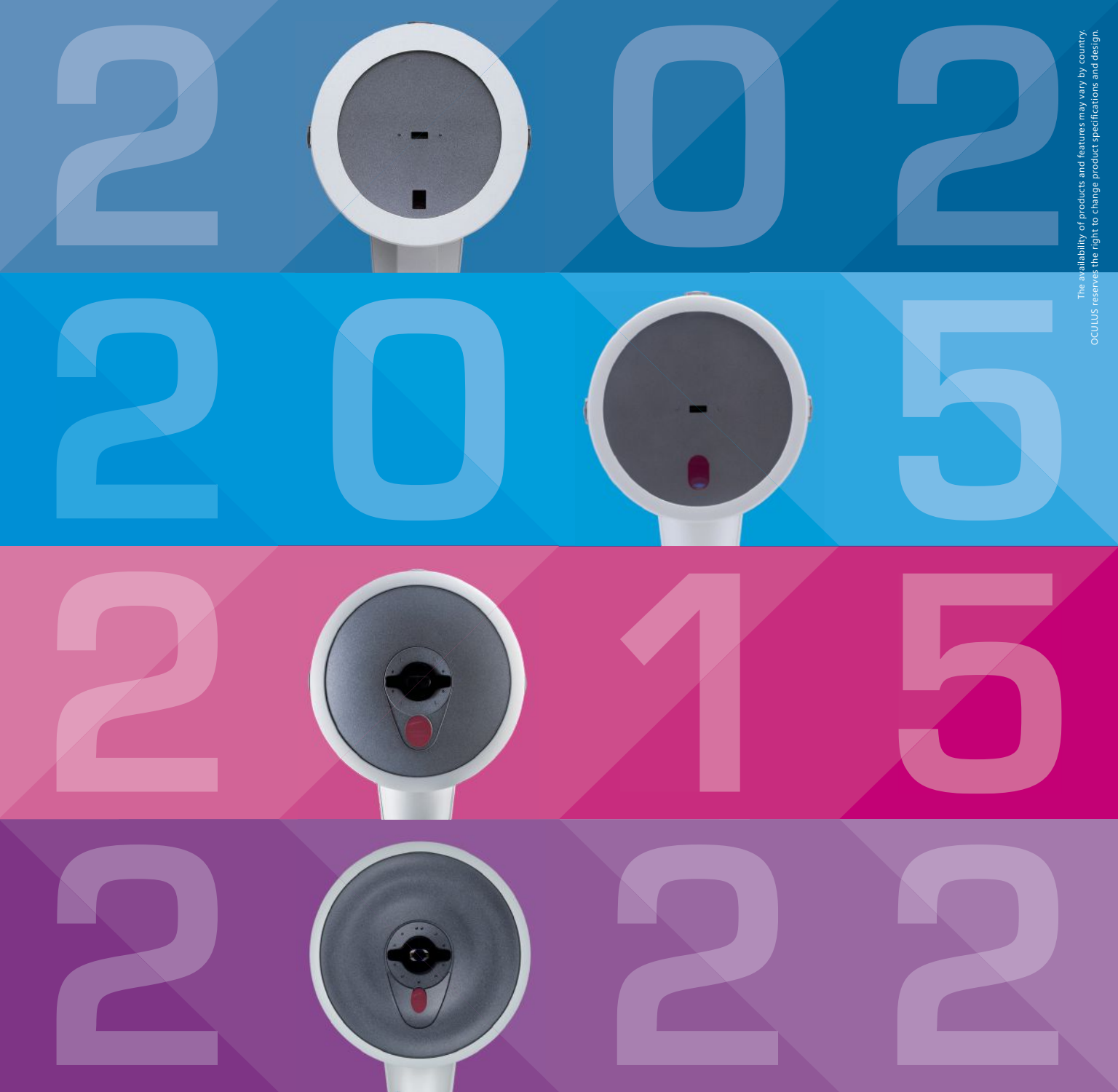
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**Successful full-thickness graft with running suture.**

About  
Dr. Shovlin

**Dr. Shovlin**, a senior optometrist at Northeastern Eye Institute in Scranton, PA, is a fellow and past president of the American Academy of Optometry and a clinical editor of *Review of Optometry* and *Review of Cornea & Contact Lenses*. He consults for Kala, Aerie, AbbVie, Novartis, Hubble and Bausch + Lomb and is on the medical advisory panel for Lentechs.



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BY MARC B. TAUB, OD, MS, AND PAMELA H. SCHNELL, OD

## FOCUS ON REFRACTION

# Teamwork Makes the Dream Work

*Referring when appropriate is one of the best ways we can ensure our patients receive the quality care they deserve.*

One of the best things an optometrist can do for their patients is make a referral to another optometrist for specialty care. I (Dr. Taub) was referred from my primary OD to a vision therapy specialist when I was in second grade, and I genuinely believe that the referral and vision therapy program altered my life path.

Even though referring when appropriate seems like common sense and should be the standard of care, too many optometrists struggle with this line of thinking. Referrals, of course, are not limited to our optometric colleagues and also include primary care and specialty care physicians. The following case highlights several off-the-beaten-path referral sources that optometrists need to consider.

## The Case

A 15-year-old patient presented for an annual exam at Southern College of Optometry for the first time. He had worn glasses for distance vision in the past but lost them, and he was unsure when his previous exam had been completed. He was reading on grade level but did not like to read. He was underperforming in school and receiving Fs. He had been diagnosed with ADHD five years prior and took an unknown medication that made little impact. He had tried several other

medications without success. He was hard of hearing and had been wearing hearing aids in both ears for many years. In school, he and several other hard-of-hearing children had an aide to help them work through their hearing disabilities, but no other services were provided.

The examination was very straightforward. The patient entered seeing 20/20 OD, OS and OU at distance and near. Binocular vision testing showed a normal near point of convergence at “to the nose,” stereopsis was 25 seconds of arc and cover testing was ortho at distance and four exophoria at near. Accommodative testing showed low but balanced negative and positive relative accommodations at +1.50 and -1.50, respectively, and his amplitudes met the minimum age norms at 13D OD and OS. Retinoscopy was plano OD and -0.25 OS; no prescription was given. The anterior and posterior segments were unremarkable.

Based on the examination data, our work here should have been done, but in our opinion, we would have failed in our duties if we had simply scheduled the next annual examination and sent him on his way. Instead, we made three referrals.

## Neuropsychologist

This doctor is concerned with exploring the relationship between a

patient’s brain and their behavior. We consider this member of the team the quarterback. They not only can assess cognition, behavior and legal, social and emotional factors, but they can also offer diagnoses and recommend treatments. They work with children and teens and routinely see adults who are suffering from a brain injury or a neurological condition such as multiple sclerosis or Parkinson’s disease. Referral for testing from other professionals, including ADHD specialists, speech/language therapists, occupational therapists and cognitive therapists, are common recommendations.

For our patient, we hoped the evaluation would reveal potential deficiencies that might be contributing to his poor school performance. With that knowledge, his school would better understand his abilities and recommendations could be incorporated into an Individualized Education Plan. As the name implies, this plan offers ways in which a child’s educational program can be enhanced through accommodations such as receiving extra time on tests, taking tests verbally and taking tests in a quiet setting.

## Audiologist

A doctor of audiology is an expert in hearing and works with individuals with audiological processing deficiencies. Hearing is analogous to seeing, so audiological processing is akin to visual processing. We are more conditioned to recognize pure hearing issues, but if the brain is not processing what is physically heard, the input will not be clean, leading to poor comprehension of what is heard. The output, in the form of speech, may also be impacted. As with the visual

**About Drs. Taub and Schnell**  
Dr. Taub is a professor, chief of the Vision Therapy and Rehabilitation service and co-supervisor of the Vision Therapy and Pediatrics residency at Southern College of Optometry (SCO) in Memphis. He specializes in vision therapy, pediatrics and brain injury. Dr. Schnell is an associate professor at SCO and teaches courses on ocular motility and vision therapy. She works in the pediatric and vision therapy clinics and is co-supervisor of the Vision Therapy and Pediatrics residency. Her clinical interests include infant and toddler eye care, vision therapy, visual development and the treatment and management of special populations. They have no financial interests to disclose.



system, wherein we ensure the clearest images, in audiology, an attempt is made to encourage the cleanest sounds. That may include hearing aids and assistive technology. When an issue with audiological processing is identified, a program of audiological rehabilitation can be provided.

For our patient, there was a previously identified hearing issue, for which he was using hearing aids in both ears. No further treatment had been offered in the form of rehabilitation, and the patient had not been seen recently to evaluate whether the current aids were still appropriate and providing the best foundation for processing. Even though the patient was under the care of one center, we referred him to another since the first did not seem to be offering all available resources.

### Neurobehavioral Specialist

Traditionally, the pediatrician is the first line in diagnosing and treating

ADD and ADHD. Apart from the history, this diagnosis is made through parent and teacher surveys. When treatment begins, the medication chosen is up to the doctor, and often, it takes several attempts to find an appropriate option. For many patients, this is a good place to start, but for others, this shotgun approach turns out to be fruitless and wastes precious time. We prefer to refer to a neurobehavioral specialist, as this type of pediatrician takes a different approach: they do genetic testing to determine which class of medication will best suit the patient. These specialists don't just use surveys to aid in making a diagnosis, often employing age-normed testing as well.

For our patient, his pediatrician had tried several different medications without success. Starting over with the specialist to confirm the diagnosis, testing for the most appropriate starting medication and offering suggestions for school accommodations

was desperately needed. As an aside, processing difficulties can muddy the waters when making a diagnosis related to attention deficits. In reality, ADHD may not be an accurate label to place on this child.

### Takeaways

As you can see, we are just at the beginning of our journey with this patient. Even though we did not offer refractive correction or even diagnose a condition requiring vision therapy, our jobs were not done. The three referrals to the neuropsychologist, audiologist and neurobehavioral specialist will hopefully aid this child socially, emotionally and academically. The referrals will also provide the mother and the school with a better understanding of the child's abilities and what they can do to effectively assist him. As optometrists, we must not stop short of helping our patients in any way we can; doing so is against our oath and fails our promise. ■

# PRESCRIBE ORAL MEDS LIKE A PRO

In the final article of our scope expansion series, we cover how to confidently treat and manage patients with the most potent pharmaceuticals available.

BY CATLIN NALLEY  
CONTRIBUTING EDITOR

An area of scope of practice expansion in optometry that has perhaps seen the most success over the last decade or so is the right to prescribe oral drugs for ocular disease. Although state-by-state laws vary regarding permitted pharmaceutical agents, ODs in every state are now allowed to prescribe some form of oral medication (e.g., antivirals, antibiotics, antifungals, anti-inflammatory drugs, analgesics, antihistamines, steroids) to treat various eye conditions, giving you an opportunity to enhance your quality of care. This means that patients are able to access needed medications sooner and more conveniently from their primary eyecare providers. But these agents come with more serious adverse effects and that may create reluctance among those unfamiliar with their use.

## Status of Oral Med Laws for ODs

There have been several prescribing authority wins for optometrists over the last few years. Most recently, in October 2021, New York passed a scope of practice bill that allows optometrists to use oral pharmaceuti-

cal agents for the treatment of eye diseases, including antibiotics, antivirals and anti-glaucoma agents. With this new bill, which takes effect on January 1, 2023, New York joins 48 other states and the District of Columbia that allow optometrists to prescribe oral medications.

To break this statistic down further, here is the number of states that currently allow ODs to prescribe the following medications:

- Controlled substances: 48
- Oral glaucoma meds: 47
- Oral immunosuppressives: 46
- Oral antifungals: 45
- Oral steroids: 43
- Hydrocodone: 36

ODs across the nation are experiencing firsthand the impact of these broadened prescribing rights on both their practices and patients. For Jill Autry, OD, RPh, who practices in Texas where optometrists recently gained the right to prescribe more oral medications (with the exception of Schedule 1 and 2 controlled substances), the biggest win has been the opportunity to start prescribing oral antivirals.

“I am in a practice with ophthalmology, so I could always turn to them for the prescription, but it used to be very difficult for ODs in the community to

try and get a primary care practitioner to prescribe or coordinate to send patients to an ophthalmologist for a prescription,” says Dr. Autry. “This was especially concerning after hours or on the weekend or when getting into an ophthalmology office could take several days when we know these medications are best started within 24 hours.”

To help ODs navigate additional opportunities to prescribe a variety of different oral medications, the fourth—and final—article in our scope expansion series will delve into the logistics of adding these services as well as cover clinical best practices to ensure optometrists have everything they need to successfully and confidently prescribe oral medications to manage patients with a wide range of ocular conditions.

## SCOPE EXPANSION SERIES

Visit [www.reviewofoptometry.com](http://www.reviewofoptometry.com) to read the other articles in this series:

- *Bringing Incisions and Injections to Your Clinic (May issue)*
- *Adding Lasers to Your Practice (June issue)*
- *Taking the Lead on Glaucoma (July issue)*





**Obtaining a comprehensive patient medical history, including past and current use of medications, is critical to avoiding adverse events from potential drug interactions.**

### Setting the Stage to Prescribe

As with any new clinical service you add to your practice, preparing to prescribe oral medications starts with ensuring you have a clear understanding of your state's rules, laws and requirements.

In Florida, for instance, a Board of Optometry–approved 20-hour oral drug review course and examination is required before prescribing or administering any oral medication for an ocular condition, according to Jessica Steen, OD, an assistant professor at Nova Southeastern University's College of Optometry.

"Prior to prescribing any controlled substance that is within the scope of state prescribing regulations, registration with the Drug Enforcement Agency is required and must be renewed every three years," says Dr. Steen. "In certain states, specific continuing education requirements exist for those who carry additional certifications or registrations."

You should check with your state optometric board to ensure you are prescribing within your scope, adds Jackie Burress, OD, of the Eastern Oklahoma VA Healthcare System. She also notes that certain medications may require lengthier training before you're able to prescribe them at your clinic due to the strength of their effect and potential for misuse. This

includes narcotics like hydrocodone used for treating painful chemical burns, abrasions or traumatic injuries, which ODs in several US states can now offer to patients.

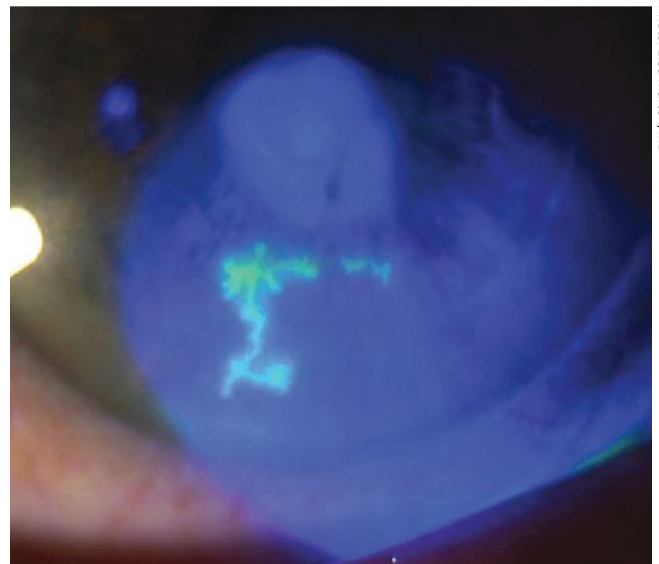
"These are usually limited in the number of days that you can prescribe the medication to prevent abuse," says Dr. Burress. "Also, ensure that you are checking the prescription drug monitoring program database before ever prescribing such medications to ensure a patient doesn't have a pattern of drug-seeking behavior."

Dr. Autry points out that steroids are part of another medication group a growing number of states allow ODs to prescribe that requires extra caution. Steroids have a high side effect profile that both patients and clinicians need to be aware of prior to starting the medication. She notes that knowledge of how to prescribe and follow patients on these agents is imperative to their health and safety.

While all colleges of optometry provide the necessary education for prescribing oral medications, Dr. Burress notes that there are a plethora of resources available whether an OD is just starting to incorporate this service into their clinic or wants to enhance the care they already provide.

To confidently prescribe oral medications, Dr. Burress recommends brushing up on common conditions you see regularly. This includes reading CE articles and reviewing the *Will's Eye Manual* for the best and most up-to-date information, she says, adding that the *Will's Eye Manual* provides excellent prescribing information for hordeola, preseptal cellulitis, herpes simplex and herpes zoster. Reaching out to your state board to see which educational and training resources they have available or know of is also a great place to start.

Aside from having the knowledge and skills to prescribe oral medications, the logistics of adding this service into practice are minimal, according to Dr. Burress. She describes that the process is the same as prescribing ophthalmic medications through your electronic health record system, which are then sent to the patient's chosen pharmacy to be filled.



**Antivirals are effective in treating several ocular infections such as herpes simplex keratitis. Allowing optometrists to prescribe these meds at the first sign of infection increases the likelihood of a positive outcome.**

No matter which new service you integrate into practice, success depends on the involvement of the entire team. “Staff should already be well familiarized with the services and treatment options the optometrists at their office provide, and there should also be a triage system in place for ocular emergencies,” advises Dr. Steen. “When an OD decides to enhance their services, staff should be involved in the discussion to ensure accurate and effective communication with patients,” she says.

### Considerations and Best Practices

One key to successfully prescribing oral medications to your patients is to obtain a comprehensive medical history, detailed medication review (including supplements and vitamins), allergy history (including reaction) and review of systems, advises Dr. Steen.

“When prescribing any medication, including oral medications, it is important to get a comprehensive review of systems to uncover potential illnesses that may be contributing to the ocular conditions you are seeing and to determine if there are contraindications for specific medications that we may be prescribing,” says Christopher Wolfe, OD, who practices at Exclusively Eyecare in Omaha, NE. “Additionally, you would want to ask about previous medication allergies as well as current medications that are being taken.”

Like you would with any patient, conducting a complete clinical evaluation is imperative to determine a diagnosis and ensure that your proposed treatment strategy and medication choice is effective in managing the underlying cause of the clinical presentation, according to Dr. Steen.

“For instance, when choosing an effective oral antibiotic for a periorbital soft tissue infection, local resistance profiles, propensity for gastrointestinal upset and assessment of risk of harboring methicillin-resistant staphylococcus aureus should all be considered, in addition



Photo: Tracy Offerdahl, PharmD, and Greg Caldwell, OD

**Patients with a lid infection like the one above, who has a hordeolum and preseptal cellulitis, may benefit from an oral antibiotic such as Augmentin (amoxicillin and clavulanate) or Moxatag (amoxicillin).**

to potential risks identified through the medical history and medication review,” she says.

A drug interaction check program or app is also an important step to confirm that the proposed medication will not introduce a potentially harmful effect due to interaction with any current medications or supplements, suggests Dr. Steen, who also notes that many electronic medical records incorporate an interaction check into the electronic prescribing module. An alternative option is by accessing an outside system, such as that through Epocrates, which can be used online or via the company’s app.

“If an interaction is identified, assess the risk associated with the interaction and choose an alternative medication when possible,” says Dr. Steen. “If an alternative medication is not clinically

appropriate, discuss the potential interaction and associated risks and benefits of your proposed treatment directly with the prescribing physician of the medication of concern. Depending on the physician’s availability and the urgency of treatment, a local pharmacist will also be able to provide decision-making support.”

Engaging with the patient throughout the entire process is another key component and the best way to make sure they’re satisfied with your care. Have a discussion with each patient before starting them on oral medication where you cover the anticipated effects—both positive and negative—as well as the potential adverse effects and what the patient should do if they occur.

“A clear understanding of expected effects of a medication can save the patient and prescriber from an additional unnecessary emergency appointment or save the patient from consequences of untreated disease or disease progression due to self-discontinuation of the medication,” explains Dr. Steen. “Every prescribing decision requires a careful evaluation of potential risks and benefits of treatment, and good adherence to therapy relies on a patient being engaged and well-informed regarding their therapy.”

It’s also important to take the patient’s insurance and financial situation into account when ordering medications, notes Dr. Burruss. “Many times there is a

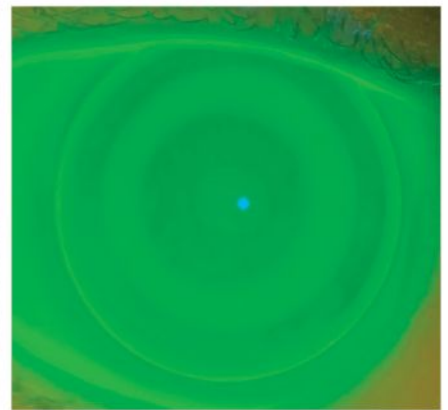
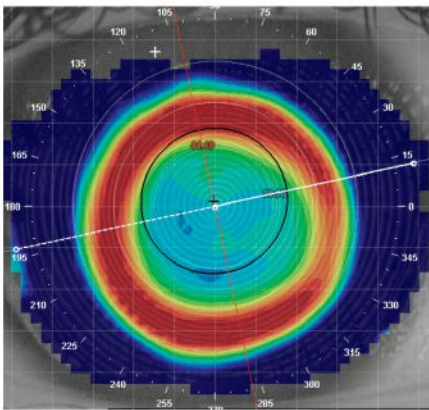


**If a patient is relying on too many pain medications to alleviate their ocular discomfort, it is best to reassess the diagnosis and figure out an alternative game plan.**





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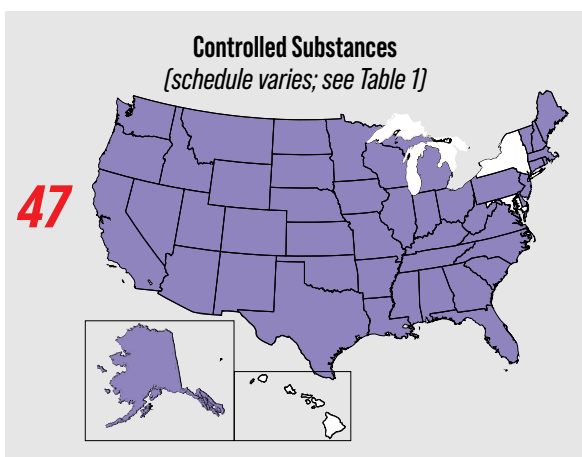
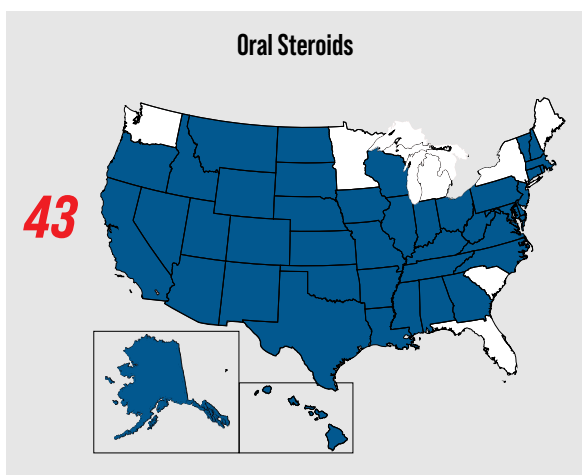
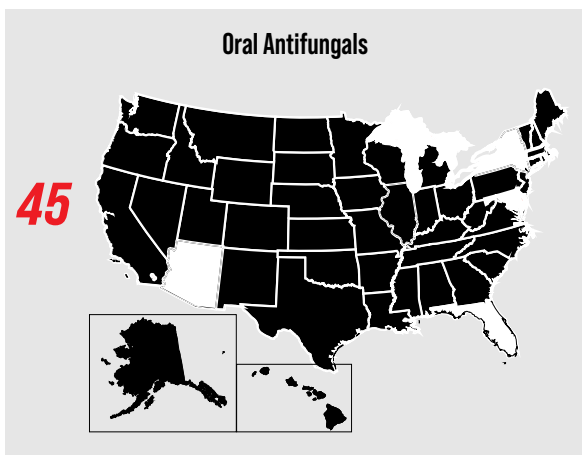


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**ODs across the US are approaching near-universal access to oral medications, but there's considerable variance within the controlled substance category. For more scope maps, see the first article in this series (May 2022).**

less expensive option if that is what's needed for the patient to improve their compliance," she points out.

### Dosing Common Oral Meds

Given the number of available drugs, prescribing oral medications may

Z-Pak (Zithromax, azithromycin), but these don't always fix severe infections, and Keflex resistance is increasing," she says. "Oral ciprofloxacin (Cetraxal) has almost no gram-positive coverage anymore, so I avoid it in cases of lid disease. Levaquin is an option but

feel overwhelming at first; however, for most eyecare issues, Dr. Autry notes there are standard medications that can be used. "As long as you check for allergies, pregnancy and severe hepatic and renal disease, you can usually prescribe the same five to seven oral medications," she says. "For most lid infections, I use amoxicillin (Moxatag) 875mg BID for adults, and for suspension in children, I use 20mg to 40mg/kg/day."

Augmentin (amoxicillin and clavulanate) 875mg can also be prescribed to adults or children with bacterial infections using the same dosing strategy as for amoxicillin; however, she notes that this isn't needed as much today since most individuals are vaccinated against *Haemophilus influenzae*.

If a patient is allergic to penicillin, Dr. Autry opts for doxycycline (Monodox) 100mg (contraindicated for children or nursing/pregnant patients) BID PO or Septra DS (sulfamethoxazole-trimethoprim) BID. The latter should not be used in patients allergic to sulfa or those who are nursing or pregnant, but there is a suspension for children, she notes.

"I know a lot of ODs like Keflex (cefalexin) or

has its own possible side effects and is expensive."

When considering pain medications, Dr. Autry typically recommends ibuprofen and/or acetaminophen. Together, the two have shown to be equivalent to Tylenol #3, she notes. "I tell patients to take 400mg ibuprofen (two of the OTC 200mg tabs) and one 500mg acetaminophen (extra strength Tylenol)."

ODs should be careful when using ibuprofen or other nonsteroidal anti-inflammatory drugs in patients with an aspirin allergy, cautions Dr. Autry, who adds that she prefers acetaminophen. If an OD finds they are using a lot of oral pain medications, she advises that they may need to rethink the patient's diagnosis or seek a second opinion.

"Most ocular issues that cause pain can be handled with topical options like bandage contact lenses, cycloplegic agents or topical steroids," Dr. Autry explains. "I don't give pain medications to bacterial keratitis patients, as I need to know if they are feeling better on the antibiotic regimen to know if I am on the right track. The most I will do for them is cycloplegia and never, ever a bandage contact lens."

Oral steroids should be used with care, particularly among older patients and those with gastrointestinal issues or diabetes. In most cases, Dr. Autry has found a Medrol (methylprednisolone) dose pack to be effective, which has its own taper schedule. When prescribing this to her patients, she tells them to take all six tablets in the morning with breakfast the first day, five tablets the next day with breakfast, and so on for the six days of therapy. She notes that this regimen follows the normal morning peaks of cortisol levels and also helps with patient compliance.

"This is a very common recommendation I saw as a pharmacist from non-emergency care practitioners such as primary care physicians and rheumatologists," Dr. Autry says. "Otherwise, if using oral steroids, you have to taper appropriately. I recommend OTC Zantac (ranitidine), Pepcid (famotidine) or Prilosec (omeprazole)

to protect the stomach with all steroid prescriptions.”

Oral antivirals are typically well-tolerated and cause few or no allergic reactions or side effects. Additionally, these agents are pregnancy and nursing safe, Dr. Autry says. For herpes zoster, she typically prescribes 1g valacyclovir (Valtrex) TID. In cases of herpes simplex (periocular infections and dendritic or disciform infections), her standard prescription is valacyclovir 500mg TID.

There are other uses for agents like this, she notes, such as Bell’s palsy (1g TID) and herpetic uveitis (500mg TID) as well as prevention of recur-

rent simplex after multiple infections (500mg valacyclovir QD to QOD long-term). According to Dr. Autry, there is no practical reason to use acyclovir (Sitavig or Zovirax) any more since it has to be given several times per day. Valacyclovir works better and has been generic for some time, she adds.

Once an OD has determined a diagnosis and the appropriate treatment strategy, including medication, dose, frequency, duration and directions for use, Dr. Steen notes that it is helpful to return to the medical history and current medications to confirm their completeness with a specific focus related to possible adverse effects of the

proposed medication before sending the prescription to the pharmacy.

“For example, before prescribing azithromycin, confirm the absence of allergy to the medication, absence of cardiac arrhythmia, heart failure and liver disease due to known adverse effects and contraindications,” she elaborates. “When prescribing any drug for a female patient of child-bearing age, re-confirm that they are not currently pregnant or lactating, and for all antibiotic prescriptions, if the patient is currently taking an oral contraceptive, advise the patient to use an alternative method of contraception during and for seven days following treatment.”

**TABLE 1. CONTROLLED SUBSTANCE PRESCRIBING RIGHTS FOR OPTOMETRISTS**

State	Schedule 2	Schedule 3	Schedule 4	Schedule 5	State	Schedule 2	Schedule 3	Schedule 4	Schedule 5
Alabama					Montana	*			
Alaska	*				Nebraska	*			
Arizona	*				Nevada				
Arkansas	*				New Hampshire				
California	*				New Jersey	*			
Colorado	*				New Mexico	*			
Connecticut	*				New York				
Delaware	*				North Carolina				
Florida			**		North Dakota				
Georgia	*				Ohio				
Hawaii					Oklahoma	*			
Idaho					Oregon	*			
Illinois	*				Pennsylvania	*			
Indiana			***		Rhode Island	*			
Iowa					South Carolina	*			
Kansas					South Dakota				
Kentucky	*				Tennessee				
Louisiana					Texas				
Maine					Utah	*			
Maryland					Vermont				
Massachusetts					Virginia	*			
Michigan	*				Washington	*			
Minnesota					West Virginia	*			
Mississippi	*				Wisconsin	*			
Missouri	*				Wyoming	*			

\* Hydrocodone products only \*\* APAP w/codeine & tramadol \*\*\* tramadol

## GAIN CONFIDENCE IN YOUR PRESCRIBING SKILLS

Adding any new service into clinical practice can feel daunting, and oral medication prescription is no exception. An abundance of choices coupled with potential side effects and drug interactions can add another layer of complexity and potential stress to clinical practice. However, that doesn't have to be the case.

ODs have the knowledge and skills to prescribe oral medications to their patients. Confidence will increase as you prescribe more oral medications and you experience the clinical benefits of that prescription, says Dr. Wolfe, while suggesting that ODs can reduce their anxiety around this service by initially limiting oral prescriptions to the management of one area or medication class. A good place to start would be for eyelid conditions.

"These are relatively common, typically very amenable to oral antibiotics and there are many resources (like the AOA's Clinical Practice Guidelines) that can provide a stepwise approach as to what antibiotic would be best and what options are good when the first-line option is contraindicated," he explains.

Get comfortable with three to five medications that you use routinely and know their side effects, dosages, what to do if the treatment isn't working, and so on, suggests Dr. Autry. "Just get your feet wet and expand as you go. It's really pretty simple given we often are using the same medications over and over." Familiarity will neutralize any anxiety over time.

"Even the ophthalmologists I work with have standard medications they use with standard dosages and standard clinical uses. I saw this as a pharmacist as well across all types of medical practices," Dr. Autry adds. "Everyone gets comfortable with certain medications in certain conditions with changes based on things like pregnancy, allergies and side effect profiles. If they can do it, so can you."

Other tips to help you get comfortable prescribing oral medications include:

- Remember you have the knowledge, education and training to provide these services safely and effectively.
- Take advantage of available educational resources, including CEs, mentors and other learning opportunities.
- Ask for help. Don't hesitate to get a second opinion from a fellow care provider.
- Be patient and integrate new services thoughtfully and strategically. You don't have to do everything at once.

At this point, the OD should outline a clear follow-up schedule and ensure that emergency contact information has been provided to the patient, according to Dr. Steen. It's also important to remember that while there is a standard approach to oral medications that can typically be followed, every patient has a unique history and needs.

"The diagnosis, treatment and management of ocular diseases and disorders is the core of providing primary eyecare and is central to optometry," says Dr. Steen. "There is no 'one size fits all' approach to the management of any individual ocular condition. Timely and appropriate treatment of ocular disorders relies on an individualized approach which starts with an accurate diagnosis and centers on careful consideration of patient, condition and medication-specific features."

## Leading Primary Eyecare

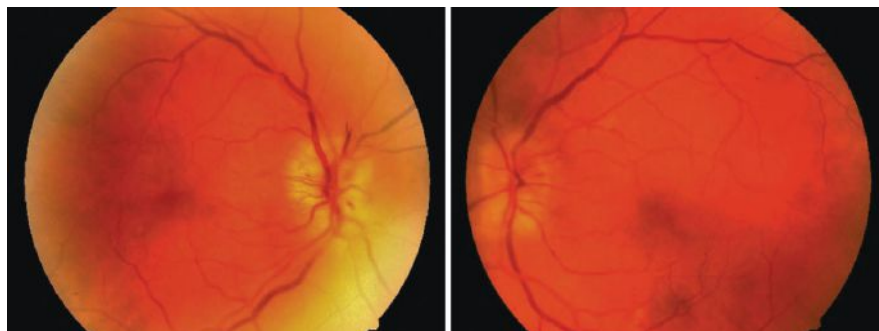
Throughout this scope expansion series, we have explored the critical role optometrists play in a variety of services and procedures, but the common message has been the important position ODs hold as primary eyecare providers. Whether we're talking about

incorporating oral therapies, removing lid lesions, injecting steroids, using lasers or managing glaucoma (the key topics covered in this series), taking advantage of new or existing practice rights is vital to continue growing in your career and to promote the well-being of your patients.

Ongoing legislative wins across the country are making it possible for more and more ODs to practice to the full extent of their expertise and embrace their leading role in eyecare. It's up to every OD—as well as the optometric community as a whole—to meet this challenge head-on.

"If you are not able to meet all of your patients' needs and offer them well-rounded care, they may seek care where they don't feel they are limited," says Dr. Burrell. "Prescribing oral medications places you in the patient's mind as their primary eyecare provider who can take care of not only their refractive needs, but ocular health needs as well."

"With the decreasing number of ophthalmologists and increasing number of patients needing care, optometry has to step up and manage medical conditions that in the past may have gone to someone else," urges Dr. Autry, adding that politicians also have to do their part to expand optometric scope of practice. "Many of our colleagues in optometry have spent their own time, sweat and tears to get us increased scope across the country. Don't let their hard work go to waste by not taking advantage of the expansion in your state." ■



**This patient's anterior ischemic optic neuropathy was effectively resolved with a systemic steroid; however, the patient had diabetes, which worsened secondary to steroid treatment. It's important to be aware of this contraindication for those with this comorbidity.**

Photo: Jason Duncan, OD





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# DECIPHERING CONTACT LENS TERMINOLOGY

Confused by the company lingo used in today's most popular products? Here's a guide to what they mean.

BY LEANNE SPIEGLE  
ASSOCIATE EDITOR

**S**ifting through the dozens of contact lens options available on the market today and choosing the one best suited for each patient can be overwhelming and time-consuming. No matter their refractive error or visual need, for nearly every patient you're likely to find multiple lenses that could fit the bill. How do you determine the right one for each?

To further complicate the matter, contact lens companies often use their own ad hoc terminology—new concepts and phrases that power their marketing message, sometimes at the expense of clarity—to describe the functionality and design features of each lens, making it more difficult to determine what exactly makes the product unique. The lens manufacturers also seem smitten with the word “technology,” often using it as sort of a cherry on top of their marketing terms. The word gets appended to at least 18 different lens design attributes described in this article.

So, it is what it is: the genuinely good science behind these products sometimes takes a backseat to marketing maneuvers that aim for catchiness over clarity.

As their eyecare provider, your patients rely on you to recommend the most appropriate lens that will offer them the most optimal vision correction. To truly be informed on all the options that exist, practitioners have to learn how to decipher the marketing jargon. In this article, we translate the language used by several leading soft contact lens companies into words and concepts that any clinician can comprehend. The goal is to give you a clearer idea of which lenses serve which purpose for your patients.

Note that all product claims discussed below come from company literature and have not been independently verified.

## Johnson & Johnson Vision

Though not the oldest contact lens company—that would be Bausch + Lomb, founded in 1853—or the one that launched the soft lens (B+L again), Johnson & Johnson's consistent use of consumer advertising gives the company and its products a strong foothold in public perceptions of contact lenses, in particular the disposable lens category that it helped establish.

Acuvue by Johnson & Johnson Vision is one popular lens brand that offers vision correction solutions for patients across the whole spectrum of

refractive error. The company carries 15 varieties of soft lenses, most of which are designed and marketed to aid with moisture retention and ocular dryness relief. They offer single-vision, toric and multifocal soft lenses with daily, biweekly or monthly replacement schedules. J&J Vision makes it fairly easy to remember which lenses it manufactures by including the name “Acuvue” in the title of each one. Its sub-brands include Acuvue Oasys, Acuvue Vita, Acuvue Moist and Acuvue TruEye.

Here are some commonly used terms found within the product line.

**Lacreon Technology** (*in: 1-Day Acuvue Moist, 1-Day Acuvue Moist Multifocal, 1-Day Acuvue Moist for Astigmatism, 1-Day Acuvue Define*).

**HydraClear 1** (*only in 1-Day Acuvue TruEye*).

**HydraClear Plus** (*in: Acuvue Oasys, Acuvue Oasys Multifocal with Pupil Optimized Design (which is replacing Acuvue Oasys for Presbyopia), Acuvue Oasys for Astigmatism*).

**HydraLuxe** (*in: Acuvue Oasys 1-Day, Acuvue Oasys 1-Day for Astigmatism*).

**HydraMax** (*in: Acuvue Vita, Acuvue Vita for Astigmatism*).

Each of the innovations listed above serve to improve lens hydration and therefore patient comfort. Every one

of these lenses features a formula that permanently embeds long-chain polyvinylpyrrolidone (PVP), a wetting agent, throughout the lens matrix. This mechanical design is what J&J Vision means by the phrase “Lacreon technology,” which was first introduced by the company in 2010 and since has evolved into other versions, including “HydraClear,” “HydraLuxe” and “HydraMax.” Its purpose is to mimic the mucin layer of the tear film and help to keep it stable. PVP is also amphiphilic, which means it has both hydrophilic (water-loving) and lipophilic (lipid-loving) structures and properties.

There are a few specific design aspects of the lens that differentiate each of these terms from the others, however. For example, HydraClear Plus contains a higher content of PVP than HydraClear 1, and HydraMax contains the highest level of PVP out of the three, which means that it offers the most lens moisture. Acuvue lenses with HydraClear Plus are made of senofilcon A, while the company’s “TruEye” lenses with HydraClear 1 have a narafilcon A material. Lenses made with HydraMax use senofilcon C.

While contact lenses may cause some patients discomfort and irritation to the ocular surface from disruption of the tear film, incorporating a wetting agent into the lens—such as the high-molecular-weight PVP used in each of these formulations—can assist in relieving symptoms of ocular dryness from contact lens wear. Additionally, internal wetting agents help solve the issue of saline solution drying up by the end of the day, which sometimes leads to frequent eye drop use. Most contact lenses on today’s market include some version of a wetting agent.

PVP is well studied and proven to be an effective and common treatment for dry eye, which suggests that lenses made with this ingredient might be beneficial for patients who suffer from symptoms of dry eye or dry eye disease.<sup>1</sup>

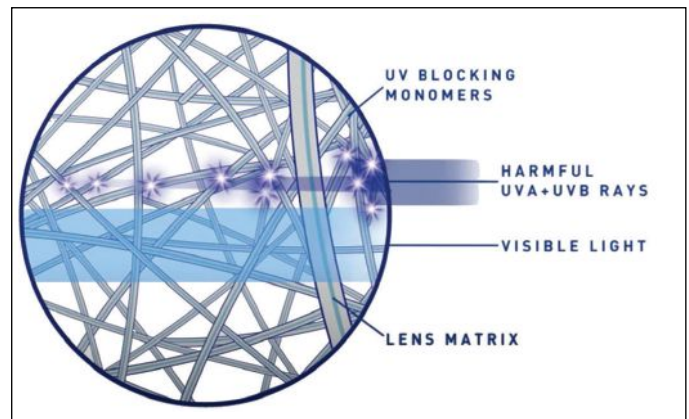
**Transitions Light Intelligent Technology** (only in Acuvue Oasys with Transitions). These lenses are photochromic, mean-

ing they automatically darken via a chemical reaction when exposed to UV light, and were developed in partnership with Transitions Optical, the ophthalmic lens company that popularized this concept in glasses.

J&J says that “Transitions light intelligent technology” enables the company’s Oasys with Transitions contact lenses to change from clear to dark in less than a minute. The specific design also enables lenses to fade back to clear in about 90 seconds when taken out of bright light.<sup>2</sup> The company claims that this mechanism is able to work while still allowing the lenses to block out 100% of UVB rays.

One thing that several studies observed that may be important to note is the influence of temperature on the performance of these contact lenses. A study from 2021 that looked at the spectral transmittance of photochromic lenses reported that, “Temperature appears to influence both the activation and deactivation of photochromic contact lenses such that the higher the temperature, the greater the light transmission.”<sup>3</sup> You may want to caution patients about this effect in case they do spend time in environments with extreme temperature fluctuations.

Aside from this consideration, photochromic lenses overall have demonstrated efficacy over spectacles or clear lenses in a handful of studies in easing visual transition in changing light conditions. Contact lens wearers who are more sensitive to indoor or outdoor light or find themselves squinting often to alleviate light intensity may benefit from photochromic lenses. Another attribute that sets Acuvue’s photochromic lenses apart the high level of UV protection, which surpasses that offered by most other lenses on the market.



**J&J Vision touts the high level of UV blocking found in its products.**

An important disclaimer to make is that UV-absorbing contact lenses are not substitutes for protective UV absorbing eyewear, such as UV absorbing goggles or sunglasses, because they do not completely cover the eye and surrounding area. The patient should be advised to continue using UV absorbing eyewear as directed.

## Alcon

Like J&J, Alcon also offers soft lenses that correct myopia, hyperopia, presbyopia or astigmatism, with 14 different lens options. The lenses are replaced either daily or monthly. Alcon’s portfolio contains a variety of product lines, each manufactured with a unique lens polymer, including Dailies Total30, Dailies Total1, Precision1, Dailies AquaComfort Plus and Air Optix. Let’s decipher some of the company lingo.

**AquaComfort Technology (Blink-activated Moisture)** (in: Dailies AquaComfort Plus, Dailies AquaComfort Plus Toric and Dailies AquaComfort Plus Multifocal). As the name suggests, “blink-activated moisture” means that the lens is designed to release polyvinyl alcohol (PVA), a water soluble synthetic polymer. The material of all AquaComfort Plus lenses is primarily composed of crosslinked PVA, with non-crosslinked PVA floating in the lens matrix. When the patient blinks, the lens releases non-crosslinked PVA, thereby bolstering tear film stability and continuously hydrating the ocular surface. This agent has been used as an eye lubricant for



decades and, like PVP, could help address patient complaints of moisture loss in their eyes or lenses after several hours of wear.

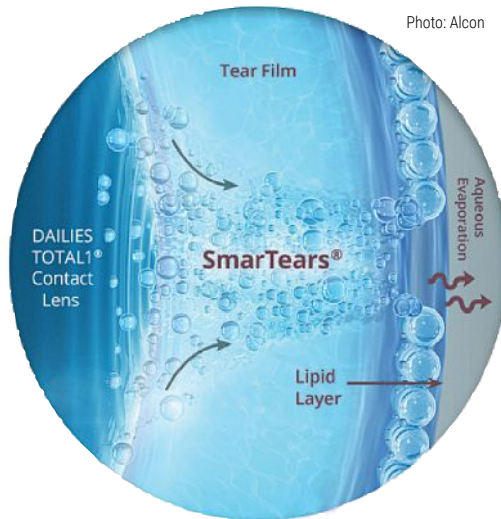
**HydraGlyde Moisture Matrix** (in: *Air Optix Plus HydraGlyde*, *Air Optix Plus HydraGlyde for Multifocal*, *Air Optix Plus HydraGlyde for Astigmatism*). Another lens feature made to help with long-lasting lens hydration, this formula by Alcon is a block copolymer (polyoxyethylene-polyoxybutylene) that embeds itself on and within the lens surface. It works to attract and retain moisture, creating a hydrophilic barrier between the lens and the eye.<sup>4</sup> Like other wetting agents, this could reduce contact lens discomfort caused by mechanical friction of the lens that some patients experience.

The “HydraGlyde moisture matrix” is also featured in OptiFree PureMoist Multi-purpose Disinfecting Solution and Clear Care Plus with HydraGlyde.

**SmartShield Technology** (in: *all monthly replacement lenses*).

**SmartSurface Technology** (in: *all Precision1 daily replacement lenses*). The purpose of these two features, according to Alcon, is to form a permanent protective shield around the outer lens surface to help protect it from lipid deposits and to ensure a smooth wetting surface as a hedge against dryness. The micro-thin layer (approximately 2µm to 3µm thick) is made up of more than 80% water and is designed to help reduce the number of silicon atoms exposed to the lens surface while aiming to keep it hydrated. “SmartShield” and “SmartSurface” work through similar mechanisms, except the former is designed for monthly lenses while the latter is made for daily lenses. These may be viable options for patients who complain of bothersome deposit build-up or inadequate lens moisture.

**SmarTears Technology** (*Dailies Total1*, *Dailies Total1 Multifocal*, *Dailies Total1 for Astigmatism*). This mechanism allows for lenses to release phosphatidylcholine (PC)—a phospholipid found naturally in tears and in all cells



**Alcon’s “SmarTears technology” allows for the continuous release of the wetting agent phosphatidylcholine into the tear film.**

in the body—as needed into the tear film to promote all-day moisture and a stabilized lipid layer. It’s designed specially for lens wearers who struggle with dry eye and is currently featured exclusively in the Dailies Total1 line of disposable lenses, where it works in conjunction with the next lens attribute on our list.

**Water Gradient Technology** (in: *Dailies Total1 and Total30 lenses*). Alcon made quite a splash (excuse the pun) when it debuted this lens design concept with the launch of the original Dailies Total1 lens in 2015. The lens core is 33% water to ensure high oxygen permeability and the water content gradually increases to nearly 100% at the lens surface to aid in moisture retention and comfort. It’s used throughout the DT1 line and also in the newer Total30 lens (where the core is 55% water rather

than 33%). One study on the performance of the “water gradient” found that it was able to improve tear film dynamics and alleviate pathological break-up pattern.<sup>5</sup>

**Celligent Technology** (in: *Total30*). This is a term Alcon uses for a gel-like surface coating on the Total30 that helps the water gradient stay active for up to 30 days. It is meant to mimic the glycocalyx of the ocular surface, Alcon says, improving surface hydrophilicity and reducing the coefficient of friction.

**Precision Profile Design** (in: *Dailies Total1 Multifocal Contact Lenses*, *Air Optix Aqua Multifocal Contact Lenses*). Featured in all of Alcon’s multifocal lens options, “precision profile design” is geared toward patients with presbyopia looking for better-quality vision across every distance range. This lens design includes the following three features that work together to deliver more seamless transitions from near to intermediate to distance vision:

- A bi-aspheric surface
- An adaptive minus power profile
- A center-near design

## SCLERAL DESIGNS GET IN ON THE ACT

Though marketing-friendly language is mostly confined to the soft contact lens market, the resurgence of interest in sclerals is bringing a little gloss to this category, too. The following two terms are functional features of Zenlens scleral lenses: *SmartCurve Technology* and *MicroVault Technology*.

Finding the perfect scleral lens fit for every patient’s unique cornea sometimes proves to be challenging. The objective behind the “smartcurve” feature in B+L’s Zenlens scleral lenses is to allow for a wide range of patients to receive a better-fitted lens through individually customizable parameters. The company claims that smartcurve is able to automatically adjust design attributes when a lens parameter is modified to ensure the patient receives a predictable fit. For example, if you increase the limbal clearance, B+L says that the other lens parameters (base curve and sagittal height) will automatically adjust.

Another design aspect of Zenlens scleral lenses is what the company calls “microvault technology,” which creates a flute to help the lens to fit around a pinguecula. It can be applied to any lens design that has stabilization and works by contouring obstructions, such as pingueculae, to help provide patients with a more comfortable fit. In some scleral lens wearers with irregular corneas, the mechanism of the microvault feature may remove the need for the physician to notch out an area of the lens in order to achieve the proper fit.



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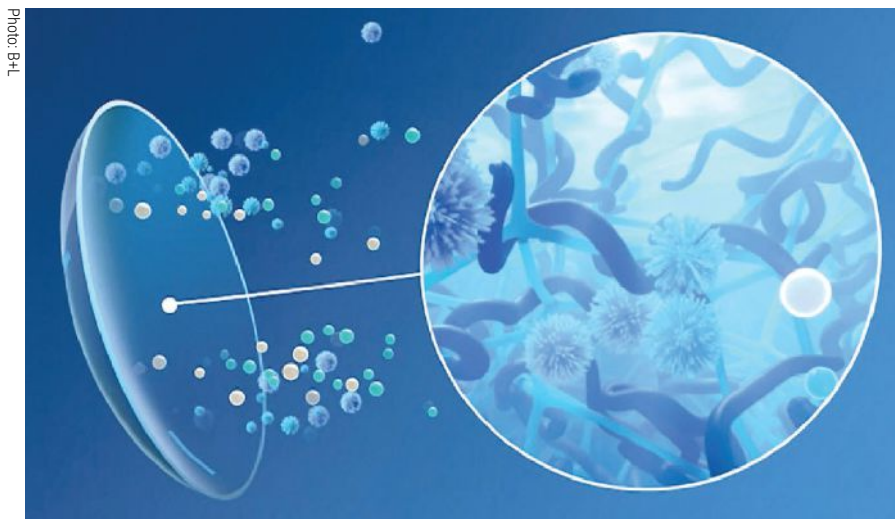
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**B+L lenses with “ProBalance technology” feature a combination of several moisturizers that work together to help the tear film maintain its homeostasis during lens wear.**

The double-aspheric lens design creates irregular curvature on both the front and back surfaces, making the lens thinner and more lightweight. This lens type is commonly used for patients with high prescriptions, as it helps improve vision quality and contrast through the reduced thickness of the lens center and edges. The adaptive minus power profile is made to minimize aberrations by enabling a smoother progression of power gradients from center-near to intermediate and distance. Finally, the center-near design tries to mimic the natural dilation and constriction of the pupil to help optimize the visual range.

### Bausch + Lomb

This pioneer in refractive correction launched the first soft contact lens—the aptly named Soflens—just over 50 years ago and made great strides in establishing the market for such a product in its fledgling years.

Bausch + Lomb offers all the same soft lens types as Alcon and J&J (spherical, toric and multifocal), although it’s also one of two major contact lens manufacturers—the other being CooperVision—that offer a toric multifocal lens (B+L Ultra Multifocal for Astigmatism). Lenses are available with daily or monthly replacement schedules and the company currently has nine lens options available. The

lenses are marketed under several sub-brands, including Infuse, Soflens, Biotrue Oneday, Ultra and PureVision. The venerable Soflens products—the ones that started it all back in 1971—are likely to be discontinued later this year.

Here are some of the terms the company uses to describe its lenses.

**ProBalance Technology** (*only in Infuse Daily Contact Lenses*). Inspired by findings in the Tear Film and Ocular Surface Society’s DEWS II report, B+L’s “ProBalance technology” uses a combination of ingredients including moisturizers that are infused into the lens and work to help maintain ocular surface homeostasis and reduce contact lens dryness. Here’s what makes up the formula:

- Erythritol and glycerin. These are osmoprotectants to help combat hyperosmotic stress.
- Potassium, an electrolyte to promote ocular homeostasis.
- Poloxamine 1107 and poloxamer 181, moisturizers that help the lens retain hydration and maintain tear proteins.

The “balance” in “ProBalance” hints at the formula’s purpose to minimize changes in ocular surface homeostasis that occur naturally throughout a day of lens wear. B+L claims the formula “balances” moisture, modulus and breathability in its Infuse daily lenses.

**MoistureSeal Technology** (*in: B+L Ultra, Ultra for Astigmatism, Ultra Multifocal for Astigmatism and Ultra for Presbyopia*). This mechanism aims to do exactly what its name implies: lock in moisture for up to 16 hours. “MoistureSeal” involves a two-phase polymerization process to optimize oxygen transmissibility and moisture retention:

- Phase 1: Creates a silicone backbone made of one long- and two short-chain monomers with a modulus of 70.
- Phase 2: PVP is integrated into the matrix. The molecular building blocks of PVP—the same wetting agent used in most Acuvue lenses—grow and surround the silicone backbone to attract moisture throughout the lens matrix.

B+L says that the design feature can help lenses maintain up to 95% of their moisture from morning to night. Patients who have tried other contact lenses and report that they became less comfortable by the end of the day might benefit from the long-lasting hydration that the company claims this polymerization process will provide.

**Dual Elliptical Stabilization** (*in: Revive custom toric, NovaKone custom lenses for keratoconus, Astera multifocal toric*). B+L acquired the company Alden Optical back in 2016, which introduced this lens feature to a handful of B+L’s toric and custom lenses for patients with astigmatism or keratoconus. “Dual elliptical stabilization” describes a process for ballasting meant to assist with lens orientation and rotational stability. More weight (extra material) is added to the lens around the three o’clock and nine o’clock positions, which is meant to help the lenses maintain the proper position and alignment of the axes as the person blinks.

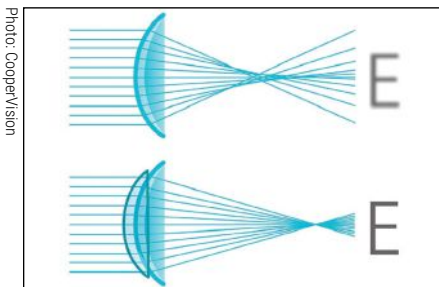
### CooperVision

Though lately celebrated for having the only FDA approved lens for myopia control (the MiSight), CooperVision has a diverse portfolio that includes 14 soft lens varieties, and, like B+L, offers the entire array of soft lens types: single vision, toric, multifocal and toric multifo-



cal. Replacement schedules are either daily, biweekly or monthly. The lens sub-brands include MyDay, Clariti, Biofinity, Avaira Vitality and MiSight. Let's unpack the terminology about the unique features of each.

**Aberration Neutralizing System** (in: *MyDay daily disposable, Biofinity, Biomedics 55 premier, Avaira Vitality*). This design feature aims to reduce bothersome spherical aberrations that can contribute to lower quality vision in some single-vision contact lens wearers. It's incorporated into all of CooperVision's spherical lenses and is meant to help patients see clearer in both dark and bright light. The "aberration neutralizing system" works by converging light rays as they hit the lens to produce a single point of focus that can help sharpen vision. This may be helpful to lens wearers who frequently complain of blurry vision, especially in low-light conditions or while driving at night.



The "aberration neutralizing system" used in some of CooperVision's spherical lenses converges light rays to produce a single point of focus, as illustrated here.

**ActivControl Technology** (only in *MiSight 1 day*). CooperVision credits the ability of MiSight 1 day lenses to slow myopia progression in children to what it calls "ActivControl technology." The lens features a dual-focus concentric ring multifocal design that combines several alternating distance correction and treatment zones to provide not only good vision but also signal to the eye to slow its growth.

Currently, these are the only daily disposable soft contact lenses on the market with an FDA indication for myopia control and that use a concentric-ring design for reducing axial length elongation in children.

Photo: CooperVision



"Aquaform technology" links hydrogen bonds to hydrophilic molecules to help certain CooperVision lenses maintain a higher water content.

**Aquaform Technology** (in: *MyDay daily disposable, MyDay daily disposable toric, Biofinity, Biofinity Energys, Biofinity toric, Biofinity multifocal, Biofinity toric multifocal*). The main intention of "Aquaform" is to offer lens wearers a higher level of oxygen permeability than many others on the market, according to the manufacturer. CooperVision also claims that this specific design helps keep eyes hydrated with a material that's made up of nearly 50% water. The lens is made up of a hydrophilic silicone hydrogel material that links hydrogen bonds to hydrophilic molecules to retain its high water content. For patients who don't blink as often as they should—which is the case for most lens wearers in this digital age—lenses containing a higher water content may help to improve the comfort of wear by keeping eyes and lenses moist.

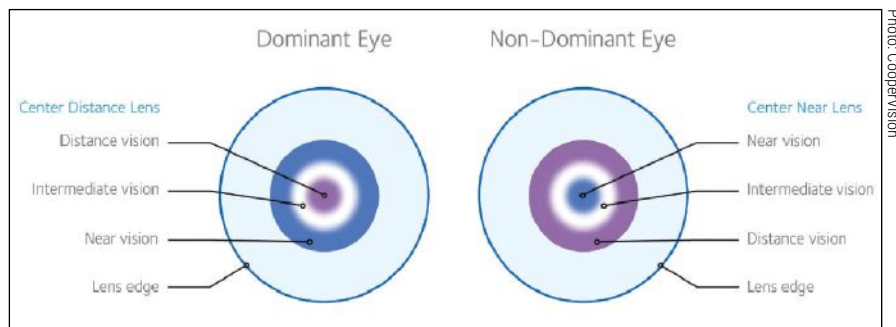
**Balanced Progressive Technology** (in: *Biofinity multifocal, Biofinity toric multifocal, Proclear multifocal, Proclear multifocal toric*).

**Binocular Progressive System** (in: *MyDay Multifocal*). Featured in most of CooperVision's multifocals, "balanced progressive technology" gives each soft lens multiple vision-correction zones for near, intermediate and distance vision. What sets these lenses apart from some others that correct presbyopia is their ability to be tailored to each patient's prescription. Doctors can choose a center-distance or center-near design based on the sphere and, for many patients, add the appropriate power needs.

The company's "binocular progressive system" serves a similar function but is exclusive to MyDay multifocal lenses. These lenses also don't offer as much customization as those that include the balanced progressive feature. Instead, MyDay multifocal lenses come in a set list of power variations for different levels of presbyopia.

**Digital Zone Optics** (only in *Biofinity Energys*). This design aims to help lens wearers combat eye strain from digital device use by easing stress on ciliary muscles. It claims to accomplish this through the multiple aspheric curves on the front surface of the lens—the "digital zone"—that are meant to distribute power more evenly, with most of the positive power in the center of the lens. Patients who use or work with screens often and complain that their eyes feel tired frequently may benefit from a lens designed to reduce accommodative burden, the company asserts.

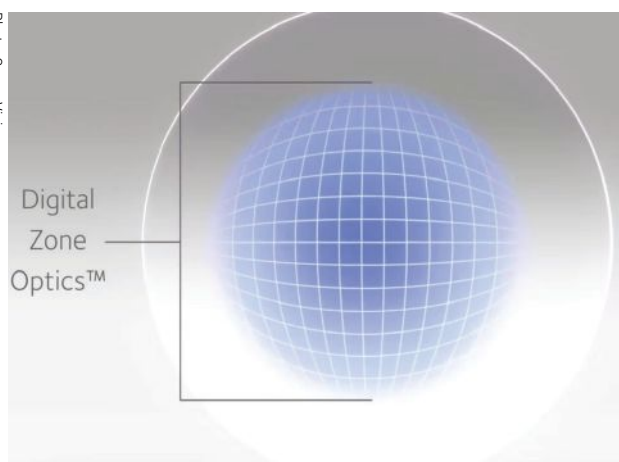
**Optimized Toric Lens Geometry** (in: *Avaira Vitality toric, Biofinity toric, Biofinity toric multifocal, MyDay daily disposable toric*). These toric lenses include a set of



This image shows the multiple vision correction zones featured in some of CooperVision's multifocal and multifocal toric lenses, aiming to provide patients with clearer near, intermediate and distance vision.

Photo: CooperVision

Photo: CooperVision



**Biofinity Energys lenses from CooperVision use “digital zone optics” to mitigate effects of digital screen use through multiple front-surface aspheric curves that work to reduce accommodative burden.**

features intended to keep the lens from moving, while also promoting clearer vision, a design approach that the developers describe as “optimized toric lens geometry.” The three features include:

- A curved back surface that allows the lens to “hug” the surface of the eye and maintain its position.
- A large toric optic zone that helps with vision performance.
- Uniform lens thicknesses in each horizontal cross-section that is meant to help improve vision clarity. In general, this means that the thickness of each cross-section doesn’t vary by greater than 10%.

Astigmats who have difficulty getting contact lenses to stay in place through-

out the day or find that the lens stability is challenged by frequent blinking may be interested in a toric lens that uses a stabilization technique. CooperVision also has a toric stabilization method (“Blink Stabilized”), as does Alcon (“Precision Balance 8|4”).

**PC Technology** (in: *Proclear, Proclear 1 day, Proclear 1 day multifocal, Proclear toric, Proclear multifocal, Proclear multifocal*

*toric*). The wetting agent featured in CooperVision’s “PC technology” is phosphorylcholine, which isn’t found naturally in the tear film. Like phosphatidylcholine (the agent in Alcon’s “SmarTears” discussed earlier, which is naturally found in the tear film), phosphorylcholine is a moisture-loving polymer that, when integrated into contact lenses, works to promote continuous hydration of the lens and tear film. The two molecules do share certain characteristics; they’re both moisture-loving and, when integrated into contact lenses, work to promote continuous hydration of the lens and tear film.

In every Proclear lens offered by CooperVision, the compound works by attracting water molecules in tears,

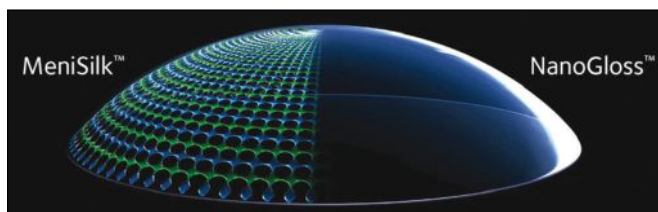
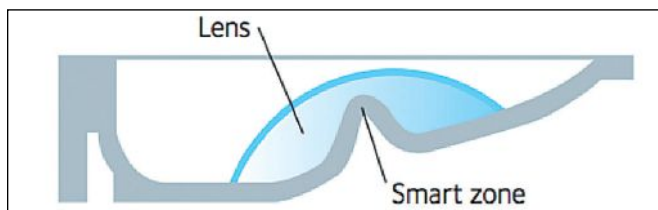
which then bind to the lens surface. The company claims that this line of lenses maintains 96% of their original water content after 12 hours of wear.

There’s no clear answer to the question of which wetting agent provides superior lens hydration; as they say, different strokes for different folks. Just know that if you see “phosphatidylcholine,” “phosphorylcholine” or “PC” on contact lens ads or packaging, it means they aim to provide moisture retention and enhance the comfort of wear.

**WetLoc Technology** (in: *Clariti 1-day, Clariti 1-day toric, Clariti 1-day multifocal*). Another feature that prides itself on providing long-lasting hydration, the Clariti line of lenses is made with what Cooper calls “WetLoc technology,” meaning the silicone hydrogel material of the lens is designed with evenly dispersed moisture molecules intended to lock in moisture (as the name suggests) and resist dehydration. The absolute moisture retention of these lenses is among the highest on the market at 98.8% (relative moisture retention: 97.8%), according to CooperVision.

## Menicon

This Japan-based company has a somewhat narrower product line than most others in the soft lens market. Each of Menicon’s soft lenses is marketed under the name “Miru,” which means “to see” in Japanese. The company offers spherical, toric and multifocal lenses that are replaced daily or monthly.



Photos: Menicon

**Menicon’s Miru lenses are packaged facing downward, a feature the company markets as “smart touch technology.” This helps the patient insert the lens without touching its inner surface, aiming to reduce the risk of infection. The lenses themselves use a polymerization process that allows ultra high Dk/t (Menicon calls it MeniSilk) and a coating called NanoGloss for bacterial resistance and wettability.**

**Smart Touch Technology** (in: *Miru 1day UpSide*, *Miru 1day UpSide multifocal*, *Miru 1day Menicon Flat Pack*, *Miru 1day Menicon Flat Pack toric*, *Miru 1day Menicon Flat Pack multifocal*). Poor contact lens handling is a common issue among lens wearers of all ages and contributes to the incidence of infection and general ocular discomfort. In an attempt to provide a better solution than simply urging patients to be more careful with handwashing, Menicon designed special lens packaging to help address the issue. Formerly, all Miru 1day flat-pack lenses were packaged with “smart touch technology” made to promote germ-free handling.

With the recent launch of Miru UpSide lenses in 2021, the company had to redesign the packaging, which now features what Menicon calls a “smart zone”—a raised area in the packaging that allows for easier grasping with the fingers during product removal from the blister pack. The lenses are also packaged with the outer surface facing up so that the wearer can avoid touch-

ing the inner surface of the lens. The company claims that this helps reduce the risk of infection by discouraging fibers, bacteria and other microbes and contaminants on patients’ hands from coming in contact with the inner lens and being transferred onto the eye.

**MeniSilk Air and NanoGloss Pro** (in: *Miru 1day UpSide*, *Miru 1day UpSide multifocal*, *Miru 1month Menicon*, *Menicon Premio*, *Menicon Premio toric*). These two terms are used to describe the design characteristics of the material for Menicon’s entire line of lenses. They’re all made with a hydrophilic monomer and silicone polymerization that help them provide high oxygen permeability, a hydrating lens surface and optimized transparency. The surface of the lenses is also bacteria-resistant to help fight contamination and risk of infection.

### Word Games

George Bernard Shaw once said, wryly, that America and England are “two countries separated by a common language,” as word choice and meaning

within each culture can be quite different despite drawing from the same source. It sometimes feels the same way when optometrists attempt to read product literature from manufacturers. Learning how to decipher company descriptions can help you make better, more informed recommendations for your patients to increase the chance of a positive visual outcome for patients, and in turn, increases their satisfaction with your care. ■

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Rick Bay served as the publisher of *The Review Group* for more than 20 years. To those who worked for him, he was a leader whose essence was based in a fierce and boundless loyalty.

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# WHICH FACTORS MATTER IN CONTACT LENS SELECTION?

Let's walk through the decision-making process for a new fit.



BY JENNIFER S. HARTHAN, OD,  
AND MICHELLE K. MAN, OD  
CHICAGO

**W**ith the multitude of soft contact lens technologies and options available to our patients, how do you choose which contact lens to prescribe for a new wearer? While many patients may seek out contact lenses to eliminate their need or reduce their dependency on glasses, there are several important factors to consider, improving their success with these medical devices. Contact lens materials, optics and replacement schedules are important considerations to enhance patient comfort, ocular health, vision and ultimately lens retention for new wearers.

## Where to Start?

Like many ocular conditions, prescribing contact lenses begins with a good case history. Getting to know your patients' lifestyle, visual demands, occupation and hobbies are all vital in recommending appropriate contact lens wear and replacement

schedules. For example, someone who has the goal of being glasses-free on the weekends might be better suited with a daily disposable lens as opposed to someone who prefers to wear contact lenses every day, who may do well with daily, biweekly or monthly replacement schedules.

Although many practitioners tend to steer away from recommending overnight wear, some occupational demands might warrant flexible or extended wear, such as for firefighters or on-call medical professionals. Selecting an approved contact lens for extended wear and educating patients on proper lens wear, care and follow-up are essential.

Ocular and systemic health are also important aspects of case history to investigate. There are contact lens replacement schedules and material considerations for patients with ocular allergies and dry eye disease. Systemic medications can exacerbate some of these ocular conditions as well. For many of these patients, daily replacement of contact lenses may be beneficial to optimize ocular health and comfort.

Setting realistic expectations for vision correction is also important prior to contact lens fitting, particularly for presbyopes. Determining the type of vision correction patients prefer (distance only with reading glasses, monovision correction, multifocal contact lenses) up front can save a lot of chair time and help with initial lens selection. Every patient at each visit requires repeated step-by-step care and handling instructions including how their underlying or associated ocular and systemic conditions may impact their contact lens wear schedule.

## Cornea Shape and Pupil Size

The patient's refractive error and corneal/scleral shape will often guide initial lens selection. Corneal and scleral shape can be measured using corneal tomography and corneoscleral profilometry. There are several profilometers available, and depending on the instrument used, scleral data points up to 22mm onto the sclera with up to 10 $\mu$ m of accuracy can be measured. This technology is beneficial to help design gas permeable (GP), hybrid, scleral, orthokeratology and custom soft

### About the authors

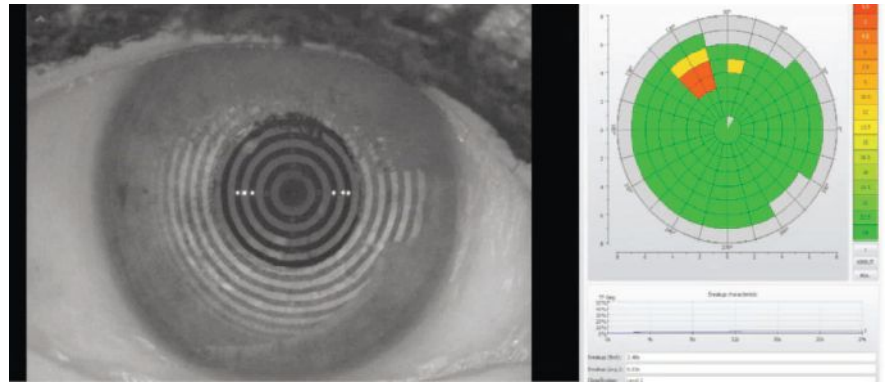
**Dr. Harthan** is a professor at the Illinois College of Optometry and chief of the Cornea Center for Clinical Excellence at the Illinois Eye Institute. She has received fees from Allergan, Essilor, Euclid, the International Keratoconus Academy, Kala, Metro Optics and SynergEyes. **Dr. Man** is an assistant professor at the Illinois College of Optometry and specialty care educational coordinator at the Illinois Eye Institute. She has no financial disclosures. Both are Fellows of the American Academy of Optometry and Scleral Lens Society.

lenses. By further understanding the scleral asymmetry, a best-fit lens can be designed to fit the contour of the ocular surface more precisely.<sup>1</sup> Higher refractive errors,  $>\pm 4.00\text{D}$ , should be vertexed back to the corneal plane, and initial power should be selected and troubleshooted based on the fitting guide, especially for multifocal lens designs. Determining the dominant eye and near add power are important when fitting contact lenses for patients with presbyopia.

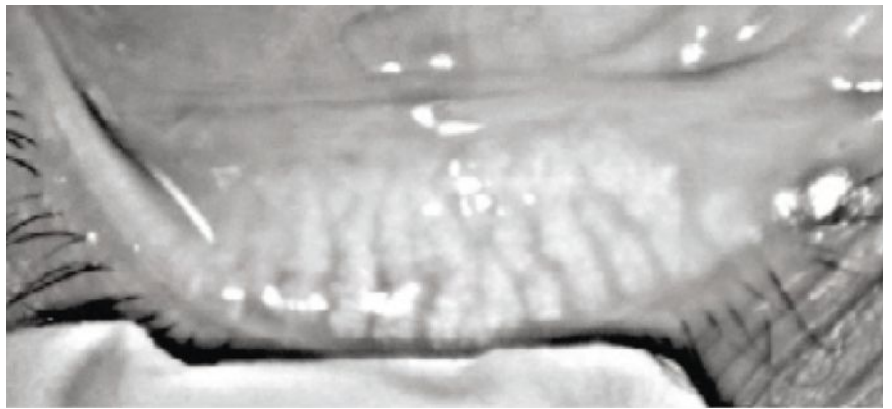
Pupil size also plays an important role when fitting multifocal lenses. Many soft and specialty multifocal lenses use the concept of simultaneous vision, with concentric aspheric rings of distance, intermediate and near focus to allow for acceptable range of vision. They may use distance center or near center designs. In order for the multifocal lens to sufficiently achieve the power distribution needed to meet the visual demands of the patient, the pupil must be large enough (between 3mm and 5mm depending on the add power for soft lenses) to cover these multiple zones.<sup>2</sup> However, if the pupil is too large (5mm), patients may experience light distortion.<sup>3</sup>

If the patient's vision is not sufficient with a simultaneous vision design, an extended depth-of-focus design, a translating GP multifocal or a specialty lens with the ability to change the multifocal zone size may be a better fit. Some custom lenses are also available with decentered optics to better align the optical center with the pupil center.

Corneal curvature may be measured with a keratometer, and pupil size and horizontal visible iris diameter (HVID) may be measured via various methods (manual vs. automated). Many practitioners use topographers, tomographers and even profilometers to help determine several factors that are beneficial when selecting a contact lens design: regular vs. irregular astigmatism, pupil size, HVID, keratometry (K) readings, eccentricity, apical centration, scleral toricity and topography and sagittal height.



**Fig. 1.** Noninvasive tear breakup time as measured by the Oculus Keratograph. This patient's first time measured at 2.48 seconds with an average of 6.83 seconds.



**Fig. 2.** Meibography of the right lower meibomian glands showing atrophy, dilation and truncation of the glands.

A cornea that is smaller or larger than average (average HVID is about 11.8mm and ranges from 11.6mm to 12.0mm), flatter ( $<42.00\text{D}$ ) or steeper ( $>47.00\text{D}$ ) than average or has more corneal astigmatism and/or scleral toricity may do better with specialty contact lens designs to improve lens centration and patient comfort.<sup>4</sup> Scleral asymmetry increases as you move away from the limbus. The nasal quadrant of the sclera is flatter than the temporal quadrant, and the sclera has a tangent profile.<sup>5,6</sup> Patients who have conjunctival irregularities (*e.g.*, pinguecula, cysts) may need specialty lenses to help improve vision, comfort and centration.

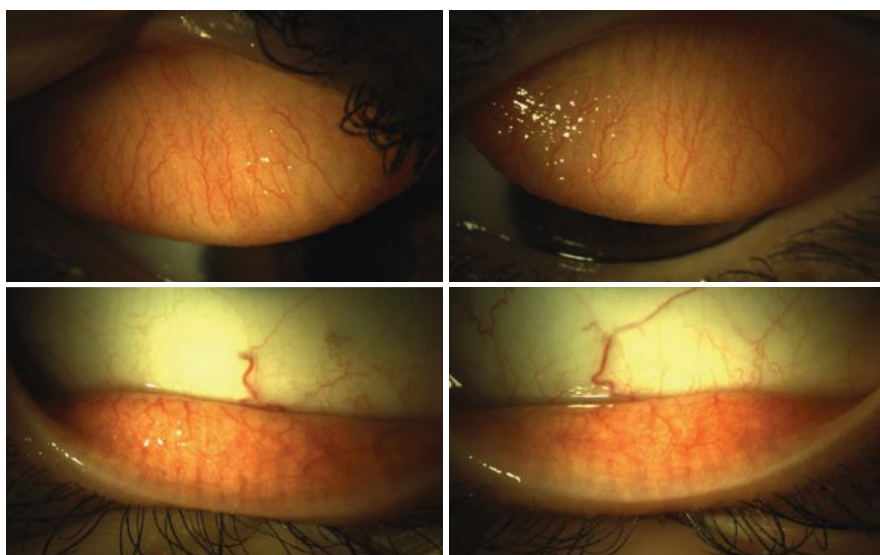
### Picking Base Curves

Many readily manufactured "boxed" soft contact lenses are only available in one diameter and one or two base curve (BC) parameters. The flexibility of soft lens materials allows them to be fit on many patients with a variety

of corneal measurements (almost one-size-fits-all), but if there is a choice between BCs, flatter K readings will do well with a flatter BC, and steeper K readings will do well with a steeper BC. However, if the lens is well-centered, provides full coverage over the limbus and moves an appropriate amount to allow tear film exchange for optimal corneal health, most patients will do well in the limited diameter and BC choices of each company.

If the lens is fitting tight or loose, a flatter or steeper BC, respectively, within the same lens brand and design can be trialed if available. Changing diameter or BC between different brands, or between lens designs within the same brand, may not change the fit in a predictable fashion due to variations in material, water content and modulus.

Another approach to lens selection, rather than considering corneal curvature to pick an initial BC, is to evaluate



**Fig. 3. Eversion of the upper and lower eyelids reveals mild papillae of the palpebral conjunctiva in each eye.**

sagittal depth data to select a lower or higher sagittal height lens that may better match the corneal shape to result in an acceptable fit. Not all soft lenses perform the same way on the eye due to their sagittal depth. When you increase the diameter of the lens, you also increase the overall sagittal depth of the lens.<sup>7</sup> Increasing the sagittal depth of the lens also reduces lens movement and may help improve overall comfort.<sup>7</sup>

In a recent study, 44 lens designs of different daily disposable, two-week replacement, four-week replacement and toric lenses were evaluated for contact lens sagittal height and ranged from 3,372 $\mu$ m to 4,157 $\mu$ m.<sup>8</sup> This shows that selecting or changing lenses based on BC alone may not be most appropriate as sagittal height varies between lenses and can have an impact on lens fit.

### Impact of Dry Eye

Ocular surface disease, specifically dry eye disease, is one of the leading causes of contact lens dropout. Performing a thorough slit lamp examination and dry eye evaluation may prevent future contact lens dropouts by addressing ocular health issues prior to lens fitting. Paying close attention to the eyelids, lashes and tear film can facilitate more successful contact lens wear. Inflammation from conditions such as blepharitis and meibomian gland dysfunction should

be managed prior to fitting contact lenses. Upper and lower lid eversion is beneficial to rule out papillary reactions and lid wiper epitheliopathy that may lead to contact lens intolerance.

Examination of the cornea for scarring, neovascularization and active inflammation can provide insight into previous lens wear habits and ocular surface conditions, as well as guide lens material selection and patient education to maximize compliance. When evaluating for dry eye disease, instruments that measure noninvasive tear breakup time, tear meniscus height, conjunctival hyperemia and meibomian gland atrophy may be helpful (*Figures 1 and 2*).

Use sodium fluorescein to assess corneal staining and evaluate invasive tear breakup time. However, some practitioners prefer to not use sodium fluorescein during the contact lens fitting visit to prevent staining the soft contact lens yellow.

Once the ocular surface condition is stabilized, these patients will benefit from daily disposable lenses. In some cases, hydrogel lenses can provide increased comfort for patients with ocular surface disease due to higher water content. Also, there are silicone hydrogel lenses that have a water gradient to improve the tear film interaction with the contact lens surface.

### Materials

This important factor enhances patient comfort and maintains ocular health. Material properties to be considered include sufficient oxygen transmission, good wettability and resistance to deposits. Each material has its advantages and disadvantages and should be carefully selected based on the patient's needs. Hydrogel contact lenses traditionally contain high water content, allowing oxygen to pass through the lens and are often a good option for patients with dry eye disease. However, these lenses tend to attract more protein deposits.<sup>9</sup> Secondary to this, hydrogel lenses should be replaced more frequently and digitally rubbed with cleaner more regularly.

Contact lenses made from silicone hydrogel (SiHy) materials allow more oxygen to reach the cornea compared with regular hydrogel lenses. These lenses are great for patients who need extended wear replacement schedules. SiHy lenses are often easier to handle for new wearers during application and removal training as they are slightly firmer compared with hydrogels. SiHy contact lenses tend to attract more lipid deposits and have decreased wetting compared with hydrogel lenses. Subsequently, many manufacturers have added various wetting agents to SiHy lenses to keep the lenses more comfortable for longer periods of time.<sup>10</sup>

### Case 1: Allergies

A 17-year-old male presented with complaints of decreased vision at distance, problems seeing the board at school and driving. His medical history was remarkable for allergies, and he took over-the-counter antihistamines when needed. He reported mucus discharge for the past two weeks. He had worn contact lenses in the past but discontinued them due to discomfort. His goal was to wear contact lenses again.

We've all had patients like this present to our offices. Secondary to his complaints, eversion of his eyelids would be important to monitor for a papillary reaction, and he would be a



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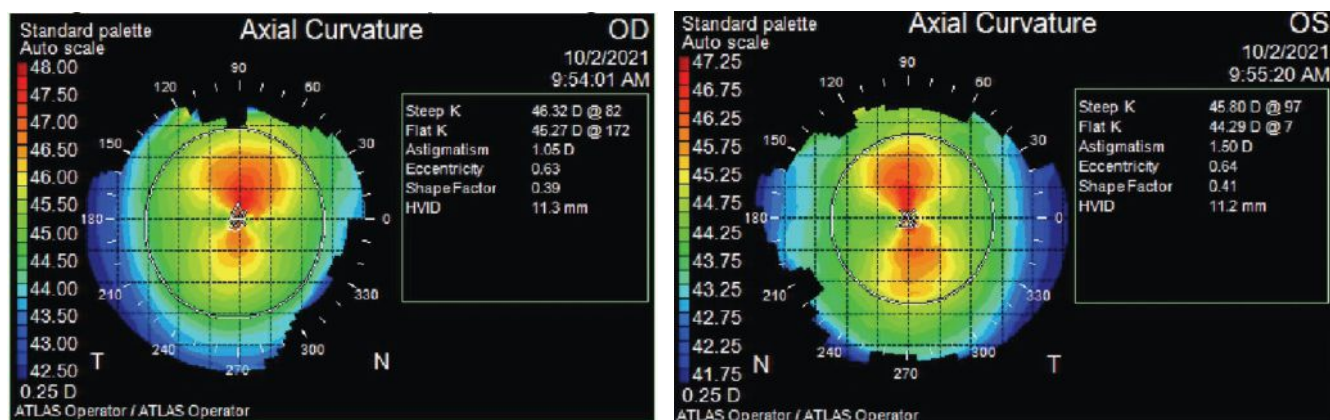
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**Fig. 4. Zeiss Atlas axial topography maps of both eyes show smaller-than-average HVID measurements and steeper-than-average K readings.**

great candidate for daily disposable contact lenses (*Figure 3*).

### Case 2: Small HVID

A 22-year-old female presented with the goal of being less dependent on glasses and was motivated to wear contact lenses daily. She denied any systemic or ocular conditions, including no symptoms of dryness or allergies. Her slit lamp examination was unremarkable. She had a moderate compound myopic astigmatism refractive error OU.

She trialed several soft toric contact lenses in different brands, materials and diameters (ranging from 14.3mm to 14.5mm) that did not result in acceptable comfort or fit. Looking at her smaller-than-average HVIDs (11.3mm OD, 11.2mm OS) and steeper-than-average K readings in the topography images explains why (*Figure 4*).

Average HVID is about 11.8mm, and a patient with a corneal size that falls outside of the 11.6mm to 12.0mm range may be a good candidate for a custom soft lens.<sup>4</sup> This patient would do well with a monthly or quarterly replacement custom soft toric lens design (OD BC 7.9mm, diameter 14.2mm; OS BC 8.0mm, diameter 14.3mm based on the fitting guide) to improve her overall comfort and fit of the contact lenses.

Custom soft contact lenses are fit empirically; the minimum data needed includes manifest refraction, K readings and HVIDs, but corneal topogra-

phy/topography maps or profilometry scans can aid in a more customized fit looking at sagittal height data. The first lenses are ordered via a fitting guide or calculator, or through the company's consultation department. Initial chair time is reduced by ordering empirically rather than diagnostically. Because the lenses are custom-made based on the patient's measurements, these soft toric lenses can often be finalized after one to two follow-up visits.<sup>11</sup>

### Case 3: Multifocals

A 61-year-old female presented with the chief complaint of poor near vision with her current contact lenses. She had been wearing daily disposable monovision contact lenses, OD dominant set for distance/OS effective add of +1.50D, for about 15 years but was recently having trouble reading small numbers on her printed spreadsheets at work. She had no issues with distance or computer vision tasks. She was motivated to try any options to prevent the need for reading glasses over contact lenses and was refit into a daily disposable multifocal lens design, which resolved her symptoms.

Although some practitioners may be hesitant to switch a patient from monovision to multifocal lens designs, the benefits of binocularity and increased range of vision (distance, intermediate and near) should be considered. Advances in technology have allowed us to offer more options for our patients

with presbyopia. Even patients who have worn monovision for years can adapt successfully to multifocal optics.

### Takeaways

Every new contact lens wearer needs to be managed individually. Assess their needs, motivation for contact lens wear, ocular and systemic health and corneal parameters. Completing a thorough assessment and prescribing a specific contact lens for their individual needs can set them and the practitioner up for success. ■

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## SECTIONS AND AUTHORS:

### Questions to Answer When Managing Myopia

*By Thanh Mai, OD, private practitioner, Anaheim, CA*

Interpreting clinical and psychological signs in a child is essential to success in myopia reduction efforts. This feature will address questions such as:

- What clinical findings indicate an abnormality sufficient to warrant intervention?
- How do you estimate for parents the likely results of intervention vs. non-intervention?
- What factors lead you toward or away from one intervention vs. another?
- What signals do you get that tell you it's time to change interventions, add a second or third simultaneously, or stop entirely?
- How do you define success and then recognize the circumstances that tell you when there's no longer a need to continue?

### How to Gear Up for Myopia Interventions

*Staff written, with comments from several myopia experts*

This feature will describe the resources a practice must have access to when offering myopia interventions. Equipment such as ultrasound, corneal topography, trial lens fitting sets for ortho-K and devices expressly marketed for myopia intervention will be discussed. How do they work and what factors matter most in day-to-day use? Which items do you need on Day 1 to begin? Practical tips for obtaining low-dose atropine from compounding pharmacies will also be given. Also discussed will be educational materials and clinical resources from industry sources, medical societies other stakeholders so that optometrists can access these and use them in practice.

# PRACTICAL MATTERS IN MYOPIA MANAGEMENT

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Growing support for the notion that childhood myopia development can be mitigated through clinical and lifestyle interventions creates exciting new opportunities for optometrists to help their patients and build their practices at the same time. But as it's a new field, questions of how to proceed are common. This supplement will guide optometrists through the practical challenges that might otherwise prevent them from pursuing myopia management.



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*Broadly speaking, the interventions for myopia happen either in the doctor's office or outside of it. They will be discussed in each of the next two features:*

### Managing Myopia in the Clinic

*By Kara Tison, OD, assistant professor, University of Louisville and Carol B. Parker, OD, Louisville VA Medical Center.*

This article will give a results-oriented guide to myopia interventions available to optometrists. On-label and off-label use of multifocal contact lenses, orthokeratology regimens, myopia-reducing spectacle lens designs (DIMS, HALT) and topical atropine will all be discussed in detail. The aim will be to give optometrists the practical guidance they need to implement such efforts in their own practices with concrete steps to follow, dos and don'ts for success and other insights that come from years of experience.

### Managing Myopia in the Home

*By Philip Winslow, OD, private practitioner, Dartmouth, MA*

The success of clinical interventions for myopia leads some optometrists—and families—to rely too heavily on a medical regimen of prescription lenses and topical atropine. The harder challenges—limiting digital device use and increasing the amount of outdoor time children experience—are too often downplayed. This feature will address environmental influences and give advice on how to overcome the obstacles to lifestyle interventions so that behavioral changes can complement the clinical interventions recommended by ODs. The latest thinking on screen time's effects on myopia development, and practical strategies for encouraging more outdoor time, will be discussed by experts who've made it work for their patients.

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# SEVEN STEPS TO SUCCESS IN MULTIFOCAL FITTING

Taking these recommendations into account will pave the way for better outcomes for you and your presbyopic patients looking to transition to this modality of contact lens wear.



BY LANGIS MICHAUD, OD  
MONTREAL

As the world population ages and lives longer, more and more presbyopic patients are going to fall into your chair. It's up to you to know how to proceed when they do. From my years of experience working in this particular field of care, I have devised a set of guidelines that, when followed, will help set you up for the best possible results.

Here, I'll outline the suggested steps for success, as told through a theoretical patient: Ms. Lopez, who was referred by a colleague for presbyopia management.

## 1. Check Your Attitude

First, express your willingness to help the patient. A successful multifocal lens fitting starts with a positive attitude toward engaging them and a strong desire to achieve optimal results.<sup>1</sup> Indeed, Ms. Lopez will be hard to convince to give multifocal lenses a try if you don't seem convinced yourself. The patient's motivation remains a key factor in the transition to this modality.<sup>2</sup>

How you frame the multifocal lens talk is very important in making a good first impression. Avoid the term "compromise." This commonly used word tells the patient that they will have to give up some of their vision or comfort while also paying more money for their lenses. Not appealing. Focus on the positives. Let patients know that, with modern designs, presbyopes tend to find multifocal contact lenses easier to adapt to than multifocal spectacles, one of which they will inevitably need.

To involve the patient, I outline the lens fitting process with a team approach. My responsibility is to provide the patient with the best lens design considering their refractive status and visual needs. I focus on the importance of balance between distance, intermediate and near vision. The patient is asked to report any signs or symptoms they experience during the first 10 days following lens fitting after neuroadaptation takes place. Achieving equilibrium by balancing distance, intermediate and near vision, knowing that changing one will affect the others, is the goal. Thus begins the process of finding a set of parameters that will allow us to achieve optimal vision at all distances.

At the same time, don't underestimate the importance of taking a proactive approach and talking about presbyopic correction options with patients who will eventually reach this reality. From ages 38 to 40, near vision can become difficult for some patients, especially if they have introduced increasingly long hours of screen time into their life. We have a duty to provide education about changes that occur to the visual system with time and which options should be considered to ease this transition. Many patients give up contact lens wear altogether because they begin to face difficulty or experience eye strain seeing at near, and they are not aware that the problem can be solved with multifocal lenses. This is where ODs come in. We must intervene before this process begins.

It is also important to suggest contact lenses as a mode of correction for candidates who are currently wearing glasses. Initiating the conversation is important; don't wait for the patient to bring it up. Almost 40% of glasses wearers are interested in lenses but don't mention it at the time of their visit and would benefit from OD guidance, as would we in the form of practice growth.

### About the author

Dr. Michaud is the dean of the School of Optometry at the L'École d'optométrie de Université de Montréal. He is a Diplomate of the American Academy of Optometry and a Fellow of the British Contact Lens Association, the Scleral Lens Education Society and the European Academy of Optometry. He has received honoraria from Bausch + Lomb, CooperVision and Acculens.

Why is it important to convert these patients to lenses or keep those already in lenses committed? Because patients who wear contact lenses, even part-time, are the most profitable to our practices. They spend 2.3-times more money than spectacle wearers and are more loyal, consulting every 14 to 16 months rather than every three to four years.<sup>3</sup>

## 2. Ask Insightful Questions

Case history reveals that Ms. Lopez has very high expectations and wants her visual needs fully met. She doesn't want to wear glasses because she feels they age her. She tried soft contact lenses previously but was not satisfied with her vision. She is a manager and travels between several stores for work. Distance vision is therefore crucial, both for day and night driving. She reads a lot of reports sometimes in small print, and she regularly reviews data on her phone or tablet sometimes in challenging light environments. She is open to any type of lens that may help her and is even willing to consider refractive surgery.

The most important part of any eye examination is the case history.<sup>4</sup> Too often, the patient questionnaire is limited to a few routine questions that don't really give us much direction. If you let the patient express their concerns, even for as little as 90 seconds without interrupting them, you will be surprised what you learn. Most of the time it will not even take 60 seconds to get on the same page.<sup>5</sup>

Encourage patients to talk about their symptoms. Many patients who experience discomfort with their contact lenses do not talk to their eyecare professional about it, considering it to be routine and normal, which could lead to dropout.<sup>6</sup> More focused patient questions identify yellow flags before they turn red. Only once you've been alerted that something is wrong can you act on it.

With multifocal lenses, it is even more important to identify the patient's visual needs and document their history. Understand patient expectations

to better meet them, and set your own. Patients who we refit into multifocal lenses have already experienced contact lens wear and, accordingly, have higher, predetermined expectations. Find out which lenses worked for their vision and comfort. New candidates for contact lenses will come at the fitting process differently as first-timers. They are unsure of what to realistically expect, so the possibilities offered by modern technology need to be clearly defined, namely the unfamiliar adaptation period associated with multifocals.

The patient's visual needs must be well-targeted. In what circumstances will the lenses be used—work, sport, social activity, specific hobbies? Some sports require high precision (archery), good distance vision (cycling) or both (golf). What visual tasks will be involved? Reading a book, using a screen, meeting with a team, driving? Do the activities take place during the day or in the evening? In normal or dim light? A truck driver working through the night will not have the same lens design as a football player or someone who works at a computer during the day.

## 3. Take Reliable Data

Performing an accurate refraction is crucial to achieve success with presbyopic contact lens fitting. It starts habitually with retinoscopy, which has unfortunately become a lost art. Instead, most practitioners rely on electronic refraction as a starting point. This method can offer some accuracy in cases where the cornea is normal and accommodation is well controlled. However, if the cornea is irregular or the patient over-accommodates, electronic refraction becomes unreliable.<sup>7</sup>

Retinoscopy, on the other hand, is never misleading when done properly. It often provides elements (quality of the

light reflex, for example) that cannot be quantified but are very useful clinically. How else can we detect the 38-year-old patient who is over-corrected in a concave lens, masking a hyperopic-toric over-refraction, and has 20/20 distance vision but complains of eye strain when working on the computer? Not taking advantage of this option likely means missing the opportunity to refit this patient in less concave toric lenses which will restore visual comfort and alleviate a potential dropout.

Then, you must refract the patient to the best of your ability. In the case of pre-presbyopes and presbyopes, we must not over-minus the patient and aim for maximum convex refraction at distance.<sup>8</sup> For near vision, make sure to measure the value of the addition according to the functional reading distance. A patient who looks at a tablet at 33cm all day as a salesperson may not be well-corrected at near if assessment occurred at 45cm.

Another tip to assess near vision: throw away the reading cards. Everyone wants to read the smallest row of letters, which is a perfect recipe for overcorrection at near. I now ask the patient to pick up their phone and try to read their texts or emails at their habitual reading distance, with their regular font and letter size. This is a more realistic target, especially during

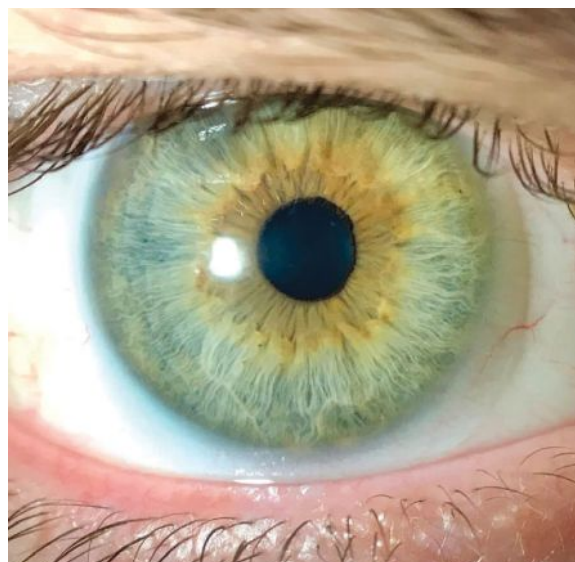


Photo: Alex Nixon, OD, MS, and Erin Rueff, OD, PhD

**Multifocal contacts offer a good option for presbyopes, often more so than spectacle lenses.**

Photo: Erin Rueff, OD, PhD



**A successful multifocal lens fitting goes back to a thorough patient history and evaluation of signs and symptoms.**

multifocal lens trials, and helps instill confidence in the patient who now feels that this lens option will work for them on a daily basis.

Finally, I always use refraction to measure dominance. Once all the refractive phases have been completed, I have the patient look at the 20/30 line and blur their vision with the retinoscopic lens (+2.00D), alternating between the two eyes. The patient then tells me which combination is more comfortable, allowing me to identify the dominant and the dominated eye. This is useful information to keep in mind during the fitting process.<sup>9</sup>

#### 4. Correct for Astigmatism

One of the most important refractive considerations is to fully correct any clinically significant astigmatism.<sup>10</sup> Correcting astigmatism gives accuracy, especially at near where it is important for presbyopic patients. On the contrary, masking astigmatism requires increasing concavity, therefore taking a toll on vision at near.

Ms. Lopez is moderately myopic, astigmatic and presbyopic in both eyes and slightly over-corrected based on her last prescription. She has never heard the term “astigmatic” and most likely was never fitted to fully compensate for her refractive error.

In our patient’s case, try a toric lens and evaluate the subjective response. I

have had patients -8.00 -0.75x60° who had a “wow” effect when fitted with toric lenses, and I have had others -2.50 -1.25x180° who saw no difference. Obviously against-the-rule astigmatism is more challenging, but a trial of toric lenses should be considered as soon as 0.75D or more of refractive astigmatism is

reached. Several products now exist in soft toric multifocal lenses and should be considered right off the bat for astigmatic patients.

Similarly, hybrid multifocal lenses provide good correction of corneal astigmatism while using a spherical lens.<sup>11</sup> Extended depth-of-focus technology is an interesting addition to the hybrid lens profile, and empirical ordering makes this process simple. For more advanced cases, spherical multifocal scleral lenses can compensate for higher levels of corneal astigmatism with the help of the fluid reservoir. The option to design lenses with decentered optics also helps to optimize the results.<sup>12</sup>

#### 5. Treat the Tear Film

When thinking about fitting contact lenses or assessing a current wearer, remember that the tear film is the primary refractive surface of the eye. A disturbed and unstable tear film is associated with fluctuating vision and loss of contrast sensitivity—a recipe for failure in multifocal lens wear.<sup>13</sup> Ms. Lopez has a reduced tear breakup time and a normal tear secretion, but she wears mascara and eye liner that leave an oily layer on her tear film and obstruct her meibomian glands. Makeup habits must be modified and lid hygiene therapy must be done before successful lens wear can be achieved.

It goes without saying that a detailed eye exam should be conducted before fitting a presbyopic patient. Many physiological changes occur in middle-aged patients, and hormonal changes can influence the balance of the tear film. Any cause of marginal dry eye, which is only increased by lens wear, should be proactively treated. Selection of the material, its wetting angle and wearing mode is heavily influenced by ocular health. Thus, a more fragile eye with persistent marginal dryness, despite treatment, will be better suited to materials with a lower coefficient of friction, a very low angle of wettability in rigid lenses and a daily disposable mode of wear in soft lenses.<sup>14</sup>

#### 6. Personalize the Lens Fitting

We all have a preferred brand/design of multifocal lenses that we are most comfortable working with and that will lead to success more often than not. The obvious trap is offering this option to every presbyope who sits in our exam chair.

Instead, we should keep all doors open. We must familiarize ourselves with all possible options, not neglecting rigid, scleral or hybrid lenses, which can represent excellent alternatives. That was the case here, and Ms. Lopez was fitted with the newest design of hybrid multifocal lenses.

It is one thing to know that X, Y and Z lenses are aspheric with a near-centered design. But it is another to know that the X-lens has an intermediate zone—a plateau—that covers intermediate vision at 50cm to 60cm, which the other lenses do not have. This lens is ideal for the patient who works on a computer all day long. The Y-lens is designed to fit the patient’s pupil and their prescription, offering an optimized combination according to the degree of myopia and the patient’s age. This lens is ideal for older patients who want to wear their lenses for outdoor activities, as it comes with a UV filter. The Z-lens with a center-distance design is better suited for emerging presbyopes. This is an ideal option for the patient who works for a shipping



service and is looking for some relief when working in his notepad and driving at night.

## 7. Use Your Resources

I know several colleagues who feel they have developed enough clinical experience to fit multifocal lenses without any guidance. They have composed their recipe and are convinced that with it, success is all but guaranteed.

I have fallen victim to this attitude in the past, but in recent years my approach has changed. Without denying my competence and that of my colleagues, it is becoming very difficult to apply homemade recipes to designs that have been developed and refined with hundreds of patients. Modern multifocal lenses are optically complicated and must be used as they were designed. Otherwise, a very good product may fail to provide the intended positive outcome.

Lens manufacturers offer fitting guides that have proven effective after passing many tests. They know the limitations of the optical profiles they offer and can help professionals achieve the best possible results. Do not hesitate to consult with allies in our field such as these.

Following clinical fitting guidelines saves chair time and improves the patient experience.<sup>9</sup> Don't run a patient around in circles because you failed to do this, promising that the next time will be better. Your patient's time is as valuable as yours, and multiple lens failures will surely make them doubt their adaptation ability and your overall competency.

Multifocal soft, hybrid and scleral lenses must be stable and centered to provide the best performance. It is important to validate the lens position and movement under the slit lamp. Soft multifocal lenses are expected to move less than spherical lenses while keeping the tear exchange unaltered. The push-up test is important to perform in this stage.

Centration can be established by performing topography on top of the lens.<sup>15</sup> The design of the lens becomes clear,

and the position of the optical axis vs. the visual axis can be determined. In the case of significant decentration with soft lenses, another design must be selected entirely as different base curves and diameters within the same brand are not offered. In hybrid and scleral modalities, modification of lens parameters can help to fix this issue. The sagittal depth of the soft lens will offer the most significant guidance.<sup>16</sup> Keep in mind that lenses must ideally be fitted with 100 $\mu$ m to 200 $\mu$ m overvaulting the ocular sag height (3200 $\mu$ m @ 14mm and 3600 $\mu$ m @ 15mm of chord).<sup>17</sup>

## Takeaways

With a wider range of products than ever before in soft, hybrid, rigid corneal (gas permeables) and scleral lenses, presbyopia correction is more than possible with contact lenses. Success can be significantly increased by adopting a positive attitude, talking to patients about their options, listening to their needs and directing them to the right product. Personalizing our care can make all the difference.

We must complement our approach with reliable refractive data and lens fitting in accordance with manufacturer recommendations. By using the right words, justifying our choices and teaming up with patients, it is possible to find the balance that will allow for successful multifocal lens correction. This keeps our patients happy in lenses, and it helps our practices remain economically healthy. ■

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**The transition to multifocal contact lenses is made smoother by educating patients and setting expectations.**

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# SURFACE TREATMENTS AND DESIGNS THAT IMPROVE COMFORT

Understand how to use these options to improve the patient experience.



BY TIFFANY ANDRZEJEWSKI, OD  
CHICAGO

Comfort is a driving factor in patients' contact lens success. It is well known among eyecare practitioners that most contact lens wearers experience contact lens discomfort at least occasionally, although many experience it to the degree that it alters their wearing habits and, in some cases, forces the patient to discontinue contact lens wear completely.<sup>1</sup>

Discomfort is the leading cause of contact lens discontinuation, also known as contact lens drop out.<sup>2</sup> In fact, 36% of new contact lens wearers cite discomfort as their reason for dropout, second only to problems with vision (41%).<sup>3</sup>

A recent review of soft contact lens materials, designs and fitting characteristics found that surface properties affect the coefficient of friction of a lens and therefore play a large part in lens comfort.<sup>4</sup> Surface treatments can include modifications of the lens material, addition of wetting agents or various structural changes at the outer surface of the lens.<sup>4</sup>

It is the search for comfort that continues to drive innovation and development of improvements in the contact lens space—whether it be the advancement of soft lens materials, addition of novel coatings for gas permeable lenses or the further customization of scleral lens design options—all aimed to improve the patient wearing experience.

Scleral lenses have made gas permeable (GP) lenses appetizing again, and as a result, there is a renewed focus on finding ways to perfect the process of making GP lenses. This is an exciting time for this vision-restoring modality and the industry has responded with ways to address the issues with lens fogging and poor wettability, as well as how to optimize patient comfort. However, to first understand the lens technology of today, we first must take a brief detour into the past.

## GP Lens Material Evolution

Rigid lens manufacturing began with polymethylmethacrylate (PMMA) material. Its advantages included high durability, excellent optical quality, and ease of care; however, it was lack-

ing in benefits to corneal health and physiology. PMMA had an oxygen transmissibility (Dk) of zero, so practitioners had to ensure excellent tear exchange under the lens to achieve a healthy fit.<sup>5</sup>

The next evolution of lens material was the addition of silicone, which allowed more oxygen transmission through the lens instead of around it. These materials were referred to as silicone acrylates, and they're still available today. The addition of silicone made the material hydrophobic and although the increased Dk was desirable, it came along with lens surface deposition, rapid drying of the tear film over the lens surface which resulted in dryness, as well as warpage, crazing and brittleness.<sup>6</sup> However, silicone acrylates aren't used as much because of poor wettability, surface deposits and patient discomfort.<sup>5</sup>

The next major step was adding fluorine to lens materials, which brings us to the widely used material in practice today: fluorosilicone acrylate. Fluorine is known for its nonstick properties—such as in Teflon-coated cooking materials—increasing the deposit resistance of the lens materi-

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als.<sup>6</sup> Adding fluorine lowered surface tension, decreased the attraction of polarized tear components to the lens surface and reduced the problem of ocular dryness. Comparison studies concluded that fluorosilicone acrylate lenses are more wettable and are perceived as more comfortable by patients than silicone acrylate lenses.<sup>7,8</sup>

## Surface Treatments

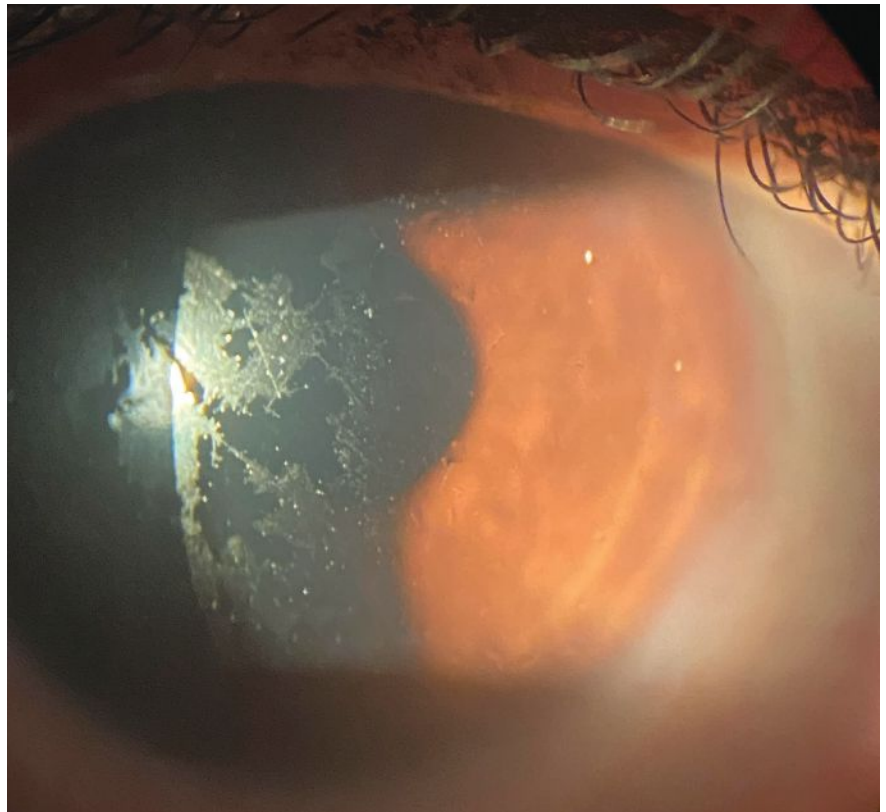
Silicone-based materials are inherently hydrophobic, so any exposed silicone in a lens has the potential to be non-wetting. Additionally, some patients have excessive lipids in their tear film which may deposit onto the lens creating a foggy, hydrophobic surface. This issue can be reduced by dispensing low-silicone-content or hydrogel soft contact lenses; however, such lenses also impede oxygen transmission, increasing the chance for neovascularization, endothelial dysfunction or corneal edema.

Other solutions may include ensuring lid hygiene and treating the lens with plasma. However, non-wetting continues to plague both patient and practitioner alike, suggesting these options are insufficient.

There are two lens surface treatments available for contact lenses: plasma treatment and Tangible Hydra-PEG coating (Tangible Science), which is quickly becoming standard in high-end GP patient care.

**Plasma.** This is one of the most misunderstood elements in GP manufacturing. It is not an actual coating but a treatment or process wherein a newly manufactured lens is bombarded with high-energy radio waves in an oxygen-rich ionized gas chamber. The oxygen radicals strike the surface of the lens, dislodging hydrocarbons such as oils that may have been picked up in the manufacturing process.<sup>9</sup> Nothing is being permanently added to the lens; rather, the process modifies the lens surface but not the basic properties of the lens material.

As a result of plasma treatment, the lens surface becomes ionized, increasing its ability to attract liquids and



**A patient complaining of discomfort and foggy vision, showing poor wettability of their scleral lens. The issues resolved with the addition of a Hydra-PEG coating.**

enhances the wetting angle, resulting in a more hydrophilic lens surface.<sup>10</sup> Therefore, after manufacturing, plasma treatment is akin to intense cleaning of the lens, removing impurities from manufacturing, and a lens material's wettability and interaction with the tear film is improved. This results in reduced fogging and a better visual experience upon application for the patient.

Plasma-treated GP lenses are typically shipped wet in a conditioning solution. In contrast, plasma processing in soft lenses is inherent in the lens material; without it, these materials would be extremely hydrophobic. Applying a plasma coating to soft lenses has been shown to enhance lens surface lubricity, which appears to be the principal contributor to patient comfort.<sup>11</sup> However, its effect on GP lens comfort has not been investigated. It is important to note that the ionization does not last forever and that it can be reduced with the use of abrasive cleaners.<sup>12</sup>

**Hydra-PEG.** This is a 90% water and polyethylene glycol (PEG) based polymer mixture that is permanently covalently bonded to the surface of the contact lens, effectively creating a wettable surface overlying the lens and separating it from the ocular surface and tear film.<sup>13</sup> The optically clear coating encapsulates the core contact lens in a 40nm mucin-like hydrophilic shell without imparting any change to the underlying properties of the lens material.<sup>13</sup> PEG has been used in ocular lubricants for decades and has been reported by several sources to improve lens surface wettability, which improves tear breakup time, increases lubricity, reducing friction between the lens and the eyelids and serves to reduce protein and lipid deposition.<sup>13-15</sup>

This coating can be applied to all contact lens materials including hydrogel, silicone hydrogel (SiHy) and GPs, including hybrids and sclerals. Currently, there is only one soft contact lens available with Hydra-PEG, SynergEyes' SimplifEyes 1Day



hydrogel daily disposable, which features both a polymer coating on the lens surface and in the packaging solution. Unity Biosync, a SiHy daily disposable coated with Hydra-PEG was distributed by VSP, but is no longer available to practices as of early 2022. SynergEyes also can apply the Hydra-PEG coating to its Duette, UltraHealth and UltraHealth FC hybrid lenses as well as their new SynergEyes iD family of products.

Hydra-PEG is indicated for lens wearers but is especially designed for patients who experience ocular dryness or discomfort associated with contact lens wear, moderate or heavy depositors and scleral lens wearers. A 2020 study comparing lens comfort and dry eye symptoms of dry eye scleral lens wearers fit with Hydra-PEG treated vs. untreated scleral lenses found that patients with Hydra-PEG-treated scleral lenses experienced superior comfort and improved dry eye symptoms, as well a reduction in ocular surface

changes and less frequent complaints of foggy vision.<sup>16</sup> The study concluded that Hydra-PEG is an effective technology that may improve outcomes for scleral lens wearers with dry eye.<sup>16</sup>

Additional care considerations exist when prescribing lenses with this coating. A coated lens will be more slippery to the touch and may be more difficult to handle, requiring a brief adjustment period for lens application and removal. Approved cleaners include Boston Simplus (Bausch + Lomb), Unique pH (Menicon), Clear Care and Clear Care Plus with HydraGlyde (Alcon) and Tangible Clean (Tangible Science).<sup>17</sup> Buffered, preservative-free, sterile saline is the recommended rinsing agent. All enzymatic, abrasive or alcohol-based cleaners should be avoided as they will damage the coating and reduce its effectiveness.<sup>17</sup>

The coating can be very durable with proper care but there are factors that will cause the coating to thin over time, which occurs more quickly for some patients than others. This is highly dependent on each patient’s unique ocular environment and include factors such as the severity of their ocular surface disease, whether they are known high depositors and other hostile conditions that impact the front surface. Severe ocular surface disease with cicatricial lid changes/scarring will be abrasive to the lens surface and wear down the coating. Personally, I’ve experienced this with cases of ocular cicatricial pemphigoid, Stevens-Johnson Syndrome and graft-vs. host disease.

Using incompatible solutions, storing lenses dry and rinsing with tap water will

also wear down the coating faster, but the coating will remain on the lenses and will continue to provide a more comfortable lens wearing experience than uncoated lenses. For all these reasons, it is impossible to standardize the durability expectation.

In contrast to plasma treatment, Hydra-PEG enhances wettability across the lifespan of the lens if patients follow the care regimen. This can mean a whole 12-month wearing cycle for some patients or less time for others. Patients with a need for specialty lenses may have pathology and conditions that warrant lenses more frequent lens replacement.

Hydra-PEG is expected to last most patients for the natural life of the lens keeping in mind that even normal wear and handling will cause the coating to be thinner at 12 months than at day one. Adding Tangible Boost as a monthly conditioning treatment should enable coated lenses to maintain peak performance longer and allow the patient to have a more reliable wearing experience.

### Lens Design and Fit

Corneal GPs carry more initial lens awareness than soft lenses or scleral lenses.<sup>18,19</sup> However, that doesn’t mean that scleral lens wearers don’t experience discomfort as well—but just like with corneal GPs, the design and/or fit of the lens can also be the culprit.

**Corneal GPs.** With corneal GPs, the discomfort arises from the interaction between the rigid edge of the lens and the eyelids, particularly the upper lid margin. Edge shape and design are the most important parameters in initial lens comfort.<sup>20</sup> The edge should be smooth and well rounded—in contrast, a GP with a defective edge (chipped, abraded, blunt or sharp) the patient will be very aware of the lens with each and every blink, and it will make for quite the negative experience. A well-blended peripheral curve system is preferred to a poorly blended or unblended peripheral curve system that can produce dryness, itchiness and scratchiness.<sup>21</sup>

TABLE 1. GP MATERIALS TO WHICH TANGIBLE HYDRA-PEG CAN BE APPLIED

Material	Manufacturer
Boston ES	Bausch + Lomb
Boston EO	Bausch + Lomb
Boston XO	Bausch + Lomb
Boston XO2	Contamac
Optimum Classic	Contamac
Optimum Comfort	Contamac
Optimum Extra	Contamac
Optimum Extreme	Contamac
Optimum Infinite	Contamac
HEXA100	Contamac
HDS	Paragon
HDS100	Paragon
FP-30	Paragon
FP-92	Paragon
Acuity 200	Acuity Polymers



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High myopia with a tessellated and thin choroid (red line), RPE disruption (gray line), DDF (yellow line), DDF (green line) enhances photoreceptors (blue line) with early degeneration and hyperreflective material (purple line)—all consistent with myopic DME.

Choroidal folds causing sub-RPE indentations (red lines).

From "Choroidal OCT by a Whole New Lens" by Sam Schwartz, MD available at [www.reviewofoptometry.com/issue/march-15-2021](http://www.reviewofoptometry.com/issue/march-15-2021)

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**DRY EYE READER SURVEY RESULTS**

What percent of your patients in each of these categories suffer from dry eye?

Adults and teens	25%
Adults 20-49 years old	30%
Adults 47-65 years old	44%
Adults 65 and older	54%
Contact lens wearers	48%
Men	36%
Women	56%
Four menopausal women	68%

From "Dry Eye Reader Survey, Validity and Usability" available at [www.reviewofoptometry.com/issue/march-15-2021](http://www.reviewofoptometry.com/issue/march-15-2021)

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Reflex associated with a subconjunctival hemorrhage.

From "The Eye Resolves: How and How Not" by Julie T'Pol, MD and David Lenzowski, MD available at [www.reviewofoptometry.com/issue/march-15-2021](http://www.reviewofoptometry.com/issue/march-15-2021)

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**CLINICAL FEATURES OF COMMON SECONDARY CONDITIONS ASSOCIATED WITH GLAUCOMA**

CONDITION	CLINICAL FEATURES	DIAGNOSTIC HINTS
Systemic hypertension	Asymmetrical optic disc cupping, arterioles (top, anterior) have narrow and central arterioles	Asymmetrical optic disc cupping, arterioles (top, anterior) have narrow and central arterioles
Systemic hypotension	Asymmetrical optic disc cupping, arterioles (top, anterior) have narrow and central arterioles	Asymmetrical optic disc cupping, arterioles (top, anterior) have narrow and central arterioles
Systemic diabetes	Asymmetrical optic disc cupping, arterioles (top, anterior) have narrow and central arterioles	Asymmetrical optic disc cupping, arterioles (top, anterior) have narrow and central arterioles
Systemic thyroid disease	Asymmetrical optic disc cupping, arterioles (top, anterior) have narrow and central arterioles	Asymmetrical optic disc cupping, arterioles (top, anterior) have narrow and central arterioles

From "Diagnosing the Eye: The Eye for the Clinician" by Jack P. Liu, MD, PhD and Patricia Wang, MD available at [www.reviewofoptometry.com/issue/march-15-2021](http://www.reviewofoptometry.com/issue/march-15-2021)

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**RESCUE PATIENTS FROM DRY EYE**

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**CLINICAL QUANTIFIED: A 57-year-old female presenting with eye redness, a painful eye of the lower lid and eyelashes. What do you think is happening and how would you treat it?**

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**FAST FACTS ON CLARD**

- only present in approximately one in three people
- provides a secondary blood supply to the inner layers of the macula
- comprises only 3.1% to 7.1% of all retinal artery occlusions
- has been associated with exudative, large, serous, serous, and serous retinal detachments, submacular, and serous retinal detachments
- can present in three ways: (1) with exudative optic neuropathy in part of the retina, (2) with serous retinal detachment, or (3) with serous retinal detachment

Management and prognosis

**CLARD:** Critical to arrange for some dry eye and OCP testing and Dexamethasone. Visual prognosis is the worst of the three due to lack of retinal blood supply.

**CLARD:** Treatment focuses on macular edema and macular thinning. Better prognosis, as the retina occlusion tends to be non-ischemic.

**CLARD:** Treatment can include macular massage, pneumatic, intra vitreal thrombolysis and hyperbaric oxygen. Best visual prognosis.

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**Localization of Common Etiologies Causing Diplopia**

Side	Neurovascular supply	Causes of Diplopia	Brain structures
Right	Trigeminal (V), Oculomotor (III), Trochlear (IV), Abducens (VI)	Strabismic diplopia, Microspherule diplopia, Microspherule diplopia, Microspherule diplopia	Strabismic diplopia, Microspherule diplopia, Microspherule diplopia, Microspherule diplopia
Left	Trigeminal (V), Oculomotor (III), Trochlear (IV), Abducens (VI)	Strabismic diplopia, Microspherule diplopia, Microspherule diplopia, Microspherule diplopia	Strabismic diplopia, Microspherule diplopia, Microspherule diplopia, Microspherule diplopia

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**ANOTHER SEVERE FACTORS IN GLAUCOMA**

**Let it all - Anterior segment inflammation**

**LPI (pigmentation) on the anterior lens capsule associated with anterior synechia.**

**W Larger aggregation of pigment on anterior lens capsule outlined suggestive**

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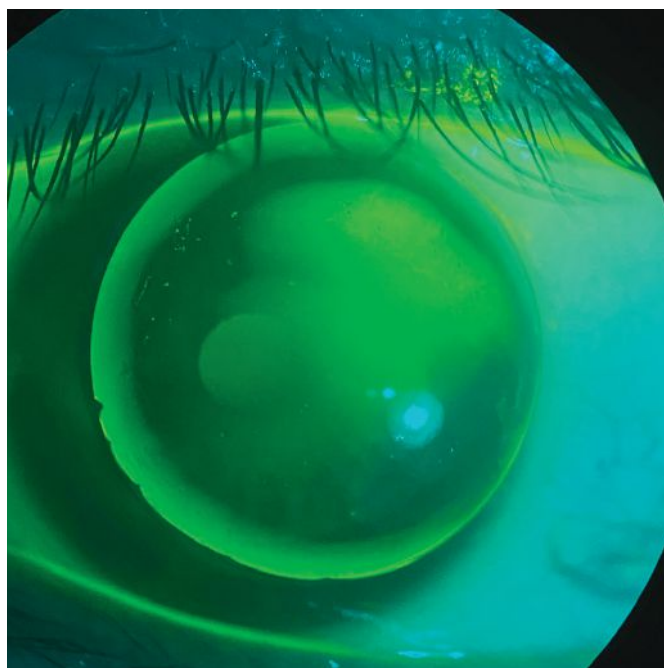
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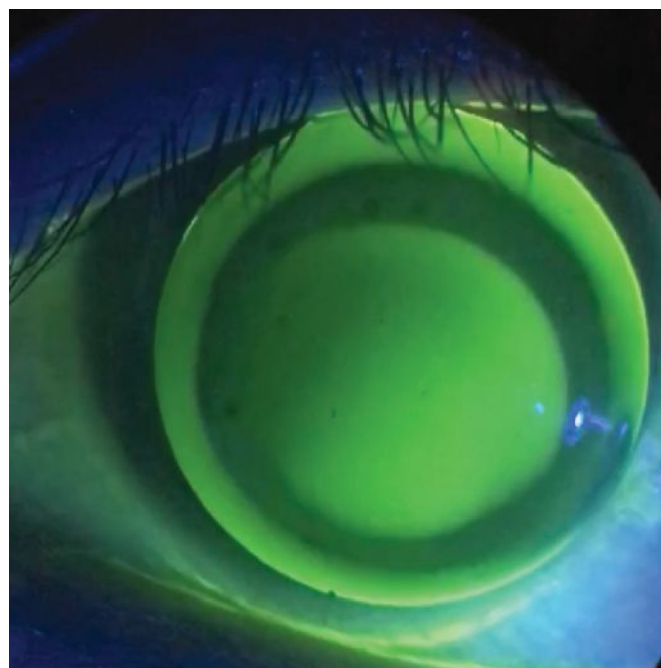
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**A patient wearing a GP lens presenting with issues of severe discomfort and peripheral corneal staining from a chipped edge.**



**A GP lens with excessive edge clearance, if not fixed, will lead to three and nine o'clock staining and reduced comfort.**

Excessive edge-clearance can also be problematic for patient comfort because it funnels in surrounding tears resulting in desiccation and corneal staining at three and nine o'clock on the peripheral corneal regions and it affects the blink quality through increased interaction between the lens edge and the superior lid.<sup>22</sup> There is also some evidence that larger GPs are more comfortable for adapted wearers; however, diameter size showed no effect on adaptation of the neophyte wearer.<sup>23,24</sup>

Although tear exchange is an important aspect in maintaining corneal health, there is little evidence that increasing tear exchange will have a positive effect on lens comfort and, to the contrary, changes to lens parameters that may bring about increased tear exchange (which usually increase lens movement as well) are likely to have a simultaneous negative impact on lens comfort.<sup>14</sup>

**Scleral lenses.** In general, due to their larger diameter, these lenses vault over the sensitive innervated corneal tissue, while being filled with fluid. The fact that they rest only on

the less sensitive conjunctiva and sclera accounts for their well-accepted comfort by both patients and the practitioners who fit them.

Scleral misalignment occurs during uneven bearing on a scleral lens landing zone and can be a key cause of fit-related patient discomfort. The sclera is often rotationally asymmetric; therefore, lenses that are rotationally symmetric (those with spherical or toric haptics) will not always sit flush with the ocular surface.<sup>25</sup> If an edge is loose, a patient will feel it almost immediately due to the friction of the edge with every blink; if an edge is too tight there will be compression and blanching, and in some cases impingement, of the conjunctival tissue under the haptic with corresponding perilimbal injection that worsens and becomes more uncomfortable with increased wear time during the day.

One study compared the performance of spherical and toric scleral lens designs and concluded that toric designs offered a higher comfort rate and increasing wearing times.<sup>26</sup> Yet, many studies still cite that discomfort is one of the main reasons, second

to handling, as to the reason why a patient may elect to discontinue lens wear.<sup>27</sup> Quadrant specific designs may further help to improve comfort by improving scleral alignment.<sup>28</sup>

The Scleral Shape Study Group reported that a relatively small percentage of eyes are described as regularly toric (28.6%), 40.7% as asymmetrical toric and 26% as irregular toric.<sup>29</sup> Other design modifications, such as vaults, lifts, microvaults, channels and notches have helped improve the ability to fit sclerals over even the most unusual ocular shapes by allowing the lens to align better with various scleral elevations (pterygia, pingueculae, blebs, etc.). This results in enhanced comfort and a better physiological response of the ocular surface for the wearer. Scleral lens customization continues to advance in an effort to improve vision and comfort for the wearer as more research evolves about scleral shape.

### Takeaways

Contact lens materials and designs have evolved immensely over the past few decades and prescribing



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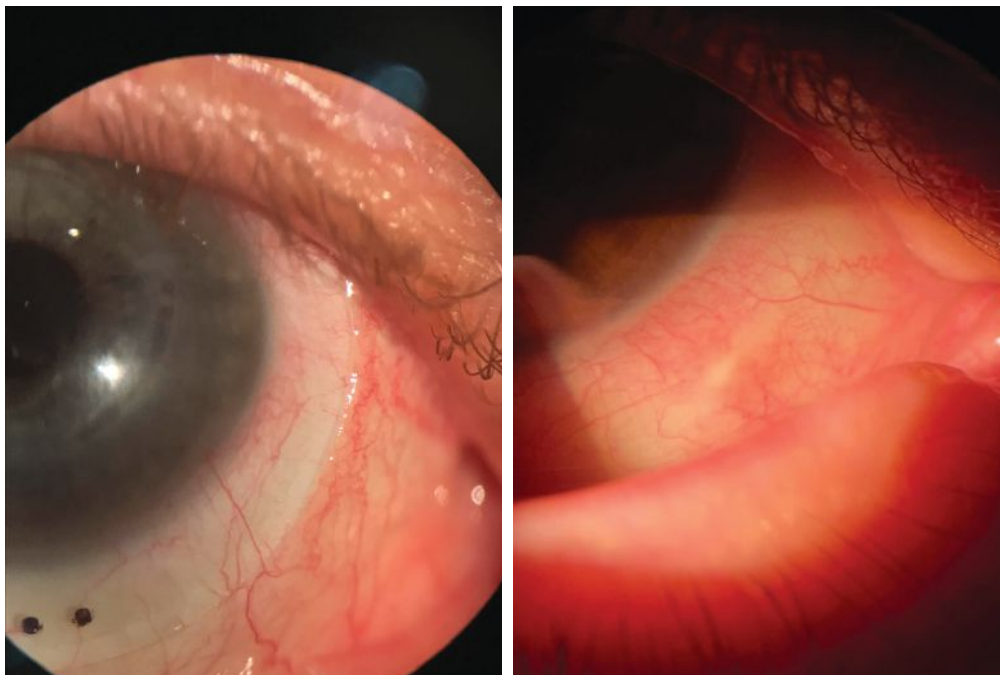
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**At left, scleral blanching and impingement causing discomfort stemming from scleral misalignment. At right, long-standing impingement can lead to conjunctival hypertrophy and other permanent changes to the tissue, so it's important that misalignment is addressed during the fitting process.**

newer lenses and adding Hydra-PEG to GP materials can potentially help practitioners address common problems. Newer contact lens materials are intended to improve ocular surface biocompatibility, and designs intended to improve fit, comfort and visual performance are also emerging. It is beneficial to stay abreast of the novel innovations and technologies in lens materials and designs to offer the best to patients.

Unfortunately, only a certain degree of improvement in patient comfort can be obtained by optimizing lens surface treatments and designs. It is incumbent upon optometrists to identify individuals at risk for contact lens discomfort. When identified, it is critical to appropriately treat the ocular surface and provide an environment conducive to comfortable long-term contact lens wear.

Optometrists need to understand and appreciate the effects of the ocular surface and how it can influence contact lens wear. A healthy ocular surface will not guarantee a successful wearing experience but will maximize the chances of one occurring.

With the ocular surface, critical clinical consideration should be made to the health of the lid margins, conjunctiva, cornea, tear film and all glands involved in producing the tear film. It is with the proactive treatment of the ocular surface and optimization of the tear film that practitioners will be able to help support the new technology of lenses that are being fit today. ■

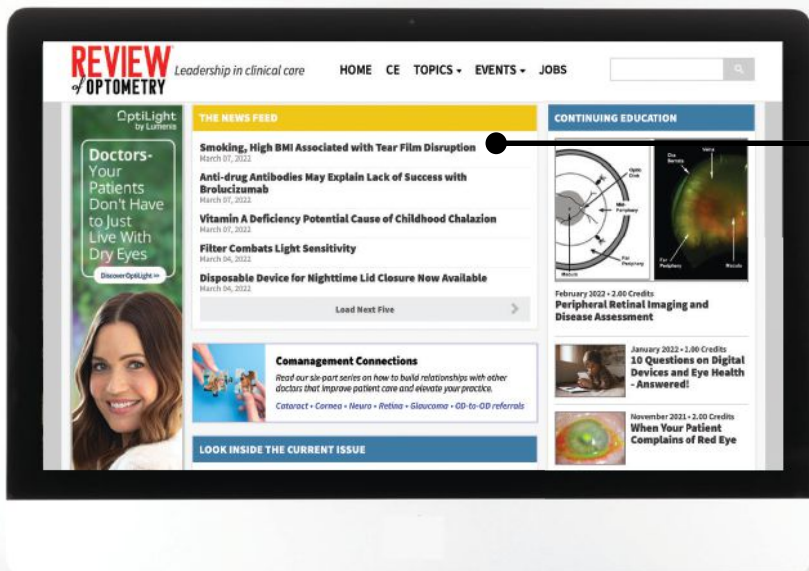
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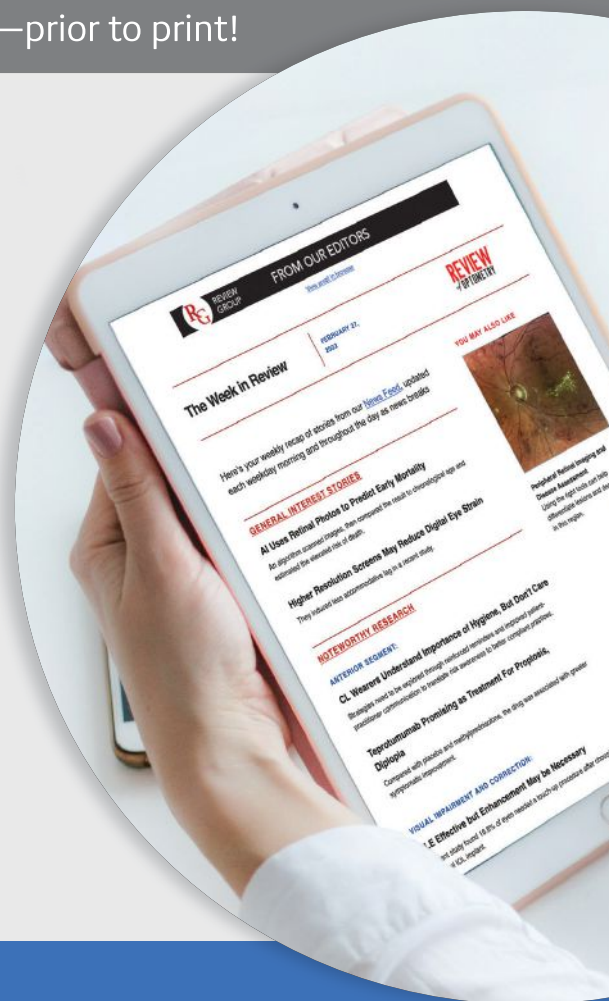
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# HOW TO ASSESS AND MANAGE NYSTAGMUS AND VERTIGO

When a patient's "world spins 'round," optometrists need to be able to identify the cause and take action.



BY SAIDIVYA KOMMA, OD,<sup>1</sup>  
KRISTINE LOO, OD,<sup>1</sup>  
RACHEL WERNER, OD,<sup>1</sup>  
AND HEATHER WHYTE, OD<sup>2</sup>

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**A** case involving visual complaints of spinning, tilting or jumping vision can be intimidating and overwhelming, but understanding the basics of nystagmus and vertigo can aid in managing these patients and referring urgently to the correct specialist when indicated.

The basic definition of nystagmus is the rapid and uncontrolled movement of both eyes, typically in a fast or slow rhythmic pattern, whereas vertigo is defined as the sensation of self-motion in a still environment.<sup>1,2</sup> Patients may present to your office with symptoms of decreased visual acuity, vertigo, dizziness or difficulty with balance, a tilted or turned head position, sensitiv-

ity to light or even oscillopsia, which is defined as the jumping or moving of the visual environment.<sup>1</sup>

This article will explore how these conditions often present in optometric practice and discuss the role of the optometrist. It will help you better understand nystagmus and vertigo and feel more comfortable assessing and managing these patients.

## What to Know About Nystagmus

Nystagmus can either be acquired or congenital. The latter is not usually associated with any other abnormalities but can be due to developmental abnormalities within the eye; however, symptoms from congenital nystagmus are typically transient and will resolve on their own in a few months to a few years without any visual disruption.<sup>3</sup> Alternatively, acquired nystagmus typically involves a medical and/or neurologic cause with damage to the peripheral or central vestibular or

visual pathways that requires an urgent investigation.<sup>1,4</sup>

Nystagmus can be further distinguished by two characteristics: jerk or pendular, with jerk being the more common of the two.

**Pendular.** This type of nystagmus has phases of equal velocity.<sup>4</sup> It does not have a fast phase and can occur in any direction including torsional, vertical, horizontal or mixed.<sup>4</sup> This can result in circular, oblique or elliptical trajectories.<sup>5</sup>

Pendular nystagmus from childhood can be from spasmus nutans, a pediatric disorder that involves a triad of nystagmus, head bobbing and torticollis, or it can develop from visual deprivation.<sup>4,5</sup> Acquired pendular nystagmus is most often caused by multiple sclerosis, brainstem infarction or cerebellar disease.<sup>4</sup>

See-saw nystagmus is a subtype of pendular nystagmus where one eye rises and intorts while the other

### About the authors

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**Demonstration of the use of +20.00D lenses in a trial frame.**

eye descends and extorts; it is more commonly caused by a parasellar mass such as a craniopharyngioma or pituitary adenoma.<sup>5,6</sup> Head trauma or visual disorders such as cone-rod dystrophies and retinitis pigmentosa can also cause see-saw nystagmus.<sup>5</sup>

**Jerk.** This nystagmus type has a slow phase that is followed by a fast phase.<sup>6</sup> It is usually described in the direction of the fast phase; however, it is the slow phase that results from the pathological or abnormal cause.<sup>6</sup> Acquired jerk nystagmus in the primary position can be classified into different types based on their trajectory, including downbeat, upbeat, horizontal, torsional and mixed.<sup>7</sup>

Downbeat nystagmus is the most common type of acquired nystagmus, with a pathologic upward slow phase and a downward fast phase.<sup>4</sup> Downbeat nystagmus can present with abnormal downward pursuits and an

alternating hypertropia in lateral gaze that can exhibit as an alternating skew deviation.<sup>4,8</sup> This type of nystagmus also obeys Alexander's law, as the nystagmus increases in intensity when looking at the direction of the fast phase; in this case, the nystagmus would be more enhanced in downgaze.<sup>8</sup>

Approximately 30% of downbeat nystagmus patients are idiopathic followed by approximately 24% from cerebellar degenerations with lesions at the cervicomedullary junction and foramen magnum and 13% from cerebellar ectopias mainly from Chiari malformations.<sup>8</sup> Less common causes are from infarctions, vascular lesions, multiple sclerosis, toxicity, tumors, trauma and infectious, paraneoplastic or metabolic etiology.<sup>8</sup>

Upbeat nystagmus has a slow downward phase and a fast upward phase. Large-amplitude upbeat nystagmus lesions have been suggested to be located in the anterior cerebellar vermis and small-amplitude upbeat nystagmus, in the medulla.<sup>8</sup> Similar to downbeat nystagmus, less common causes have been reported to be from infarctions, multiple sclerosis or other demyelinating diseases, Chiari malformations and cerebellar degenerations.<sup>8</sup>

Horizontal nystagmus can occur from peripheral or central vestibular lesions.<sup>8</sup> Peripheral lesions from vestibular neuritis or partial neurectomy are causes of pure horizontal nystagmus where the fast phase is typically directed away from the side of the lesion.<sup>1</sup> Horizontal nystagmus from peripheral lesions can be suppressed with visual fixation making it difficult to assess and diagnose.<sup>1</sup> With central vestibular lesions, however, horizontal nystagmus persists, or can even worsen, with fixation and often presents as periodic alternating nystagmus where the horizontal nystagmus beats in one direction for a couple of minutes then beats in the other direction.<sup>9</sup> It is important to note that Alexander's law is followed in nystagmus due to peripheral vestibular lesions which can help differentiate from central vestibular lesions.<sup>10</sup>

Periodic alternating nystagmus can be congenital or acquired from damage to the vestibulocerebellar pathways, cerebellar degeneration, multiple sclerosis, stroke, tumors or infections.<sup>8</sup> Pure torsional nystagmus typically has a central cause with lesions located at the medulla, pons, cerebellum or mesencephalon resulting in an imbalance of the vertical semicircular canal function.<sup>11</sup> Pure torsional nystagmus is most commonly caused by brainstem infarction or multiple sclerosis, can beat either toward or away from the

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**Estimated Time to Complete Activity:** two hours

Jointly provided by the Postgraduate Institute for Medicine (PIM) and Review Education Group

**Educational Objectives:** After completing this activity, the participant should be better able to:

- Recognize the potential causes of vertigo and nystagmus.
- Identify and assess these conditions among their patients.
- Explain the vestibular system and its relationship to ocular function.
- Determine when these conditions indicate a medical emergency.

**Target Audience:** This activity is intended for optometrists engaged in managing patients with nystagmus and vertigo.

**Accreditation Statement:** In support of improving patient care, this activity has been planned and implemented by PIM and the Review Education Group. PIM is jointly accredited by the Accreditation Council for Continuing Medical Education, the Accreditation Council



for Pharmacy Education and the American Nurses Credentialing Center to provide CE for the healthcare team. PIM is accredited by COPE to provide CE to optometrists.

**Reviewed by:** Salus University, Elkins Park, PA



**Faculty/Editorial Board:** Saidiyya Komma, OD, Kristine Loo, OD, Rachel Werner, OD, and Heather Whyte, OD

**Credit Statement:** This course is COPE-approved for two hours of CE credit. Activity #124410 and course ID 79566-NO. Check with your local state licensing board to see if this counts toward your CE requirement for relicensure.

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**TABLE 1. JERK VS. PENDULAR NYSTAGMUS**

Jerk	Pendular
Slow phase followed by fast phase	Nystagmus in equal velocity, no fast phase
Direction of nystagmus = direction of fast phase	May occur in any direction
Directions of jerk nystagmus: horizontal, upbeat, downbeat, torsional, mixed	Not characterized by direction due to no fast phase Subtype: see-saw nystagmus

side of the lesion and can present with oscillopsia and a skew deviation.<sup>6,12</sup>

Nystagmus can be a physiologic response to the environment as optokinetic nystagmus or a vestibulo-ocular reflex from head rotations, congenital factors or pathologic reasons due to damage to the vestibular or visual pathways.<sup>13</sup> The most common symptom of nystagmus is vertigo or spinning sensations due to a disruption in the vestibular pathway.<sup>7,9,13</sup>

A broad overview of the vestibular system is categorized into the peripheral and central pathways. The peripheral system involves the semicircular canals, the otolithic organs and the vestibular portion of cranial nerve VIII.<sup>9,13</sup> There are three semicircular canals that detect head rotation.<sup>9</sup> The otolith organs include the utricle and saccule, which detect linear acceleration and head position.<sup>9</sup> These peripheral system organs play a role in the vestibulo-ocular reflex, providing compensatory eye movements to allow images to remain steady on the fovea during head movements.<sup>4</sup>

The central vestibular system involves input from the vestibular organs along with the somatosensory and visual systems to the vestibular nuclei and cerebellum to maintain a sense of balance and position.<sup>9,13</sup> Symptoms of vertigo from nystagmus are mostly associated with peripheral vestibular disease but can include involvement from the central vestibular system as well.<sup>7</sup> When associated with the central vestibular system, this could result in the need for urgent care.

When a patient presents with acute vertigo combined with a clinical sign

of nystagmus, one of the first areas to assess is whether this is a central or a peripheral vestibular system condition. Differentiating between a central or peripheral vestibular condition will help dictate the urgency of the patient’s complaints. Vertigo that localizes to the central vestibular system could indicate neurologic ischemia or infarction.<sup>14</sup>

Central vertigo will usually present with more mild symptoms that are constant and do not wax and wane with time, whereas peripheral vertigo usually presents with sudden and severe onset of symptoms that can be episodic or even change with posture positioning.<sup>14,16</sup> Also, peripheral vertigo can be linked with a viral illness, such as herpes zoster, and the presence of a rash may be seen.<sup>9</sup>

Other associated findings for peripheral vertigo are related to other vestibulocochlear symptoms such as tinnitus or loss of hearing, but central vertigo, due to its correlation with brainstem involvement, will present with neurologic symptoms (*i.e.*, weakness, numbness or diplopia).<sup>14</sup>

Once the likely underlying etiology is determined, creating a list of differential diagnoses can aid in further assessment and management of the patient. The most common cause for central vertigo, especially in elderly patients, is ischemia of the central vestibular structures—the cerebellum, brainstem and vestibular nuclei. However, in younger patients, the most common cause is due to acute demyelination, such as multiple sclerosis.

Some less common causes of central vertigo include medication (*i.e.*, anti-

convulsants such as phenytoin, phenobarbital and carbamazepine), infection, trauma, a posterior fossa brain tumor, rotational vertebrobasilar insufficiency, Wallenberg’s syndrome syndrome, Chiari malformation, multiple sclerosis, episodic ataxia type 2, disembarkment syndrome and migraine.<sup>14,15</sup>

Peripheral vertigo is typically caused by benign paroxysmal positional vertigo (BPPV). Other, less common causes are acute labyrinthitis, acute vestibular neuritis, cholesteatoma, herpes zoster oticus, Meniere’s disease, otosclerosis, perilymphatic fistula, vestibular neuritis, labyrinthine concussion, semicircular canal dehiscence syndrome, vestibular paroxysmia, Cogan’s syndrome, recurrent vestibulopathy, vestibular schwannoma, aminoglycoside toxicity and otitis media.<sup>14,16</sup>

Vestibular neuritis occurs from inflammation of the eighth cranial nerve, most commonly sequelae from a viral infection.<sup>14</sup> Meniere’s disease is thought to be caused by increased endolymphatic fluid pressure causing inner ear dysfunction.<sup>14</sup>

### Central vs. Peripheral Vertigo

The first step in determining the underlying cause is the initial intake, or history. Particularly in cases of transient vertigo where symptoms cannot be elicited in-office, patient history may be the only information available to help with diagnosis. Taking a detailed history will aid in differentiating between central vs. peripheral vertigo.

Several important questions to ask are the onset of symptoms, frequency of symptoms, any recent illnesses or presence of a rash, change in symptoms related to posture, associated headaches, tinnitus or even loss of hearing or any other associated symptoms that could be indicative of brainstem involvement such as weakness, numbness or double vision.<sup>2,14,16</sup>

When taking a history for these patients, a useful acronym to go by is TITrATE: timing, triggers and targeted examination.<sup>17,18</sup> By gathering this data, the type of vertigo can be categorized into episodic triggered,



**TABLE 2. CENTRAL VS. PERIPHERAL NYSTAGMUS**

	Central	Peripheral
<i>History</i>	Numbness, weakness, diplopia, dysarthria	Prior viral illness, change in symptoms with posture
<i>Symptoms</i>	Vertigo (dizziness/spinning sensation), diplopia	Vertigo (dizziness/spinning sensation) that worsens with head movements, possible loss of hearing in one ear, tinnitus, loss of balance
<i>Duration</i>	Longer duration, occurring more often than not	Episodic, acute onset
<i>Nystagmus - Direction</i>	Horizontal, upbeat, downbeat, torsional	Horizontal, horizontal/torsional
<i>Nystagmus - Eccentric Gaze</i>	Gaze-evoked: changes direction on gaze	Unidirectional: horizontal direction does not change with gaze position
<i>Fixation</i>	Persists, or worsens, with fixation	Dampens with fixation
<i>Occlusion</i>	No change	Can be induced with occlusion, latent
<i>HINTS</i>	Head impulse: normal (no corrective saccade) Nystagmus direction: changes direction on eccentric gaze Skew deviation: positive (vertical ocular misalignment)	Head impulse: abnormal (corrective saccade) Nystagmus direction: does not change direction on eccentric gaze Skew deviation: negative

spontaneous episodic or continuous vestibular.<sup>17</sup> This may be useful in narrowing down differential diagnoses.

Another important component of history intake is to document current medication use, as any drugs that pose a risk for hypotension, hypoglycemia, anticholinergic side effects of the central nervous system, cerebellar toxicity and ototoxicity can induce vertigo.<sup>18</sup> Next, the patient’s blood pressure should be measured while standing and supine to assess for the most common cause of episodic triggered vertigo, which is orthostatic hypotension.<sup>17-19</sup> Orthostatic hypotension, which accounts for positional changes in blood pressure, is defined as a drop in systolic blood pressure by 20mm Hg, a drop in diastolic blood pressure by 10mm Hg or a pulse increase by 30 beats per minute.<sup>18</sup>

**Clinical Examination**

Following the initial intake, a physical exam will further aid in differentiating between a central or a peripheral vestibular system etiology. The Dix-Hallpike maneuver may be performed in-office to diagnose the most common cause of vertigo in adults: BPPV.<sup>18,20,21</sup> This is a non-ischemic disorder of the inner ear due to misplaced calcium crystals and debris usually located in the posterior semicircular canal.<sup>20</sup>

To perform the Dix-Hallpike maneuver, the patient must first be sitting upright while the doctor positions the patient’s face 45° to the right. The doctor then quickly but gently lays the patient on their back while supporting their head, which should partially hang off the exam table. This position should be maintained for 30 to 60 seconds, during which the patient’s eye movements must be assessed for nystagmus. If no nystagmus is present after 60 seconds, the patient should sit upright again for another 30 seconds. This procedure should then be repeated with the patient’s face turned to the left in order to test the other ear. The symptoms associated with a positive result will be triggered when the affected ear is facing down. If the maneuver induces vertigo, either with or without nystagmus, this is a positive test and confirms the diagnosis of BPPV. However, a negative test does not definitively rule out BPPV.<sup>18</sup>

If the Dix-Hallpike test is negative, the next step is to rule out a stroke by performing a series of tests known as HINTS.<sup>2,15,22</sup> The HINTS examination stands for head impulse testing, direction of nystagmus and test of ocular skew deviation. Using the HINTS evaluation tool as part of the clinical assessment can be helpful to determine if the etiology lies within the

peripheral or central nervous system. It is important to note that not all patients are good candidates for HINTS testing, and it should be avoided in the following cases: head trauma, neck trauma, spinal instability, concern for arterial dissection and severe carotid stenosis.<sup>22</sup> The components of the HINTS exam are as follows:

**Head impulse testing.** While the patient is sitting upright and fixating on the examiner’s nose or a nearby object, the examiner will rapidly move the patient’s head from side to side by 10°. In the setting of a central vertigo, there will be no corrective saccade back to fixation; however, in the setting of a peripheral vertigo, there will be.<sup>22</sup>

**Direction of nystagmus.** While testing extraocular motility, assess for the presence of nystagmus that may or may not change direction on eccentric gaze. The examiner will assess the patient viewing in primary gaze and then lateral gaze. If the nystagmus direction changes, this would be consistent with a gaze-evoked nystagmus and likely a central vertigo, whereas in peripheral vertigo the nystagmus will not change direction. If the test elicits a horizontal nystagmus that exacerbates when gazing in the direction of the nystagmus, there is likely a peripheral cause. If there is a vertical or torsional nystagmus, there is likely a central cause.

**TABLE 3. MEDICATIONS INDUCING VERTIGO**

Drug Class	Mechanism of Action
Alcohol Antiarrhythmics Antidementia Antiepileptics Antihistamines Antihypertensives Anti-infectives (antifungals, fluoroquinolones) Parkinson's medications ADHD medications Digitalis Dipyridamole Narcotics Nitrates Phosphodiesterase type 5 inhibitors Skeletal muscle relaxants Sodium-glucose cotransporter-2 inhibitors Urinary anticholinergics	Hypotension, orthostatic hypotension
Skeletal muscle relaxants Urinary and GI antispasmodics	Central anticholinergic effects
Antiepileptics Benzodiazepines Lithium	Cerebellar toxicity
Antidiabetic medications Beta-blockers	Hypoglycemia
Aminoglycosides Antirheumatic medications	Ototoxicity
Anticoagulants Antithyroid medications	Bleeding, bone marrow suppression

Nystagmus secondary to peripheral causes can be suppressed with fixation.

**Test of ocular skew deviation.** The test of a skew deviation, or a vertical ocular misalignment, will also aid in determining a central vs. peripheral cause of vertigo. While the patient is centrally fixated at a distant target, perform an alternating cover test. If the covered eye exhibits a vertical deviation or positive skew deviation after uncovering it, there is likely brainstem involvement related to central vertigo.<sup>23</sup>

These tests may be performed remotely as well, through synchronous or asynchronous telemedicine.<sup>21</sup> In fact, video-oculography technology has been shown to improve accuracy in identifying a positive head impulse test or presence of nystagmus.<sup>19,21</sup> One important condition that does not

follow this formulaic workup is anterior inferior cerebellar artery (AICA) ischemia, which will have cerebellar and brainstem involvement and a positive head impulse test despite its central etiology.<sup>2,17-19</sup> In this case, use HINTS+, where the + accounts for unilateral hearing loss that is typical of AICA ischemia to the lateral pons.<sup>2,17-19</sup>

Central HINTS findings include a normal head impulse test (no corrective saccade), nystagmus that changes direction on eccentric gaze and a positive skew deviation test. Peripheral findings include an abnormal head impulse test (corrective saccade), nystagmus that does not change direction on eccentric gaze and a negative skew deviation test.

A multidirectional or gaze-evoked nystagmus is typically associated with

central vertigo, whereas a unidirectional horizontal nystagmus is observed with peripheral vertigo.<sup>2,14,16</sup>

One study found a correlation between retinal nerve fiber layer thickness and central vertigo as measured via OCT. Considering that the central retinal artery is an indirect branch of the internal carotid artery, it is likely the ischemic etiology of central vertigo that leads to mild thinning of the retinal nerve fiber layer.<sup>24</sup> In isolated cases of vertigo, in the absence of nystagmus and presence of other neurologic abnormalities, neuroimaging is indicated. Since vertigo is most commonly associated with posterior circulation insufficiency, a vertebralbasilar Doppler is recommended for further evaluation if the diffusion-weighted MRI is unremarkable for stroke.<sup>19</sup>

### Traumatic Brain Injury (TBI)

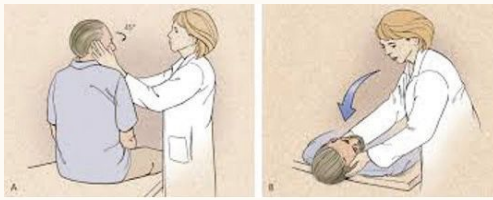
Patients who have suffered a TBI may have complaints of vertigo, a major cause of disability following brain injury as some patients are unable to work through their symptoms.

Post-traumatic vertigo can occur from a traumatic vestibulopathy, although some patients who have no evidence of a vestibulopathy experience vertigo-like symptoms. In these cases, there is no clear understanding as to why their symptoms occur, but it is thought that the injury can result in microscopic damage to both the central and peripheral vestibular systems. One study showed that vestibular rehabilitation therapy may or may not be helpful, with patients reporting an improvement in symptoms but many still unable to return to work.<sup>25</sup>

### The Role of the OD

Vertigo secondary to ischemic causes is rare, as only 3% to 5% of cases are secondary to a stroke, but proper diagnosis can prevent severe functional loss if vascular insufficiency is confirmed early.<sup>17</sup> That percentage may be grossly underestimated due to the frequency of misdiagnosis in these cases.

The underlying cause must be found to address treatment. Neuroim-



**Patient positioning in treatment of vertigo.<sup>32</sup>**

aging with a focus on the midbrain and posterior fossa is indicated in vascular episodes. Keep in mind that CT and MRI have poor sensitivity in detecting ischemic events affecting the vestibular system and posterior circulation.<sup>2,17,19</sup> Peripheral lesions of the vestibular system that lead to vertigo are often benign; however, central lesions are likely secondary to stroke.<sup>19</sup> An appropriate workup assessing visual, ocular motor and vestibular function in-office is more sensitive than neuroimaging in detecting an acute stroke related to vertigo.<sup>17</sup>

Other signs and symptoms of stroke include diplopia, dysarthria, ataxia, dysphasia and dizziness. Be aware that patients with a lateral medullary infarction (Wallenberg's syndrome) almost always present with a horizontal or torsional nystagmus.<sup>26</sup> If the nystagmus is horizontal, the fast phase will be beating away from the side of insult.<sup>27</sup> These patients may also present with Horner's syndrome, unilateral ataxia and difficulty sitting or walking.<sup>26</sup>

Wallenberg's syndrome is commonly caused by vertebral artery or posterior inferior cerebellar artery occlusion.<sup>26</sup> When this syndrome is suspected, perform MRA with head imaging to aid in diagnosis. If results come back unremarkable, consider looking into drug toxicity as the source of the nystagmus. Possible causes of drug-induced nystagmus include anticonvulsants, organophosphate poisoning and selective serotonin reuptake inhibitors.<sup>28-30</sup>

Proper evaluation of nystagmus can help aid in localization of the issue. Observe the patient in primary gaze and determine the type of nystagmus (jerk vs. pendular) and the direction of the nystagmus. Evaluate the nystagmus both with and without fixation. Trial +20.00D lenses to assess nystag-

mus without fixation. If the nystagmus is suppressed, this would indicate a peripheral lesion.

It is important to observe the nystagmus in all directions of gaze to identify a null position. The null position will give the patient the best visual acuity and fewest symptoms. If prescribing yoked prism to put the patient in the null position, the apex should be pointing toward the null point. A small amount of base-out prism can be prescribed if the nystagmus is dampened with convergence. Educate the patient that this should reduce their symptoms in primary gaze, but as they move their eyes, symptoms may increase.

Neurology referral for the medical treatment of nystagmus may be necessary. Medications are dependent on the type of nystagmus present, but the most common ones include clonazepam, aminopyridines, baclofen and memantine.<sup>16</sup> Although these medications may help with reducing nystagmus, your patient may still feel symptomatic as dizziness and incoordination are possible side effects from these drugs.<sup>16</sup> Other options for the treatment of nystagmus include a combination of high-plus glasses over high-minus contact lenses or auditory/tactile feedback devices.<sup>31</sup>

## Takeaways

Patients who experience nystagmus or vertigo may present to a primary eyecare clinic for further assistance. Determining the underlying condition is imperative in providing additional care or appropriate referrals. ■

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1. Which is the most common symptom associated with nystagmus?
  - a. Oscillopsia.
  - b. Vertigo.
  - c. Blurred vision.
  - d. Abnormal head position.
2. Nystagmus and vertigo occur from disruption of which system?
  - a. Optokinetic.
  - b. Ocular.
  - c. Vestibular.
  - d. Positional.
3. Patients with jerk nystagmus usually describe their symptoms in the direction of which phase?
  - a. Fast.
  - b. Slow.
  - c. Mixed.
  - d. Down.
4. In jerk nystagmus, the pathological phase is which phase?
  - a. Fast.
  - b. Slow.
  - c. Mixed.
  - d. Down.
5. Acquired pendular nystagmus can be caused by which of the following?
  - a. Multiple sclerosis.
  - b. Brainstem infarction.
  - c. Cerebellar disease.
  - d. All of the above.
6. Vestibular neuritis affects the eight cranial nerve and is most commonly caused by which of these?
  - a. Increase in endolymphatic fluid.
  - b. Viral infection.
  - c. Orthostatic hypotension.
  - d. Ischemia.
7. The most common reason for peripheral vertigo is:
  - a. Ischemia.
  - b. BPPV.
  - c. Medication-induced.
  - d. Demyelination conditions.
8. During the HINTS test, a peripheral vertigo will exhibit which of the following?
  - a. Positive test of skew deviation.
  - b. Nystagmus that changes direction based on gaze.
  - c. Normal head impulse test with no corrective saccade.
  - d. Negative test of skew deviation.
9. The most common reason for central vertigo in younger patients is which of the following?
  - a. Acute demyelination.
  - b. Infection.
  - c. Migraine.
  - d. Medication-induced.
10. Which is the most common cause of triggered episodic vertigo?
  - a. Stroke.
  - b. Migraine.
  - c. Orthostatic hypotension.
  - d. Medication use.
11. The Dix-Hallpike maneuver is used to diagnose which?
  - a. Central vertigo.
  - b. Vestibular neuritis.
  - c. BPPV.
  - d. Meniere's disease.
12. During HINTS testing, if the head impulse test triggers a saccade, then the vertigo is likely of which etiology?
  - a. Peripheral.
  - b. Central.
  - c. Ischemic.
  - d. Positional.
13. In AICA ischemia, the head impulse test will be which of the following?
  - a. Positive.
  - b. Negative.
  - c. Indeterminate.
  - d. Invalid.
14. Which imaging is ideal for isolating posterior circulatory insufficiencies?
  - a. Diffusion-weighted MRI.
  - b. CT scan.
  - c. CT angiography.
  - d. Vertebrobasilar doppler.
15. Which direction will the fast phase of horizontal nystagmus be beating in a patient with Wallenberg's syndrome?
  - a. Toward the insult.
  - b. Away from the insult.
  - c. The nystagmus will be pendular, so there is no fast phase.
  - d. Patients with Wallenberg syndrome do not present with nystagmus.
16. Common symptoms of stroke include which of these?
  - a. Dizziness.
  - b. Dysarthria.
  - c. Diplopia.
  - d. All of the above.
17. Which of the following is a common sign of Wallenberg's syndrome?
  - a. Nystagmus.
  - b. Coughing.
  - c. Aphasia.
  - d. Loss of vision.
18. Medical treatment of nystagmus includes all of the following except \_\_\_\_\_.
  - a. Anticonvulsants.
  - b. Baclofen.
  - c. Memantine.
  - d. Clonazepam.
19. Prism prescribed to relieve symptoms of nystagmus should be placed in what way?
  - a. Apex away from patient's null point.
  - b. Prism should never be prescribed for nystagmus.
  - c. Apex toward patient's null point.
  - d. Prism should always be base-in for nystagmus.
20. A lesion in which of the following areas is most likely to result in nystagmus?
  - a. Frontal lobe.
  - b. Temporal lobe.
  - c. Brainstem.
  - d. All of the above.

# Examination Answer Sheet

## How to Assess and Manage Nystagmus and Vertigo

Valid for credit through August 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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**Payment:** Remit \$35 with this exam. Make check payable to Jobson Healthcare Information, LLC.

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**Processing:** There is a four-week processing time for this exam.

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### Answers to CE exam:

1.  A  B  C  D
2.  A  B  C  D
3.  A  B  C  D
4.  A  B  C  D
5.  A  B  C  D
6.  A  B  C  D
7.  A  B  C  D
8.  A  B  C  D
9.  A  B  C  D
10.  A  B  C  D
11.  A  B  C  D
12.  A  B  C  D
13.  A  B  C  D
14.  A  B  C  D
15.  A  B  C  D
16.  A  B  C  D
17.  A  B  C  D
18.  A  B  C  D
19.  A  B  C  D
20.  A  B  C  D

### Post-activity evaluation questions:

Rate how well the activity supported your achievement of these learning objectives. 1=Poor, 2=Fair, 3=Neutral, 4=Good, 5=Excellent

21. Recognize the potential causes of vertigo and nystagmus. ① ② ③ ④ ⑤
22. Identify and assess these conditions among their patients. ① ② ③ ④ ⑤
23. Explain the vestibular system and its relationship to ocular function. ① ② ③ ④ ⑤
24. Determine when these conditions indicate a medical emergency. ① ② ③ ④ ⑤
25. Based upon your participation in this activity, do you intend to change your practice behavior? (Choose only one of the following options.)
  - A I do plan to implement changes in my practice based on the information presented.
  - B My current practice has been reinforced by the information presented.
  - C I need more information before I will change my practice.
26. 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):
27. If you plan to change your practice behavior, what type of changes do you plan to implement? (Check all that apply.)
 

<input type="checkbox"/> A Apply latest guidelines	<input type="checkbox"/> D Change in current practice for referral	<input type="checkbox"/> G More active monitoring and counseling
<input type="checkbox"/> B Change in diagnostic methods	<input type="checkbox"/> E Change in vision correction offerings	<input type="checkbox"/> H Other, please specify: _____
<input type="checkbox"/> C Choice of management approach	<input type="checkbox"/> F Change in differential diagnosis	_____
28. How confident are you that you will be able to make your intended changes?
  - A Very confident
  - B Somewhat confident
  - C Unsure
  - D Not confident
29. Which of the following do you anticipate will be the primary barrier to implementing these changes?
 

<input type="checkbox"/> A Formulary restrictions	<input type="checkbox"/> D Insurance/financial issues	<input type="checkbox"/> G Patient adherence/compliance
<input type="checkbox"/> B Time constraints	<input type="checkbox"/> E Lack of interprofessional team support	<input type="checkbox"/> H Other, please specify: _____
<input type="checkbox"/> C System constraints	<input type="checkbox"/> F Treatment related adverse events	_____
30. Additional comments on this course: \_\_\_\_\_

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

First Name

Last Name

E-Mail

The following is your:  Home Address  Business Address

Business Name

Address

City  State

ZIP

Telephone #  -  -

Fax #  -  -

OE Tracker Number

### 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

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

Signature \_\_\_\_\_ Date \_\_\_\_\_ Lesson 123026 RO-OSC-0822



EDITED BY PAUL C. AJAMIAN, OD

## CLINICAL QUANDARIES

# When to Dread the Red

*Sectoral injection may mean episcleritis, but scleritis should be on your differential as well.*

**Q** A 29-year-old male with a history of systemic lupus erythematosus (SLE) presented with a red eye with mild tenderness and light sensitivity for six days. His doctor put him on a generic topical steroid Q3H for three days without improvement. What are the next steps?

**A** Whenever there is localized (sectoral) injection, we should consider superficial causes such as conjunctival abrasion, *Staph.* marginal keratitis or infiltrates and episcleritis,” says Anthony DeWilde, OD, of the Kansas City VA Medical Center in

Missouri.” Phenylephrine 2.5% can aid in the diagnosis, and in this case, lessened the injection somewhat but not completely.”

### Distinguish Simple from Severe

Episcleritis commonly appears as sectoral injection involving both the episcleral tissues and overlying conjunctiva, usually concentrated in either the nasal or temporal quadrant.

Most cases are unilateral, but they may occur bilaterally in cases of toxic exposure or underlying systemic disease. There may be symptoms of pain or burning, but patients are always alarmed by the redness. Most cases of episcleritis are self-limiting, resolving spontaneously within two to three weeks even without treatment.

Take care to distinguish episcleritis from the more severe scleritis, which may appear similar. Ocular injection is typically deeper with scleritis, and the eye will not blanch with 2.5% phenylephrine as it would in episcleritis.

Scleritis can be anterior or posterior based on its relative location to the recti muscle insertion. Anterior scleritis, the most common form, can be subdivided into diffuse, nodular or necrotizing forms, with diffuse being the most common and causing widespread inflammation,” says Dr. DeWilde.

Nodular scleritis tends to have more localized injection with a raised nodule. Necrotizing scleri-

tis is associated with collagen vascular disorders and causes destruction of the sclera. Posterior scleritis occurs far more often than previously thought and can lead to rapid and permanent visual loss.<sup>1</sup> Fundus examination is critical and may reveal optic nerve edema, exudative retinal detachment or choroidal effusions.

### Treatment and Follow-up

In this patient, there was no improvement with three days of topical treatment. “While Durezol (difluprednate 0.05%, Novartis) could be more effective than Pred Forte (prednisolone acetate 0.1%, Allergan), our patient was suspected to have scleritis, which requires oral NSAIDs and/or oral corticosteroids (1mg/kg),” Dr. DeWilde says.

In this case, NSAIDs were not used due to a contraindication with the patient’s chronic stage 1 kidney disease. He was treated with oral methylprednisolone 30mg PO daily. He was advised to continue the Cellcept (mycophenolate mofetil, Genentech) and Plaquenil (hydroxychloroquine, Sanofi) that he still takes for SLE. The patient’s symptoms were resolved after four days of oral corticosteroids, with a significant improvement in redness.

Due to the pre-existing autoimmune disease, the decision was made to not pursue more laboratory tests. If patients are diagnosed with scleritis, there is about a 50% chance they have an associated autoimmune condition. “Most commonly these are rheumatoid arthritis, SLE and polyarteritis nodosa,” Dr. DeWilde says. “To evaluate for associated conditions in scleritis, a referral to rheumatology would be warranted.” ■

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**Most cases of scleritis will only blanch partially with topical 2.5% phenylephrine.**

About  
Dr. Ajamian

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.





“ I didn't realize  
**STARS**  
were little dots that twinkled ”

—Misty L, *RPE65* gene therapy recipient

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BY JOSEPH W. SOWKA, OD

## THERAPEUTIC REVIEW

# Hurt Feelings

*Lack of pain and decreased corneal sensation can signal problems.*

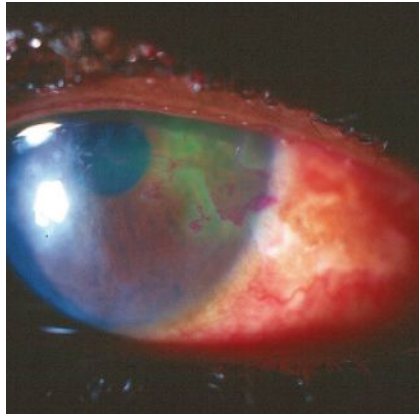
**A**n 81-year-old woman presented with a three-day history of vision loss and mild ocular irritation in her right eye.

Her medical history included moderate primary open-angle glaucoma OU that was medically uncontrolled in her right eye. Her left eye had undergone trabeculectomy several years earlier and was stable. She had received an aqueous shunting procedure with conjunctival grafting OD several months earlier, which required two surgical revisions, and subsequently developed persistent inflammation and cystoid macular edema unresponsive to topical therapy.

She then underwent four surgical vitreal placements of Ozurdex implants (dexamethasone, Allergan), the most recent of which was one month prior to her emergency visit. She was still using timolol 0.5% BID in her right eye.

Her entering visual acuity in her right eye was hand motion at two feet (previously 20/40). Biomicroscopic evaluation revealed the cause of her reduced vision. She had a large central corneal abrasion and underlying corneal edema encompassing the central 50% of the cornea. While a simple corneal abrasion would normally be easily treated or even self-resolving, her history of multiple invasive procedures combined with surgically induced chronic inflammation, along with very minimal ocular discomfort, was cause for concern.

Corneal sensitivity testing revealed virtually no sensation. This suggested that she didn't have a simple corneal



**Neurotrophic corneal ulcer from herpes simplex.**

abrasion but rather a more complicated neurotrophic keratitis.

### A Lack of Feeling

Neurotrophic keratitis is a degenerative corneal condition due to reduced neural innervation.<sup>1-11</sup> Neurotrophic keratitis is classified into three overlapping stages: stage 1 involves general epithelial alterations; stage 2 involves persistent epithelial defects; and stage 3 involves frank corneal ulceration.

A characteristic of all stages is decreased corneal sensation. Because of this, patients rarely complain of discomfort, and there is a significant discrepancy between clinical findings and subjective symptoms. Disease progression is often unnoticed by the patient but results in severe vision loss due to scarring and corneal perforation.

Trauma, tumors, inflammatory lesions, herpetic infections, chronic corneal exposure, amyloidosis and surgical procedures have all been capable of

initiating the cascade.<sup>8</sup> Abuse of topical ophthalmic anesthetics is also a strong cause, as well as exposure to smoke from crack cocaine.

One should also consider the effect of iatrogenic disease on persistent epithelial defects. Sometimes the corneal epithelium cannot heal when exposed to multiple medications and their preservatives in high doses. Damage to the trigeminal nerve anywhere between its origin in the midbrain and the branches within the cornea can cause neurotrophic keratitis.<sup>1-6</sup>

The corneal epithelium may demonstrate breakdown even in the absence of desiccation, active microbial infection or direct traumatic insult.<sup>5</sup> There is no gender predilection. Since neurotrophic keratitis is a result from injury, infection or inflammation, its course depends on the identification and treatment of the underlying cause, along with anti-infective, anti-inflammatory and immunologic support for the cornea itself.<sup>9-13</sup>

The corneal epithelium responds to injury by synthesizing several cytokines, growth factors and tissue-remodeling molecules.<sup>14</sup> Proinflammatory cytokines have been implicated in the inflammation that follows corneal epithelial injury. Any poorly regulated corneal reactions that occur after insult can retard healing. In turn, persistent corneal epithelial defects and inflammation may lead to ocular morbidity and permanent visual loss.<sup>14</sup>

Physical discomfort that is disparately low compared with the clinical findings should raise suspicion for neurotrophic keratitis.

### Treatments

Evaluation of corneal sensitivity and tear film function is important diagnostic data.<sup>2</sup> Initial management includes appropriate topical cycloplegia,

**About  
Dr. Sowka**

**Dr. Sowka** is an attending optometric physician at Center for Sight in Sarasota, FL, where he focuses on glaucoma management and neuro-ophthalmic disease. He is a consultant and advisory board member for Carl Zeiss Meditec and Bausch Health.

depending upon the severity of the accompanying inflammation. If there is significant epitheliopathy, use a topical antibiotic such as moxifloxacin QID to Q2H to prevent secondary infection of the compromised cornea. Prescribe copious non-preserved artificial tears as well as a bandage soft contact lens to support epithelial healing.

Punctal plugs can also be used to help ensure the cornea receives adequate lubrication. Eyelid patching and tarsorrhaphy can also be used to promote corneal healing. Neurotrophic corneas that are not treated aggressively can progress through stromal lysis to perforation.<sup>5</sup>

An alternate therapy that has been successful in the management of neurotrophic keratitis involves the placement of an amniotic membrane.<sup>15-17</sup> Additionally, autologous serum can also be beneficial in promoting corneal healing.<sup>18,19</sup> Autologous serum eye drops are useful in corneal re-epithelialization when a patient's serum is diluted by 20% or 50% and used every three to four hours daily.<sup>20</sup>

Recently, there has been a step forward with the development of Oxervate (cenegermin-bkbj 0.002%, Dompé), the first therapy approved for the treatment of neurotrophic keratitis.

Cenegermin is a recombinant human nerve growth factor that promotes healing in neurotrophic keratitis. Nerve growth factors act directly on corneal epithelial cells and have been shown to support corneal re-innervation.<sup>21</sup> These mechanisms are essential to overcome the degenerative cycle of neurotrophic keratitis.

Cenegermin is typically used as a first-line treatment for patients with stage 2 or 3 neurotrophic keratitis who have not responded to other conventional nonsurgical treatments for two weeks. One drop in the affected eye(s), six times per day at two-hour intervals, for eight weeks is recommended.<sup>22-24</sup>

Clinical results from cenegermin have been impressive. At eight weeks, complete healing has been seen in 75% of patients compared with 43% in the vehicle placebo group.<sup>24</sup>

## Patient Follow-Up

The patient presented here was educated about the likelihood of a protracted course of therapy. An amniotic membrane was avoided due to the aqueous shunt with grafting previously performed in that eye. She was prescribed copious non-preserved artificial tears and a topical antibiotic (moxifloxacin QID), and a soft bandage contact lens was placed on her eye. When she returned the next day, she had a diffuse epitheliopathy, but the central abrasion had decreased to involve now only 10% of the central cornea (down from 50%). She again manifested virtually no corneal sensation to cottonswipe testing.

“Disease progression is often unnoticed by the patient but results in severe vision loss due to scarring and corneal perforation.”

The patient was continued on copious tears and a hypertonic saline solution, but a bandage contact lens was not used. Over several days, her epithelial defect did close, but she had persistent epitheliopathy, minimal corneal sensation and an irregular area of negative staining in the shape of the original abrasion, indicating a very fragile cornea.

Due to the severity of the corneal hypoesthesia, autologous serum tears were deferred in favor of the more condition-specific treatment, cenegermin. She was maintained on preservative-free artificial tears until she was able to move through the process of obtaining the medication, which involved insurance determination, prior authorization and patient assistance grant submission (due to the high cost of cenegermin). She returned two weeks after obtaining cenegermin and using it at the recommended dosing of six times per day. She reported that instillation of her glaucoma medication in that eye now caused mild stinging. Commensurate with this history was an increase in sensation upon corneal sensitivity testing.

Her acuity had improved to 20/60, and her cornea, while manifesting a grade 2 diffuse epitheliopathy, showed no evidence of a focal corneal defect. She is currently completing her course of cenegermin. ■

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BY JAMES L. FANELLI, OD

## GLAUCOMA GRAND ROUNDS

# But Wait, There's More!

*A thorough investigation by a patient's care team helps paint a fuller picture of potential concurrent diagnoses.*

**A** 73-year-old Caucasian female was referred to me by a neuro-ophthalmic colleague for continued care. The patient had relocated to my area about 18 months prior, and she brought with

her a lengthy history involving a pituitary adenoma that had been resected 10 years earlier. She had also undergone bilateral cataract surgery approximately six years earlier. Essentially, the patient had been stable

prior to moving to the area and was continuing care with new providers. She had been seen most recently by neuro about three months prior to my first visit with her.

### The Case

At the initial visit her entering visual acuities were 20/50- OD and 20/40- OS. She complained of some increased blur interfering with her daily activities. Best-corrected visual acuities through hyperopic astigmatic and presbyopic correction were 20/40+ OD and 20/40+ OS. Pupils were equal, round and reactive to light and accommodation, with no afferent pupillary defect. Extraocular muscles were full in all positions of gaze.

Slit lamp examination of her anterior segments was essentially unremarkable. There was mild epithelial basement membrane dystrophy present OU, the anterior chamber angles were open 360° and the chambers were quiet. There was mild dermatochalasis present bilaterally. Applanation tensions were 14mm Hg OD and OS.

Through dilated pupils, her posterior chamber intraocular lenses were clear and centered; the posterior capsules were opened secondary to YAG capsulotomies OU. Bilateral posterior vitreous detachments were present.

Close stereoscopic examination of her optic discs revealed some not so surprising findings and one remarkable finding. Both optic nerves were pale and of normal size. The pallor was subtle but distinctly present. There was some peripapillary atrophy present OU, making physical examination of the edges of the optic disc and cup somewhat difficult. She also had rather significant optic



The radial BMO-MRW scans of the patient's right (top) and left (bottom) eyes. Note the OCT segmentation of the PMB in each eye; interestingly, the right PMB is essentially normal, and the left is somewhat compromised.

### About Dr. Fanelli

Dr. Fanelli is the founder and director of the Cape Fear Eye Institute in Wilmington, NC. He is chairman of the EyeSki Optometric Conference and the CE in Italy/Europe Conference. He is an adjunct faculty member of PCO, Western U. and UAB School of Optometry. He is on advisory boards for Heidelberg Engineering and Glaukos.

cupping; her cup-to-disc ratios were estimated to be 0.7 x 0.9 OD and 0.65 x 0.75 OS.

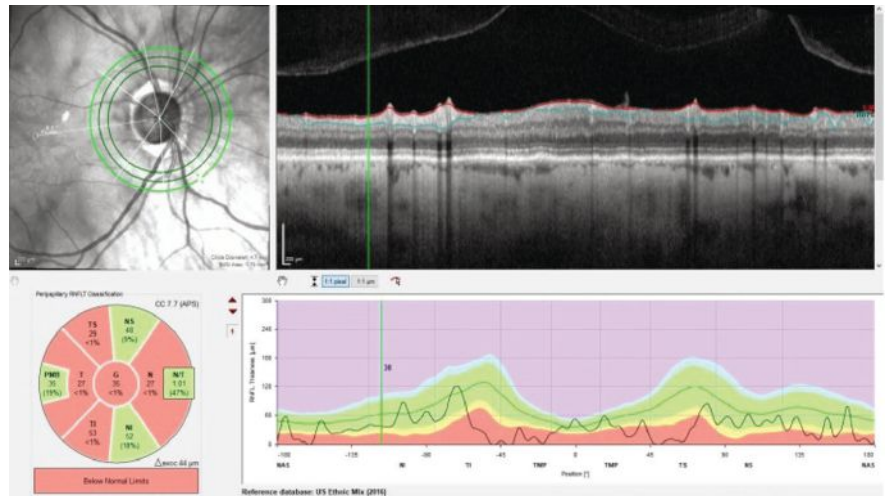
The presence of both the optic atrophy and loss of axons at the optic nerve is not surprising in patients with pituitary issues such as this one. She had initially presented to her primary care provider many years ago with headaches that prompted neuroimaging. The pituitary adenoma was found at that time, but there weren't any significant ancillary issues that warranted surgical intervention at that time.

Ultimately, after several years, symptoms increased and so did the adenoma, ultimately requiring surgical resection. Symptoms included changes in vision, headaches and involvement of the cavernous sinuses on both sides.

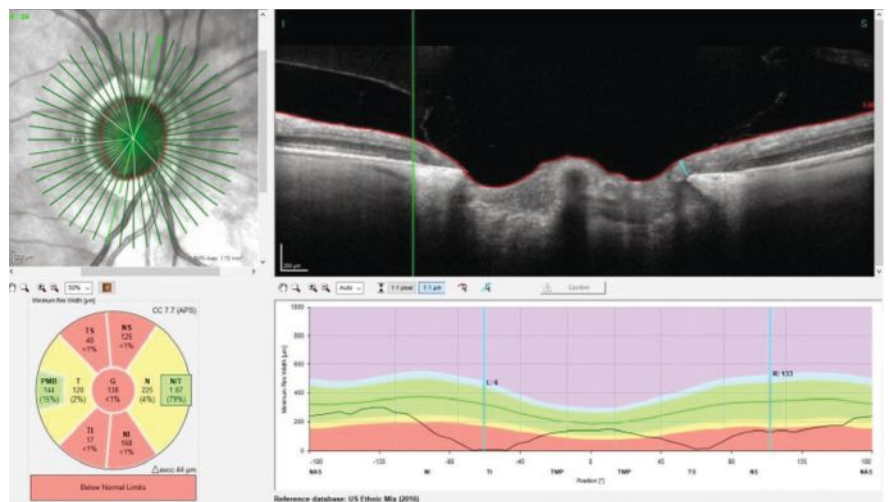
Following surgical intervention, her symptoms subsided. But given the protracted length of time the adenoma was present and gradually involving the chiasm, the atrophy and pallor were not surprising. What I did find surprising was the extent of her optic cupping bilaterally.

Her macular evaluations were characterized by retinal pigment epithelial granulation and drusen OU, consistent with her somewhat reduced acuity. There was no clinical evidence of neovascular age-related macular degeneration. The retinal vasculature was characterized by mild arteriolar sclerotic retinopathy and crossing changes. Her peripheral retinal evaluations were unremarkable.

Following the dilated fundus examination, I ordered a neuro profile OCT of her optic nerves. This particular optic nerve OCT segments out not only the circumpapillary retinal nerve fiber layer (RNFL) and Bruch's membrane opening-minimum rim width (BMO-MRW) as do the standard glaucomatous optic nerve scans but also the papillomacular bundle (PMB) fibers. As you know, the PMB fibers head straight to the optic nerve from the ganglion cells adjacent to



**Superior temporal and inferotemporal RNFL thinning OD, not inconsistent with glaucoma, with preservation of the PMB.**



**An eroded inferotemporal neuroretinal rim with a paltry 6μm of tissue remaining at the scan marker.**

the fovea, and these fibers are often damaged in non-glaucomatous optic neuropathies and under inflammatory optic nerve conditions, such as optic neuritis.

My OCT protocol when there are neuro-ophthalmic findings that can affect the optic nerve is to run this type of scan, as it tells me what I need to know from a glaucoma perspective and also sheds light on any concurrent neuro-ophthalmic problems.

While these OCTs demonstrated sectorally thinned neuroretinal rims, what I found interesting was the preservation of the PMB in the right eye and somewhat compromised

PMB in the left. Furthermore, the extent and characteristics of the optic disc neuroretinal rim loss were also suggestive of glaucomatous damage as seen in the inferotemporal and superior temporal segments of each nerve, more noticeable OD than OS. This can even be seen in the periopic RNFL OD in the 4.7mm circle scan, somewhat distant from the neuroretinal rim.

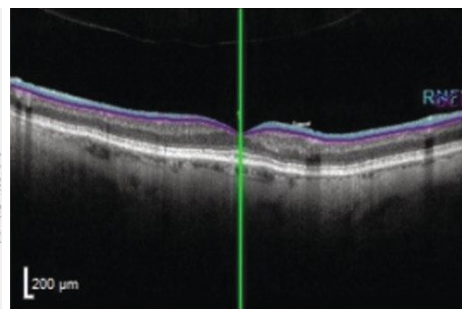
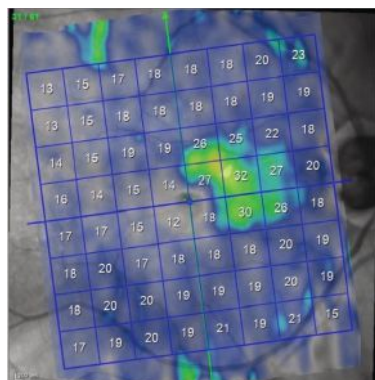
Upon interpreting these OCT reports, I was concerned about the possibility, and frankly probability, of this patient also having concurrent normal-tension glaucomatous damage to both optic nerves (OD>OS).

I discussed the findings with the patient and asked to see her back in a week to run threshold fields and pachymetry.

### The Outcome

The patient returned as requested. At this visit, applanation tensions were 15mm Hg OD and 14mm Hg OS. Pachymetry was 537µm OD and 540µm OS. Threshold visual fields demonstrated several things, namely bitemporal field loss OU, with the vertical meridian affected OS at fixation, as well as superimposed bilateral arcuate defects above and below OD>OS consistent with glaucomatous field loss. In essence, the field defects demonstrated bitemporal hemianopia consistent with the chiasmal/pituitary problem, more noticeable in the left eye, along with arcuate field defects consistent with glaucoma, more noticeable in the right eye.

The preservation of a portion of the macular ganglion cell layer in the



Significant macular ganglion cell layer loss OD, except for the ganglion cells in the PMB.

right eye accounts for why the vertical meridional field defect OD did not involve fixation.

I discussed my findings with the patient and explained the concurrent presence of normal-tension glaucoma and the need to therapeutically intervene. Intraocular pressure (IOP)-lowering drops were prescribed, and at the follow-up about 12 days later, IOPs had been reduced to 9mm Hg OD and 10mm Hg OS. The medication was well-tolerated.

Later that day, I spoke with neuro, and after seeing the images, we agreed on the concurrent pressure-independent glaucomatous findings. The patient is scheduled to see me again next month for continued care.

Working closely with interdisciplinary colleagues, including other ODs, who appreciate your skills is satisfying professionally and ultimately makes better patient care possible. ■

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AND WALTER O. WHITLEY, OD, MBA

## SURGICAL MINUTE

# All that Glistens

*New IOL materials and designs aim to reduce bothersome issues such as dysphotopsias.*

BY JAKE WYSIADLOWSKI, OD  
AUSTIN, TX

With the development of each new intraocular lens (IOL) comes new concerns and complications. This fact of life then drives the continued development of even more innovative IOLs and designs—whether it be new optical modalities, haptic designs, edge designs, materials or lens coatings.

## Ongoing Issues

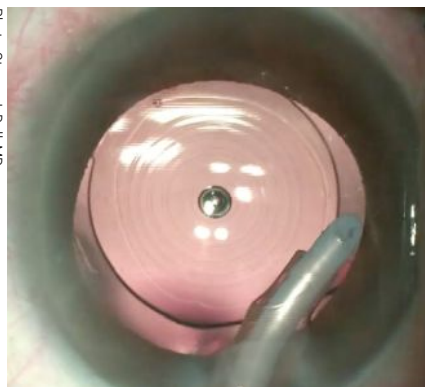
Some issues that continue to be troublesome are glare, halos, contrast sensitivity, poor night vision, chromatic aberrations, dysphotopsias, surface haze and different levels of IOL glistenings.

Dysphotopsias are disruptive photopic phenomena that can lead to poor patient satisfaction after cataract surgery. Positive dysphotopsias present as bright arcs, streaks, starburst, halos or rings of lights projected onto the retina. Negative ones present as dark portions, like shadows on the retina. These tend to lessen as neuroadaptation occurs, but not all patients will adapt the same.

Surface haze results in a rough appearance to an IOL due to the manufacturing process, which can leave small imperfections on the surface of the optic zone. This haze can be observed immediately after implanting the lens. The IOL can appear to have a matte texture, a sandpaper appearance or even look similar to frosted glass.

For a video of the procedure, read this article online at [www.reviewofoptometry.com](http://www.reviewofoptometry.com).

Photo: Steven J. Dell, MD



**This Clareon PanOptix IOL is manufactured in such a way as to reduce the phase separation that gives rise to glistenings, according to Alcon.**

Microvacuoles can appear within the IOL as small reflections, or glistenings. They occur due to phase separation of water within hydrophobic acrylic IOLs. Glistenings have been reported in the subsurface area as well as the central region. Subsurface glistenings tend to be larger, while the central ones are smaller in size. Glistenings appear within a one-to-16 month period after implantation of the lens.

Glare, halos, decreased contrast sensitivity, poor night vision and chromatic aberrations are common side effects with extended depth of focus and multifocal design IOLs. These have become necessary trade-offs of this modality of lenses to provide patients with an improved range of vision.

## Recent Responses

Responding to the presence of these common issues and side effects, Alcon and Johnson & Johnson have devel-

oped new IOLs materials aimed at reducing these annoyances.

Alcon has released a new family of IOLs called Clareon, which includes monofocal and toric lenses as well as the PanOptix and Vivivity IOLs. The Clareon lenses aim to reduce glistening formation as well as the amount of surface haze that occurs during manufacturing. Alcon says the water content has been increased to 1.5% and is uniformly distributed throughout the lens to decrease phase separation. An Alcon-funded study found the Clareon material exhibited the lowest level of surface haze and glistenings of among other premium monofocal IOLs.<sup>1</sup>

Johnson & Johnson has recently released its Tecnis Symphony and Tecnis Synergy designs in a new version called OptiBlue. These IOLs aim to reduce dysphotopsias in three ways. First, a violet light filter is used instead of one for blue light because violet light has been reported to create more light scatter, thereby reducing dysphotopsias. Second, an echelette design used on the lens increases the range of vision while also reducing light scatter and glare issues, according to J&J. Lastly, an achromatic design corrects for chromatic aberrations and increases contrast sensitivity during the day as well as night.

By being aware of the potential side effects unique to each IOL type, patients can be properly educated and can make an informed decision that will last them a lifetime. ■

1. Werner L, Thatthamla I, Ong M, et al. Evaluation of clarity characteristics in a new hydrophobic acrylic IOL in comparison to commercially available IOLs. *J Cataract Refract Surg.* 2019;45(10):1490-7.

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I was only seeing light flashes early on, but light

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when you've not seen anything for  
so many years—it was wonderful

—Keith H, retinal prosthesis recipient

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# Nothing to Sneeze At

*Blood suddenly appears in a patient's anterior chamber. What could have caused it? How serious is the condition?*

**A** 73-year-old African female presented with a chief complaint of blurry vision OS>OD of two months' duration. She was able to pinpoint that the persistent/constant blur developed after a sneeze. She denied trauma. Her previous ocular and systemic histories were remarkable for hypertension,

for which she was properly medicated and compliant. She denied any known allergies to medications or other substances.

## Clinical Findings

Her best-corrected entering visual acuity was 20/200 OD and 20/30 OS at distance and near. Refraction revealed

hyperopia of +0.75 OD and +1.50 OS with no improvement in vision. The pertinent biomicroscopic findings are illustrated in the photograph.

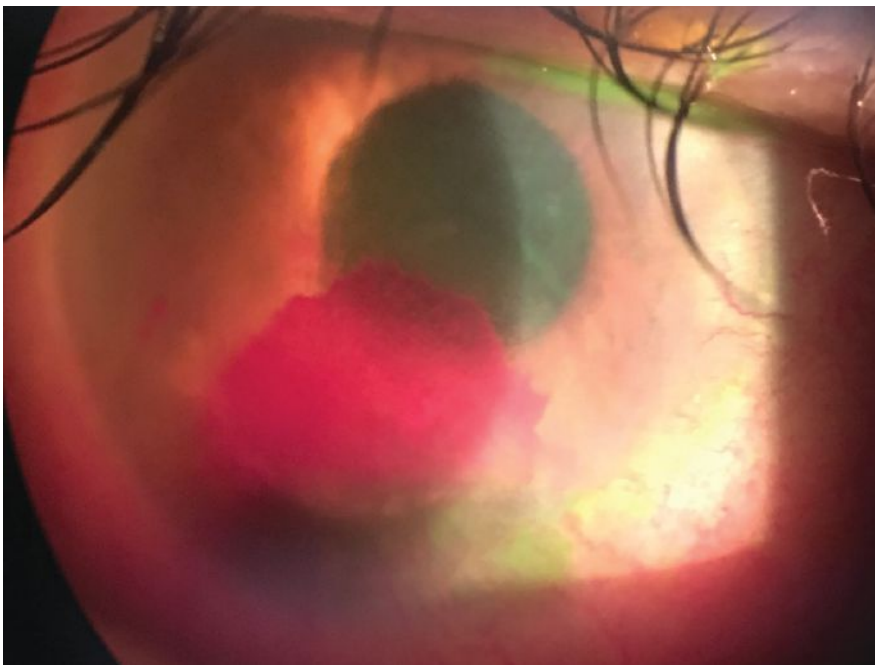
Her intraocular pressure (IOP) readings measured as 35mm Hg OD and 18mm Hg OS using Goldmann applanation tonometry. Dilated fundus examination revealed no significant posterior pole or peripheral retina findings: the nerves were distinct with cup-to-disc ratios of 0.3/0.35 OD and OS.

## For More Information

Additional studies included optical coherence tomography in each eye to examine the status of the nerve fiber layer and assess for evidence of glaucomatous damage, given the high IOP. An extensive dilated examination was completed to rule out the presence of mid-peripheral hemorrhages. Laboratory and Doppler testing was ordered to rule out the presence of other undiagnosed systemic diseases, such as diabetes and carotid artery disease. Gonioscopy was not completed so as not to increase the risk of rebleed; this could be completed at a later date.

## 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). ■



This was the patient's presentation on slit lamp exam. She reported blurry vision as well.

### About Dr. Gurwood

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.

**NEXT MONTH IN THE MAG**

In September, we present our 45th annual technology report. Articles will include:

- Artificial Intelligence for Diabetic Retinopathy Today and Tomorrow
- Reader Survey: What Tech Tools are on Your Shopping List?
- OCT Devices: A User's Guide to the Top Systems on the Market
- Telemedicine in Optometry: Can it Work for Us Long-term?

*Also in this issue:*

- Ocular Nutrition: Take Charge of the Dietary Conversation



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**Overall vision clarity** and **stability** of Biofinity® toric multifocal was rated higher over a month of daily wear compared to ULTRA® Multifocal for Astigmatism.<sup>4</sup>



**Significantly more wearers** agreed Biofinity® toric multifocal **met their vision needs** compared to ULTRA® Multifocal for Astigmatism.<sup>5</sup>

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1. CVI data on file, 2021. Prospective randomized, patient masked, crossover, bilateral dispensing study at 8 sites in North America. 56 habitual SCL wearers were fitted with Biofinity® toric multifocal and Ultra Multifocal for Astigmatism. 2. 38% patients strongly preferred Biofinity® toric multifocal vs. 9% for ULTRA® Multifocal for Astigmatism, p<0.01). 3. Typical day during 1 month wear, average wearing time vs comfortable wearing time Biofinity® toric multifocal 11.1 hours vs 10.2 hours and ULTRA® Multifocal for Astigmatism 10.7 hours vs 8.3 hours respectively. 4. Based on ratings for meeting or exceeding needs on days 7, 14 and 28; p<0.05. 5. CVI data on file, 2021. Prospective randomized, patient masked, crossover, bilateral dispensing study at 8 sites in North America. 56 habitual SCL wearers were fitted with Biofinity® toric multifocal and ULTRA® Multifocal for Astigmatism. 6. CVI data on file, 2020. Rx coverage database; 42 to 70 years ≥0.75DC. 7. CVI data on file, 2021. US industry reports and internal estimates. 8. CVI data on file 2021. Decision Analyst online survey of 376 Biofinity® prescribing ECPs in USA, Japan, Germany, France and Spain. On average, 86% strongly/somewhat agree. 9. CVI data on file 2021. Decision Analyst online survey of 1,027 Biofinity® wearers aged 16–65 years in USA, Japan, Germany, France and Spain. On average, 84% strongly/somewhat agree.



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<sup>2</sup>Based on a laboratory study.

<sup>3</sup>Antioxidant protects hyaluronan against free radicals.

<sup>4</sup>For 12 hours compared to Biotrue Multi-Purpose Solution, based on a laboratory study.

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