CLQA: Managing Scleral Decentration, *P. 94* • URGENT CARE: Open-globe Injuries, *P. 100*

REVIEW® of OPTOMETRY

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Leadership in clinical care

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Eye-Popping Office Spaces

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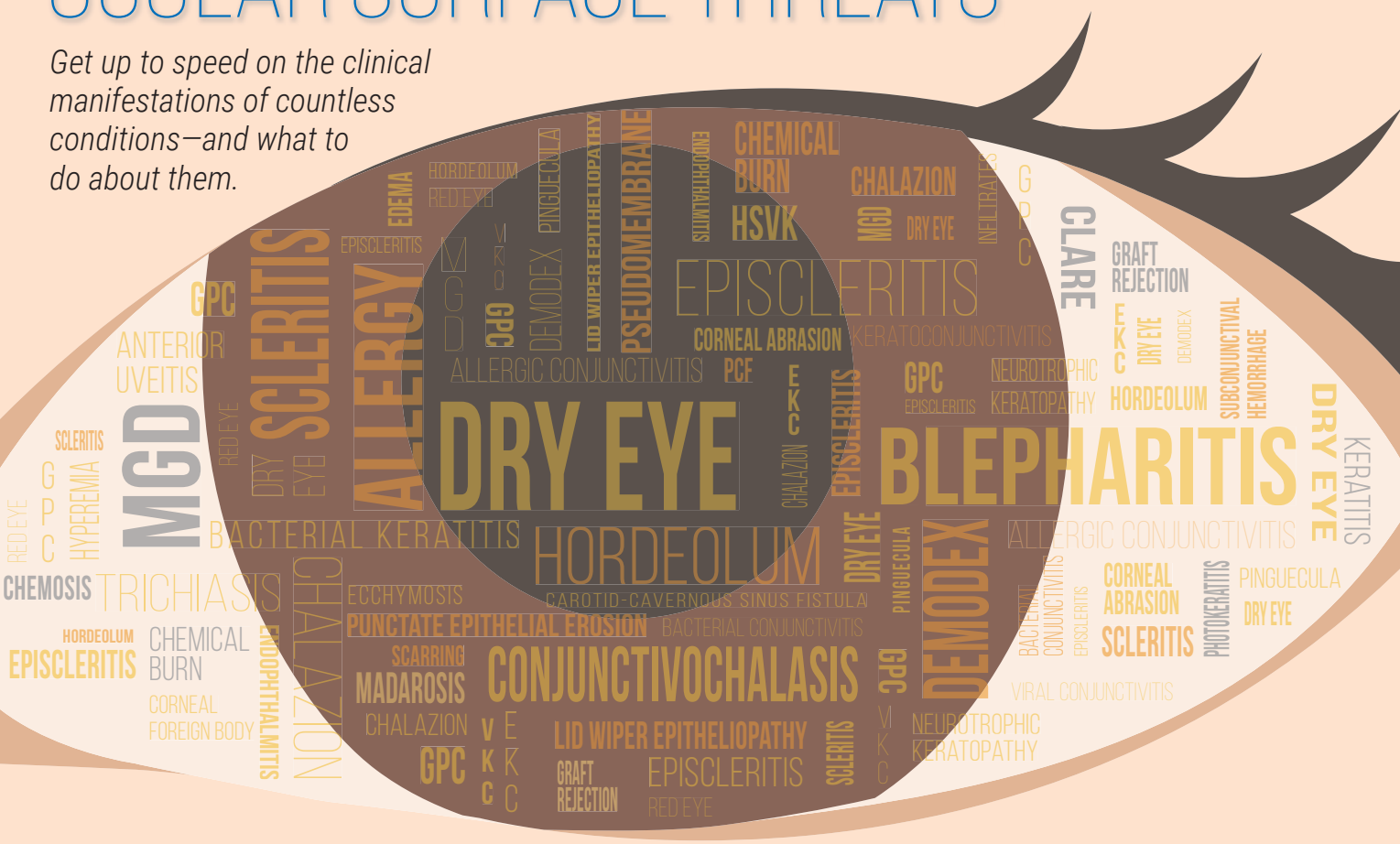
OCULAR SURFACE THREATS

Get up to speed on the clinical manifestations of countless conditions—and what to do about them.



VYZULTA®
(latanoprostene bunod ophthalmic solution), 0.024%

THE HORSEPOWER YOU NEED TO LOWER IOP

Powerful IOP reduction with excellent tolerability[1,2]

VYZULTA delivered **up to 9.1 mmHg mean IOP reduction** from baseline in pivotal trials.[1,2*]

TAKE A TEST RIDE AT VYZULTAHCP.COM

*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).[2,3]

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 ≥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.

BAUSCH+LOMB

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 ≥ 0.28 times the clinical dose. Doses ≥ 20 µg/kg/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 mcg/kg/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 mcg/kg/day. Abortion occurred at doses ≥ 0.24 mcg/kg/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 ≥ 0.24 mcg/kg/day and late resorptions at doses ≥ 6 mcg/kg/day (approximately 7 times the clinical dose). No fetuses survived in any rabbit pregnancy at doses of 20 mcg/kg/day (23 times the clinical dose) or greater. Latanoprostene bunod produced structural abnormalities at doses ≥ 0.24 mcg/kg/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 mcg/kg/day. Maternal toxicity was produced at 1500 mcg/kg/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 ≥ 300 mcg/kg/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 mcg/kg/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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Based on 9612403 (Folded), 9612303 (Flat) 5/2019

VYZ.0109.USA.20 Issued: 5/2020

New Therapeutics Expand Intervention Options

The innovations include a refillable implant that treats AMD with far fewer injections, an eye drop for presbyopia that constricts pupils and a nasal spray that boosts tear production.

No fewer than four new ophthalmic drugs received FDA approval in October, and each hopes to distinguish itself with a unique approach to care. Retina specialists will have access to a ranibizumab-dispensing implant for wet age-related macular degeneration (AMD) and a suprachoroidal injection to treat uveitic macular edema. Optometrists will be able to prescribe the first of several forthcoming eye drops for presbyopia and a nasal spray to treat dry eye.

For the ODs

Corrective lenses for presbyopia have a new competitor to contend with. The first drug for such use—Vuity, from Allergan—has finally entered the market.

The pupil-constricting drop (pilocarpine 1.25%) reaches peak efficacy one hour after use, then begins to wane. Patients begin experiencing visual improvement in as little as 15 minutes, and at least some positive effects can last up to six hours, according to the drug's FDA trial data. Dosing is QD.

Vuity's two Phase III trials (Gemini 1 and 2) used a primary endpoint of achieving three lines of near vision improvement under mesopic conditions without losing more than one line of distance vision, when measured at day 30, hour three, of use. This was met by 31% and 26% of subjects, respectively, in the two studies. Both groups showed statistically significant improvement over placebo, a press release notes.

Headache and conjunctival hyperemia were the most common adverse events. The company says the drug's vehicle is formulated to adapt to the pH of the eye to reduce blur and discomfort.

Photo: Allergan

Pharma companies have their eyes on presbyopia. Vuity is the first to market.

In a first for dry eye patients, a nasal spray that stimulates the trigeminal parasympathetic pathway offers a new means of boosting tear production. Tyrvaya (varenicline 0.03mg, Oyster Point Pharma) is a cholinergic agonist that triggers basal tear production, the company says. Patients gained 10mm or more in Schirmer's scores.

For the MDs

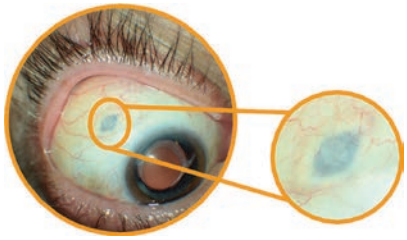
While the average patient with wet age-related macular degeneration (AMD) today is treated via monthly or bimonthly anti-VEGF injections, a new therapeutic approach—using a refillable ocular implant that releases ranibizumab continuously—may reduce the number of yearly treatments to two. Susvimo (Genentech), previously referred to as the Port Delivery System, gained approval from the FDA after demonstrating in clinical trials its ability to produce results comparable to that of monthly anti-VEGF injections.

The device is implanted into the patient's eye during a one-time surgical procedure and must be refilled by an ophthalmologist every six months; after implantation, Susvimo delivers 100mg/mL ranibizumab into the eye, a press release from Genentech explains. The company notes that, if needed, supplemental ranibizumab treatment can be given while the implant is in place. During clinical trials, 98% of patients treated with Susvimo were shown to achieve and maintain vision gains at the same rate as those receiving monthly injections (+0.2 and +0.5 letters from baseline), the company reports.

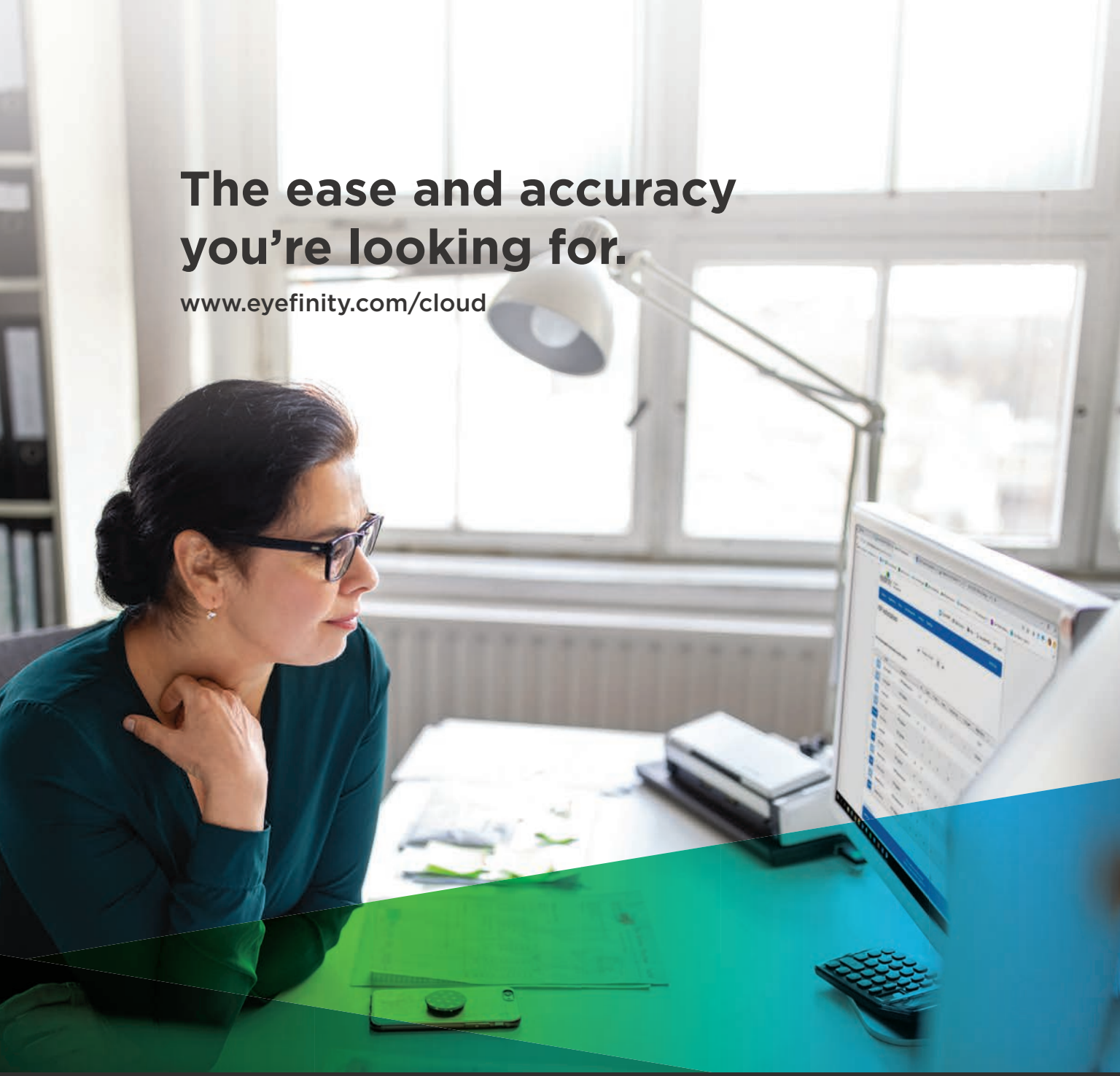
The most frequent complication observed was endophthalmitis, which occurred at three times the rate for patients with the Susvimo implant (2% total) than those receiving monthly ranibizumab injections. Genentech advises that close monitoring and early detection with surgical repair of conjunctival retractions or erosions may reduce the risk of endophthalmitis.

Also approved last month was Xipere (triamcinolone acetonide, Bausch + Lomb/Clearside Biomedical) a suprachoroidal injection for uveitic macular edema. That route of administration provides more targeted delivery and rapid dispersion of drug to the affected area, B+L says.

Photo: Anat Loewenstein, MD



Surgeons implant the Susvimo drug reservoir such that it can be refilled with a needle every six months.



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CA, NY Expand Scope of Practice

California ODs can now treat all non-cancerous anterior segment conditions and permanently administer COVID vaccines, while New York ODs gained oral med Rx privileges.

Optometrists in California will no longer be hamstrung by limited prescribing and treatment authorities, thanks to a twin set of expanded scope of practice bills that were recently signed by Governor Gavin Newsom. The new law also grants ODs permanent privileges to administer COVID-19 vaccines.

The first bill, AB 407, revises the Optometric Practice Act to eliminate the restrictive list of allowed drugs and conditions, and instead authorizes treatment of all non-cancerous anterior segment conditions, with some limitations, according to the California Optometric Association (COA).[1] The updates will also mandate new rules for optometric and medical assistants, including a prohibition of subjective refraction done by assistants via telemedicine.[1] This bill will take effect January 1, 2022.

The other bill, AB 691, gives ODs permanent authority to administer COVID-19 vaccines and perform clinical lab improvement amendment (CLIA)-waived COVID-19 testing, according to the COA.[1] Optometrists see patients more frequently than other providers, and each visit to the optometrist is an opportunity to vaccinate, the COA said in a recent press release.[1] In addition to the ongoing need for booster shots, optometry clinics can play a big role in improving public health, the COA suggests.[1]

"Previously, we were under emergency use to administer the COVID-19 vaccine, but now it is part of our scope, and it's effective immediately, so there isn't any more tiptoeing around and asking for permission to do immunizations," says optometrist Mark Nakano, associate dean for clinics at Southern California College of Optometry. "This is a game-changer for optometrists who have been certified to administer vaccinations, as they can be part of the frontline. If optometrists haven't been certified yet, they can be now and should be welcomed and accepted with open arms."

Dr. Nakano, who is part of the COA legislative team and helped negotiate the bills, says the new law clears up several points of ambiguity and some misunderstandings regarding specific optometric privileges. For example, if one went by the letter of the previous scope of practice law, ODs weren't authorized to treat blepharitis.

"We tried to go for a broader-based bill that is closer to what is taught. Most optometrists are trained far beyond what we are able to practice, especially in California, so this is closer as far as disease processes that we can treat and medications we can use," Dr. Nakano explains.

The previous law, which Dr. Nakano describes as being very "prescriptive," only allowed ODs to treat limited types of inflammation in individuals over 18 and prescribe a small amount of antiviral medications.

"Now we can treat almost every type of viral infection a patient may be experiencing, and we're not limited to certain medications, so this really opens up the door for optometrists," Dr. Nakano says.

The new law will also allow ODs to perform tests for systemic conditions that may be related to an ocular problem, he adds. "It's important that ODs in California can now order any tests, imaging or cultures, as we were restricted before," Dr. Nakano says.

Specifically, the new scope expansion law includes the following:[2]

- Eliminates the lists of allowed drugs and conditions in statute, and instead authorizes treatment of all non-cancerous anterior segment conditions
- Permits the use of antiviral and antifungal agents and eliminates a referral requirement for anti-allergy agents.
- Allows ODs to order more medical tests, including CLIA-waived testing for systemic conditions and COVID-19 testing.
- Permits optometrists the use of a scalpel to remove foreign bodies, as well as intense pulsed light and low-level light therapy.

The new law also outlines rules for medical and optometric assistants performing subjective refractions, requiring direct and on-site supervision and 45 hours of documented training, and precludes their ability to write prescriptions.[2]

The COA also advocated for two other bills signed into law earlier this year.[1] AB 1534 prohibits retail optical companies from interfering in an optometrist's professional judgement, and SB 509 allows optometry school graduates to temporarily practice under supervision if they are unable to take Part III of the NBEO due to COVID-19.[1]

Photos: Getty, Nathan Lighthizer, OD, Jessica Robinson, OD

Snapshots of the "hands-on" optometry that continues to gain steam, as expansive new laws bring more procedures to ODs in two large states.

(Continued on p. 9)

UPLIFTED

Give Acquired Ptosis Patients an EYE-OPENING Lift With a Daily Drop of Upneeq® (oxymetazoline hydrochloride ophthalmic solution), 0.1%[1]

The only FDA-approved prescription eyedrop proven to lift upper eyelids in adults with acquired blepharoptosis (low-lying lids)[1]

Learn more at Upneeq.com.

INDICATION

Upneeq® (oxymetazoline hydrochloride ophthalmic solution), 0.1% is indicated for the treatment of acquired blepharoptosis in adults.

IMPORTANT SAFETY INFORMATION

WARNINGS AND PRECAUTIONS

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

ADVERSE REACTIONS

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

DRUG INTERACTIONS

- Alpha-adrenergic agonists, as a class, may impact blood pressure. Caution in using drugs such as beta blockers, anti-hypertensives, and/or cardiac glycosides is advised. Caution should also be exercised in patients receiving alpha adrenergic receptor antagonists such as in the treatment of cardiovascular disease, or benign prostatic hypertrophy.
- Caution is advised in patients taking monoamine oxidase inhibitors which can affect the metabolism and uptake of circulating amines.

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

Please see next page for Brief Summary of full Prescribing Information.

Reference: 1. Upneeq® (oxymetazoline hydrochloride ophthalmic solution), 0.1%. [Prescribing Information].

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PM-US-UPN-0197-2 06/21

Learn more at Upneeq.com

UPNEEQ®
(oxymetazoline hydrochloride ophthalmic solution), 0.1%

Eye-Opening Possibilities

UPNEEQ® (oxymetazoline hydrochloride ophthalmic solution), 0.1%, for topical ophthalmic use

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

1 INDICATIONS AND USAGE

UPNEEQ is indicated for the treatment of acquired blepharoptosis in adults.

2 DOSAGE AND ADMINISTRATION

Contact lenses should be removed prior to instillation of UPNEEQ and may be reinserted 15 minutes following its administration.

If more than one topical ophthalmic drug is being used, the drugs should be administered at least 15 minutes between applications.

4 CONTRAINDICATIONS

None.

5 WARNINGS AND PRECAUTIONS

5.1 Ptosis as Presenting Sign of Serious Neurologic Disease

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

5.2 Potential Impacts on Cardiovascular Disease

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

5.3 Potentiation of Vascular Insufficiency

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

5.4 Risk of Angle Closure Glaucoma

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

5.5 Risk of Contamination

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

6 ADVERSE REACTIONS

6.1 Clinical Trials Experience

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

A total of 360 subjects with acquired blepharoptosis were treated with UPNEEQ once daily in each eye for at least 6 weeks in three controlled Phase 3 clinical trials, including 203 subjects treated with UPNEEQ for 6 weeks and 157 subjects treated with UPNEEQ for 12 weeks. Adverse reactions that occurred in 1-5% of subjects treated with UPNEEQ were punctate keratitis, conjunctival hyperemia, dry eye, blurred vision, instillation site pain, eye irritation, and headache.

7 DRUG INTERACTIONS

7.1 Anti-hypertensives/Cardiac Glycosides

Alpha-adrenergic agonists, as a class, may impact blood pressure. Caution in using drugs such as beta-blockers, anti-hypertensives, and/or cardiac glycosides is advised.

Caution should also be exercised in patients receiving alpha adrenergic receptor antagonists such as in the treatment of cardiovascular disease, or benign prostatic hypertrophy.

7.2 Monoamine Oxidase Inhibitors

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

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Risk Summary

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

Data

Animal Data

Effects on embryo-fetal development were evaluated in rats and rabbits following oral administration of oxymetazoline hydrochloride during the period of organogenesis. Oxymetazoline hydrochloride did not cause adverse effects to the fetus at oral doses up to 0.2 mg/kg/day in pregnant rats during the period of organogenesis (28 times the MRHOD, on a dose comparison basis). Oxymetazoline hydrochloride did not cause adverse effects to the fetus at oral doses up to 1 mg/kg/day in pregnant rabbits during the period of organogenesis (278 times the MRHOD, on a dose comparison basis). Maternal toxicity, including decreased maternal body weight, was produced at the high dose of 1 mg/kg/day in pregnant rabbits and was associated with findings of delayed skeletal ossification.

In a rat prenatal and postnatal development study, oxymetazoline hydrochloride was orally administered to pregnant rats once daily from gestation day 6 through lactation day 20. Maternal toxicity was produced at the high dose of 0.2 mg/kg/day (28 times the MRHOD, on a dose comparison basis) in pregnant rats and was associated with an increase in pup mortality and reduced pup body weights. Delayed sexual maturation was noted at 0.1 mg/kg/day (14 times the MRHOD, on a dose comparison basis). Oxymetazoline hydrochloride did not have any adverse effects on fetal development at a dose of 0.05 mg/kg/day (7 times the MRHOD, on a dose comparison basis).

8.2 Lactation

Risk Summary

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

8.4 Pediatric Use

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

8.5 Geriatric Use

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

10 OVERDOSAGE

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

PATIENT COUNSELING INFORMATION

Advise the patient to read the FDA-approved patient labeling (Instructions for Use).

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Bridgewater, New Jersey 08807

PM-US-UPN-0203 01/21

CA, NY Expand Scope of Practice

(Continued from p. 6)

NY ODs Gain Oral Med Rx Rights

On the heels of California's news, the state of New York recently passed an expanded scope bill (S. 1519/A. 1921) that will allow its ODs to prescribe a formulary of oral therapeutic pharmaceutical agents (TPAs).

New York ODs have been using diagnostic drugs since the mid-1980s and topical therapeutics since the mid-1990s. However, they were unable to prescribe oral medications for the treatment of eye disease until now, says Thomas J. Coté, MBA, CAE, executive director of the New York State Optometric Association (NYSOA).

Specifically, the new law permits optometrists to use oral TPAs, including antibiotics, antivirals and antiglaucoma agents, according to the American Optometric Association (AOA). ODs must also be certified to prescribe oral medications for glaucoma and ocular hypertension and must complete an oral therapeutic drug certification course and exam unless they graduated from an accredited college of optometry and passed board examinations after the law takes effect on January 1, 2023, the AOA says.

The bill's passage is significant for many reasons, the NYSOA suggests, including improved patient care and enhanced access to health care, especially since New York ODs are the primary eye care providers in much of the state, especially in rural and low-income urban areas.

ODs are highly qualified caregivers, with robust training and experience, and the new law mirrors the oral med prescribing privileges that are available to ODs in almost every other state, the NYSOA cites.

With its new bill, New York joins 48 other states and the District of Columbia in permitting their ODs to prescribe oral medications, the NYSOA reports. A total of 32 states granted oral prescription authority to ODs more than a decade ago, and North Carolina adopted its statue in 1977. Massachusetts remains the only state that doesn't grant ODs this oral med prescribing right, according to the NYSOA.

Also of note: ODs in other states that have granted prescribing privileges haven't experienced an increase in malpractice or professional misconduct based on oral authority, nor has any state ever repealed the authorization or limited the right of ODs to prescribe oral medications, the NYSOA says.

At least 18 states now let ODs prescribe oral medications without restrictions, the NYSOA explains.

1. California Optometric Association sponsored legislation signed into law. California Optometric Association. Press Release. October 8, 2021.

2. California amends optometry's approved treatments, medications and testing. American Optometric Association. October 13, 2021. www.aoa.org/news/advocacy/state-advocacy/california-amends-optometrys-approved-treatments-medications-and-testing?sso=y. Accessed October 19, 2021.

E-cigarette Use Linked to Visual Impairment

Tobacco smoking increases health risks and the chance of developing many diseases, including ocular diseases such as cataracts and thyroid eye disease. Less is known about the effects of tobacco-free alternative e-cigarettes. Looking to bridge this gap, researchers analyzed over 1.1 million responses from adults over the age of 18 from the Behavioral Risk Factor Surveillance System to study the association between e-cigarette smoking and perceived visual impairment.

The study concluded there is an association between e-cigarette use and increased visual impairment. The study found that younger people used e-cigarettes more often and older people had higher odds of visual impairment, with a relatively consistent association of e-cigarette use on visual impairment across the board.

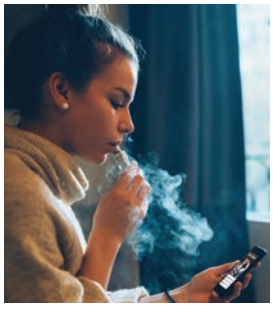

Photo: Getty Images

A previous study showed a correlation between e-cigarette use and increased dry eye and decreased tear film, theorizing that "propylene glycol used as solvent for e-cigarette liquid produces free radicals which damage the lipid layer of the tear film by lipid peroxidation."

In this study, e-cigarette users had lower tear meniscus heights and tear breakup times, "which were thought to be from deterioration of the lipid layer, but normal to elevated Schirmer testing indicated increased reflex tearing," the authors noted.

Even though e-cigarettes don't contain tobacco, they share similarities with cigarettes. "E-cigarettes have been shown to create oxidative stress and decrease antioxidants. Oxidative stress and reduction in antioxidants have been implicated in the development of cataracts, AMD and even glaucoma," the authors explained. "E-cigarettes also contain nicotine, which has been implicated in vasoconstriction in the eye and may increase the risk for glaucoma via vasoconstriction of episcleral veins or arteries supplying the optic nerve."

While e-cigarette use is associated with increased prevalence of vision impairment, the authors suggest a longitudinal, observational study to further investigate this association.

Golla A, Chen A, Tseng VL, et al. Association between e-cigarette use and visual impairment in the United States. Am J Ophthalmol. September 15, 2021. [Epub ahead of print].

Glaucoma Patients More Likely to Develop CBS

Charles Bonnet syndrome, characterized by recurring episodes of visual hallucinations, affects more than 7% of this population, research shows.

Charles Bonnet syndrome (CBS) causes complex visual hallucinations and presents in individuals with vision loss or impairment. Rather than a cognitive or neurological disease, CBS is a result of the brain's natural response to fill in for the images no longer being processed by the visual system. The person is typically aware that these hallucinations are not real.

Glaucoma is the ocular disease responsible for causing irreversible vision loss in the highest number of people, subjecting this patient population to secondary conditions such as CBS. One study found CBS had a prevalence of 20% in a group of glaucoma patients who sought treatment for extensive vision loss. Despite previous research associating CBS with the loss of visual acuity (VA), the findings of this study revealed that CBS may also present in patients with glaucomatous visual field loss, even if VA is preserved.

The study included 337 patients (average age: 78) with open-angle glaucoma (OAG) recruited from a hospital in Sweden. Patients were excluded if they had any neurological conditions that could lead to hallucinations or if they had advanced macular degeneration (AMD) or macular edema. More than half (56%) had ocular comorbidities, predominantly mild cataract and mild dry AMD, and most were older with more advanced glaucoma.

Photo: Getty Images

Patients with impaired vision from glaucoma may develop CBS, which involves seeing things that are not there.

After excluding all other factors, 24 (7.1%) of glaucoma patients in the cohort were diagnosed with CBS and admitted to having complex visual hallucinations (*e.g.*, seeing people, animals, flowers or patterns that aren't there). Of these, 14 patients did and 10 did not have ocular comorbidity, demonstrating no significant difference between groups, which the researchers note suggests that the hallucinations transpired from glaucoma. Only one of the 24 patients determined to have CBS knew of the condition prior to the study. Half of the individuals with CBS reported hearing difficulties, two reported a mild concussion and two reported a former period of depression.

The researchers observed the following in the group of patients with CBS:

- Over two-thirds (71%) of CBS patients had at least one eye with a visual field index of 30% or less compared with 34% of patients without CBS.
- More patients in the CBS group (52%) had at least one eye with a best-corrected VA (BCVA) below 0.3 compared with 23.3% of those without CBS.
- The most frequent reason for visual impairment was glaucoma or a combination of glaucoma and cataract.

"We report that the likelihood of CBS increases with decreasing visual field function and visual acuity," the researchers wrote. "Interestingly, about a third of the patients with glaucoma-associated CBS had relatively well-preserved VA (BCVA ≥0.5)."

"Out of 24 participants with CBS, only four (17%) had additional causes of visual impairment, *e.g.*, cataract," the researchers continued. "Together, these findings allow us to cautiously infer that the visual hallucinations were, indeed, caused by glaucoma."

With a prevalence rate of over 7% observed in this study, CBS is not a rare finding in patients with OAG, the study authors concluded. Patients may also be hesitant to admit they are experiencing hallucinations, as the phenomenon is commonly associated with mental illness. The authors advise clinicians to become familiar with CBS and question glaucoma patients about the presence of associated signs and symptoms, as many are reluctant to bring it up on their own.

Peters D, Molander S, Lomo T, Singh A. Charles Bonnet Syndrome in patients with open-angle glaucoma - prevalence and correlation to visual field loss. Ophthalmology. October 12, 2021. [Epub ahead of print].

IN BRIEF

Up to one-third of patients who undergo intraocular surgery develop ptosis. In most cases, the condition improves on its own within one to three months. However, researchers recently found that **patients who undergo longer and more invasive intraocular procedures, such as pars plana vitrectomy (PPV), may be more likely to develop persistent postoperative ptosis.**

A total of 57 patients (60 eyelids) with PPV were included in this study. The findings showed clinical postoperative ptosis in 57% of eyelids one month post-op and in 47% six months post-op. **Clinically significant postoperative ptosis was observed in 21% and 11% at one and six months**, respectively. The researchers noted that this frequency is markedly higher than cataract patients, in which roughly only 3% to 4% of patients experience clinically significant persistent ptosis lasting longer than six months.

"PPV is associated with a longer duration of procedure, higher number of incisions, more intraocular globe rotation and movement and more severe and longer postoperative inflammation than cataract surgery," the authors explained. "A significant increase of mean eyelid crease height from 9.4mm to 10.5mm in the first and 9.8mm in the last follow-up could imply a levator dehiscence mechanism." These findings suggest **a link between the invasiveness of the intraocular procedure and the likelihood of a patient developing persistent ptosis postoperatively.** Fortunately, the data shows the majority of patients improve within a few months.

Abdolalizadeh P, Kashkouli MB, Falavarjani KG, et al. Postoperative blepharoptosis after pars plana vitrectomy procedure. Ophthalmic Plast Reconstr Surg. 2021;37(5):431-4.

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Patients with DR at Higher Risk for Cataract

Those with ocular manifestations of this multisystem condition may face three times the likelihood, study shows.

Diabetes patients have up to a five-fold increased risk of cataract formation in their lifetime; however, not all of these cases are sight-threatening or require surgical intervention. Certain risk factors, including diabetic retinopathy (DR), place some patients with diabetes at a higher risk of developing cataracts severe enough to warrant surgery.

Taiwanese researchers recently gathered data on 3,297 DR patients, 13,188 diabetes control patients and 13,188 non-diabetes controls. Participant data was traced from 2000 through 2016. Throughout this period, 919 sight-threatening cataract events (27.9%) occurred in the DR patients, demonstrating a far greater relative risk than control subjects with diabetes (8.4%) or without (7.3%).

Sight-threatening cataracts were three times as likely among patients with DR vs. controls. Patients with proliferative DR or nonproliferative DR were found to have a comparable risk for sight-threatening cataracts, far higher than those with diabetes without any retinopathy. Other identified risk factors for sight-threatening cataracts included older age (>60 years), cardiovascular disease, chronic pulmonary disease, inflammatory disease, ocular disorders and oral or topical steroid use.

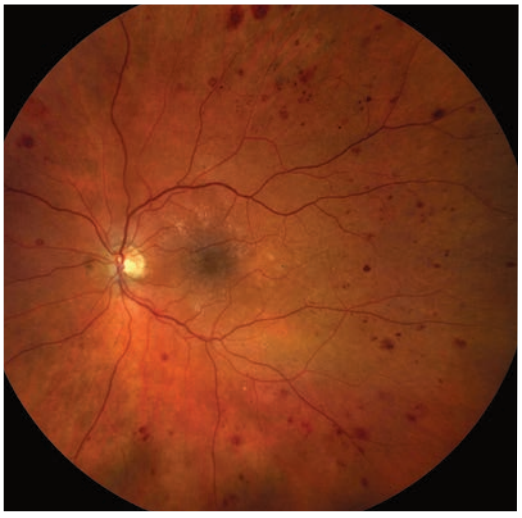

Photo: Jay Haynie, OD

A study finds the oxidative stress that occurs from diabetic retinopathy may also contribute to lenticular changes.

"The major pathophysiology of [diabetes] that induces cataracts is thought to be the fluid accumulation process," the researchers explained in their study. "Hyperglycemia leads to the additional production of sorbitol from the polyol pathway for glucose metabolism in the lens. Due to elevated osmotic pressure caused by the buildup of sorbitol, excess fluid influxes the lens, which leads to cell swelling, membrane impairment and subsequent cataracts."

By contrast, diabetic retinopathy "leads to intraocular hypoxia, ischemia and inflammation," they continued. "A previous review article concerning proliferative DR indicated that reactive oxygen species, inflammatory cytokines and vascular endothelial growth factors were increased in the vitreous cavity, and previous laboratory studies indicated that oxidative stress is also a risk factor for cataract formation." Therefore, DR likely influences the microenvironment in the eye more, increasing the catalysts for cataract development, they concluded.

Unlike previous studies that have unanimously associated diabetes with cataracts, the findings from this study suggest that patients with DR face a significantly more elevated risk of sight-threatening cataracts compared with those without ocular manifestations. Closely monitor and inform this patient population of any physical or clinical signs of cataract development.

Nien CW, Lee CY, Chen HC, et al. The elevated risk of sight-threatening cataract in diabetes with retinopathy: a retrospective population-based cohort study. BMC Ophthalmol. 2021;21:349.

IN BRIEF

An association between retinal detachment (RD) and atopic dermatitis (AD) may not be top of mind during routine eye exams but the connection warrants attention, researchers say. A team in Korea determined that **atopic patients develop RD at a younger age with a poorer prognosis due to a high incidence of proliferative vitreoretinopathy (PVR) or recurrence.** AD patients also had a much higher risk of RD after cataract surgery.

The retrospective review analyzed 2,257 patients who underwent RD surgery between 2008 and 2018. The researchers found 61 patients who were diagnosed as AD and assigned them into the experimental group. They randomly selected and assigned 100 patients who did not have AD into the control group.

The study found **post-op VA and prognosis were significantly worse, and bilateral involvement of RD was more common in the AD group** than the control group. Characteristics of retinal breaks were different between the two groups. Despite similar macula-off rates and preoperative VAs between the two groups, vitrectomy and encircling together as an initial operative method was performed more in the AD group than the control group (38% vs. 3%).

The study also found that the risk of developing RD within one year after cataract surgery was significantly higher in pseudophakic patients of the AD group than the control group. In phakic eyes, the movement of the vitreous body might be limited due to the lens. Thus, the progression of RD could be suppressed to a certain extent.

"Atopic patients could also be vulnerable to RD due to their specific immune reactions and the resulting degeneration of the vitreous body."

They concluded that AD patients need extensive treatment and management including regular examinations to achieve the best patient outcomes."

Lee Y, Park WK, Kim RY, et al. Characteristics of retinal detachment associated with atopic dermatitis. BMC Ophthalmol. October 11, 2021. [Epub ahead of print].

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‡In-Home Use Study: N=728 dry eye sufferers; April 2021. §Hyaluronan is sourced from a large-scale natural fermentation process.

References: 1. Bron AJ, et al. *Ocul Surf*. 2017;15(3):438-510. doi:10.1016/j.tos.2017.05.011 **2.** Jones L, et al. *Ocul Surf*. 2017;15(3):575-628. doi:10.1016/j.jtos.2017.05.006

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Patients Favor Same-day Bilateral Cataract Surgery

Convenience was the leading reason some chose the immediate option, while surgeon recommendation was the top reason others chose to delay the second procedure.

Surgeons now operate in the context of elevated patient expectations for outcomes, regardless of whether or not a patient has chosen a premium IOL, and many have discussed improving patient satisfaction (and surgical efficiency) by offering bilateral procedures.

"Although it is the patient who stands to benefit from the convenience of the immediate procedure and has to bear the consequences from any complications, there are few studies of patient experience with this surgical option," researchers at Kaiser Permanente in Northern California noted in a recent paper they published.

The team conducted a study to understand patient experiences and decision-making regarding immediate sequential bilateral cataract surgery in the era of heightened patient expectations about refractive results following the procedure. The study reported high levels of satisfaction in patients who underwent the immediate surgery and the majority of them would recommend the procedure to a friend or family member. Of the immediate bilateral cataract surgery patients surveyed, 96% would choose that procedure again, while 80% of delayed bilateral surgery patients would choose their procedure again.

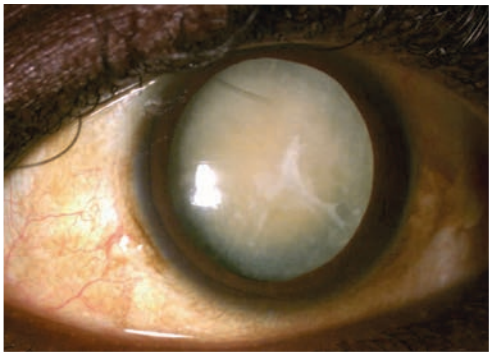

Photo: Joseph W. Sowka, OD

Study shows that 94% of patients having undergone immediate bilateral surgery would recommend the same to friends and family.

The survey asked 1,290 cataract surgery patients (672 immediate and 618 delayed) to explain their reasons for choosing their specific procedure, concerns about cataract surgery and whether the loss of opportunity to modify the surgical plan for the second eye affected their decision to undergo immediate sequential bilateral cataract surgery.

Among the immediate surgery patients, 65% indicated they chose it because of convenience, with the second highest reason being surgeon recommendation (56%). For the delayed surgery patients, recommendation of the surgeon was by far the most common reason chosen (68%). Still, 94% of patients having undergone immediate bilateral surgery would recommend the same to friends and family, whereas only 68% the delayed surgery patients would recommend that approach to friends and family. More delayed surgery patients (20%) than immediate (4%) indicated that, if suitable, they would change to the other format for cataract surgery.

The researchers note that, for suitable patients, immediate sequential bilateral cataract surgery is an option that is efficient for healthcare systems and cataract surgeons, convenient for patients and has been shown to have high levels of patient satisfaction.

However, they also recognize that presenting that surgical option may increase the complexity of preoperative surgical decision-making. The team considers whether using a personalized decision aid that incorporates ocular comorbidity burden and any potential refractive benefit of delayed surgery will help decide between the two bilateral surgery procedures and result in improved patient satisfaction.

Carolan JA, Amsden LB, Lin A, et al. Patient experience and satisfaction with immediate sequential and delayed sequential bilateral cataract surgery. Am J Ophthalmol. September 25, 2021. [Epub ahead of print].

IN BRIEF

Choosing the most effective anti-inflammatory prophylaxis after cataract surgery is important in ensuring successful outcomes, but which type of drugs are the most effective?

In a recent study of 470 patients, **researchers sought to determine whether a combination of prednisolone and NSAID eye drops is better in preventing macular thickening after cataract surgery compared with NSAID monotherapy and dropless surgery** using a sub-Tenon capsule depot. They also wanted to test whether pre-op eye drops are better than starting treatment the day of surgery.

Three months after surgery, **no differences in central subfield thickness (CST) or visual acuity were detected** between combination treatment of prednisolone and NSAID eye drops vs. NSAID monotherapy or sub-Tenon dropless surgery. More than half of the patients in the sub-Tenon group received additional anti-inflammatory treatment, which might explain why no difference in CST was found at three months, despite the significant increase in the measurement detected three weeks postoperatively.

Additionally, **IOP was higher in the groups that used prednisolone eye drops** compared with NSAID monotherapy and sub-Tenon dexamethasone depot in the first three weeks post-op. However, the mean IOP was low in all groups, and it didn't rise above 25mm Hg at any post-op visit.

"NSAID monotherapy with initiation on the day of surgery may be preferred as an anti-inflammatory prophylactic regimen in uncomplicated cataract surgery," the investigators concluded."

Erichsen JH, Holm LM, Jacobsen MF, et al. Prednisolone and ketorolac vs. ketorolac monotherapy or sub-tenon prophylaxis for macular thickening in cataract surgery a randomized clinical trial. JAMA Ophthalmol. August 12, 2021. [Epub ahead of print].

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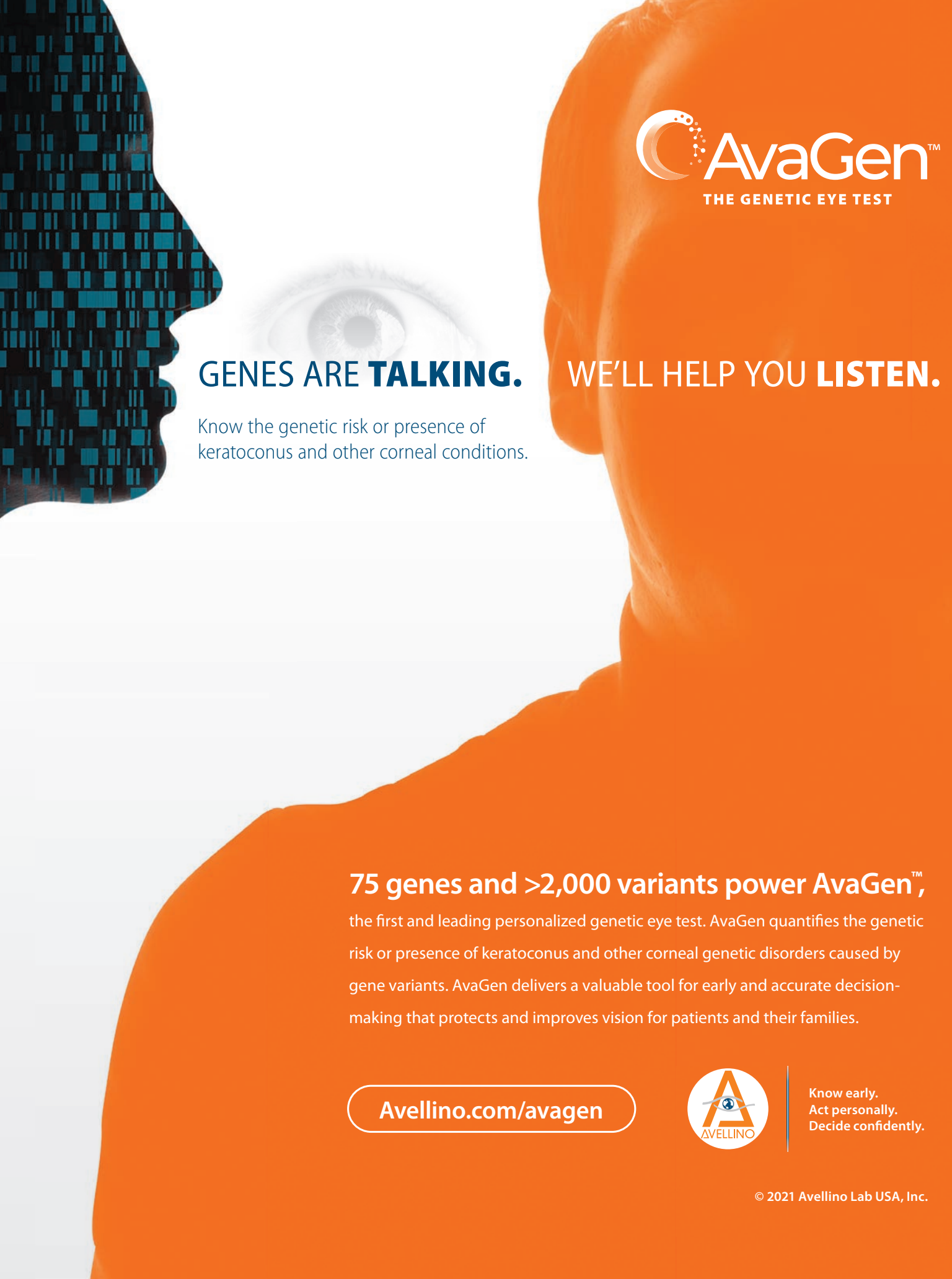
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FEATURES

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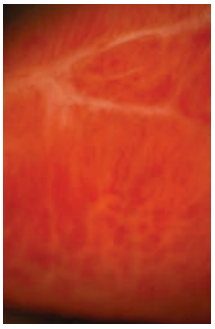
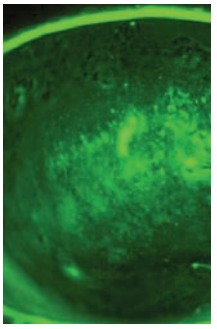


48
The Conjunctiva Up Close

Here's how to recognize and manage a few common conditions that affect this part of the eye.

By Megan Mannen, OD



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Dry Eye: Where Do We Stand with Omega-3 Supplements?

A review of recent research for and against this treatment supplementation.

By Luis Rojas, OD

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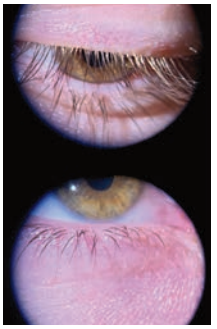
Beneath the Mask: OSD Issues Spike Due to Improper Wear

Since the onset of COVID, doctors have noted an increase in dry eye, chalazion, blepharitis and hordeolum cases. Here, several experts offer diagnosis and treatment tips.

By Jane Cole, Contributing Editor



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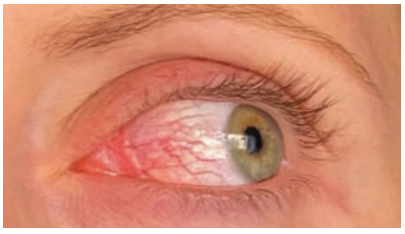
Anterior Blepharitis: The Front Line of OSD

We dissect everything you need to know about this common condition, including proper treatment and management, and how it can be a sign of *Demodex*.

By Andrew McLeod, OD, and Amy Nau, OD



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When Your Patient Complains of Red Eye

The key to uncovering the root cause is a thorough patient history and clinical exam.

By Suzanne Sherman, OD, and Christina Cherny, OD

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38

2021 DESIGN CONTEST

Eye-Popping Office Spaces

ODs bounced back from the COVID doldrums with bold and adventurous new design ideas.

When patients rely on artificial tears alone, inflammation may persist.
Xiidra can disrupt the chronic inflammatory cycle in dry eye disease.*
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*Xiidra blocks LFA-1 on T cells from binding with ICAM-1 that may be overexpressed on the ocular surface in dry eye disease and may prevent formation of an immunologic synapse which, based on in vitro studies, may inhibit T-cell activation, migration of activated T cells to the ocular surface, and reduce cytokine release. The exact mechanism of action of Xiidra in DED is not known.[1,2,5]

†The safety and efficacy of Xiidra were assessed in four 12-week, randomized, multicenter, double-masked, vehicle controlled studies (N=2133). Patients were dosed twice daily. The mean age was 59 years (range, 19-97 years). The majority of patients were female (76%). Use of artificial tears was not allowed during the studies. The study end points included assessment of signs (based on Inferior fluorescein Corneal Staining Score [ICSS] on a scale of 0 to 4) and symptoms (based on patient-reported EDS on a visual analogue scale of 0 to 100). Effects on symptoms of dry eye disease: a larger reduction in EDS favoring Xiidra was observed in all studies at day 42 and day 84. Xiidra reduced symptoms of eye dryness at 2 weeks (based on EDS) compared to vehicle in 2 out of 4 clinical trials. Effects on signs of dry eye disease: at day 84, a larger reduction in ICSS favoring Xiidra was observed in 3 out of the 4 studies.[1]

Indication

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

Important Safety Information

- Xiidra is contraindicated in patients with known hypersensitivity to lifitegrast or to any of the other ingredients.

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Important Safety Information (cont)

- In clinical trials, the most common adverse reactions reported in 5-25% of patients were instillation site irritation, dysgeusia and reduced visual acuity. Other adverse reactions reported in 1% to 5% of the patients were blurred vision, conjunctival hyperemia, eye irritation, headache, increased lacrimation, eye discharge, eye discomfort, eye pruritus and sinusitis.
- To avoid the potential for eye injury or contamination of the solution, patients should not touch the tip of the single-use container to their eye or to any surface.
- Contact lenses should be removed prior to the administration of Xiidra and may be reinserted 15 minutes following administration.
- Safety and efficacy in pediatric patients below the age of 17 years have not been established.

For additional safety information about XIIDRA®, please refer to the brief summary of Prescribing Information on adjacent page.

References: 1. Xiidra [package insert]. East Hanover, NJ: Novartis Pharmaceuticals Corp; June 2020. **2.** Bron AJ, de Paiva CS, Chauhan SK, et al. TFOS DEWS II Pathophysiology Report. *Ocul Surf.* 2017;15(3):438-510. **3.** US Food and Drug Administration. Code of Federal Regulations, Title 21, Volume 5 (21CFR349). Accessed May 25, 2021. https:/www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfcfr/CFRSearch.cfm?CFRPart=349&showFR=1 **4.** Jones L, Downie LE, Korb D, et al. TFOS DEWS II Management and Therapy Report. *Ocul Surf.* 2017;15(3):575-628. **5.** Pflugfelder SC, Stern M, Zhang S, Shojaei A. LFA-1/ICAM-1 interaction as a therapeutic target in dry eye disease. *J Ocul Pharmacol Ther.* 2017;33(1):5-12.

XIIDRA® (lifitegrast ophthalmic solution), for topical ophthalmic use
Initial U.S. Approval: 2016

BRIEF SUMMARY: Please see package insert for full prescribing information.

1 INDICATIONS AND USAGE

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

4 CONTRAINDICATIONS

Xiidra is contraindicated in patients with known hypersensitivity to lifitegrast or to any of the other ingredients in the formulation *[see Adverse Reactions (6.2)]*.

6 ADVERSE REACTIONS

The following serious adverse reactions are described elsewhere in the labeling:

- Hypersensitivity *[see Contraindications (4)]*

6.1 Clinical Trials Experience

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

In five clinical trials of DED conducted with lifitegrast ophthalmic solution, 1401 patients received at least one dose of lifitegrast (1287 of which received lifitegrast 5%). The majority of patients (84%) had less than or equal to 3 months of treatment exposure. One hundred-seventy patients were exposed to lifitegrast for approximately 12 months. The majority of the treated patients were female (77%). The most common adverse reactions reported in 5%-25% of patients were instillation-site irritation, dysgeusia, and reduced visual acuity.

Other adverse reactions reported in 1%-5% of the patients were blurred vision, conjunctival hyperemia, eye irritation, headache, increased lacrimation, eye discharge, eye discomfort, eye pruritus, and sinusitis.

6.2 Postmarketing Experience

The following adverse reactions have been identified during post-approval use of Xiidra. Because these reactions are reported voluntarily from a population of uncertain size, it is not always possible to reliably estimate their frequency or establish a causal relationship to drug exposure.

Rare serious cases of hypersensitivity, including anaphylactic reaction, bronchospasm, respiratory distress, pharyngeal edema, swollen tongue, urticaria, allergic conjunctivitis, dyspnea, angioedema, and allergic dermatitis have been reported. Eye swelling and rash have also been reported *[see Contraindications (4)]*.

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy

Risk Summary

There are no available data on Xiidra use in pregnant women to inform any drug-associated risks. Intravenous (IV) administration of lifitegrast to pregnant rats, from premating through gestation day 17, did not produce teratogenicity at clinically relevant systemic exposures. Intravenous administration of lifitegrast to pregnant rabbits during organogenesis produced an increased incidence of omphalocele at the lowest dose tested, 3 mg/kg/day (400-fold the human plasma exposure at the recommended human ophthalmic dose [RHOD], based on the area under the curve [AUC] level). Since human systemic exposure to lifitegrast following ocular administration of Xiidra at the RHOD is low, the applicability of animal findings to the risk of Xiidra use in humans during pregnancy is unclear *[see Clinical Pharmacology (12.3) in the full prescribing information]*.

Data

Animal Data

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

8.2 Lactation

Risk Summary

There are no data on the presence of lifitegrast in human milk, the effects on the breastfed infant, or the effects on milk production. However, systemic exposure to lifitegrast from ocular administration is low *[see Clinical Pharmacology (12.3) in the full prescribing information]*. The developmental and health benefits of breastfeeding should be considered, along with the mother's clinical need for Xiidra and any potential adverse effects on the breastfed child from Xiidra.

8.4 Pediatric Use

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

8.5 Geriatric Use

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

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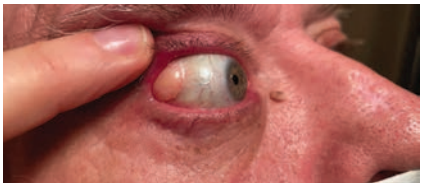
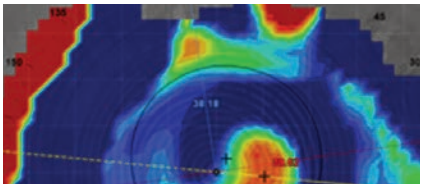
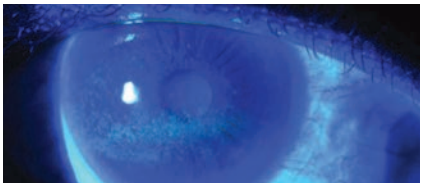
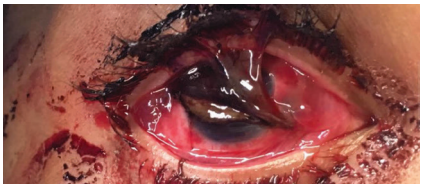
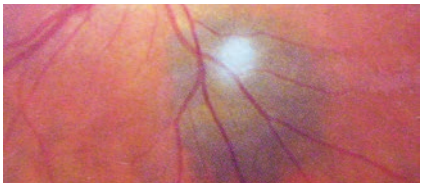
REVIEW OF OPTOMETRY • NOVEMBER 15, 2021











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Leadership in clinical care

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395 Hudson Street, 3rd Floor, New York, NY 10014

REVIEW OF OPTOMETRY (ISSN 0147-7633) IS PUBLISHED MONTHLY, 12 TIMES A YEAR BY JOBSON MEDICAL INFORMATION LLC, 395 HUDSON STREET, 3RD FLOOR FLOOR, NEW YORK, NY 10014. PERIODICALS POSTAGE PAID AT NEW YORK, NY AND ADDITIONAL MAILING OFFICES. POSTMASTER: SEND ADDRESS CHANGES TO REVIEW OF OPTOMETRY, PO BOX 81, CONGERS, NY 10920-0081. SUBSCRIPTION PRICES: US: ONE YEAR $56; TWO YEARS $97, CANADA: ONE YEAR $88, TWO YEARS $160, INT'L: ONE YEAR $209, TWO YEARS $299. FOR SUBSCRIPTION INFORMATION CALL TOLL-FREE (877) 529-1746 (USA); OUTSIDE USA, CALL (845) 267-3065. OR EMAIL US AT REVOPTOMETRY@CAMBEYWEST.COM. PUBLICATIONS MAIL AGREEMENT NO: 40612608. CANADA RETURNS TO BE SENT TO BLEUCHIP INTERNATIONAL, P.O. BOX 25542, LONDON, ON N6C 6B2.

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Founded 1891
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Editorial Offices

19 Campus Blvd., Suite 101• Newtown Square, PA 19073

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Subscription inquiries: (877) 529-1746
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Printed in USA

BY JACK PERSICO
EDITOR-IN-CHIEF
OUTLOOK

Good Vibrations

Patients experience your office environment before (and after) they see you. Use it to create a great first impression.

The first optometry office I went to—as a kid in the 1970s—was in the converted basement of my friend Isaac's house. It had, yes, the infamous shag carpeting and wood-paneled walls of that era. Depending on the time of your appointment, you may very well have been able to hear Isaac's mom making dinner upstairs. The whole place was cozy and dishev-eled and informal, just like my friend's dad, the OD of the practice.

That vibe prevailed at lots of optom-etry offices in the '70s, and surely well into the '80s too at many locations. But as the optometry profession migrated more and more toward mainstream medical care in the intervening years, the aesthetic of most practices came along with it. White coats, clean spaces, salaried staff (instead of family mem-bers) and increasingly more high-tech equipment all became the standard look and feel.

Fair or not, presentation matters at least to some extent in what the public thinks and expects, especially of the professionals they turn to for the frequently sensitive work of discuss-ing their bodies and lives. So, I was encouraged to see the impressive array of entries in our biennial office design contest, the results of which are show-cased this month on page 38.

Again and again we saw, in the essays that contestants sent in, how much these doctors prioritize the "feel" of being at their practices instead of merely the results.

"The aesthetics of the office is often the highlight of the overall experi-ence," said one practice owner in the contest. "Patients who are passing by the office often take a moment to come inside just to take photos." Imagine *wanting* to go to a doctor's office even if you don't need to. Can you say that about the physicians you see? Me neither.

Typical redesign goals cited by most of this year's contestants in-cluded open floorplans, upscale décor, accommodations for special needs, quiet and uncluttered waiting rooms, high-quality lighting and other fixtures, social media–friendly spaces… the list goes on and on. I won't spoil the fun but there's definitely also some real personality shining through in at least one of the entries this year.

None of this means that you abso-lutely need to plow hundreds of thou-sands of dollars into a splashy office design to succeed in this profession. For many practices, that's just not on the table, especially these days as we collectively are still trying to rebound from a pandemic-induced downturn.

So, pick your battles. Not everyone needs an espresso bar and an Instagram wall and other niceties. Maybe your physical space limitations preclude the airy layouts that others can achieve. But it's still worth putting yourself in your patients' shoes once in a while to see how moving through the office, sta-tion by station, makes you feel.

Most practices have already done an overhaul to accommodate COVID safety protocols. The addition of PPE has already imbued your practice with a more medical feel if that had been lacking. That's great—just don't overlook whatever comforts, physical or emotional, you can create, too.

And if your design philosophy is retro kitsch, I know where you can get a good deal on vintage shag. ■

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1. 3.5 times more patients preferred MyDay® multifocal for overall vision clarity than with DAILIES TOTAL1® Multifocal. Strongly prefer/slight prefer MyDay® multifocal 58.6%, DAILIES TOTAL1® Multifocal 17.2%, no preference 24.1%; p=0.002. For statistical analysis, "no preference" response evenly distributed between two products.] [REF: CVI data on file 2021. Prospective, subject-masked, randomized, bilateral, two-week cross-over dispensing study at 5 US sites with MyDay® multifocal and DAILIES TOTAL1® Multifocal; n=58 habitual multifocal contact lens wearers. 2. CVI data on file 2021. Prospective, subject-masked, randomized, bilateral, two-week cross-over dispensing study at 5 US sites with MyDay® multifocal and DAILIES TOTAL1® Multifocal; n=58 habitual multifocal contact lens wearers. 3. CVI data on file 2020. Prospective, double-masked, bilateral, one-week dispensing study UK with MyDay® multifocal; n=104 habitual multifocal contact lens wearers; CVI data on file 2021. Prospective, subject-masked, randomized, bilateral, two-week dispensing study at 5 US sites with MyDay® multifocal; n=58 habitual multifocal contact lens wearers. 11082A

LETTERS TO THE EDITOR

Feedback and ideas from the optometric community.

SHARE YOUR THOUGHTS

Letters are welcome. Write to: editor@reviewofoptometry.com.

Submissions may be edited for length, content or clarity.

The Lowdown on Low Vision

Don't be so quick to write off its business viability, readers argue.

Low Vision Can Flourish in Private Practice

■ The August issue contains an excellent article on intraprofessional collaboration called, "Mastering OD-to-OD Referrals," which includes a section on the importance of addressing low vision with every affected patient. Thank you for raising awareness of the need for more low vision care, whether provided directly or comanaged with a doctor suitably skilled for it.

However, there is a comment in the low vision discussion that is, in our opinion, inaccurate. A doctor states that "proper low vision care is time-consuming and very difficult to fit into a private practice model." The International Academy of Low Vision Specialists (IALVS), established in 2006, has 40 low vision optometrists throughout the United States and Canada who are in private practice. All of our doctors are fully trained and experienced to provide low vision care and rehabilitation in the private practice setting.

—Richard J. Shuldiner, OD, FAAO
President, International Academy of Low Vision Specialists

Clinical Director, Low Vision Optometry of Southern California

Low Vision Diplomate Emeritus, American Academy of Optometry

Vision Rehab Can Set a Practice Apart

■ Reading the feature, "Mastering OD-to-OD Referrals," I was blown away by some of the opinions regarding low vision—and not in a good way.

There's a comment stating that most low vision services are offered today at academic and non-profit institutions rather than in private practice and that this isn't likely to change "until insurance reimbursement structures for low vision devices and services are altered to lessen the time and financial burdens that make it impractical for private practice ODs to take part."

My wife, Dr. Lynne Noon, and myself are 1982 graduates of the New England College of Optometry. I chose a career in commercial optometry while Lynne chose vision rehabilitation and subsequently achieved Diplomate status in the discipline of low vision.

She started her solo practice from scratch doing only vision rehab. She spent countless hours meeting with state agencies and other vision rehabilitation experts. She traveled throughout Arizona and the surrounding Southwest region doing low vision exams and lecturing to support groups, optometrists and other medical professionals. Through her hard work and that of others, she helped Arizona adopt biopic driving privileges.

We have both recently retired. But here's the kicker! It literally took years to find someone to purchase our practice even though it grossed over $2 million annually. What does that say about our profession? The medical model is being taught and pushed to practitioners, yet insurance reimbursements are not adequate. The key to any successful business is to provide a service no one else provides and, better yet, a business that doesn't rely on insurance reimbursement for products.

Low vision rehabilitation currently meets those two criteria.

The "social welfare model" for low vision care is ancient history. Do not assume these patients are poor and unable to pay for such products and services.

And, as has been proven time and time again, insurance companies are not our friends! We rely on them at our own peril—and our patients' too.

—Robert Kanocz, OD
Mesa, AZ

From the Editor: The experience of Dr. Shuldiner and his colleagues in the IALVS does show that low vision can thrive in private practice. However, it's not a contradiction to also acknowledge that ramping up a practice devoted to such care—and ensuring such patients receive the additional time and attention that a typically frail population requires—can be time-consuming and, to many, intimidating.

Dr. Kanocz's anecdote about the difficulty he encountered selling his practice seems to document that widespread hesitation does exist among individual doctors and/or investors. Rightly or wrongly, there's at least a perceived barrier to entry. We thank both letter-writers for modelling success in this important area of care. Let's hope others follow in their footsteps.

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INDICATIONS AND USAGE

CEQUA™ (cyclosporine ophthalmic solution) 0.09% is a calcineurin inhibitor immunosuppressant indicated to increase tear production in patients with keratoconjunctivitis sicca (dry eye).

IMPORTANT SAFETY INFORMATION

WARNINGS AND PRECAUTIONS

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

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

ADVERSE REACTIONS

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

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

References: 1. US Patent 9,937,225 B2. **2.** Cholkar K, Patel A, Vadlapudi AD, Mitra AK. Novel nanomicellar formulation approaches for anterior and posterior segment ocular drug delivery. *Recent Pat Nanomed.* 2012;2(2):82-95. **3.** Data on file. Cranbury, NJ: Sun Pharmaceutical Industries, Inc.

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

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

INDICATIONS AND USAGE

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

CONTRAINDICATIONS

None.

WARNINGS AND PRECAUTIONS

Potential for Eye Injury and Contamination

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

Use with Contact Lenses

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

ADVERSE REACTIONS

Clinical Trials Experience

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

In clinical trials, 769 patients received at least 1 dose of cyclosporine ophthalmic solution. The majority of the treated patients were female (83%).

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

USE IN SPECIFIC POPULATIONS

Pregnancy

Risk Summary

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

Data

Animal Data

Oral administration of cyclosporine oral solution (USP) to pregnant rats or rabbits was teratogenic at maternally toxic doses of 30 mg/kg/day in rats and 100 mg/kg/day in rabbits, as indicated by increased pre- and postnatal mortality, reduced fetal weight, and skeletal retardations. These doses (normalized to body weight) were approximately 3200 and 21,000 times higher than the maximum recommended human ophthalmic dose (MRHOD) of 1.5 mcg/kg/day, respectively. No adverse embryofetal effects were observed in rats or rabbits receiving cyclosporine during organogenesis at oral doses up to 17 mg/kg/day or 30 mg/kg/day, respectively (approximately 1800 and 6400 times higher than the MRHOD, respectively). An oral dose of 45 mg/kg/day cyclosporine (approximately 4800 times higher than MRHOD) administered to rats from Day 15 of pregnancy until Day 21 postpartum produced maternal toxicity and an increase in postnatal mortality in offspring. No adverse effects in dams or offspring were observed at oral doses up to 15 mg/kg/day (approximately 1600 times greater than the MRHOD).

Lactation

Risk Summary

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

Pediatric Use

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

Geriatric Use

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

PATIENT COUNSELING INFORMATION

Handling the Vial

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

Use with Contact Lenses

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

Administration

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

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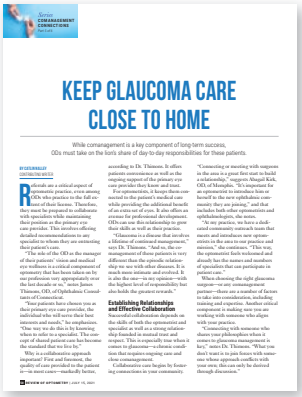
SUN OPHTHALMICS

Who Defines What Constitutes an "Expert"?

■ I read the article, "Keep Glaucoma Care Close to Home," in the July 2021 issue with interest. Well done!

One comment: Dr. Danica Marrelli is referred to in the piece as a "glaucoma expert." I believe such a reference is subjective and borderline inappropriate. Instead, Dr. Marrelli's accomplishment as a Clinical Diplomate in the Glaucoma Section of the American Academy of Optometry should have been the salient distinguishing credential that documents her "expertise," which she *most* certainly possesses.


KEEP GLAUCOMA CARE CLOSE TO HOME

While comanagement is a key component of long-term success, ODs must take on the lion's share of day-to-day responsibilities for these patients.

As optometry moves toward clear recognition of subspecialization (as discussed at length in your October 2020 issue), it should be the goal to recognize appropriate "expertise" that is certified by a body of similar subspecialists (*i.e.*, the Academy Diplomate program).

Thank you for the great service you provide to the profession.

—Jeffrey C. Krohn, OD, FAAO
Fresno, CA

Diplomate, American Board of Optometry and American Academy of Optometry

Chair, AAO Section on Cornea, Contact Lenses & Refractive Technology

Administrator, Vision Source

From the Editor: The above perspective is an interesting one, but the need for precision in discussing credentials may be more acute in messages the public sees rather than those within the optometric community.

Patients need credible resources that direct them to the best doctor for their condition. As discussed in the October 2020 article mentioned by Dr. Krohn, any OD can choose to self-identify as a "specialist" or an "expert" if they feel justified in doing so. There's at least the potential for patients to wonder about the basis for such a claim.

By contrast, within the profession experts like Dr. Marrelli are well-recognized as such, so we frequently do use the shorthand descriptions "specialist" and "expert" without elaboration—as a matter of brevity and a nod of respect.

Still, we do see the value of conveying more fully the accomplishments of our contributors and will make the effort to do so in the future. In fact, we've already started: the letters here from Dr. Krohn and Dr. Shuldiner both list their professional affiliations in detail.

Stop Ignoring Third-party Plans

■ A recent letter entitled, "Low Marks for Low Vision," in July 2021 voiced concerns about the lack of sufficient coverage for that important topic.

I'd like to add another low mark for neglected coverage—this time about third-party vision plans and the damage they do to our profession. These plans and their administrators, oppressive fee schedules and complex Explanation of Benefits rules dominate our profession and consume most of our office time, but the optometric press is woefully deficient in providing any articles, discussions, criticism or even praise for these companies and their policies.

Throughout the years, I have often petitioned numerous publications to address this vital part of practice, only to have such calls fall on deaf ears. My suggestion was to create an open forum that would include a monthly article by an OD or a vision insurance executive, with printed responses from readers.

Review is the premier journal for our profession. Its articles are superb, and it keeps us well informed. It is my hope that *Review* would give serious consideration to this suggestion.

—Alan Frank, OD
Kingston, PA

From the Editor: We thank Dr. Frank for his praise as well as his criticism. The topic of third-party plans is certainly on the minds of many ODs, and we welcome the opportunity to enable conversation about it right here—in our Letters to the Editor section. Readers who wish to share anecdotes, gripes, success stories, horror stories or anything else are encouraged to write to editor@reviewofoptometry.com. Tell us your tales!

Femto Rationalization Falls Short

■ Thank you for publishing my letter, "Femto 'Facts'—or Fake News?" along with the letter from Paul Ajamian, OD, in the October issue. FLACS is a major advance in cataract surgery and deserves a complete and open discussion. Thank you for beginning that.

However, I am almost amused by the editor's response to my letter. Their defense for the inadequate references used to belittle FLACS in the *Clinical Perspectives on Patient Care* supplement is the authors' "decades of hands-on expertise that also informed their views." While it is true they have decades of experience, it has been in comprehensive optometry, including general exams, contact lenses, glaucoma treatment and so on. I wonder how that equates to the "decades of experience" of Dr. Ajamian, who helped found and establish comanagement of cataract surgery.

Dr. Ajamian has 40 years of experience being the lead optometrist in a surgical practice. Along the same lines, I have 36+ years of experience in a cataract and refractive surgery practice. It is our experience that tells us FLACS is a superior procedure in the hands of an experienced surgeon.

—Howell M. Findley, OD
Lexington, KY

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BY PAUL M. KARPECKI, OD
CHIEF CLINICAL EDITOR

Owning OSD

New treatments can help us keep up with this perennial problem.

Ocular surface disease (OSD) is a double threat, inducing chronic discomfort and hindering vision, the latter of which complicates every corrective method we have. The result: spectacle remakes, contact lens drop-out and post-cataract surgery dissatisfaction. It's important to properly treat all types of OSD, especially those that may not be on your radar. We discuss them below, along with effective treatments and new drugs on the horizon that could give your patients much-needed relief.

Mucin-deficient Dry Eye

Although we treat lipid-deficient and aqueous-deficient dry eye, many of us exclude mucin deficiency as a third potential subtype. I believe there are three stages to this form:

(1) conjunctival staining
(2) staining with mucin strands
(3) filamentary keratitis

If a patient exhibits staining, start with a short course of steroids. Vitamin A ointment Qhs (Hylo Night, Optase) is surprisingly effective for goblet cell recovery. Immunomodulators (*e.g.*, lifitegrast, cyclosporine) have been shown to aid goblet cells, and biologic drops are quite helpful. These include autologous serum (Vital Tears) and cytokine-extract drops (Regener-Eyes). Amniotic membrane (BioTissue, Atlas) would only apply in the presence of filamentary keratitis, although a 15mm version could assist with conjunctival staining. In non-responsive filamentary keratitis, consider compounding acetylcysteine 10% drops TID, which has a bad odor but can dissolve mucin.

Blepharitis

To identify this condition, look closely at the eyelids for telangiectasia, tylosis or capped glands, and become proficient at meibomian gland expression. Also, have the patient gaze down and scan the base of the upper lashes looking for collarettes, which are pathognomonic for *Demodex* blepharitis.

> **Ocular surface disease comprises the largest patient population an OD will see. Fortunately, our talents and our treatments continue to keep pace with today's needs.**

New to market is MyboClean, a brush and lid spray that combines aloe, coconut oil and Manuka honey (known to have antimicrobial, antiparasitic and anti-inflammatory properties). BlephEx in-office treatments, IPL and low-level light therapy have also shown efficacy.

A therapeutic candidate known as TP-03 (Tarsus Pharmaceuticals) is showing almost complete eradication of the *Demodex* mite with BID dosing for six weeks. Given the strong clinical data and safety profile, this drug could receive FDA approval next year.

Omega Fatty Acids

If someone told me there is a nutritional supplement that could effectively treat dry eye disease, I would be skeptical. Having treated over 1,200 patients with a gamma-linolenic acid (GLA)/fish oil combination (HydroEye, SBH), I'm convinced it exists. Every day I have patients without symptoms that are only using hydrating compresses (Bruder), lid scrubs (OcuSoft) and HydroEye. They comment on the noticeable difference and, should they stop using HydroEye, their symptoms return quickly. But don't rely on my experience: a GLA/fish oil combination has more studies on its efficacy than any other omega supplement to date, including positive results in aqueous-deficient DED, post-PRK DED, SS-KCS, contact lens intolerance, MGD and post-menopausal DED.[1-7]

Mask-associated Dry Eye

Lately, we've been seeing a significant increase in not only hordeola and chalazia, but also blepharitis, DED and even conditions like recurrent corneal erosion (RCE). The key is to perform the Korb-Blackie lid light test. Patients who show inadequate lid closure are developing more DED and even RCE. I personally have suffered from recalcitrant RCE for more than 25 years; I've had more recurrences since masks were introduced than over the last 20 years combined. That doesn't mean I won't wear a mask to see patients, but we need to be aware of the effects of redirected air flow on our patients.

OSD comprises the largest patient population an OD will see. Fortunately, our talents and our treatments continue to keep pace with today's needs. ■

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About Dr. Karpecki

Dr. Karpecki is medical director for Keplr Vision and the Dry Eye Institutes of Kentucky and Indiana. He is the Chief Clinical Editor for *Review of Optometry* and chair of the New Technologies & Treatments conferences. A fixture in optometric clinical education, 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.

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BY MONTGOMERY VICKERS, OD

CHAIRSIDE

More Like Mid-*career* Crisis

Whatever the catalyst, you should just go on and get it over with.

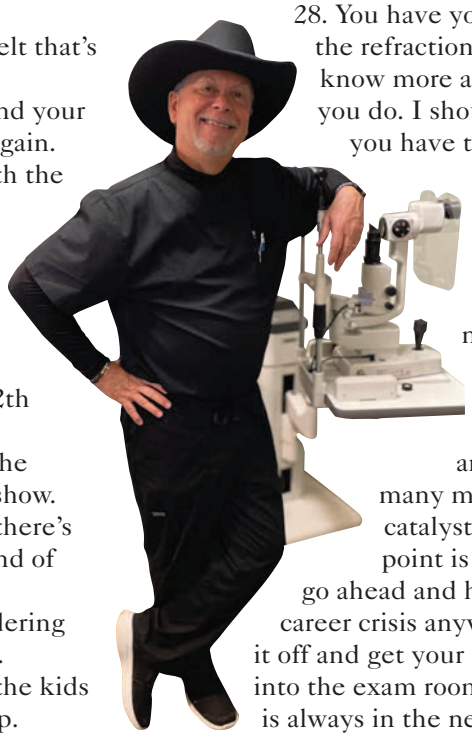
Have you had your mid-career crisis yet? If not, why not? The only good excuse is you just started your career or you are in the process of ending your career. Everyone else needs to get on with it.

An optometrist's mid-career crisis often seems to be triggered by a single adverse event. For example, you may have had a bad online review, perhaps posted by your wife when you forgot your anniversary. I may or may not be speaking from personal experience. But it was not my fault. Ruth, who owned a gift shop next to my office, was specifically instructed to remind me. This one is on you, Ruth.

Maybe your mid-career crisis was triggered by something quite important like the impending ice age or global warming or climate change or whatever they are calling it these days. Maybe your mid-career crisis was triggered by something that's not as easy for politicians to manipulate like, I don't know, COVID-19?

Whatever it is, there is certainly something. There are many, many common warning signs that you are entering your mid-career crisis phase. Here's a few:

1. You start to like other people's kids.
2. You start sitting in the front row at CE courses so nobody will talk to you.
3. You want a cat.
4. You donate to charity, but not for tax deduction purposes.
5. You consider taking up jogging again but order pizza instead.
6. You ignore your father's advice to never clean the inside of your ear with a cotton swab.
7. You don't try to convince that -11.00D myope to pay for scanning laser ophthalmoscopy. You just do it.
8. You Google CBD.
9. You read about online eye exams and wonder what these companies would pay you to work there.
10. You buy a belt that's not on sale.
11. You try to find your high school ring again.
12. You chat with the mailman.
13. You floss.
14. You don't tell the patient who abuses his contacts not to do that (for the 12th time).
15. You blame the weather for a no-show.
16. You realize there's more than one kind of CRT.
17. You stop ordering more khaki pants.
18. You realize the kids won't ever shut up.
19. You don't really care if the receptionist texts all day.
20. You beg off babysitting the grandchildren because the college cornhole championship is on TV.
21. You finally put your foot down and raise your exam fee by $50 even though it has zero effect whatsoever on what the vision plan pays you.
22. You pat yourself on the back for not having a beer with lunch—not just one anyway.
23. You lay yourself off.
24. You reenergize the practice with newer technology. They call it Netflix.
25. You protect your patients from COVID-19 by keeping them in the parking lot.
26. You relocate but cannot remember where you relocated.
27. You schedule an office meeting for all the doctors in your solo practice.
28. You have your techs do the refraction because they know more about vision than you do. I should mention you have to become an ophthalmologist first.



Everyone has their triggers. Yours may not have made the list, and for that I apologize. There are just too many mid-career crisis catalysts to count. The point is that you should go ahead and have your mid-career crisis anyway. Then shake it off and get your psycho self back into the exam room. What matters is always in the next room. ■

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.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Out of Orbit

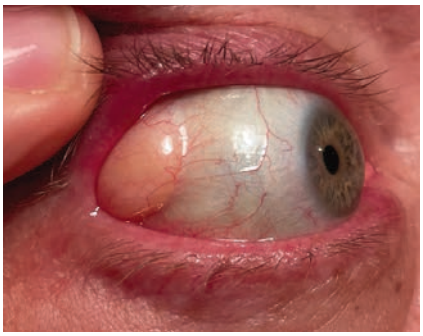
Prolapse of fat can disturb patients but may not be harmful.

Q A concerned patient presented with the chief complaint of a growth under his upper lid. What is my differential and what do I do about it?

A "Subconjunctival orbital fat prolapse is a rarely reported, benign condition," says Paige Thompson, OD, of SouthEast Eye Specialists in Chattanooga, TN. "Most patients present for evaluation due to cosmetic concerns or to rule out potential for malignancy."

Orbital fat occupies the space surrounding the extraocular muscles and the globe—a protective cushion for the eye. The orbital fat is comprised of two compartments: intraconal and extraconal. Orbital fat may be prolapsed or displaced secondary to aging, trauma or surgery.[1,2] With extraconal fat prolapse, the orbital fat migrates beyond the orbital septum and results in lower lid festoons.[2] When intraconal fat is displaced through Tenon's capsule, it can be visualized in the subconjunctival space.[1]

Subconjunctival orbital fat is most commonly seen in elderly males as a result of age-related weakening of Tenon's capsule.[2,3] This finding may be unilateral or bilateral, but in bilateral cases it is often asymmetric. Subconjunctival herniated orbital fat presents as a soft, mobile, yellow mass with superficial vasculature.[1-3] Dr. Thompson says this mass is most often seen in the superior temporal quadrant and can be indented with a cotton tip applicator. Prolapsed orbital fat will become more prominent with pressure applied to the globe or with downward movement of the eye.[1] Patients with



Subconjunctival orbital fat may be prolapsed secondary to aging, trauma or surgery.

subconjunctival herniated orbital fat are typically asymptomatic; however, patients may report mild irritation and tearing.[4]

Differential and Treatment

Dermolipoma, lacrimal gland prolapse, lipomatous tumors and lymphoma are all potential differential diagnoses in these cases. A dermolipoma is a congenital lesion of the orbit which presents as an immobile, pinkish-white mass in the superior temporal quadrant of the orbit. Lacrimal gland prolapse is often difficult to visualize without lid eversion. Lipomatous tumors are very rare and can be benign or malignant. These appear as a yellowish-pink mass on the conjunctiva in adults and often require histopathology for definitive diagnosis.

Conjunctival lymphoma presents as a salmon-colored growth that is diffuse and non-mobile. Lymphoma typically grows more rapidly than prolapsed orbital fat, may present with feeder vessels and is firm to the touch.[2-4]

Most often, subconjunctival herniated orbital fat can be differentiated from other orbital tumors on clinical exam. But in difficult cases, Dr. Thompson suggests that histopathology may be required to make a definitive diagnosis.

"Neuroimaging with MRI or CT can also clearly demonstrate prolapsed orbital fat, but are indicated only when a diagnosis cannot be made based on clinical exam," she says. On neuroimaging, subconjunctival orbital fat prolapse is continuous with the intraconal fat, unlike many other orbital lesions.[5]

Treatment of subconjunctival orbital fat prolapse typically involves observation. In some cases, a patient may elect to have the mass removed due to symptomatology, cosmetic concerns or suspicion for malignancy. Most often, prolapsed fat is accessed through a transconjunctival incision. Orbital fat is typically resected and the incision is then closed with sutures or fibrin glue.[2,4,6] This procedure is performed on an outpatient basis and involves local anesthesia.[3] Some surgeons prefer to reposition the orbital fat rather than resect it; however, resection is still the most common approach. Risks of surgical resection include infection, lacrimal gland damage and retrobulbar hemorrhage.[4]

"Fortunately, this procedure has a high success rate and risk of recurrence is low," Dr. Thompson says. ■

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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. He has no financial interests to disclose.

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BY JOHN RUMPAKIS, OD, MBA
CLINICAL CODING EDITOR

CODING CONNECTION

Innovate for Success

Educate yourself when approaching new technology.

With November comes one of my favorite meetings—the American Academy of Optometry annual convention. The Academy meeting always makes me think of the great innovation taking place in our profession. New technologies will be on display, tempting clinicians with clinical and productivity advances. Yet, this cutting-edge science and innovation also brings to mind the great responsibility we all have in educating ourselves about coding, coverage and reimbursement specifics before we can implement them in our practices.

Educating ourselves about new technologies or procedures is key before spending a pretty penny to adopt them. What are the key questions and critical items you need to know prior to the purchase? After all, you don't want to own tech that doesn't provide a clinical benefit, especially when you haven't planned on compliance, coverage and reimbursement details in respect to its use. Let's lay them out:

Code it Right

Coding is the process of legally translating the service provided into an appropriate CPT, HCPCS Level II or Category 3 code. There are differences between what these codes describe and therefore their use. Make sure you know the appropriate code to use. The characteristics of that code are also paramount before employing the technology or procedure. For example, is the procedure unilateral or bilateral? Does it require physician supervision? If a surgical code, what is the global period associated with it?

I see a lot of claims submitted to carriers with improper or inappropriate CPT codes used, which creates tremendous exposure for you and your practice.

> **Determine whether you can perform the new procedure or use the new tech in your practice before investing in it.**

EHRs are Not Always Right

Update your codes in your EHR to ensure the system reflects the proper coding for the new technology or procedure. EHR companies are all different, and many may not be timely in updating the new CPT, HCPCS II, Category 3 or ICD-10 codes. However, you, the practitioner, are always responsible for using the correct ones.

Carrier Policy

Before purchasing or deploying any new technology or procedure, understand where your carriers (both medical and managed vision care) stand on coding, coverage and reimbursement. If they are covered, ask about the indications and limitations of medical necessity, frequency or utilization guidelines and, finally, contracted reimbursement amounts.

If these procedures or technologies are not covered, *i.e.*, designated as "investigational or experimental," then make sure that all doctors and staff understand the requirements for providing an Advanced Beneficiary Notice (ABN) or waiver of liability form as required by the specific carrier.

Scope of Practice

Legislative victories in many states have resulted in an acceleration of an increased scope of practice. It is easy to get excited about new technology that comes with increased scope when we hear the successes of our colleagues. Since optometry is still a state-by-state legislated profession, what may be within the scope of practice of one practitioner may not be within the scope of your practice. Determine whether you can perform the new procedure or use the new tech in your practice before investing in it. The best sources of information are your state board and your state law.

Informed Consent

If the new technology or procedure requires informed consent by state law or by carrier policy, make sure to create a specific informed consent packet to present to the patient. Have an attorney who is familiar with these laws review these forms on an annual basis to make sure each is in alignment with current legal interpretation for your given jurisdiction.

'Do it Right,' Not 'Do it Over'

There is a lot to love about advancing technology in our profession. The COVID-19 pandemic certainly accelerated the development and deployment of great innovations to provide better patient care. Attending meetings, such as the Academy's, provides us the forum to learn more about this cutting-edge science. Be prepared to incorporate it properly into your practice and create a process that allows you to do it with little risk and a lot of benefits. ■

Send your coding questions to rocodingconnection@gmail.com.

About Dr. Rumpakis

Dr. Rumpakis is president and CEO of Practice Resource Management, a firm that provides consulting, appraisal and management services for healthcare professionals and industry partners. As a full-time consultant, he provides services to a wide array of ophthalmic clients. Dr. Rumpakis's full disclosure list can be found in the online version of this article at www.reviewofoptometry.com.

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2021 DESIGN CONTEST

EYE-POPPING OFFICE SPACES

ODs bounced back from the COVID doldrums with bold and adventurous new design ideas.

Review's 2021 Office Design Contest shows what optometrists can do to stand out when they set their minds to it. Each practice that entered showcased their creativity, and all had the same goal: improving the patient experience.

We always look forward to our biennial Office Design Contest and seeing optometrists from all over the country show off their style and, in some cases, their personality. This year, we were thrilled to have 24 practices enter the contest. The photo collage to the right includes one sample image from each participant. We wanted to showcase the breadth of contributions this time to show the range of what has been done over the past two years. There was a great deal of passion put into each space—we can't wait for you to see the unique designs that may help you reimagine your own office space.

Peruse the collage, pick your faves, then turn the page for a celebration of this year's winners!

MEET THE JUDGES

In 2019, these practices excelled with their own office renovations. This year, they provided expert feedback to pick the cream of the crop.

Scot Morris, OD
Eye Consultants of Colorado
Conifer, CO
2019 Winner

Kumar Patel, OD
Personaleyes Vision Care
Flower Mound, TX
2019 1st Runner-up

Rob Szeliga, OD
Spring Hill Eyecare
Spring Hill, TN
2019 2nd Runner-up



Hello Autumn

DRY EYE
& SPECIALTY CENTER

i love my glasses
so much

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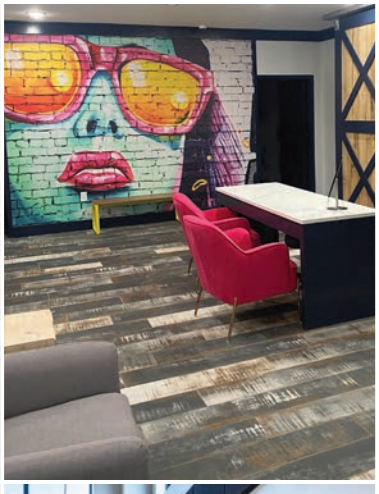
Care
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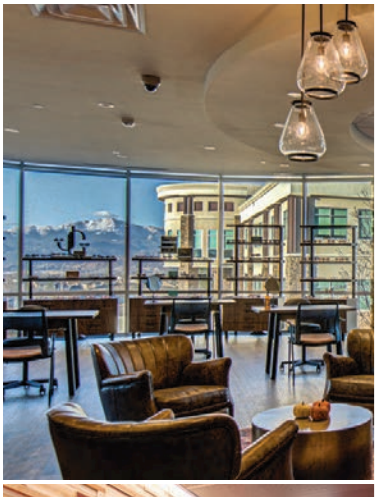



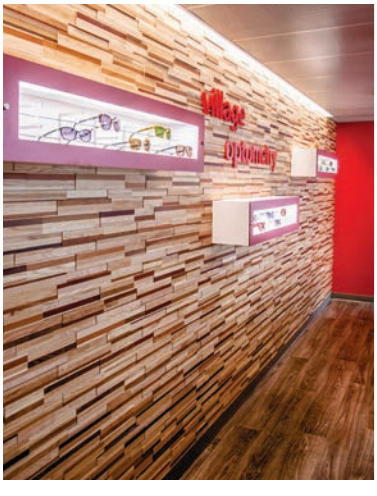
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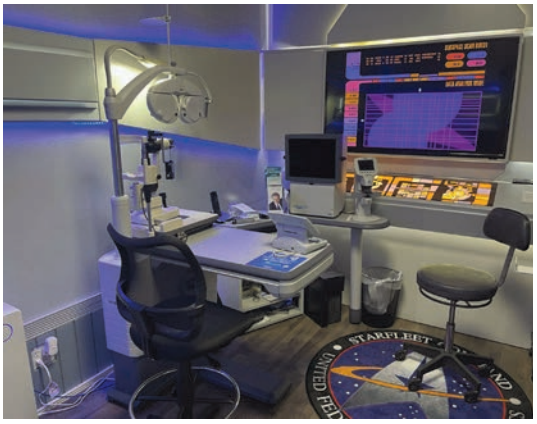
WINNER



WADA OPTOMETRY, ANAHEIM, CA

GARRETT WADA, OD

This practice decided to "boldly go" where no one had gone before—and it paid off.

Dr. Garrett Wada took his love for Star Trek and turned it into a space that is as close to a replica of the television set as possible.

"I can't imagine anybody as crazy as me," Dr. Wada laughed about his concept. "I wanted to show people that an eye doctor doesn't have to be in a regular office," he says. "I try to make it fun and have creativity and imagination."

While judge Dr. Rob Szeliga noted he is not a fan of Star Trek, he *is* a fan of a well-executed theme. "The attention to detail from ceiling to floor is incredible—mission accomplished!" he explains. "The amount of effort it took to think of the design and actually execute it is amazing. The continuity of the along with its attention to detail was much appreciated," says judge Kumar Patel, OD

You are immediately transported to the set of Star Trek the moment you walk into his office and almost forget you are walking into an optometrist's office, but instead a spaceship. Dr. Wada says patients are truly amazed to see the inside after walking into an average-looking building. There's a celestial ceiling, a bridge area with seats for patients and screens that plays Star Trek episodes.

It all started when one of his former patients, whose occupation was building movie sets, suggested to Dr. Wada that he could do something "really cool" and different with his office space. Dr. Wada already had Star Trek memorabilia all over the office, but this patient helped take the theme to a whole new level.

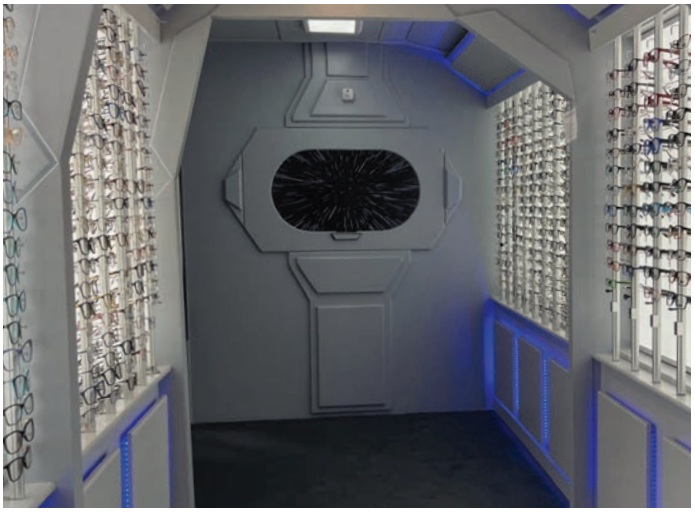
Then Dr. Wada found another patient who has an eye for design and helped him build his practice into the ultimate Star Trek experience.

"I came into contact with an old prop manager for the *Star Trek: Voyager* series and purchased Borg panels and other accessories that were used on the set of the show and built the rest of the practice around it," Dr. Wada explains.

He also added a lot of technology into the office to match the decor, went with automated instrumentations and all the computerized equipment to go along with the theme.

Dr. Wada has spent over $150,000 fixing his office and is continuously adding on to the 1,600sq. ft. space. This truly unique space is a one-of-a-kind experience. We certainly haven't seen an office space ever quite like this.

"It feels like we're in a spaceship," Dr. Wada says. "Patients are excited when they come in. I'm very happy I ended up doing this."



1st RUNNER-UP

THE VISION CENTER AT SEASIDE FARMS, MOUNT PLEASANT, SC

BRAD BODKIN, OD

"*Stylish Southern charm* are the words that come to mind," says Dr. Scot Morris, one of this year's judges, about The Vision at Seaside Farms. "I love the mix of modern white walls and glass with the classic wood." Adding to that charm is the use of large barn doors throughout the practice. Practice owner Brad Bodkin, OD, originally added them to help with efficiency, but they have been an aesthetic hit with patients, too.

"We used barn doors everywhere we could to make better use of our room space, but it has had the added benefit of being the most talked about aspect of our new building by patients," Dr. Bodkin explains.

Behind those barn doors in the exam rooms, Dr. Bodkin created angled desks so he and his staff face patients more so than at a standard desk, he explains. Secondary monitors are hung from stands so his patients can see all the technology used during each exam.

As you walk into the practice, you are greeted by tall ceilings and hit with tons of natural light from every direction in an open layout. "The large windows and open concept help widen the space, all while having clean designated areas for patients to explore the optical," says Dr. Patel.

The flow of the almost 6,000sq.ft practice is one big circle. Patients seamlessly move from one room to the next.

"The patient starts at the front desk, then the next room they come to is the pre-test room; around the corner are the exam lanes, then the contact lens training area, then back out to optical," Dr. Bodkin says. "That makes the patient flow very easy and intuitive for everyone. Circular patient flow greatly improves our efficiency and keeps patients and staff from running into each other in the hallways." Also, back-office responsibilities are now handled upstairs away from patient care so that patients don't hear phones ringing or phone conversations, he explains. "Patients love the wide open, naturally lit optical area as well and it gives a very inviting impression to patients when they walk in the door."

2nd RUNNER-UP

DRY EYE & SPECIALTY CENTER SUGAR LAND, TX

FAHEEM INAYATALI, OD

Cutting-edge was one of the first words used to describe our second runner-up, Dry Eye & Specialty Center, due to its modern and futuristic feel and advanced technology incorporated in all aspects of the office.

White and blue are the only colors used, giving the space it a clean, pristine look throughout, with white floors, unique light fixtures and a treatment room surrounded by glass that immediately catches your eye.

"This style instills confidence that they are on the cutting edge," notes judge Dr. Rob Szeliga. "I like the choice of colors and how

they are incorporated throughout the office. It's a very sleek, clean and modern look."

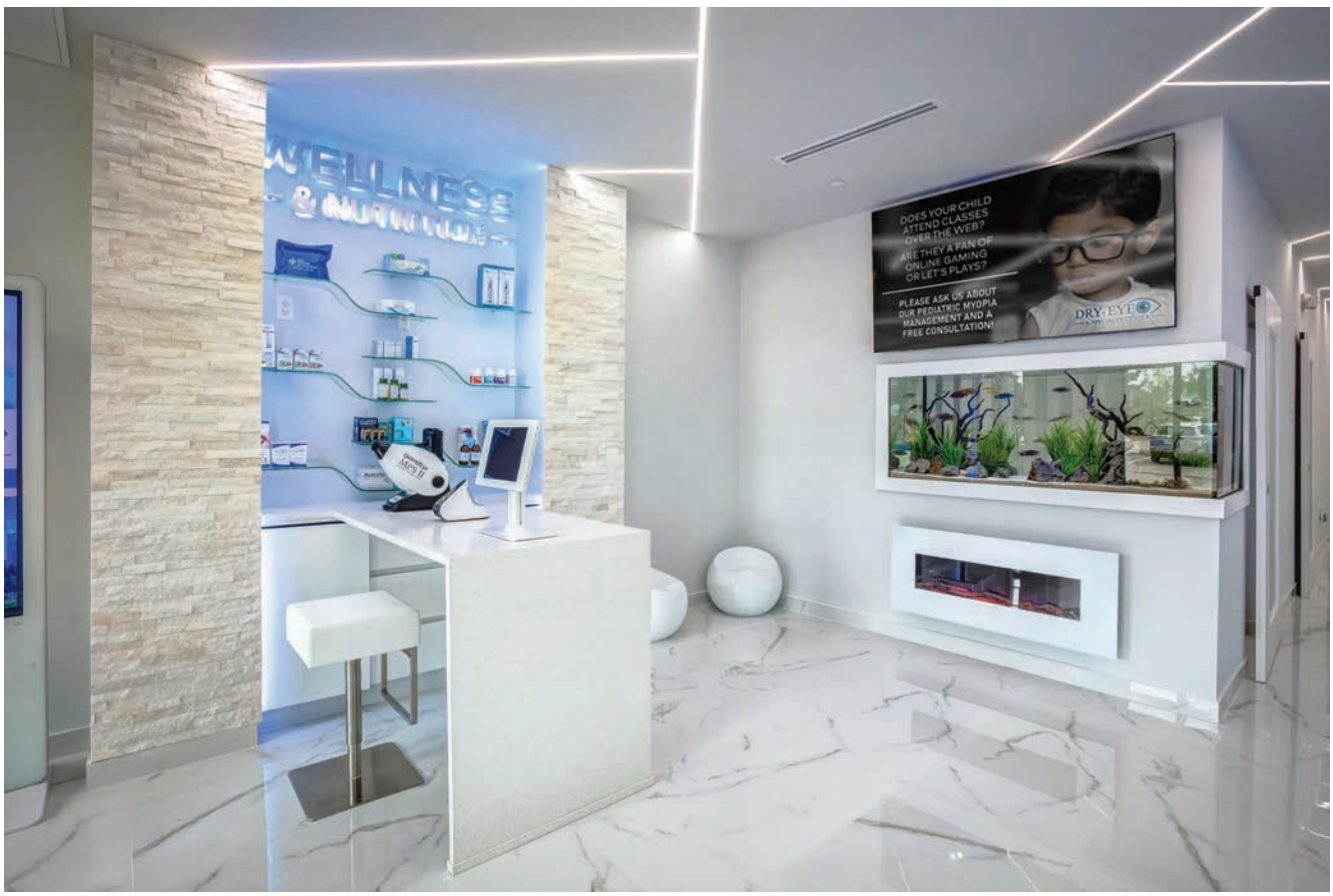
The glass-walled treatment area was specifically designed with an ergonomic exterior that prevents IPL light from shining through during treatments.

"[It] has an iPad and large HD screen that are wirelessly connected to have an interactive session describing their ocular health with every patient encounter," Dr. Inayatali notes. "As patients begin treatment, a waterfall behind the chair creates an ambiance that is relaxing to ease any anxiety. The exam room is located directly across from the treatment room so the doctor and technician can switch for added efficiencies using in-office communication software (Bluenotes) to keep our team linked together and reduce wait time."

Dr. Inayatali also integrated technology—while improving functionality—by creating an app that generates a QR code with information that patients can take home regarding any ocular conditions that need to be managed. Gone are the days of badly photocopied patient handouts strewn about the waiting room.

As much as the technology has enhanced the patient experience and played a role in changing the entire look of the office, Dr. Inayatali says the aesthetics are the highlight of the overall experience, with people passing by often coming inside just to take pictures of the space.

"Our in-ceiling LED lights and waterfall create a contemporary appeal that has attracted patients from all over the nation, plus Mexico and Canada," he explains.



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THE CONJUNCTIVA UP CLOSE

Here's how to recognize and manage a few common conditions that affect this part of the eye.

BY MEGAN MANNEN, OD
NORTHERN UTAH

The conjunctiva is a thin mucus membrane whose primary functions are to provide barrier protection, immunity and lubrication to the ocular surface. There are three distinct anatomical locations of conjunctival tissue: the palpebral, the bulbar and the forniceal. The conjunctiva itself is made up of the epithelium and the stroma (also known as the substantia propria). The epithelium is a few cell layers thick and consists of various cell types. Stratified cuboidal cells are found over the tarsus, columnar cells are found in the fornices and squamous cells are found on the bulbar conjunctiva.[1] The stroma is made up of loose, vascularized connective tissue rich in elastic fibers. This gives the conjunctiva the ability to flex and stretch upon blinking and eye movement.[2] The stroma is also rich in lymphocytes and plays an important role in the immunologic response of the ocular surface.

The conjunctiva is dense in mucin-producing glands including goblet cells, Crypts of Henle and glands of Manz. Goblet cells are located in the conjunctival epithelium, Crypts of Henle are located in the palpebral conjunctiva and glands of Manz are located near the limbus. The mucin layer is the innermost layer of the tear film and is made up of glycoproteins. On the ocular surface, hydrophilic mucins are responsible for adherence of the tear film to the ocular surface, decreasing surface tension and ensuring the overlying aqueous can spread evenly across the front of the eye. This is critical for protecting the conjunctival and corneal epithelium by preventing dryness, clearing debris and fending off pathogens.[3]

The accessory lacrimal glands of Krause and Wolfring can also be found in the conjunctiva. They are located in the fornices and the tarsus, respectively. These glands produce aqueous secretions to supplement the lacrimal gland.[4] The accessory lacrimal glands do not contain parasympathetic innervation and are thought to be responsible only for basal secretions.[5]

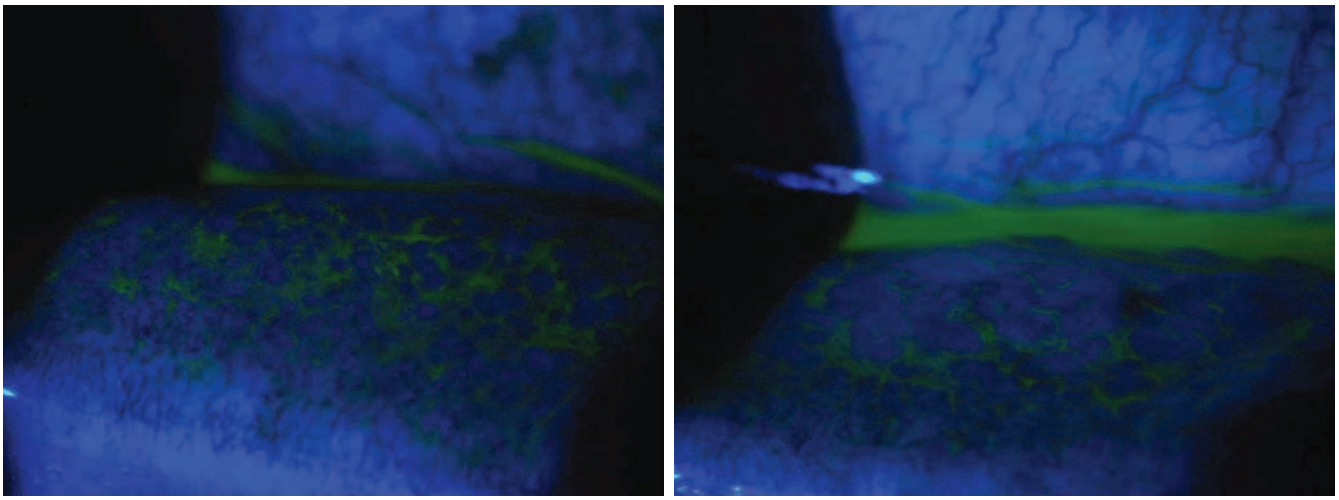
Now that we have reviewed the anatomy, let's take a closer look at how several common conjunctival conditions manifest clinically. Understanding the innerworkings of this ocular structure will help you differentiate and diagnose the following:

Acute Conjunctivitis

Conjunctival inflammation is marked by a variety of signs including injection, chemosis and discharge. Accurate discrimination of the causes of inflammation is important to direct appropriate treatment, patient education and follow-up. An important differentiation in conjunctivitis is a follicular vs. papillary response. Follicles are aggregations of lymphoid tissue and appear as gray/white dome-like elevations with a small surrounding blood vessel. They are formed within the conjunctival stroma. Follicular conjunctivitis is associated with acute viral and chronic chlamydial infections, Parinaud's oculoglandular syndrome and hypersensitivity to topical ophthalmic medications.[4]

Papillae, in contrast, contain a central vessel making the elevated tissue red in color. They are formed by the hyperplastic conjunctival epithelium. Papillary conjunctivitis

About the author **Dr. Mannen** practices at a private optometry and ophthalmology clinic in northern Utah. She completed her residency at the Walla Walla Veteran Affairs Medical Center and Pacific Cataract and Laser Institute. She is a Fellow of the American Academy of Optometry. She has no financial interests to disclose.



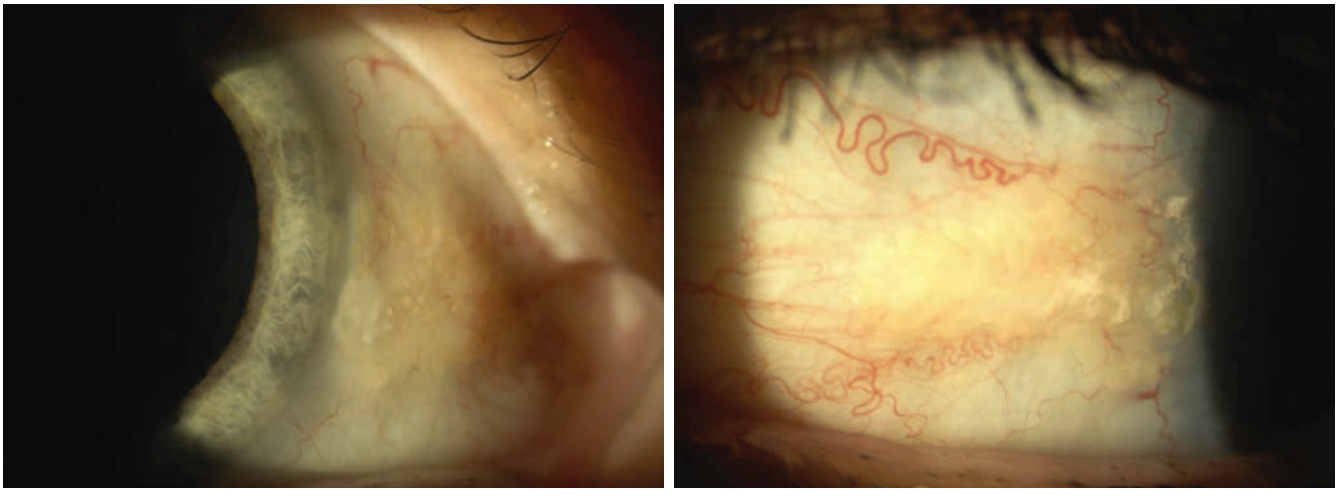
A 58-year-old male presented with complaints of irritation in the left eye. He saw another provider the day prior and was given moxifloxacin. He started using the drops but felt this made his symptoms worse, and the pain and redness moved to both eyes. He reported tearing and mild crusting of his lids in the morning. On examination, both eyes revealed 2+ conjunctival injection and a 2+ follicular response. The patient was diagnosed with viral conjunctivitis and educated on the contagious nature and expected duration of the condition. He was instructed to discontinue the topical antibiotic, wash all towels and sheets and use preservative-free artificial tears four times daily in both eyes. Despite the controversy over steroids in viral disease in the absence of corneal involvement, the patient was placed on a sample of Eysuvis (loteprednol etabonate, Kala Pharmaceuticals) four times daily in both eyes due to the degree of discomfort and his ability to take time off work. He was instructed to return in two weeks for follow-up with an IOP check and to call with any worsening of symptoms.

is indicative of allergic or bacterial conjunctivitis, chronic blepharitis, contact lens–associated reactions and floppy eyelid syndrome.[4]

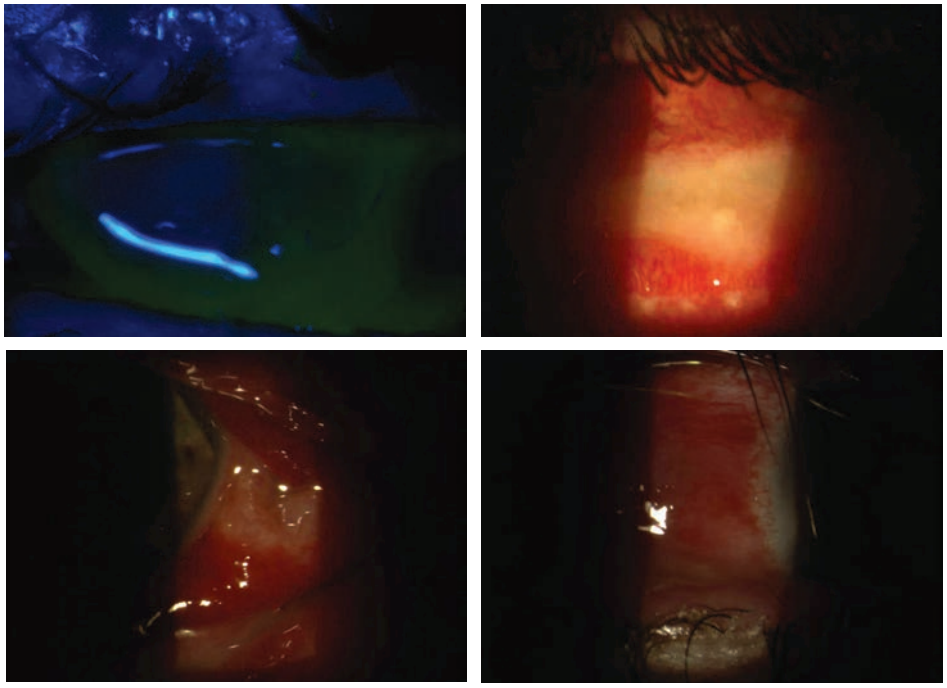
Viral. This form of conjunctivitis is the most common type of infectious conjunctivitis. It often starts in one eye and moves to the other within a few days. The most common pathogen is adenovirus. A four- to 10-day incubation period is typical of adenoviral conjunctivitis.[4] The virus can continue to shed for approximately 12 days.[4]

The most common types of adenoviral conjunctivitis are pharyngoconjunctival fever (PCF) and epidemic keratoconjunctivitis (EKC), both of which are highly contagious. PCF is more prominent in children and is often accompanied by a recent upper respiratory infection and a low-grade fever. It is predominantly caused by adenovirus serotypes three, four and seven.[4] EKC is often caused by hand-eye contact. There are typically no concurrent systemic symptoms. EKC is caused by adenovirus serotypes eight and 19.[4]

Viral conjunctivitis typically presents with watery discharge, injection, follicles and lid edema. Patients often report discomfort and photophobia. In severe cases, subconjunctival hemorrhages, chemosis and pseudomembranes can manifest. The preauricular or submandibular lymph nodes are often swollen as well. In EKC, punctate epithelial erosions are observed from days seven to 10.



Asymptomatic nasal and temporal pingueculae in a 60-year-old Caucasian female.



Severe mucopurulent bacterial conjunctivitis with significant lid swelling, ecchymosis, conjunctival injection and chemosis in a 30-year-old Caucasian male. Symptoms had started four days prior and seemed to be worsening daily. The patient was referred from his primary care provider. He denied any history of contact lens wear or trauma. The patient had a positive history for unprotected intercourse with a new partner two days prior to the onset of symptoms, but neither had genitourinary symptoms and his female partner had no ocular symptoms. Based on the severity of discharge, gonococcal conjunctivitis was suspected. The discharge was cultured, and the patient was sent for a 1g IM injection of ceftriaxone and placed on moxifloxacin hourly. He was instructed to keep the lids as clean as possible and regularly flush out the discharge with saline. He was followed daily to monitor for corneal involvement. Ultimately, testing came back negative for gonococcal disease, chlamydia and syphilis. With this negative result, an especially severe *Staph*. or *Strep*. infection was suspected.

Later, subepithelial infiltrates present, followed by anterior stromal infiltrates.

Pseudomembranes can occur in severe adenoviral conjunctivitis or gonococcal conjunctivitis. They can develop on the upper and lower palpebral conjunctiva and fornices. Pseudomembranes consist of exudates that have gently adhered to the conjunctival epithelium, which should be peeled off with a damp cotton swab or forceps to avoid disrupting the conjunctival epithelium.[4] True membranes, in contrast, involve the conjunctival epithelium. Removal of a true membrane often causes bleeding and scarring. They contain white blood cells, fibrin and necrotic debris that firmly adheres to epithelial cells.[6] Common causes of true conjunctival membranes include *Streptococcus pyogenes* and *Corynebacterium diphtheria*.[4]

Testing for adenoviral conjunctivitis can be performed in-office with a QuickVue Adenoviral Conjunctivitis Test (Quidel), formerly known as the RPS Adenoplus. It has a high sensitivity (85% to 90%) and specificity (96% to 98%) when compared with cell culture and polymerase chain reaction, more cumbersome diagnostic alternatives.[7] It is best used on the more inflamed eye within seven days of onset and takes 10 minutes to deliver results.

Treatment is largely supportive and includes both cool compresses and artificial tears to provide symptomatic relief. Resolution usually occurs within 14 days. Antibiotics should be avoided in viral conjunctivitis, and steroids should be used judiciously in cases of corneal infiltrates or severe inflammation only. Topical steroids can provide symptomatic relief, but they can also cause increased viral shedding and longer duration of disease.[8-10] This means the patient may remain contagious for a longer period of time. Patients should be advised to frequently wash their hands, avoid touching their eyes and wash their towels and sheets. They are considered contagious as long as their eyes are still producing watery discharge.

The off-label use of betadine 5% is also a highly effective means of reducing the viral load, especially in earlier stages of disease. Betadine shortens the infectious period and reduces the risk of subepithelial infiltrates in EKC.[11] The recommended procedure is to instill a topical anesthetic followed by a topical NSAID, then four to five drops of betadine. Have the patient gently close their lids and move their eyes around for 30 to 60 seconds. Then irrigate the eyes thoroughly with saline. Once irrigation is complete, instill another NSAID and prescribe Lotemax (loteprednol etabonate ophthalmic suspension or gel, Bausch + Lomb) four times daily for four to five days. Lotemax aids in both comfort and improvement of the ocular surface following the betadine flush. Follow-up is recommended within a few days to ensure improvement in clinical signs and symptoms.[11]

Bacterial. This next form of conjunctivitis most commonly affects children but can also occur in adults. It results from infiltration of the conjunctival epithelium and occasionally stroma. The most common pathogens are *Staphylococcus epidermidis*, *Staphylococcus aureus*, *Streptococcus pneumoniae* and *Haemophilus influenzae*. Look for papillae, redness and purulent discharge. It is important to rule out corneal involvement in these cases. Patients

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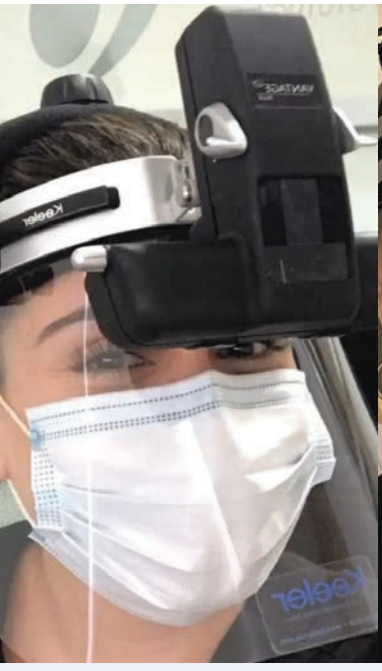

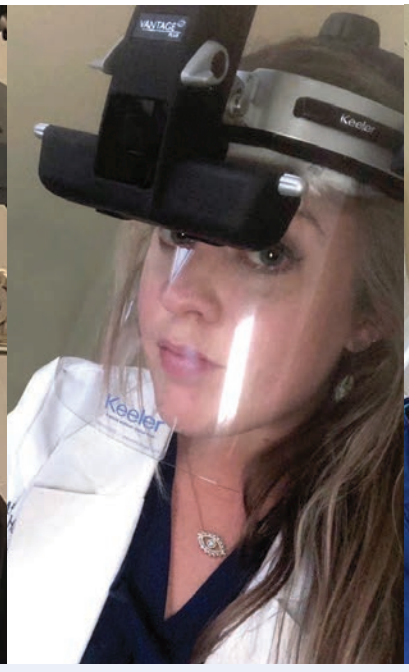

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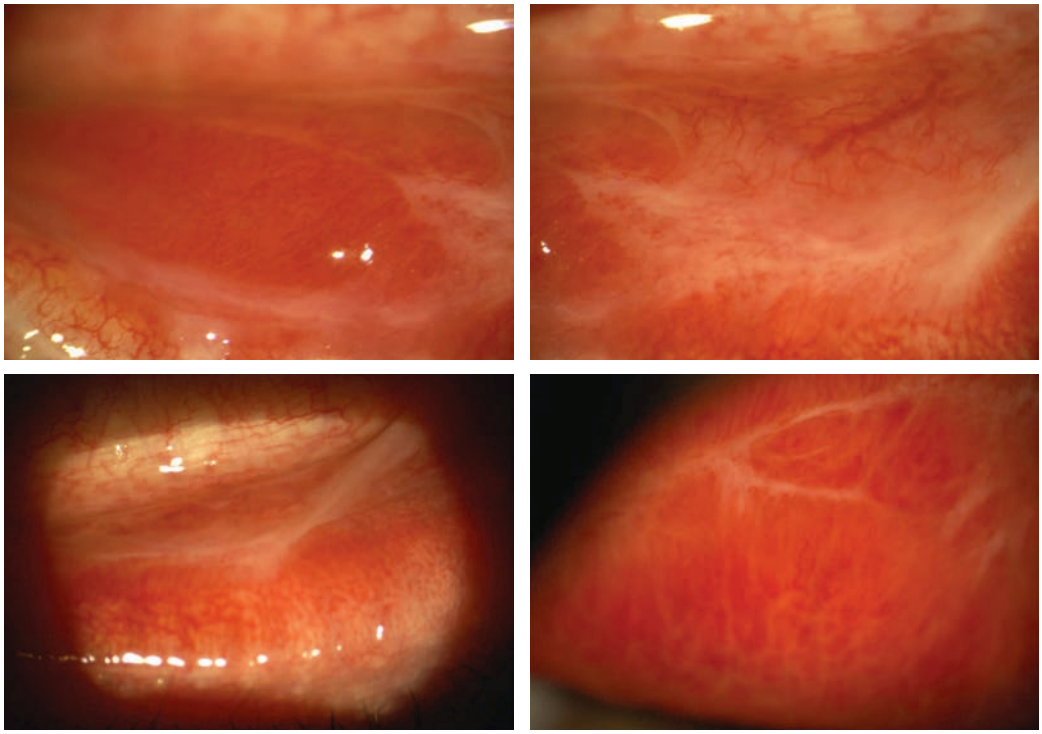


True conjunctival membranes and residual conjunctival scarring in the same 30-year-old Caucasian male in the previous set of photos with severe bilateral bacterial conjunctivitis. The membranes were confirmed when a damp cotton swab was unsuccessful in removal. Once discharge subsided and the ocular surface was considered sterile, the patient was treated with aggressive topical steroids to minimize conjunctival scarring and resolve corneal infiltrates.

may complain of burning, a gritty sensation and their lids sticking together, especially in the morning.

Bacterial conjunctivitis is often self-limiting, resolving within 10 to 14 days, especially in milder forms of disease. Broad-spectrum antibiotics, however, can alleviate symptoms, shorten duration of the condition and reduce the risk of recurrence.[12,13] Antibiotics should also be strongly considered in contact lens wearers due to the risk for corneal involvement and a higher prevalence of gram-negative pathogens. Contact lens wear should be discontinued until symptoms have ceased. Patients should resume wear when appropriate with a new set of contact lenses and a new case. Instruct patients to keep their lids and lashes clean and clear of discharge.

Acceptable broad-spectrum options include Polytrim (polymyxin B and trimethoprim, Allergan), Azasite (azithromycin, Akorn), erythromycin ointment and fluoroquinolones.[14] Polymyxin B and trimethoprim, erythromycin and fluoroquinolones are dosed four times daily, while azithromycin is dosed twice daily for five to seven days. Patients should respond to treatment within 24 to 48 hours. Although later-generation fluoroquinolones are highly effective agents at treating a variety of bacterial strains, alternative antibiotics should be considered for routine bacterial conjunctivitis. Avoiding antibiotic resistance is critical, as fourth-generation fluoroquinolones are the first line of treatment for corneal ulcers and severe bacterial conjunctivitis and must remain efficacious in treating more sight-threatening infections.

Hyperacute bacterial conjunctivitis should be cultured and treated rapidly. This condition is caused by *Neisseria gonorrhoeae* and appears with severe mucopurulent discharge within 12 hours of exposure. Concurrent genitourinary symptoms are common. Patients with suspected gonococcal conjunctivitis should be asked about their recent sexual history and possible source of exposure.

The recommended treatment is 1g of intramuscular ceftriaxone and a topical fluoroquinolone.[15] These patients should be monitored daily, as *Neisseria gonorrhoeae* can penetrate an intact cornea. Generally, culturing is not required in acute infectious conjunctivitis, but it is warranted in suspected gonococcal disease due to the risk of rapid corneal ulceration and its unique treatment. *Neisseria gonorrhoeae* has developed resistance to many antibiotic classes, and culturing allows testing for antibiotic susceptibility. In patients where a concurrent infection of chlamydia has not been ruled out, a seven-day course of 100mg doxycycline twice daily is also recommended.[15]

Allergic. This type of conjunctivitis is a bilateral condition marked by ocular itching. Other symptoms may include tearing, burning and foreign body sensation. Upon examination, eyelid edema, conjunctival hyperemia, papillae and ropy white discharge may also be observed. A careful case history is important to determine the causative agent(s).

Allergic conjunctivitis encompasses acute, seasonal and perennial conjunctivitis. It is a type 1 hypersensitivity reaction. In this condition, circulating allergens trigger the release of IgE and go on to stimulate mast cell production and histamine release. Mast cells are present in high concentrations in the conjunctival epithelium in these patients.[16] Allergic conjunctivitis is more prominent in young adults, as symptoms tend to improve with age,

and eczema is a common concurrent condition in these patients.[17]

First-line treatment includes topical antihistamines or a combination of antihistamine and mast cell stabilizers. Over-the-counter combination options include Pataday (olopatadine, Alcon), Zaditor (ketotifen, Alcon) and Alaway (ketotifen, Bausch + Lomb), the latter of which is now available in a preservative-free formulation. Solo topical antihistamine options include Bepreve (bepotastine besilate, Bausch + Lomb), Lastacaft (alcaftadine, Allergan) and Zerviate (cetirizine, Eyevance Pharmaceuticals). All three of these formulations are available by prescription only.

Oral antihistamines can also be considered, especially when nasal symptoms accompany ocular symptoms. These are best used preventatively. Another supplemental option is a topical mast cell stabilizer such as Crolom (cromolyn sodium, Bausch + Lomb). Cool compresses and artificial tears can provide adjunctive symptomatic relief. In more severe forms of allergic conjunctivitis, soft steroids can be considered such as Alrex (loteprednol etabonate, Bausch + Lomb), which is FDA-approved for allergic conjunctivitis, Lotemax (loteprednol, Bausch + Lomb) and FML (fluorometholone, Allergan). It is also important to educate patients to avoid eye rubbing and known allergens.

Vernal keratoconjunctivitis (VKC) is a more severe form of allergic conjunctivitis and can be sight-threatening. It is a recurrent, bilateral condition marked by cobblestone papillae on the upper palpebral conjunctiva. It is more common in young males in dry, warm climates. Patients suffering from VKC will experience severe itching, increased blink rates and mucus discharge. VKC is both IgE- and cell-mediated and is marked by significant eosinophil, mast cell and fibroblast release. It resembles both type one, IgE-mediated and type four, delayed hypersensitivity reactions.[18,19] Patients should be monitored carefully for limbal and corneal involvement. Treatment is very similar to that of allergic conjunctivitis. Combination antihistamine and mast cell stabilizers should be considered first-line therapy, but topical steroids may be required in more significant disease.[4]

Giant Papillary Conjunctivitis (GPC)

This non-allergic condition occurs secondary to mechanical rubbing on the tarsal conjunctiva and an immune-mediated inflammatory response. Although not fully understood, it also exhibits features of both type one and type four hypersensitivity reactions.[20] GPC most commonly occurs due to contact lens wear but can also be stimulated by exposed sutures, filtering blebs, ocular prostheses and scleral buckles. When induced by contact lenses, symptoms tend to be worse following lens removal. Patients will often report foreign body sensa-

tion, itching, redness and increased mucus discharge. The condition is marked by redness and papillae of the superior palpebral conjunctiva. Protein deposition is also commonly found on contact lenses in lens-induced GPC.

The first line of treatment is to remove the irritant for a couple of weeks. For lens-induced GPC, the patient should switch to a different contact lens material or to daily disposable contact lenses when wear is resumed. Patients should also be discouraged from overwearing their lenses. Topical steroids can be utilized to treat inflammation. In cases where daily disposables are not a viable alternative, it is important to ensure proper cleaning of contact lenses. Thorough disinfection is also imperative in cases of GPC induced by an ocular prosthesis. An ocularist can be consulted in these instances.

Conjunctivochalasis

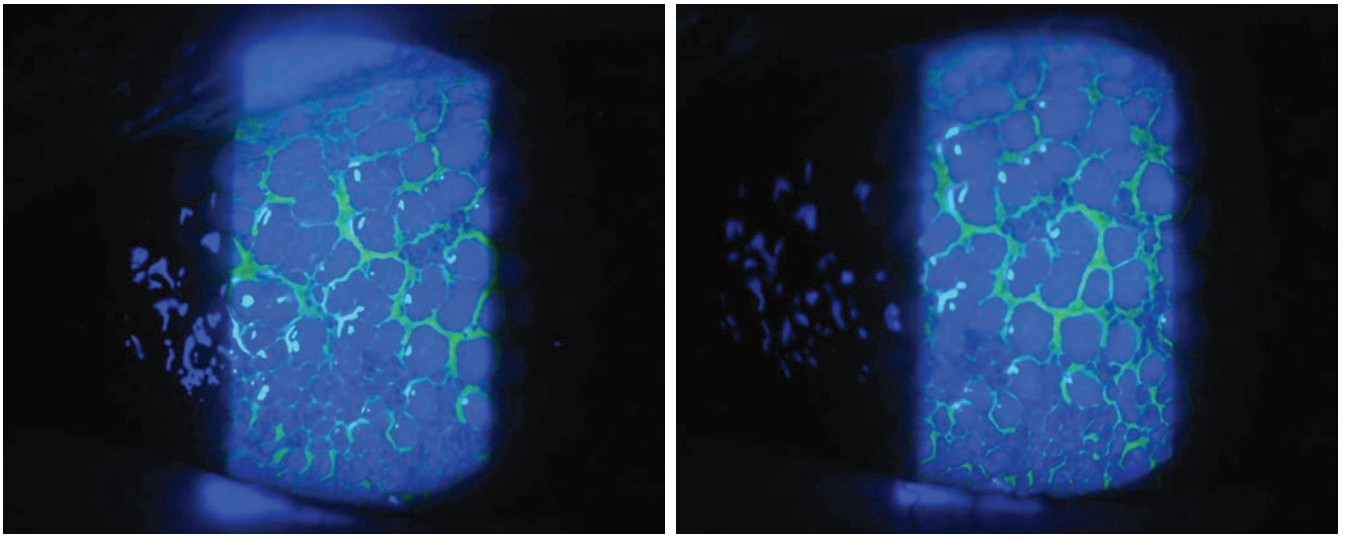
This condition is evident by redundant conjunctival tissue which occurs most commonly with increasing age as elastic fibers are lost.[21] Ocular rubbing, mechanical forces, trauma and previous surgeries can also increase the risk of conjunctivochalasis development.[21,22] It most commonly occurs in the infratemporal quadrant of the bulbar conjunctiva. Although frequently asymptomatic, symptoms such as ocular surface discomfort, epiphora and dryness can occur. Conjunctivochalasis blocks normal tear movement and disrupts the tear meniscus.[23,24] Symptoms often worsen with downgaze and with an increased blink rate.[25] Conjunctivochalasis is frequently under-diagnosed as a source of ocular discomfort.

In asymptomatic patients, no treatment is required. In cases of mild discomfort, frequent artificial tears can be utilized. This helps to ensure that an adequate supply of tears is spread across the ocular surface despite a disrupted tear meniscus. If the redundant conjunctiva is exposed overnight, consider lubricating ointment or patching. A short, soft topical steroid course is the next line of treatment if supportive therapy is unsuccessful. This is especially helpful in cases of increased inflammation. Cyclosporine may also be beneficial based on its inhibitory effect on inflammatory cytokines, which are often found in the tear film of those with conjunctivochalasis. In patients with more severe symptoms, the chalasis can be surgically excised and resected, or thermal cautery can be performed on the redundant tissue.

Pinguecula and Pingueculitis

A pinguecula is an extremely common benign, yellow/white elevated lesion found on the bulbar conjunctiva. It is often bilateral and asymptomatic. Pingueculae are caused by UV exposure and other elemental factors including wind and dust. This leads to elastic degeneration of collagen fibers in the conjunctival stroma. Similar to pterygia, they are more commonly found nasally.[4] This is thought to be due to the internal reflection of temporal incident light across the cornea, resulting in 20-times the concentration of light focused at the nasal limbus.[26,27]

Mild symptoms of discomfort, itching and foreign body sensation can be treated with artificial tears. In cases of more significant inflammation, *i.e.*, pingueculitis, a short course of soft topical steroids can be considered. UV protection is recommended to prevent progression. Surgical excision or removal with argon laser photocoagulation is rarely performed, except for cosmetic reasons.



A 59-year-old Caucasian female presented with irritation and foreign body sensation in the left eye greater than the right for the last few days. She reported sleeping in her two-week disposable contact lenses prior to the onset of irritation. Examination revealed GPC in the left eye greater than the right. The patient was instructed to discontinue contact lens wear for two weeks and placed on Tobradex (tobramycin and dexamethasone, Novartis) QID for one week. Based on her high-risk contact lens history, mild crusting of the lid margin and mild corneal edema in the left eye on examination, an antibiotic-steroid combination was selected. The patient was instructed to return in two weeks for follow-up, at which point she was switched to a daily disposable contact lens modality. She responded well to therapy.

Takeaways

The conjunctiva serves a critical role in ocular surface integrity. It does so by producing mucins and basal aqueous secretions to moisturize the ocular surface. It also serves as a physical barrier to foreign irritants and pathogens. As a highly vascularized tissue, it provides nutrients to its surrounding tissues and immunologic protection. Signs and symptoms of conjunctival inflammation can be nonspecific and have significant overlap between etiologies. It is critical to perform a thorough case history and careful ocular examination to tease out the nuances to make an accurate diagnosis and appropriate treatment plan. ■

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BENEATH THE MASK: OSD ISSUES SPIKE DUE TO IMPROPER WEAR

Since the onset of COVID, doctors have noted an increase in dry eye, chalazion, blepharitis and hordeolum cases. Here, several experts offer diagnosis and treatment tips.

BY JANE COLE
CONTRIBUTING EDITOR

Face mask wear has become a norm since the onset of the pandemic in 2020 and is often considered a first line of protection against the spread of COVID-19. While masks have now been integrated into many daily routines—from logging eight-hour days at the office to quick trips to the grocery store—eyecare practitioners are seeing a notable rise in dry eye disease (DED) and other ocular surface disease (OSD) issues they attribute to improper mask wear, and possibly even extended mask wear.

Overall, poorly worn masks can cause significant problems for the ocular surface and may even affect lower lid motility, alter blink rate and blink efficacy to add a different dimension to what has been offered as causes for ocular surface disease, says Joseph Shovlin, OD, of Scranton, PA. "When patients come into the office, they sometimes have the upper portion of their mask close to or even riding above their lower lid," he says.

These mask-induced OSD issues that doctors are seeing in their chairs are mirrored in the literature. A recent study that looked at the effects of daily face mask wear on the ocular surface found that improper use may lead to increased ocular irritation and DED symptoms.[1] Additionally, a case report published in *Eye & Contact Lens* found a heightened number of DED symptoms in regular mask-wearing patients with no previous history of ocular surface issues.[2]

"When there isn't an appropriate seal between the skin and the mask, it creates an artificially challenging microenvironment on the surface of the eye," explains Mile Brujic, OD, of Bowling Green, OH.

The challenge here is twofold: the inappropriate mask seal causes additional airflow that is directed toward the eyes, and it increases microbe exposure to the ocular surface. "With this in mind, it's incumbent on eyecare practitioners to educate patients on appropriate mask wear and provide them with the best treatments for what is now commonly referred to as 'mask-induced dry eye'," Dr. Brujic says.

An Uptick in Symptoms

Mask wear has become the tipping point for DED development in many previously healthy patients, while it has worsened symptoms in others who already had the condition, says Kambiz Silani, OD, chief clinical director of Beverly Hills Optometry and founder of its Advanced Dry Eye Center in Beverly Hills, CA. "In the latter group, some individuals are having a hard time with productivity at work, while others have debilitating symptoms that make them unable to drive or cause them to rely on sunglasses to help with sensitivity," he says.

However, the disruption of the ocular surface caused by mask wear doesn't appear to be limited to just dry eye alone, as DED has been linked to blepharitis and the development of chalazion.[3]

A team of Australian researchers found improper face mask wear led to inadvertent corneal abrasions and subsequent, recurrent corneal erosion syndrome and infections.[2]

Lid margin diseases, such as hordeola, chalazia and blepharitis, are the most prevalent mask-related OS conditions seen by optometrist Paul Karpecki, chief medical director for Keplr Vision and the Dry Eye Institutes of Kentucky and Indiana. Additionally, Dr. Karpecki is treating more individuals with a history of recurrent corneal erosion—who had previous well controlled conditions—only to have them resurface due to mask wear.

"We are seeing ocular surface issues well beyond dry eye," he says.

During the early days of the pandemic, Dr. Shovlin noticed an alarming increase in patients with chalazia with both upper and lower lid involvement, which he says reflects what is being reported in the literature.[4]

"I would estimate a two-to-three times increased rate of chalazion over years prior to COVID-19 mask wear, along with an increase in patients with dryness symptoms," he says.

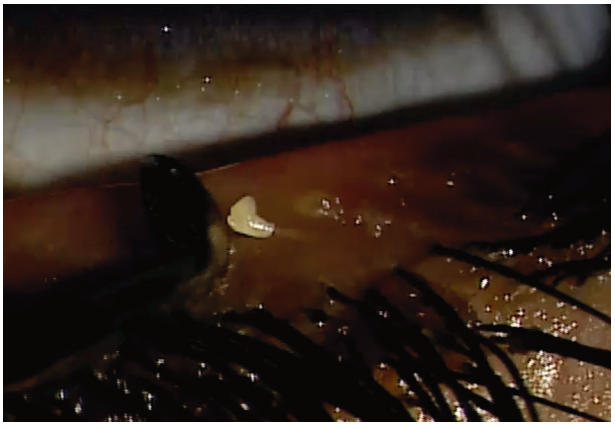
Dr. Brujic cites an upward trend of patients presenting with internal and external hordeolum caused by mask wear. In addition to styes, optometrist Scott Hauswirth, assistant professor at the University of Colorado School of Medicine, is also encountering more cases of blepharitis, which he attributes to improper mask wear.

The Bacteria Funnel

Looking at the mechanism behind why the ocular surface is altered, experts say it essentially comes down to too much air being directed into the eyes over an extended period and bacteria infiltrating the OS.

Specifically, poor face mask fits result in increased airflow over the ocular surface, which in turn increases the evaporation of the tear film and compromises its protective barrier, resulting in dry eyes.[2] In individuals who already have a compromised epithelial surface, this can increase their susceptibility to infection.[2]

Photo: Mile Brujic, OD



Debriding clogged meibomian gland.

Additionally, the ocular surface becomes dryer due to the accelerated evaporation, and patients are touching their faces more often, Dr. Shovlin explains. Some researchers have even proposed a conduction theory whereby there may be a "funnel" of bacteria that is aimed directly at the lid area, he adds.

"Ocular flora may be altered significantly, according to a few investigators," Dr. Shovlin says. "This in turn affects the ocular surface in several ways, resulting in blepharitis and meibomian secretion 'hardening'."

In addition, oral flora is easily incorporated into expired droplets for transmission to the eye, he adds.

Dr. Brujic likens the mechanism to being in a room where you have a nonstop breeze blowing in your eyes.

"Your breath is constantly being redirected towards the eyes, which aren't equipped to receive that much air over an extended period of time," Dr. Brujic says.

In addition to bacterial infiltration, Dr. Karpecki cites another reason for OSD-related issues caused by mask wear: the desiccation of the ocular surface, which he says is a similar process to what can happen to the eye during continuous positive airway pressure (CPAP) overnight treatments.

"It's similar to wearing a mask all day, since there is continuous airflow that is causing many of the same issues, like blepharitis and dry eye. Though the air isn't bacteria-filled, CPAPs can cause desiccating stress or desiccation of the cornea, and meibomian glands don't get to recover when they are supposed to during that downtime," he says.

Testing Offers Clues

While some patients have DED or other ocular surface problems independent of mask wear, a few telltale signs during the exam may tip off clinicians to a mask-related OSD problem.

A study in *Cornea* found patients with moderate-to-severe dry eye had a decrease in their tear film stability based on lower tear break-up time (TBUT) readings after mask wear.[5] In the investigation, participants' first noninvasive TBUT reading with a face mask was 6.2 seconds, which increased to 7.8 seconds without one—a difference of 1.6 seconds.[5] The average noninvasive TBUT measurement with a face mask was 12.3 seconds and increased to 13.8 seconds without the use of a mask—a difference of 1.5 seconds.[5]

Another investigation found long-term use of face masks not only shortened TBUT time but also reduced Schirmer-1 measurements.[1] The research paper cited a significant increase in OSDI scores and ocular surface staining according to the Oxford scale after eight hours of continuous face mask use.[1] Furthermore, it was observed that taping down the open upper portion of the mask improved test parameters by preventing exhaled dry air from contacting the eyes.[1]

Dr. Hauswirth says he's more frequently noticing younger patients with no history of dry eye complaining of symptoms, and often these individuals don't have corneal staining.

"It's very situational and is a reminder that taking a careful history is important in helping with the diagnosis," says Dr. Hauswirth, who will be launching an upcoming NEI-NIH funded investigation on mask wear related OS issues in a group of healthcare workers.

During the exam, Dr. Silani checks the patient's meibomian glands using meibography, evaluates tear film consistency, quality and stability, in addition to performing staining such as lissamine green or fluorescein. Practitioners can check for staining of the cornea and conjunctivae, looking for lid wiper epitheliopathy, punctate epithelial defects, superficial punctate keratitis and how quickly the tear film is evaporating. Additionally, meibography images can tell a big picture story about the structure and function of the glands, he says.

In Patients With Diabetic Eye Disease (DR and DME),

HELPING TO PROTECT VISION STARTS WITH YOU

IF YOU SEE OR SUSPECT DIABETIC RETINOPATHY

EDUCATE PATIENTS[1]

- Your early and frequent discussions about progression of disease, timely referral, and potential treatment options can empower patients[1]

REFER APPROPRIATE PATIENTS[1]

- The AOA recommends referring patients with severe NPDR and PDR within 2 to 4 weeks, and patients with higher-risk PDR with or without macular edema within 24 to 48 hours[1]

IMPORTANT SAFETY INFORMATION

CONTRAINDICATIONS

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

WARNINGS AND PRECAUTIONS

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

Please see Important Safety Information throughout and Brief Summary of the full Prescribing Information on the following page.

EYLEA®
(aflibercept) Injection
For Intravitreal Injection

Brought to you by **REGENERON®**

FOLLOW UP WITH PATIENTS

- Encourage referred patients to promptly visit a retina specialist

CONTINUE TO MONITOR PATIENTS[1]

- The AOA recommends frequent monitoring of patients[1]
  - At least every 6 to 9 months in patients with moderate NPDR and more frequently for patients with greater disease severity

The more you know about anti-VEGF agents and other potential treatments for DR, the better you can help inform your patients. Find out more by visiting diabeticretinaldisease.com.

ADVERSE REACTIONS

- Serious adverse reactions related to the injection procedure have occurred in <0.1% of intravitreal injections with EYLEA including endophthalmitis and retinal detachment.
- The most common adverse reactions (≥5%) reported in patients receiving EYLEA were conjunctival hemorrhage, eye pain, cataract, vitreous detachment, vitreous floaters, and intraocular pressure increased.
- Patients may experience temporary visual disturbances after an intravitreal injection with EYLEA and the associated eye examinations. Advise patients not to drive or use machinery until visual function has recovered sufficiently.

INDICATIONS

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

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

Reference: 1. Eye care of the patient with diabetes mellitus. American Optometric Association. Accessed April 2, 2021. http://aoa.uberflip.com/i/1183026-evidence-based-clinical-practice-guideline-eye-care-of-the-patient-with-diabetes-mellitus-second-edition/

07/2021
EYL.21.03.0229

EYLEA®
(aflibercept) Injection
For Intravitreal Injection

BRIEF SUMMARY—Please see the EYLEA full Prescribing Information available on HCP.EYLEA.US for additional product information.

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

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

4 CONTRAINDICATIONS

4.1 Ocular or Periocular Infections
EYLEA is contraindicated in patients with ocular or periocular infections.

4.2 Active Intraocular Inflammation
EYLEA is contraindicated in patients with active intraocular inflammation.

4.3 Hypersensitivity
EYLEA is contraindicated in patients with known hypersensitivity to aflibercept or any of the excipients in EYLEA. Hypersensitivity reactions may manifest as rash, pruritus, urticaria, severe anaphylactic/anaphylactoid reactions, or severe intraocular inflammation.

5 WARNINGS AND PRECAUTIONS

5.1 Endophthalmitis and Retinal Detachments
Intravitreal injections, including those with EYLEA, have been associated with endophthalmitis and retinal detachments [*see Adverse Reactions (6.1)*]. Proper aseptic injection technique must always be used when administering EYLEA. Patients should be instructed to report any symptoms suggestive of endophthalmitis or retinal detachment without delay and should be managed appropriately [*see Patient Counseling Information (17)*].

5.2 Increase in Intraocular Pressure
Acute increases in intraocular pressure have been seen within 60 minutes of intravitreal injection, including with EYLEA [*see Adverse Reactions (6.1)*]. Sustained increases in intraocular pressure have also been reported after repeated intravitreal dosing with vascular endothelial growth factor (VEGF) inhibitors. Intraocular pressure and the perfusion of the optic nerve head should be monitored and managed appropriately.

5.3 Thromboembolic Events
There is a potential risk of arterial thromboembolic events (ATEs) following intravitreal use of VEGF inhibitors, including EYLEA. ATEs are defined as nonfatal stroke, nonfatal myocardial infarction, or vascular death (including deaths of unknown cause). The incidence of reported thromboembolic events in wet AMD studies during the first year was 1.8% (32 out of 1824) in the combined group of patients treated with EYLEA compared with 1.5% (9 out of 595) in patients treated with ranibizumab; through 96 weeks, the incidence was 3.3% (60 out of 1824) in the EYLEA group compared with 3.2% (19 out of 595) in the ranibizumab group. The incidence in the DME studies from baseline to week 52 was 3.3% (19 out of 578) in the combined group of patients treated with EYLEA compared with 2.8% (8 out of 287) in the control group; from baseline to week 100, the incidence was 6.4% (37 out of 578) in the combined group of patients treated with EYLEA compared with 4.2% (12 out of 287) in the control group. There were no reported thromboembolic events in the patients treated with EYLEA in the first six months of the RVO studies.

6 ADVERSE REACTIONS
The following potentially serious adverse reactions are described elsewhere in the labeling:
- Hypersensitivity [*see Contraindications (4.3)*]
- Endophthalmitis and retinal detachments [*see Warnings and Precautions (5.1)*]
- Increase in intraocular pressure [*see Warnings and Precautions (5.2)*]
- Thromboembolic events [*see Warnings and Precautions (5.3)*]

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 other clinical trials of the same or another drug and may not reflect the rates observed in practice.
A total of 2980 patients treated with EYLEA constituted the safety population in eight phase 3 studies. Among those, 2379 patients were treated with the recommended dose of 2 mg. Serious adverse reactions related to the injection procedure have occurred in <0.1% of intravitreal injections with EYLEA including endophthalmitis and retinal detachment. The most common adverse reactions (≥5%) reported in patients receiving EYLEA were conjunctival hemorrhage, eye pain, cataract, vitreous detachment, vitreous floaters, and intraocular pressure increased.

Neovascular (Wet) Age-Related Macular Degeneration (AMD). The data described below reflect exposure to EYLEA in 1824 patients with wet AMD, including 1223 patients treated with the 2-mg dose, in 2 double-masked, controlled clinical studies (VIEW1 and VIEW2) for 24 months (with active control in year 1).
Safety data observed in the EYLEA group in a 52-week, double-masked, Phase 2 study were consistent with these results.

Table 1: Most Common Adverse Reactions (≥1%) in Wet AMD Studies

	Baseline to Week 52		Baseline to Week 96	
Adverse Reactions	**EYLEA (N=1824)**	**Active Control (ranibizumab) (N=595)**	**EYLEA (N=1824)**	**Control (ranibizumab) (N=595)**
Conjunctival hemorrhage	25%	28%	27%	30%
Eye pain	9%	9%	10%	10%
Cataract	7%	7%	13%	10%
Vitreous detachment	6%	6%	8%	8%
Vitreous floaters	6%	7%	8%	10%
Intraocular pressure increased	5%	7%	7%	11%
Ocular hyperemia	4%	8%	5%	10%
Corneal epithelium defect	4%	5%	5%	6%
Detachment of the retinal pigment epithelium	3%	3%	5%	5%
Injection site pain	3%	3%	3%	4%
Foreign body sensation in eyes	3%	4%	4%	4%
Lacrimation increased	3%	1%	4%	2%
Vision blurred	2%	2%	4%	3%
Intraocular inflammation	2%	3%	3%	4%
Retinal pigment epithelium tear	2%	1%	2%	2%
Injection site hemorrhage	1%	2%	2%	2%
Eyelid edema	1%	2%	2%	3%
Corneal edema	1%	1%	1%	1%
Retinal detachment	<1%	<1%	1%	1%

Less common serious adverse reactions reported in <1% of the patients treated with EYLEA were hypersensitivity, retinal tear, and endophthalmitis.

Macular Edema Following Retinal Vein Occlusion (RVO). The data described below reflect 6 months exposure to EYLEA with a monthly 2 mg dose in 218 patients following central retinal vein occlusion (CRVO) in 2 clinical studies (COPERNICUS and GALILEO) and 91 patients following branch retinal vein occlusion (BRVO) in one clinical study (VIBRANT).

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

	CRVO		BRVO	
Adverse Reactions	**EYLEA (N=218)**	**Control (N=142)**	**EYLEA (N=91)**	**Control (N=92)**
Eye pain	13%	5%	4%	5%
Conjunctival hemorrhage	12%	11%	20%	4%
Intraocular pressure increased	8%	6%	2%	0%
Corneal epithelium defect	5%	4%	2%	0%
Vitreous floaters	5%	1%	1%	0%
Ocular hyperemia	5%	3%	2%	2%
Foreign body sensation in eyes	3%	5%	3%	0%
Vitreous detachment	3%	4%	2%	0%
Lacrimation increased	3%	4%	3%	0%
Injection site pain	3%	1%	1%	0%
Vision blurred	1%	<1%	1%	1%
Intraocular inflammation	1%	1%	0%	0%
Cataract	<1%	1%	5%	0%
Eyelid edema	<1%	1%	1%	0%

Less common adverse reactions reported in <1% of the patients treated with EYLEA in the CRVO studies were corneal edema, retinal tear, hypersensitivity, and endophthalmitis.

Diabetic Macular Edema (DME) and Diabetic Retinopathy (DR). The data described below reflect exposure to EYLEA in 578 patients with DME treated with the 2-mg dose in 2 double-masked, controlled clinical studies (VIVID and VISTA) from baseline to week 52 and from baseline to week 100.

Table 3: Most Common Adverse Reactions (≥1%) in DME Studies

	Baseline to Week 52		Baseline to Week 100	
Adverse Reactions	**EYLEA (N=578)**	**Control (N=287)**	**EYLEA (N=578)**	**Control (N=287)**
Conjunctival hemorrhage	28%	17%	31%	21%
Eye pain	9%	6%	11%	9%
Cataract	8%	9%	19%	17%
Vitreous floaters	6%	3%	8%	6%
Corneal epithelium defect	5%	3%	7%	5%
Intraocular pressure increased	5%	3%	9%	5%
Ocular hyperemia	5%	6%	5%	6%
Vitreous detachment	3%	3%	8%	6%
Foreign body sensation in eyes	3%	3%	3%	3%
Lacrimation increased	3%	2%	4%	2%
Vision blurred	2%	2%	3%	4%
Intraocular inflammation	2%	<1%	3%	1%
Injection site pain	2%	<1%	2%	<1%
Eyelid edema	<1%	1%	2%	1%

Less common adverse reactions reported in <1% of the patients treated with EYLEA were hypersensitivity, retinal detachment, retinal tear, corneal edema, and injection site hemorrhage.
Safety data observed in 269 patients with nonproliferative diabetic retinopathy (NPDR) through week 52 in the PANORAMA trial were consistent with those seen in the phase 3 VIVID and VISTA trials (see Table 3 above).

6.2 Immunogenicity
As with all therapeutic proteins, there is a potential for an immune response in patients treated with EYLEA. The immunogenicity of EYLEA was evaluated in serum samples. The immunogenicity data reflect the percentage of patients whose test results were considered positive for antibodies to EYLEA in immunoassays. The detection of an immune response is highly dependent on the sensitivity and specificity of the assays used, sample handling, timing of sample collection, concomitant medications, and underlying disease. For these reasons, comparison of the incidence of antibodies to EYLEA with the incidence of antibodies to other products may be misleading.
In the wet AMD, RVO, and DME studies, the pre-treatment incidence of immunoreactivity to EYLEA was approximately 1% to 3% across treatment groups. After dosing with EYLEA for 24-100 weeks, antibodies to EYLEA were detected in a similar percentage range of patients. There were no differences in efficacy or safety between patients with or without immunoreactivity.

8 USE IN SPECIFIC POPULATIONS

8.1 Pregnancy
Risk Summary
Adequate and well-controlled studies with EYLEA have not been conducted in pregnant women. Aflibercept produced adverse embryofetal effects in rabbits, including external, visceral, and skeletal malformations. A fetal No Observed Adverse Effect Level (NOAEL) was not identified. At the lowest dose shown to produce adverse embryofetal effects, systemic exposures (based on AUC for free aflibercept) were approximately 6 times higher than AUC values observed in humans after a single intravitreal treatment at the recommended clinical dose [*see Animal Data*].
Animal reproduction studies are not always predictive of human response, and it is not known whether EYLEA can cause fetal harm when administered to a pregnant woman. Based on the anti-VEGF mechanism of action for aflibercept, treatment with EYLEA may pose a risk to human embryofetal development. EYLEA should be used during pregnancy only if the potential benefit justifies the potential risk to the fetus.
All pregnancies have a background risk of birth defect, loss, or other adverse outcomes. The background risk of major birth defects and miscarriage for the indicated population is unknown. In the U.S. general population, the estimated background risk of major birth defects and miscarriage in clinically recognized pregnancies is 2-4% and 15-20%, respectively.

Data
Animal Data
In two embryofetal development studies, aflibercept produced adverse embryofetal effects when administered every three days during organogenesis to pregnant rabbits at intravenous doses ≥3 mg per kg, or every six days during organogenesis at subcutaneous doses ≥0.1 mg per kg.
Adverse embryofetal effects included increased incidences of postimplantation loss and fetal malformations, including anasarca, umbilical hernia, diaphragmatic hernia, gastroschisis, cleft palate, ectrodactyly, intestinal atresia, spina bifida, encephalomeningocele, heart and major vessel defects, and skeletal malformations (fused vertebrae, sternebrae, and ribs; supernumerary vertebral arches and ribs; and incomplete ossification). The maternal No Observed Adverse Effect Level (NOAEL) in these studies was 3 mg per kg. Aflibercept produced fetal malformations at all doses assessed in rabbits and the fetal NOAEL was not identified. At the lowest dose shown to produce adverse embryofetal effects in rabbits (0.1 mg per kg), systemic exposure (AUC) of free aflibercept was approximately 6 times higher than systemic exposure (AUC) observed in humans after a single intravitreal dose of 2 mg.

8.2 Lactation
Risk Summary
There is no information regarding the presence of aflibercept in human milk, the effects of the drug on the breastfed infant, or the effects of the drug on milk production/excretion. Because many drugs are excreted in human milk, and because the potential for absorption and harm to infant growth and development exists, EYLEA is not recommended during breastfeeding.
The developmental and health benefits of breastfeeding should be considered along with the mother's clinical need for EYLEA and any potential adverse effects on the breastfed child from EYLEA.

8.3 Females and Males of Reproductive Potential
Contraception
Females of reproductive potential are advised to use effective contraception prior to the initial dose, during treatment, and for at least 3 months after the last intravitreal injection of EYLEA.

Infertility
There are no data regarding the effects of EYLEA on human fertility. Aflibercept adversely affected female and male reproductive systems in cynomolgus monkeys when administered by intravenous injection at a dose approximately 1500 times higher than the systemic level observed humans with an intravitreal dose of 2 mg. A No Observed Adverse Effect Level (NOAEL) was not identified. These findings were reversible within 20 weeks after cessation of treatment.

8.4 Pediatric Use
The safety and effectiveness of EYLEA in pediatric patients have not been established.

8.5 Geriatric Use
In the clinical studies, approximately 76% (2049/2701) of patients randomized to treatment with EYLEA were ≥65 years of age and approximately 46% (1250/2701) were ≥75 years of age. No significant differences in efficacy or safety were seen with increasing age in these studies.

17 PATIENT COUNSELING INFORMATION
In the days following EYLEA administration, patients are at risk of developing endophthalmitis or retinal detachment. If the eye becomes red, sensitive to light, painful, or develops a change in vision, advise patients to seek immediate care from an ophthalmologist [*see Warnings and Precautions (5.1)*].
Patients may experience temporary visual disturbances after an intravitreal injection with EYLEA and the associated eye examinations [*see Adverse Reactions (6)*]. Advise patients not to drive or use machinery until visual function has recovered sufficiently.

REGENERON

Manufactured by:
Regeneron Pharmaceuticals, Inc.
777 Old Saw Mill River Road
Tarrytown, NY 10591

Issue Date: 08/2019
Initial U.S. Approval: 2011

Based on the August 2019 EYLEA® (aflibercept) Injection full Prescribing Information.

EYL.20.09.0052

"We know that 86% of patients have dry eye because their glands structurally aren't there, healthy or functioning properly," Dr. Silani says.[6]

Dr. Silani also uses the Oculus Keratograph 5M to examine the meibomian glands, provide non-invasive tear film break-up time readings and tear meniscus height measurements, in addition to an evaluation of the lipid layer.

Dr. Karpecki is seeing more patients with inadequate lid closures with these mask-related OSD issues. This condition should not be confused with lagophthalmos, the inability to close the eyelids, he suggests.

In order to determine if lid seal issues are causing the problem, Dr. Karpecki recommends the Korb-Blackie light test. Any light escaping from the lid margin will become evident, indicating incomplete or inadequate lid seal, he says.

If a patient comes into the office and complains of a third consecutive stye in a month, Dr. Karpecki will always check the lid seal and usually will find this is the source of the problem.

Regarding fluorescein staining, Dr. Karpecki recommends looking for dryness in the lower part of the cornea and conjunctivae, which tend to show linear staining patterns in these patients.

THE IMPORTANCE OF ASSESSING THE FACIAL SKIN

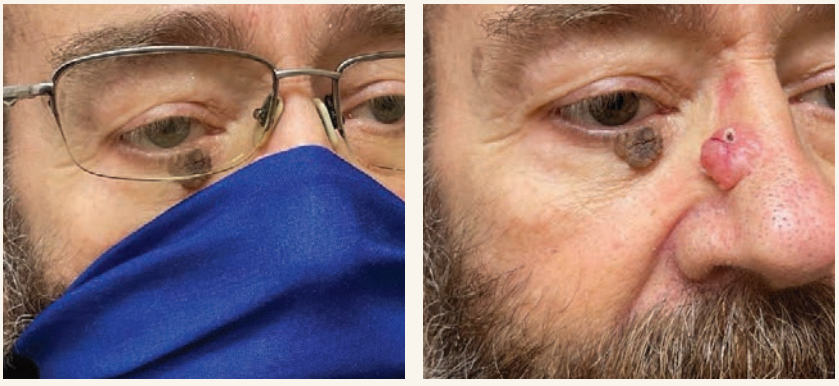
By Marc Myers, OD

Expanded responsibility of the primary eye care provider includes inspection of the skin of the head and neck to identify both benign and potentially malignant skin lesions. Mask wear may obscure much of the skin of the face, necessitating mask removal to perform a more complete examination of structures.

Customarily, I perform a general assessment by scanning the skin of the face and neck while completing the medical and ocular history. When a suspicious skin lesion is identified, further discussion of signs and symptoms is performed and a more detailed assessment of the findings in question is carried out either grossly or with magnification. Key symptoms include the report of a lesion that is growing in size, may have recurrent bleeding and is painful, numb or irritated. Signs associated with potential malignancy include lesion asymmetry, border irregularity, color changes, elevation, and the presentation of a non-healing sore.

Taking the time to complete a simple, general assessment of the skin of the head and neck can lead to the identification of a large percentage of the distribution of cutaneous cancers. Refer to either primary care or dermatology for prompt management.

Dr. Myers is senior staff optometrist at Coatesville Veterans Affairs Medical Center in Coatesville, PA.



Photos: Marc Myers, OD

Suspicious large, pigmented skin lesion involving the right lower lid. Mask removal revealed a large, elevated lesion with an area of central ulceration.

Rethink Treatment Protocols

Although the eye conditions are familiar, you may want to rethink your typical treatment protocol when addressing mask wear–related ocular surface problems, experts suggest.

In these cases, Dr. Brujic first assures that the lid margin is absent of any inflammation or blepharitis, and that InflammaDry (Quidel) testing is negative prior to punctal occlusion.

Patients predisposed to blepharitis should be reminded about the importance of lid hygiene, he says.

Additionally, mask wear has caused some patients to switch to contact lenses to avoid foggy glasses. In these cases, prescribe the best contact lens technologies possible, Dr. Brujic says.

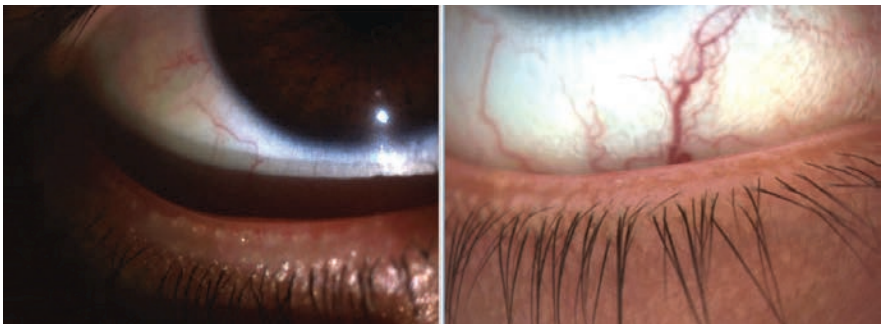
Of course, treatments also depend on patient demographics, Dr. Hauswirth adds. At his practice, many of the patients with dry eye are not contact lens wearers, tend to be older and many have autoimmune disorders. Based on these factors, Dr. Hauswirth frequently prescribes anti-inflammatory treatments and serum tears, and has noticed an increase in his use of antibiotics due to more cases of blepharitis and hordeola since the start of the pandemic.

If mask-related DED is detected during the exam, Dr. Silani will customize a treatment plan for the patient. This could include home remedies, such as warm compresses and eyelid hygiene and a high quality, science-based omega-3 supplement. He may also recommend lipid-based lubricating drops for evaporative dry eye cases. Depending on the patient's condition, he may also suggest in-office treatments such as intense pulsed light (IPL) therapy, thermal expression treatments and microblepharoexfoliation.

A recent case report published in the *American Journal of Ophthalmology* found an increased incidence of chalazion with mask use.[4] The authors suggest a multi-pronged preventative approach:

- a commercially approved antiseptic mouthwash containing hydrogen peroxide, alcohol or povidone iodine to reduce bacterial load and decrease the likelihood of masked breathing patterns altering the normal flora of the eyelids and periorbital region
- frequent hot water washing of cloth face masks
- good hand hygiene practices; avoidance of face touching and excessive mask adjustment
- the use of adhesive tape over

Photo: Kambiz Silani, OD



Lid margin integrity and meibum function improving due to office-based treatments in a 27-year-old female patient with DED secondary to MGD. She works in a healthcare facility and prolonged face mask wear has exacerbated her dry eye condition.

a mask on the bridge of the nose to minimize the upward direction of air towards the eyes.[4]

Additionally, the authors suggest the use of a 1% hypochlorous acid solution eyelid scrub as part of daily eyelid hygiene to act as both an antiviral and antibacterial blepharitis deterrent.[4]

Due to airflow and inadequate lid closure issues, Dr. Karpecki is recommending thicker lubricating agents for these patients. "I'm more likely to use a gel that has some staying power and will stay on the eye instead of going away more quickly," Dr. Karpecki says.

In addition to thicker tear ointments, Dr. Karpecki points to a new product he helped developed that will be coming soon for those individuals with lid seal problems: SleepTite (Ophthalmic Resources Partners), which is a single-use device intended to hold the eye closed to prevent it from unintended exposure to fluids, airborne contaminants or excessive drying due to incomplete lid closure.

Dr. Karpecki is also finding many patients do well with hydrating compresses, especially if they are getting hordeolum, and he's turning to in-office procedures such as blepharoexfoliation, IPL, low level light therapy and in-office thermal expression.

"It seems many of these patients are having a lot more issues with their eyelid margins drying and accumulating keratin plugs or biofilm. For example, I'm finding that if I don't do a quick lid debridement, the patients tend not to get a good response, and they may get multiple hordeola otherwise," he says.

Patient Education is Key

In addition to reaching for your Rx pad, patient education on proper mask wear can also help mitigate OSD issues. In choosing a mask, the CDC recommends that it has two or more layers of washable, breathable fabric, completely covers the nose and mouth, fits snugly against the sides of the face and doesn't have gaps and also is equipped with a nose wire to prevent air from leaking out of the top.[7] Reusable masks should be washed as soon as they become dirty, or at least once a day.[7] If you have a disposable face mask, throw it away after wearing it once, the CDC advises.[7]

Dr. Silani suggests asking patients how long they wear masks throughout the day, as prolonged use can contribute to mask associated dry eye or styes.

"We recommend that patients remove their masks when they are able or alone, to make sure the mask top half is pinned down correctly to minimize upward airflow and to tape down the top half of the mask if the individual is noticing their glasses are fogging up," he says.

Additionally, some patients are bringing up their masks too high and limiting their lower eyelid from fully making contact with the upper eyelid, so placement or positioning of the mask is important, Dr. Silani adds.

"If a patient is complaining of mask-related dry eye, consider suggesting different mask options—specifically ones that have a reinforced barrier across the bridge of the nose and across the upper cheek that allow for an air-tight fit," Dr. Hauswirth says.

Researchers from Wills Eye Hospital who looked into bacterial dispersion with patient face mask use during simulated intravitreal injections found alterations of bacterial dispersion around the eye during treatment based on the type of mask worn.[10] The authors noted significantly more bacterial dispersion when wearing a tight-fitting face mask without tape vs. a tight-fitting one with tape. Additionally, their study found no difference in bacterial dispersion between tight-fitting surgical masks with tape and N95 masks.[8]

In addition to recommending patients tape their mask on the bridge of the nose to minimize an upward draft toward the eye and take care not to affect the normal blink dynamics or eyelid closure, Dr. Shovlin also suggests reminding the patient to avoid touching their face or adjusting their mask as much as possible.

Patients with pre-existing DED and other ocular surfaces issues such as recurrent corneal erosion syndrome may need additional care with proper mask fitting.[2]

Despite the OSD issues occurring, mask wear is a necessity for health and safety, Dr. Silani adds.

"We are very pro-health and safety. Yes, mask-associated dry eye does exist, and taking steps to avoid and treat it is important. But doctors should recommend patients wear masks to protect themselves and others. Patients should tape down the top of their masks, and when they aren't around people or in a safe place, they can take it off or use lubricating drops at work if they can't remove their mask," Dr. Silani says.

Another recent study found most individuals didn't experience a change in ocular symptoms, but a significant portion still reported an increase in ocular discomfort while wearing a mask.[9] The investigation suggests not to underestimate all the symptoms that could discourage the population from using masks, and that ODs should verify the presence of clinical signs in those complaining about mask-induced eye discomfort and recommend ways to mitigate these issues.

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Mask-Related OSD Trends

Normally, one would expect that people who work at jobs that involve heavy computer use would have more mask-related OSD issues, but Dr. Brujic says he's not seeing this occurring. "At the beginning of the pandemic, a majority of these people were working from home and didn't have to wear a mask," he explains.

On the other hand, Dr. Brujic was treating more OSD cases in individuals who worked at venues that required staff in masks to be on site in stores, plants and factories.

As far as age posing a potential risk factor, Dr. Hauswirth says most of his symptomatic patients over the last year-and-a-half are younger, healthy individuals who never had ocular surface issues before, despite the fact they are computer users. "We are seeing a lot of people naïve to the disorder, who weren't really dry eye patients beforehand," Dr. Hauswirth says.

"Other patients with existing issues, such as rosacea and blepharitis, are also increasingly presenting with OSD issues due to mask wear," Dr. Karpecki says. Additionally, he is noticing an uptick in contact lens-wearing patients with mask-related complications.

Even before the pandemic, the Tear Film & Ocular Surface Society (TFOS) had already reported that discomfort while wearing contact lenses were associated with a reduction in the compatibility between CLs and the ocular environment.[10]

Exploring the impact of contact lenses and mask wear, a team of researchers from Portugal found mask use increased dry eye symptoms in contact lens wearers and negatively impacted their visual quality.[11] Additionally, lens wear significantly decreased after the onset of COVID, and the sensation of dry eye was found to be worse in those using monthly replacement contact lenses.[11]

Looking Ahead

With face mask use likely extending into at least the near future, eye dryness, irritation and keratopathy from mask wear may become a problem for a large percentage of the population.[14] If present, this mask-associated ocular irritation raises concerns about eye health and increased risk of disease transmission with prolonged wear.[12]

Considering this forecast, additional investigations may be warranted. One consideration for future studies could be an analysis of geographical differences from one region to another and a comparison of ocular surface prevalence issues in areas that are more compliant in mask-wearing practices or in areas with higher rates of COVID-19, Dr. Shovlin suggests.

Along with mask-induced dry eye, Dr. Silani also stresses that it is important to consider potential comorbidities, such as lagophthalmos, ocular allergies and anterior blepharitis, as multiple, contributing factors could be at play.

Another point to consider: look for any suspicious lesions under the mask that may warrant testing, experts advise.

"Masks are here to stay," Dr. Brujic says. "We don't know what the capacity of masks are going to be, but they'll be part of our society. Today, it's not uncommon to see people in masks, but it's important for optometrists to be asking about it. We see the patient for 15 minutes in our office, but we need to know how much or how little they're wearing their masks outside of the office and provide them appropriate solutions." ■

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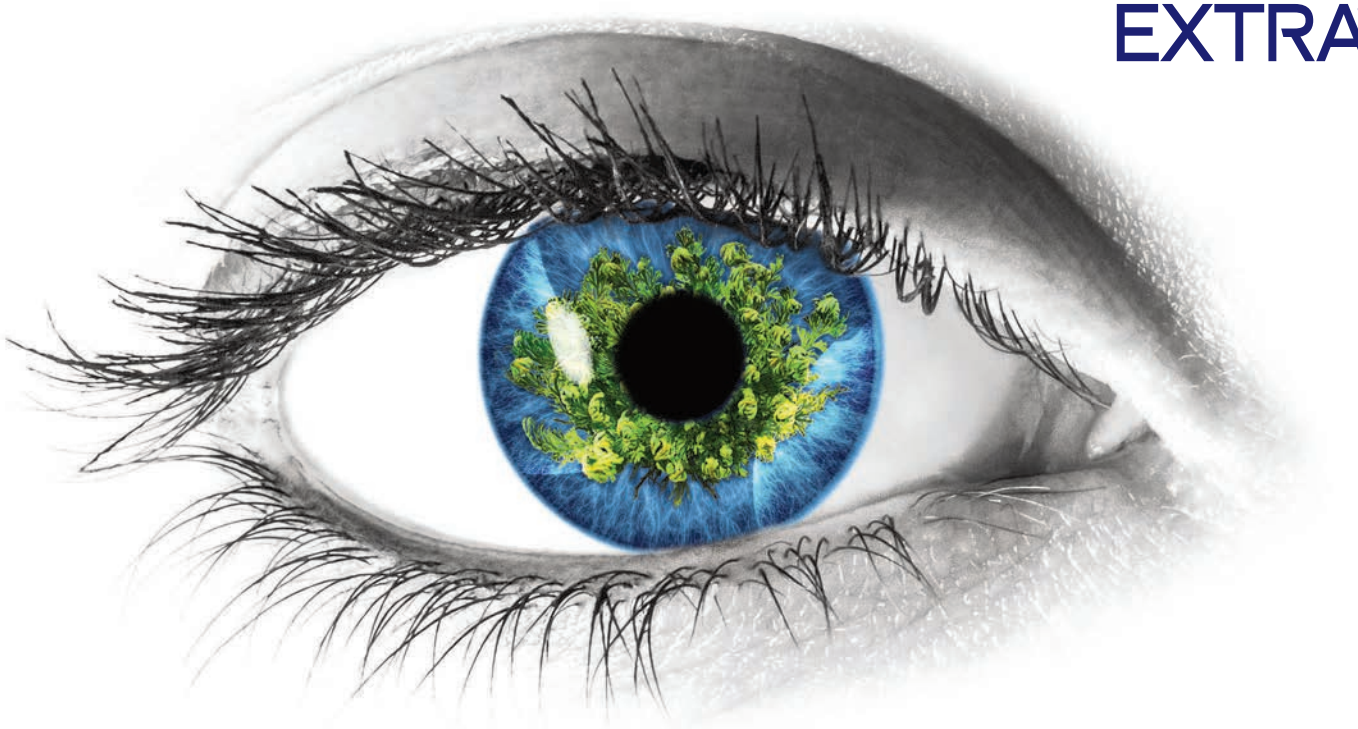

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DRY EYE: WHERE DO WE STAND WITH OMEGA-3 SUPPLEMENTS?

A review of recent research for and against this treatment supplementation.

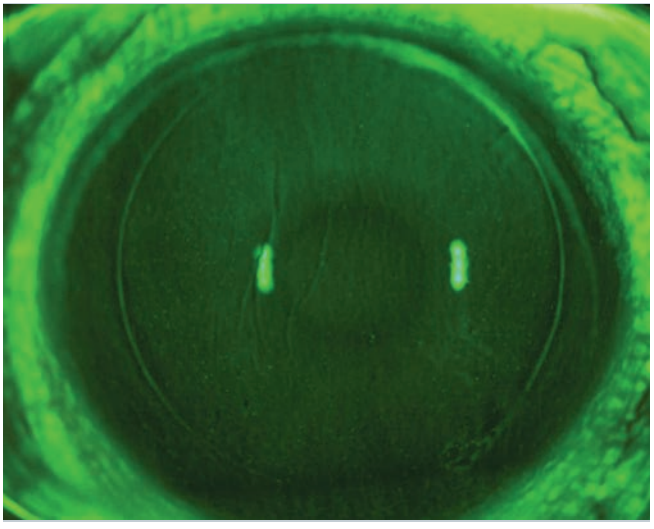
BY LUIS ROJAS, OD
MCKINNEY, TX

It has been three years since the release of the three-year randomized clinical trial by the National Institute of Health (NIH) known as the DREAM Study. This was the first multicenter, double-blind study comparing the efficacy of 3,000mg fish-derived oral omega-3 (EPA/DHA) daily supplementation for the treatment of moderate-to-severe dry eye disease (DED) vs. a placebo group containing refined olive oil. The findings shocked clinicians, as well as patients, after results showed no significant benefit between omega-3 and the olive oil placebo group. It is worth noting that 61% of those in the treatment arm and 54% in the control group achieved a 10-point improvement in OSDI score; however, the difference between the two groups was not statistically significant.[1]

The buzz surrounding these headlines made patients question the role these supplements have on their dry eye regimens. This created a divide between practitioners who had been using this supplement for years as adjunct or stand-alone therapy with great clinical results and those who were already on the fence about its therapeutic effect and role in dry eye management. This article will review the latest discourse surrounding this supplement option and what impact the DREAM Study will have on treatment today.

The Discussion So Far

Some criticism was aimed toward the DREAM study's methodology based on its inclusion and/or exclusion criteria, as it allowed patients to continue their current dry eye regimen to mimic a "real-world" scenario and included those with moderate-to-severe disease.[2-4] Others saw this as a positive dialogue regarding what roles overall nutrition and supplements may play in adjunct therapy.[4] Shortly after, the follow-up DREAM Extension Study results were released and corroborated the study's original findings.



LASIK-induced dry eye with diffuse SPK and micorostriae.

The 12-month Extension Study pulled 43 patients from the original treatment arm and randomized them into two groups to compare the effects between those who continued omega-3 supplementation vs. those who discontinued the treatment. The authors reported no significant difference in the mean change between the treatment and placebo groups for OSDI score, conjunctival and corneal staining, TBUT and Schirmer's test.[5]

About the author

Dr. Rojas is a cofounder of DeNovo Eye in McKinney, TX where he specializes in ocular disease, specialty contact lenses and myopia management. He is a consultant for Johnson & Johnson Vision.

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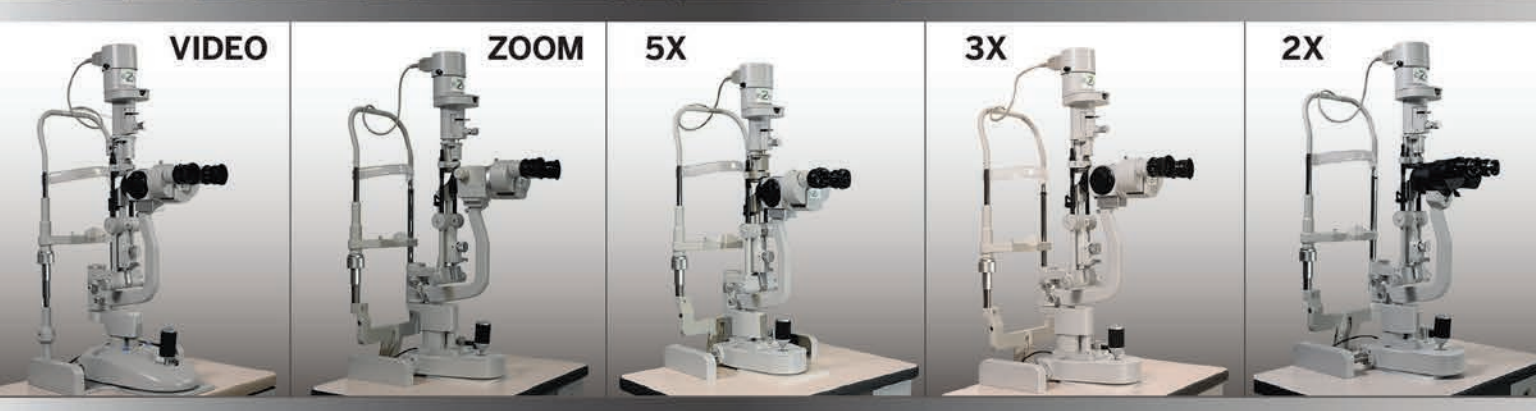

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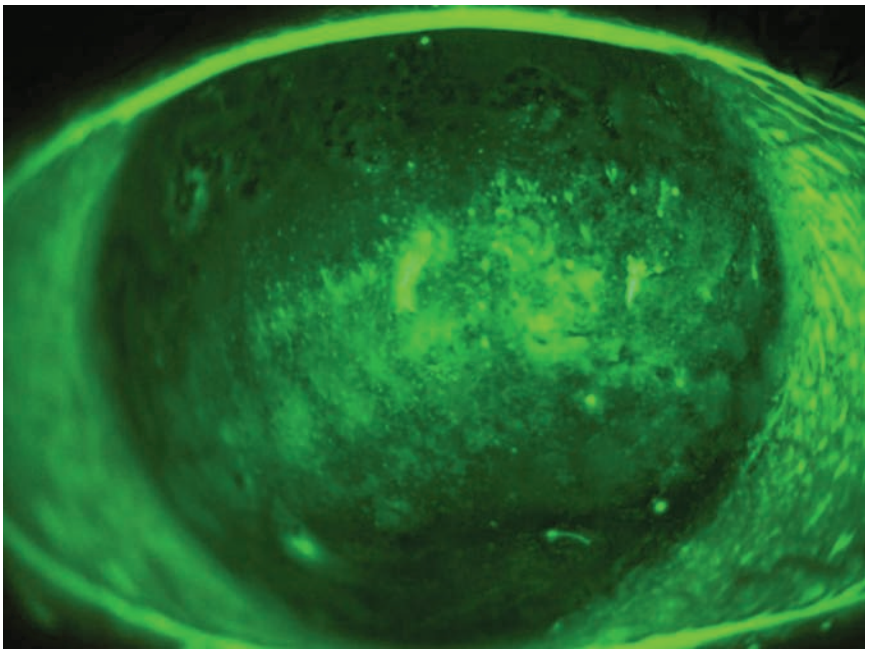

Interstitial keratitis with advanced dry eye following a recalcitrant case of herpes zoster ophthalmicus (HZO).

A Cochrane review in 2019 summarized research regarding the effects of omega-3 and omega-6 polyunsaturated fatty acids (PUFA) supplementation on dry eye signs and symptoms. The review included 34 randomized controlled trials with more than 4,314 participants from 13 countries. Supplementing omega-3 as monotherapy showed little to no benefit on dry eye symptoms, relative to placebo, but improved clinical signs. However, dry eye symptoms improved when omega-3 was used as adjunct therapy along with other dry eye treatments (artificial tears, warm compresses and/or topical steroids), and when compared with omega-6 supplementation. The authors concluded that additional research is needed to improve our understanding on how to use omega-3 and omega-6 depending on the type and severity of DED.[6]

Research on the effect of omega-3 supplements on dry eye is ongoing in other subspecialties in eye care, such as in pre- and postoperative management, to investigate its anti-inflammatory properties. A recent prospective comparative cohort study in Korea evaluated the clinical outcomes of systemic re-esterified triglyceride (rTG) form omega-3 in patients with dry eye symptoms after cataract surgery. The researchers randomly assigned 32 of the 66 patients to the omega-3 group who received two tablets twice daily for two months of rTG form omega-3 supplement (containing a total of 1,680mg of EPA and 506mg DHA) along with artificial tears four times per day for the treatment of dry eye symptoms following uncomplicated cataract surgery. The remaining 34 patients in the control group only received artificial tears four times a day without omega-3 supplementation. At the eight-week mark, subjects in the treatment arm showed a significant improvement in Oxford corneal staining score (p-value 0.004), OSDI score (p-value 0.007), DEQ score (p-value 0.004) and MMP-9 level (p-value 0.027) compared with the control group.

Interestingly there was no significant improvement in both Schirmer's score and TBUT given the short eight-week course; however, the authors did observe a positive trend in both parameters stating a longer follow-up would have shown significant improvements as seen in other studies. Limitations in this prospective study include exclusion criteria, duration of eight weeks, small sample size of 66 patients and lack of a double-blind study design. Despite this, omega-3 had a positive therapeutic effect on reducing ocular surface inflammation and improvement in both signs and symptoms of post-surgical dry eye syndrome.[3]

Furthermore, a 2019 meta-analysis compared the efficacy of omega-3 supplementation with placebo for the treatment of DED.[7] A total of seventeen clinical trials were assessed providing 3,363 patients' outcome measures—dry eye symptoms, tear break up time (TBUT), Schirmer test and corneal fluorescein staining across several countries. Interestingly, this analysis noted a significant association between the efficacy of omega-3 and the study's country of origin.

For example, improvements in dry eye symptoms and TBUT were significantly higher in studies performed in India compared with other countries. The authors theorize that this higher efficacy of omega-3 supplementation may be partly due to differences in diet, as Indian culture is predominantly vegetarian with lower intake of fish-derived omega-3. The use of omega-6–containing cooking oils, such as safflower and sunflower oil, is also believed to inhibit the conversion from ALA to DHA and raise omega-6/omega-3 ratios. The outcomes of this large meta-analysis provide sufficient evidence that omega-3 fatty acid supplementation significantly improves symptoms and signs and is an effective treatment for DED.[7]

A recent literature review looked at several clinical trials within the past two decades regarding the efficacy of omega-3 PUFAs on DED. Trials included in this review consisted of randomized clinical trials, prospective comparative studies, and non-comparative interventional studies with levels of evidence ranging from I to III. Study sample size ranged from 12 to 905, study duration from one to 12 months, and daily dosages from 360mg to 2,000mg of EPA and 240mg to 1,050mg of DHA. This review showed that omega-3 supplementation may be an effective treatment strategy for improving both objective and subjective outcomes in DED and meibomian gland dysfunction (MGD),

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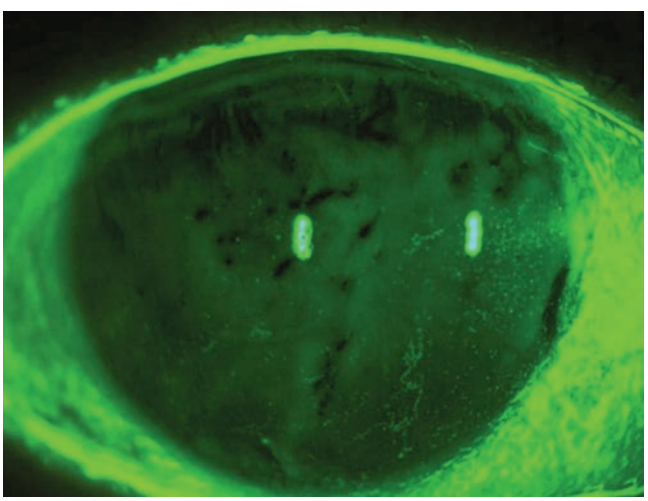
tear film stability and dry eye symptoms. The authors note that no formal consensus on omega-3 treatment guidelines has been established due to considerable clinical trial heterogeneity including omega-3 dosage, duration, composition, and the use of conventional objective and subjective testing that offers limited reproducibility.[8]

Maintaining healthy neuromodulation of the corneal nerve plexus is important in DED, especially in neurotrophic corneal disease.[4] The acknowledgement of neurosensory abnormalities as an etiologic factor in dry eye was added to the definition and classification of DED in the TFOS DEWS II report.[9] A prospective, comparative pilot study in 2017 investigated the effects of oral omega-3 supplementation on central corneal sub-basal nerve plexus in DED. Study participants received either omega-3 (1,000mg EPA plus 500mg DHA) or placebo (olive oil 1,500mg) daily for 90 days, and mean change in sub-basal plexus was quantified using in vivo confocal microscopy. Those in the omega-3 group saw a reduction in OSDI score and tear osmolarity, as well as increase in corneal nerve branch density and length compared with placebo suggesting neuroprotective effects.[10]

A 2018 cross-sectional study evaluating the relationship between omega-3 and omega-6 in postmenopausal women with DED and MGD found that dietary consumption of both fatty acids was not associated with DED; however, high omega-3 and moderate omega-6 consumptions were found to be protective against MGD. Saturated fatty acids have a higher melting point, and it is theorized that unsaturated fatty acids, such as omega-3, may have an effect on meibomian lipid composition by lowering the melting point; therefore, improving its fluidity and secretion.[11]

Despite these significant findings, those specializing in ocular surface and dry eye have not changed their prescribing patterns based on their own clinical experience. In fact, this has shifted the conversation for some eye care providers to learn more of the effects nutraceuticals can

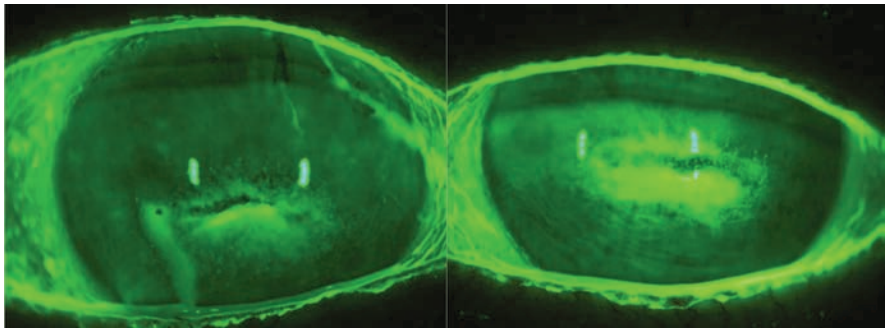


Evaporative dry eye syndrome with reduced TBUT and diffuse superficial punctate keratitis.

have in managing dry eye, especially when more patients are now looking for alternative therapies instead of prescription medications.

A Personal Take

The power behind using a treatment that has many systemic benefits such as omega-3 has made it easy for many of us to continue prescribing it as stand-alone or adjunct therapy for our dry eye patients. Our colleagues in the cardiovascular world prescribe it as monotherapy or in combination with statins to significantly reduce triglyceride levels and risk of heart attack and stroke in diabetics and hypercholesterolemic patients. When taken at therapeutic levels, EPA has been found to reduce markers of vascular inflammation, endothelial dysfunction, improve HDL functionality and slow the development of atherosclerotic disease.[12]

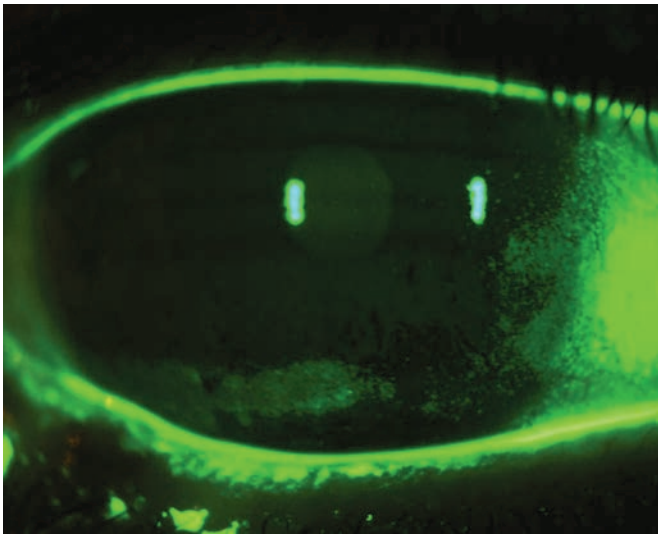


Stage 2 neurotrophic keratitis.

We now know that the source, form and dosage influence omega-3's bioavailability and effect. The re-esterification process involves the removal of the artificially induced alcohol in the chemically modified ethyl ester form to create a more natural triglyceride form of omega-3 that is better tolerated, has lower gastrointestinal side effects, and achieves superior bioavailability.[3,13]

Patients need specific guidance and instructions when selecting any nutraceutical including omega-3 supplements. They can easily become overwhelmed with the plethora of products available, specifically by marketing and labeling. It is recommended to stay with reputable brands who offer third party testing for purity and consistency. Storing fish oils away from heat and light prevents further breakdown of omega-3 and refrigeration for liquid forms is also beneficial. I have found better patient compliance and clinical improvement in symptoms and signs of dry eye when staying within therapeutic dosages between 1,000mg to 3,000mg EPA/DHA per day.

Prior to prescribing an omega-3 regimen to my patients, I ensure that there are no absolute contraindications as



Exposure keratopathy secondary to nocturnal lagophthalmos.

well as minimal medication interactions, and consider any dietary restrictions. A 2017 systematic review found that fish oil reduced platelet aggregation in healthy patients; however, this did not increase pre- or post-surgical bleeding risk and therefore discontinuation prior to surgery is not needed.[14] Caution should still be taken with doses above 3,000mg of EPA/DHA, especially with the elderly who are on blood thinners (warfarin, heparin, apixaban) or those with hemophilia, due to its blood-thinning effects.[6] Substituting cod or other fish liver oils instead of omega-3 supplements is not ideal as these liver oils contain high levels of fat-soluble vitamins A and D that may lead to toxicity.

Be sure to consult with the patient's primary care physician and check blood pressure on patients taking hypertension medication who are planning to start a high-dose omega-3 regimen as it may have a hypotensive effect. It is important to note that consuming fish or fish oil may have a chemo-resistant effect and should be avoided on the days surrounding chemotherapy treatment.[15]

There are patients who may show improvement in clinical signs prior to symptomatic relief, and vice versa, so keep this in mind before you consider it a failed treatment. As a general practice, I normally explain to patients that it may take anywhere from three to six months to allow for maximum levels of omega-3 in the blood stream; similar to checking HbA1c. It is good clinical practice to obtain baseline omega-3 levels prior to starting a regimen.[6] This will help determine if there is a true omega-3 deficiency or an omega-3/omega-6 ratio imbalance.

Third party labs such as OmegaQuant and LipidLab offer simple to use in-office and at-home tests that provide quantitative metrics of a patient's omega-3 index, omega-3/omega-6 ratio, arachidonic acid (AA) to EPA ratio and other inflammatory markers. These tests help tailor your treatment dosage, motivate patients for better compliance and even improve their dietary choices for overall health. For non-responders, I incorporate omega-6 gamma-linolenic acid (GLA) as monotherapy or in combination with omega-3, due to its documented effects in improving symptoms of irritation and lower ocular surface inflammation.[16,17]

Takeaways

Dry eye is a multifactorial process that is influenced by systemic health, nutrition, metabolism and other exogenous factors.[18] Incorporating a treatment that has a therapeutic role in dry eye and offers multiple systemic health benefits, has made omega-3 a topic of interest for many researchers and clinicians alike.

Current research shows that omega-3 is here to stay; however, we look forward to future studies that can shed light on improving our dosage and composition protocols, provide faster patient screenings to identify those who have omega-3 deficiencies and establish treatment guidelines that can be tailored to our patients. ■

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ANTERIOR BLEPHARITIS: THE FRONT LINE OF OSD

We dissect everything you need to know about this common condition, including proper treatment and management, and how it can be a sign of *Demodex*.

BY ANDREW MCLEOD, OD, AND AMY NAU, OD
BOSTON

In 2017, the Tear Film & Ocular Surface Society's Dry Eye Workshop (DEWS) II Report updated the definition of dry eye disease, describing it as "a multifactorial disease of the tears and ocular surface that results in symptoms of discomfort, visual disturbance and tear film instability with potential damage to the ocular surface. It is accompanied by increased osmolarity of the tear film and inflammation of the ocular surface."[1] Recently, treatment has focused on meibomian gland dysfunction (MGD), since it is the most common cause of evaporative dry eye.[2] However, one must not lose sight of the multifactorial nature of dry eye, which requires treatment of each aspect of the disease, including blepharitis. Addressing eyelash and lid margin hygiene is an often overlooked component of a comprehensive treatment strategy.

Eyelashes protect the eye by preventing debris and particulate matter from reaching the ocular surface.

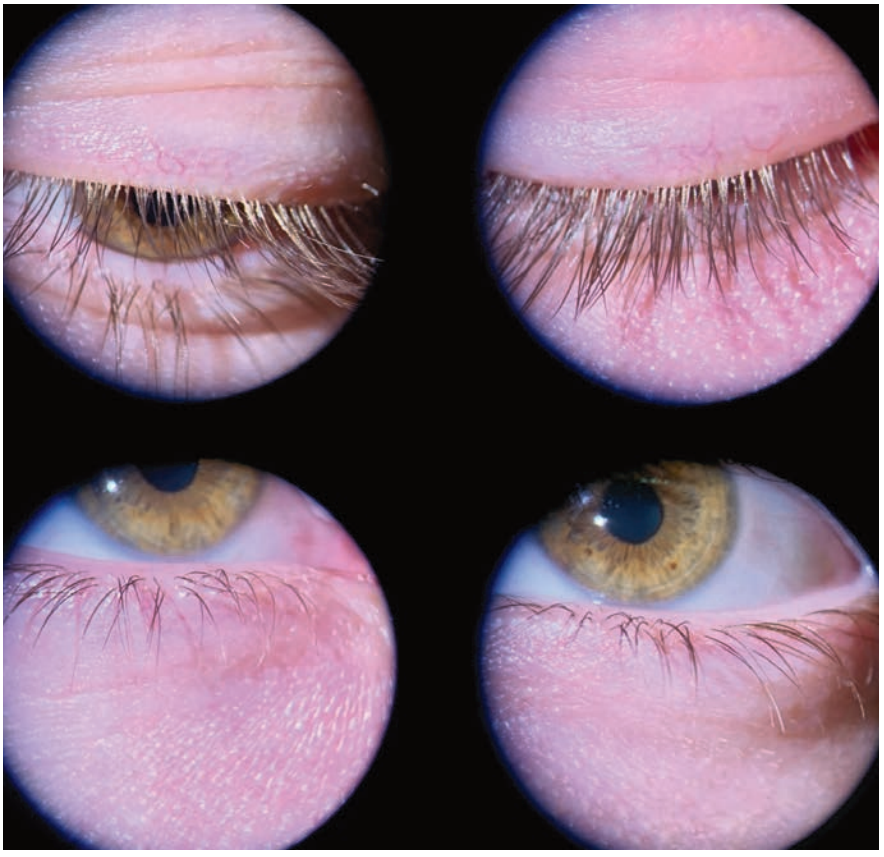

Fig. 1. Mild anterior blepharitis in a younger male patient with collarettes at the base of the lashes and mild flaking throughout. Although mild, it is important to treat early to prevent disease progression. This patient undergoes quarterly in-office treatments.

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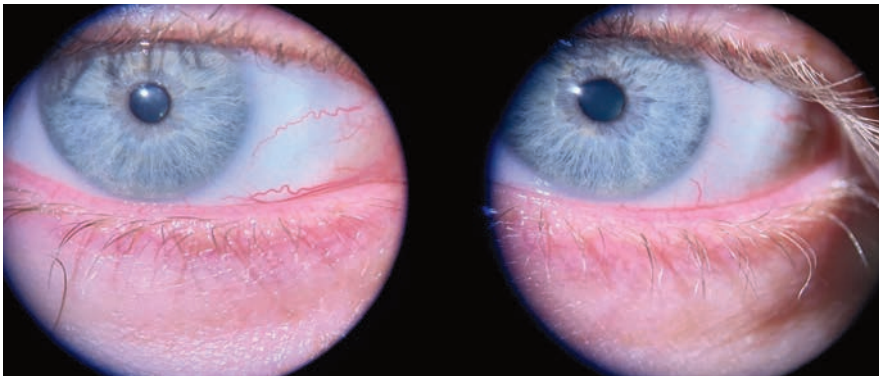

Fig. 2. Seborrheic blepharitis is visible as the oily-yellow film that has accumulated between the lashes on the lower and upper lids.

Inferiorly, there are usually three or four rows with about 75 to 80 lashes, while superiorly five to six rows may be present with approximately 90 to 160 lashes.[3] Each lash has a visible shaft above the skin surface and a follicle that lies below the lid margin. Lashes usually grow to 12mm in length and have a slight curvature.[3] For proper function, the lashes must be durable, flexible and able to regenerate, as they fall out and regrow about every four to 10 weeks.[3] For optimal health, both the lashes and lid margins need to remain clean and healthy.

Let's examine the different forms of blepharitis, its treatment and care and how to manage this condition.

Etiology and Prevalence

Blepharitis, defined as an inflammation of the eyelid margin, can be either acute or chronic in nature. Acute anterior blepharitis can be caused by a variety of bacteria, viruses, fungi and parasites; it is treated with topical or systemic medications.[4,5] While acute infections tend to be irritating and can produce significant inflammation or even ulcerative lesions, once adequately treated they do not tend to contribute to chronic dry eye. However, if left untreated, the acute issues can become more entrenched, leading to lid margin alterations or loss of lashes that can have longer-term effects.

Chronic blepharitis, which is the most common form of anterior blepharitis, tends to arise from overgrowth of normal skin flora. The healthy lid margin is represented by a stable and relatively limited ocular microbiome, which probably plays a regulatory function for ocular homeostasis. *Staphylococcus aureus* and coagulase-negative *Staphylococcus* are the most commonly found microorganisms on the eyelids.[6] However, the microorganism population can become more diverse in cases of chronic blepharitis.[4]

The pathophysiology of anterior blepharitis is less related to chronic infection than it is to bacterial overgrowth, and the deposition of biofilms that release inflammation induces exotoxins and lipases along the lid margin.[5] This leads to chronic inflammatory responses, increasing telangiectasia, lid hyperkeratinization, folliculitis and decrease in function of the meibomian glands. Due to the close proximity of the lids to the cornea, visible epithelial defects, marginal infiltrates and neovascularization may also be present.

Anterior blepharitis can be further differentiated into the staphylococcal (squamous) form that is typically present in younger patients (*Figure 1*) and the seborrheic form, which often afflicts older patients (*Figure 2*), while mixed anterior blepharitis represents a combination of both forms (*Figure 3*).[7] Symptoms for all subtypes include dryness or foreign body sensation, lid irritation or itchiness, burning, loss of eyelashes and lid margin erythema. It should not be overlooked that eyelid disease can be a manifestation of other skin conditions like rosacea, acne or atopic dermatitis, which may need to be treated concurrently—sometimes with the input of a dermatologist. Persistent asymmetric or unilateral disease that is not responsive to treatment should raise suspicion for carcinoma or immune-related lid disease.

When evaluating blepharitis, the examiner must be mindful to include *Demodex* infestation in their differential. *Demodex folliculorum* and *Demodex brevis* are saprophytic mites that normally reside on human skin near the pilosebaceous unit as a commensal organism. The mites can pass between humans through direct contact. While typically harmless, they assume a pathogenic role only when present in high densities (greater than five per lash follicle), resulting in lid inflammation known as demodicosis. *Demodex brevis* are also associated with rosacea. The mites have a 14-day lifecycle, which starts with procreation and laying eggs inside the hair follicle or

TABLE 1. OUR COMPREHENSIVE DRY EYE TESTING REGIMEN

- Complete medical, ocular and med history
- Symptom questionnaires
- Lifestyle questionnaires
- Slit lamp examination
- Meibography
- Ocular surface and tear film analysis with vital dyes (sodium fluorescein and lissamine green/rose bengal)
- Tear film testing (MMP-9 and tear film osmolarity)
- Tear film interferometer
- Gland expression with Meibomian Gland Evaluator (MGE, Johnson & Johnson)
- Neuropathic pain assessment (evaporative stress testing, scleral contact lens testing or proparacaine challenge)
- ID integrity (Korb-Blackie test and lid laxity testing)
- Total and partial blink rates

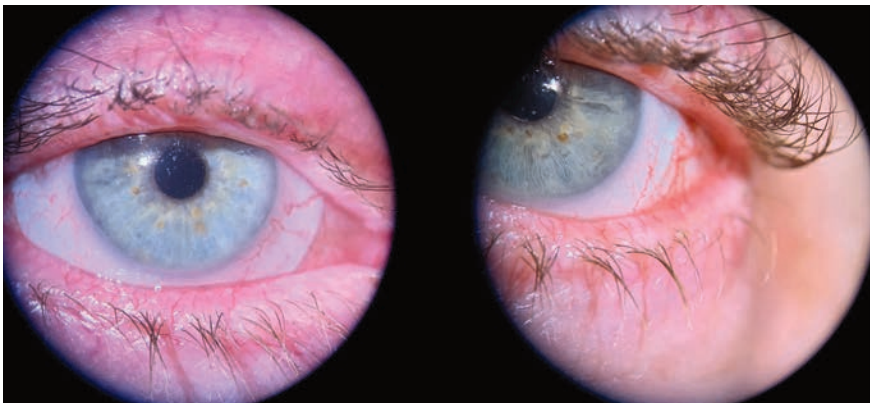

Fig. 3. Advanced blepharitis with lid margin erythema, scarring and telangiectasia. Note areas of missing lashes and lashes clumping in a triangular fashion.

sebaceous gland. They then rely on epidermis and sebum for nourishment. After several weeks, deceased mites decompose within sebaceous glands (*D. brevis*) or hair follicles (*D. folliculorum*).[8] *Demodex* infection appears as collarettes at the base of the lashes, very similar to staphylococcal overgrowth, but can be differentiated with microscopic examination.

A contemporary discussion about the pathophysiology of anterior blepharitis would not be complete without a nod to cosmetic use (and misuse). The beauty industry offers the public multiple options for lash enhancement including false eyelashes, lash serums for growth, procedures for lash tinting and various makeup options to enhance lash appearance. The false eyelash industry alone is predicted to be a $1.6 billion business by 2025.[9] These products often contain harmful chemicals, some of which can induce hypersensitivity reactions or destroy meibomian glands.[10] In addition, women often use eyeliner and eyeshadow that soil the eyelid margins, eyelash follicles and clog the meibomian glands (*Figure 4*).

The cosmetic industry is relatively unregulated and chemicals such as parabens, formaldehyde and phthalates are common ingredients in ocular cosmetics, especially those that are waterproof. These harmful chemicals are often not adequately removed; prolonged contact with the skin can cause damage to the lid margins, meibomian glands and lash follicles. The majority of cosmetic users do not discard their products in a timely manner or wash application brushes regularly, leading to contamination by bacteria, *Demodex* mites and fungi. Patients who use lash extensions often do not adequately remove applied cosmetics for fear that this will cause the extensions to fall off. Because these habits can exacerbate the disease process and impede treatment, it behooves all practitioners to be familiar with the risks associated with cosmetic use on and around the eyelids as potential contributors to blepharitis.

Determining the prevalence of anterior blepharitis as a solitary clinical entity is challenging. Some of this difficulty lies in the inexact nature of current definitions. To illustrate the difficulty present in the literature, the DEWS II Epidemiology Report variously used the following terms when discussing the prevalence of dry eye: dry eye syndrome, dry eye, keratoconjunctivitis sicca or MGD/abnormalities blepharitis, but *not* Sjögren syndrome.[11] Dry eye disease is known to affect over 16 million Americans, and a large proportion of these patients will have lid margin disease.[12] Therefore, while arguably imprecise, it is probably a reasonable marker of blepharitis prevalence as well.

MGD was determined to be the leading cause of dry eye throughout the world at the 2011 International Workshop on MGD, which defined it as "a chronic, diffuse abnormality of the meibomian glands, commonly characterized by terminal duct obstruction and/or qualitative/quantitative changes in the glandular secretion. This may result in alteration of the tear film, symptoms of eye irritation, clinically apparent inflammation and ocular surface disease (OSD)."[2]

Anterior blepharitis is, however, a separate disease process from MGD, and while many patients suffer from both, the names are not synonymous. MGD is often reported as posterior blepharitis to differentiate the two processes, but these two names are also not interchangeable. Posterior blepharitis is simply an inflammation of the posterior eyelid, but it is not solely related to MGD. Moreover, MGD is not the only cause of dry eye, and narrowly focusing treatment of dry eye on MGD may result in suboptimal outcomes.

Evaluation

Evaluation of anterior blepharitis is accomplished through slit lamp examination and should be an integral aspect of any comprehensive dry eye evaluation (*Table 1*).

Blepharitis is typically graded on a 0-4 scale but can be further categorized by notating whether it appears to be acute or chronic, whether ulceration or greasy scales are present, whether cosmetics are playing a role and the degree to which eyelash folliculitis or lid margin inflammation are present. Inspection for *Demodex* mites is done by looking for eggs and lash collarettes. If there is doubt, epilating a lash and placing it on a glass slide with fluorescein will aid in visualization when looking under a light microscope.

One should also note any sequelae of chronic blepharitis, including madarosis, trichiasis, lid margin erythema and telangiectasia, as well as the condition of the line of Marx and any scarring of the lid margins. Slit lamp photography is often crucial for patient education, but also to document interval changes with treatment.

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Treatment

Some patients will require an initial pulse of medical management in addition to home therapy. This could include milder topical antibiotics like erythromycin, neomycin/polymyxin-B or azithromycin. Keep in mind that antibiotic-resistant organisms are common and unnecessary over-prescribing increases resistance. A recent study showed that both coagulase-negative *Staphylococcus* and *Staphylococcus aureus* were often resistant to erythromycin. Some strains were also resistant to penicillin, ciprofloxacin and rifampicin in this same study.[6] Bacterial cultures are typically not needed unless the condition is unresponsive to treatment.

When considering medical therapy, recall that anterior blepharitis often has an inflammatory component. When considerable lid margin erythema is present, a two-week course of topical steroid ointments, such as loteprednol or antibiotic/steroid combinations like neomycin/polymyxin/dexamethasone, can be extremely effective. Brand-name drugs can be expensive, so looking for generic options is a responsible way to offer treatment that can also enhance compliance.

TABLE 2. OUR METHOD FOR COMPREHENSIVE EYELID/EYELASH CLEANING

- Apply warm compress (42°C for 12 minutes) to help loosen lid debris.
- Apply topical anesthetic with proparacaine to the eye and along the eyelid margins.
- Perform eyelid cleaning with BlephEx device according to manufacturer's directions with the patient's usual cleaning product (Figure 5).
- Remove remaining debris in the slit lamp with brushes/cotton-tipped applicators (Figure 6).
- Inspect the eyes at the slit lamp to ensure that all debris has been removed (Figure 8).
- Rinse eyes and lids with chilled saline and apply cool compress to help reduce lid swelling.
- Instill a drop of Lumify (Bausch & Lomb) to reduce redness prior to leaving the office.

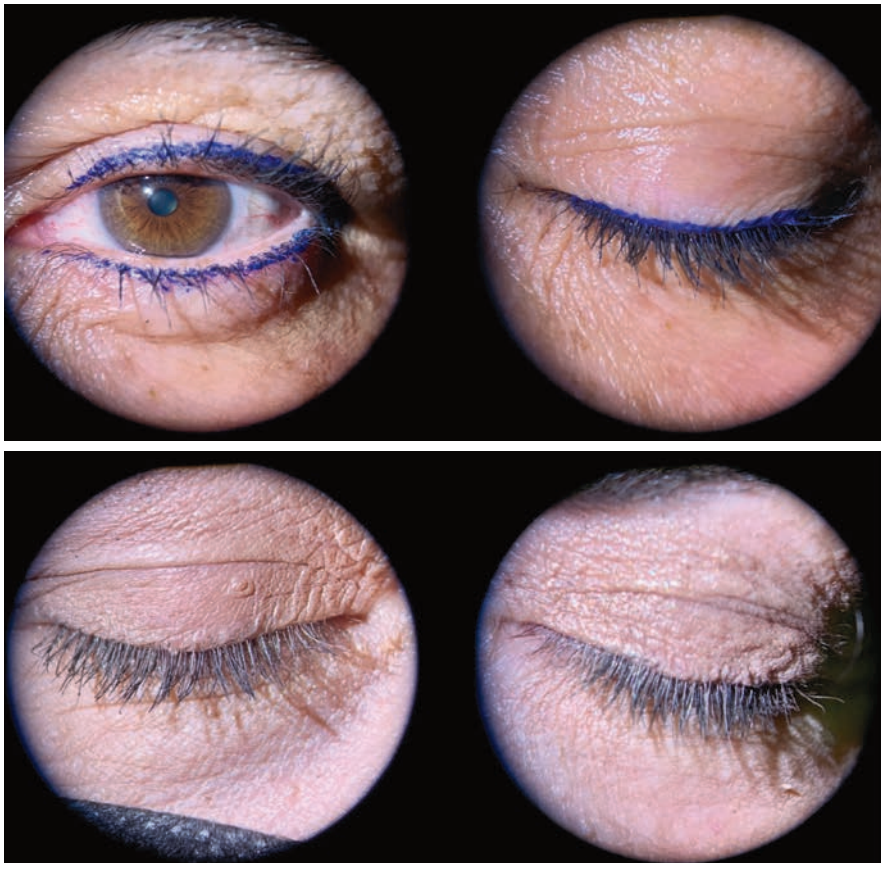

Fig. 4. *Top:* Excess makeup at the base of the lashes with eyeliners can increase blepharitis. *Bottom:* Excess foundation and face powder are often used by some patients to cover lid redness or discoloration. This, with mascara, has left the lashes and lid margins coated with makeup.

When treating anterior blepharitis, the use of ointment or gel formulations is preferred as they will have prolonged contact time with the lids. If solutions are the only available option, then instruct the patient to apply the medication directly to the eyelids with gentle rubbing.

Chronic disease unresponsive to topical therapy may warrant oral antibiotics, like low-dose doxycycline (50-100mg), for their protein denaturing and anti-inflammatory properties. Alternative oral treatment includes a pulse of oral azithromycin 500mg for three days, then off for four days and repeated for a total of four weeks. As stated earlier, anterior blepharitis does not represent an infection with a pathogenic microorganism; rather, it is the toxic byproducts of normal bacterial biofilms present on the lid margin. It is important for patients to realize that medications are to augment home therapy and will not eradicate the problem alone.

If *Demodex* mites are found, their elimination can be accomplished using tea tree eyelid shampoo formulations or hypochlorous acid (HA) products; however, long-term prospective studies are lacking.[13] A recent paper suggested that tea tree oil may be harmful to meibomian gland epithelial cells *in vitro*.[14] Intense pulsed light therapy and oral ivermectin are alternative options for treatment.[15,16]

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Fig. 5. Doctor using BlephEx electronic cleaning system on upper and lower lids during in-office cleaning. It is important to get both the lashes and the lid margin, including the meibomian gland orifices during the treatment.

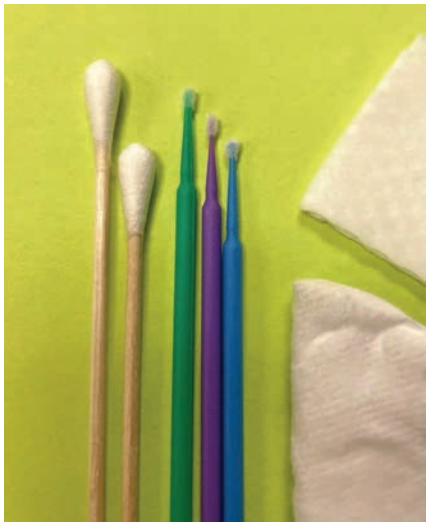

Fig. 6. Cleaning tools that can be used for home or office cleaning. Cotton-tipped applicators, bristle brushes and makeup rounds that can be moistened with various products. Pre-moistened towelettes are also available.

getting ahead of anterior blepharitis and providing patients instructions about proper at-home procedures. Semi-annual cleanings performed in-office is a reasonable approach, but adoption will be patient-dependent. Patients with poor vision, limited dexterity, cognitive impairment/dementia or who are averse to touching their eyes may need to be seen more frequently. Women who habitually get lash extensions should come in for a comprehensive cleaning between applications to remove glue, lashes, desquamated epithelium and cosmetic residue. Patients with anterior blepharitis should have a comprehensive cleaning before any surgical consultation.

In terms of patient education regarding cosmetic use, some practitioners may simply tell them to stop using makeup, but most individuals will not be willing to do so. However, educating patients about the deleterious effects of some cosmetic ingredients in a non-patronizing way is usually appreciated if done properly. It can be more prudent to provide tips on application, placement and removal of periocular cosmetics, and even recommend dry eye–friendly product lines, such as Èyes Are the Story, that improve patients' appearance by reducing inflammatory reactions to these chemicals.

Home Care

Despite the realization that vision is one of the most vital senses in everyday life, ocular personal care is often completely neglected by patients. Part of this problem is the reactive nature of the eyecare profession, which has failed for decades to impart the necessity of preventative eyelid health, starting in middle school.

In our practice, the dental model is invoked as an analogy, since this is a concept relatable to patients, even at an early age. A consistent message for every patient, at every visit, should include a recommendation for routine home care with intermittent office visits for more in-depth cleaning if required. This is analogous to brushing one's teeth at home and having intermittent cleanings in the office. Frequency of home care can be tailored to the severity of the condition. This can vary from lid cleaning a few times per week in milder cases to twice daily in more advanced cases of blepharitis or for regular heavy makeup wearers. Fortunately, unlike warm compress therapy, which is notorious for patient non-adherence, eyelash cleaning is simpler and quicker, and tends to be better accepted by patients.

When introducing a patient to a home care routine, it is very important to outline a schedule, provide written instructions and spend the time demonstrating the techniques in the office (*Table 2*). This will increase patient compliance and lead to more successful clinical outcomes. First, recommend the type of product you wish the patient to use. Long gone are the days of saline, mineral oil or diluted baby shampoo as the only options for lid hygiene. Industry has responded to data showing that eyelid hygiene is an effective method to treat anterior blepharitis and eyelid disease in general, including dry eye.

A plethora of new safe and effective products are available. In broad terms, these can be classified as surfactant/soap, tea tree oil or HA-based products. All three categories have different brands and concentration levels, so it is best to familiarize yourself with these and curate those products in which you have confidence. Patients with sensitive skin should be started at lower concentrations of the active ingredient to better monitor for adverse events. Tea tree and HA products are recommended if a concurrent infestation with *Demodex* mites is present.

After selecting the cleaning product, it is very important to recommend a type of applicator (*Figure 6*). Several products on the market can be sprayed onto the lids, but we recommend lightly scrubbing the lid margin and lashes. For the same reason, manual rubbing of contact lenses is recommended, effective removal of

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Fig. 7. Patient using NuLids electronic lid cleaning system on lower and upper eyelids for at-home cleaning.

debris is best accomplished with physical contact. Cotton-tipped applicators are most often used. Medical-grade options are stiffer and the cotton is less likely to whisp off into the eye. Bristle brushes, created for applying lash extensions, can be helpful for hard-to-remove biofilms and makeup. Cotton rounds or pre-moistened pads are best for patients without the vision or dexterity to manage other options. With young children or patients who find it difficult to find time to "do that one extra thing," current products can be applied in the shower. Electric versions with disposable tips, like an electric toothbrush, are available (*e.g.*, NuLids). (*Figure 7*).

Having staff members demonstrate the techniques of eyelid and lash cleaning is key to long-term success. Pitfalls that will derail your home therapy recommendations include: patients closing their eyes so tightly that they cannot access the junction of the eyelid and lash, development of a contact dermatitis because they did not understand that washing off the cleaning solution was necessary and cleaned the palpebral conjunctiva instead of the lid margin and base of the eyelashes.

Patients with concurrent MGD can get confused about whether cleaning should be done before or after warm compress therapy. Some patients prefer to do it before to remove dirt, debris and makeup so the oil can escape the glands once heat is applied. Others prefer to complete lid maintenance after the warm compress since the debris is often loosened and easier to remove. Either option is viable, if the proper technique is used.

With lash hygiene, the target is the base of the lashes where oil can accumulate or *Demodex* can form collarettes, as well as the space between the lashes, where a film and desquamated epithelium and/or cosmetics can accumulate. Lid margin scrubs aim to clear slightly posterior to this at the orifices of the meibomian glands and the mucocutaneous junction (line of Marx). Cotton-tipped applicators can be held like a pencil and run across these two areas, similar to makeup application. On the upper lid, it should be done with the eye closed and while everting the upper lid slightly (*Figure 5*).

Practice Management

As previously discussed, anterior blepharitis is rarely found in isolation and is often part of the multifactorial constellation of dry eye disease. Therefore, diagnosis and treatment are often pursued in conjunction with other management recommendations. Dry eye treatment is poised for continued growth, with revenues estimated to reach $6 billion globally by 2023.[17]

Many practitioners become overwhelmed when they try to do too much during a comprehensive eye exam. Annual exams, much like routine physicals, are meant to screen for ocular pathology. When abnormal results are found, the patient returns for more testing, monitoring or treatment. For example, if a patient has an abnormal intraocular pressure or cup-to-disc asymmetry, they are instructed to return for a glaucoma work-up. When treating anterior blepharitis this same approach should be followed.

Too often, this very common condition is undertreated or not treated at all because the proper time is not allotted to educate the patient and control the problem. Left untreated, it becomes a larger project requiring greater resources. In addition, because of the significant association of anterior blepharitis with MGD and *Demodex* mite infestation, a more thorough examination looking for these comorbidities is often warranted.

In-office cleanings are not covered by insurance but nevertheless represent a common-sense and efficient strategy for initial treatment of the

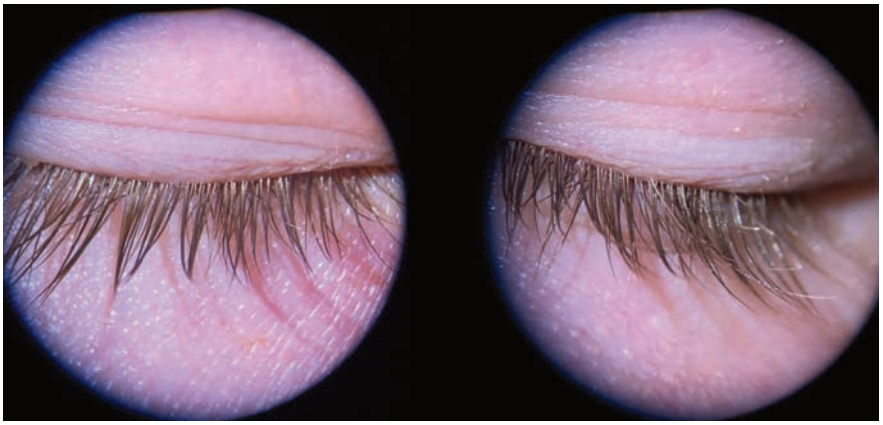

Fig. 8. Superior lid margins and lashes of the same younger male patient (Fig. 1) after comprehensive in-office lid cleaning.

patient with chronic anterior blepharitis. Regardless of insurance coverage, all testing and in-office treatments should be documented with a CPT code. BlephEx and lid cleaning procedures do not currently have a CPT code, so 92499 (unlisted ophthalmological service or procedure) should be used.[18] Patients should always be provided with an Advanced Beneficiary Notice to outline testing and treatments that may be reimbursed by their insurance and those for which the patient may be responsible.

Takeaways

As our knowledge of OSD expands, it's important to remember it is a multifactorial disease that requires comprehensive recommendations that address *each* contributing factor. This typically includes patient education and a foundation of home therapy with lid and lash hygiene, warm compresses, blinking exercises and lubricating tears or meds as needed.

In addition, lifestyle modifications especially with respect to cosmetic use are necessary. Invoking the dental model of preventative and restorative care should be pursued with regular office visits and therapies used in conjunction with home care for increased success. Patients should be reminded that blepharitis and dry eye are both chronic in nature and require their ongoing participation for self-care. Long-term prevention and maintenance, rather than reactive therapies, requires a change in mindset for practitioners and patients alike. ■

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WHEN YOUR PATIENT COMPLAINS OF RED EYE

The key to uncovering the root cause is a thorough patient history and clinical exam.

BY SUZANNE SHERMAN, OD,[1] AND CHRISTINA CHERNY, OD[2]
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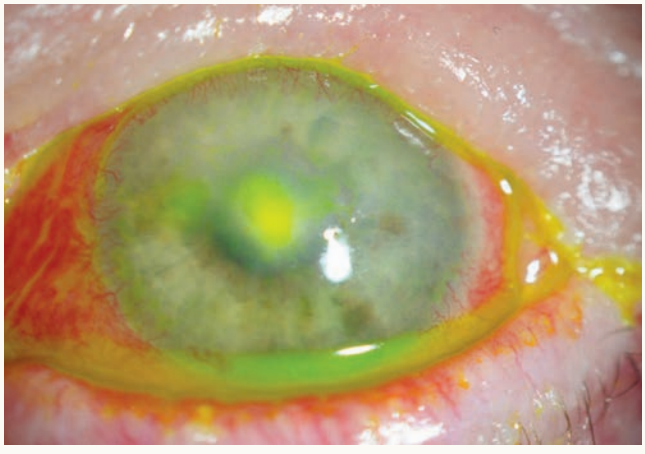
A "red eye" is one of the most common clinical signs and symptoms encountered in eye care. A variety of etiologies exist, making the clinical history an important component in narrowing down the list of differential diagnoses. A thorough examination of clinical signs and symptoms is necessary to appropriately diagnose and manage these patients.

Red eye is a broad term, encompassing anything from the garden variety viral infection to allergic reactions, or a vision-threatening infection. This article will discuss the pathophysiology behind the red eye and how to take a careful ocular, medical and social history from the patient. We will also delve into what to look for during the exam to find clues that will lead to the underlying cause and how to proceed accordingly.

Clinical History and Exam

A systematic approach to patient history and clinical examination is key in properly managing each patient who presents with a red eye. Topics to ask the patient about include laterality, symptom duration and course, rapid or gradual onset, quality and quantity of discharge, presence of diffuse or sectoral hyperemia, pain, photophobia, decreased vision, prior or concurrent medical or topical treatment, contact lens use, allergies, systemic disease, previous trauma and surgical and social history.[1] As data is collected during the exam, a working diagnosis should begin to form, along with several alternative differentials.



This neurotrophic cornea developed a bacterial ulcer. The patient came in acutely due to redness but was not in any pain.

Conditions With Mild to Moderate Pain

Patients can present with red eye due to any number of problems, from contact lens discomfort and allergies to episcleritis, conjunctivitis and dry eye, to name a few. The many causes of red eye are associated with varying levels of discomfort and pain. To ensure an appropriate diagnosis and

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treatment, optometrists must have the knowledge to differentiate these various conditions:

Conjunctivitis. The most common cause of red eye symptoms, this condition is an inflammation of the bulbar and palpebral conjunctiva.[1] Inflammation of the conjunctiva is precipitated by infectious pathogens, noninfectious irritants and dryness.[1-4] This leads to injection or dilation of the conjunctival vessels, resulting in the characteristic hyperemia and edema seen in conjunctivitis.[4] Additional symptoms include a mild burning sensation, epiphora and discharge.[2,4] Minimal pain and photophobia are expected. Visual acuity, pupils and the anterior chamber are typically unaffected, and sodium fluorescein uptake is not expected.[2] Noninfectious etiologies include allergies or ocular irritants; causative agents may vary seasonally.[1,2] Infectious etiologies include viral and bacterial organisms and are typically self-limiting, although topical treatment may be administered in many cases to help speed up resolution or prevent secondary infection.

Viral conjunctivitis. Viral infection is the most predominant conjunctivitis etiology. Viral conjunctivitis typically presents with watery discharge in the setting of a hyperemic eye.[1-3] An upper respiratory infection may precede ocular symptoms, and preauricular lymph nodes may be enlarged.[1-3]

The peak season for common variety strains of viral conjunctivitis is in the summer.[3] The most common causative pathogen is the adenovirus, and spontaneous resolution of signs and symptoms often occurs within one to two weeks.[1-3] Due to the highly contagious nature that persists one to two weeks from onset, contact precautions and hygiene are necessary, and sterilization of exam rooms is imperative after each patient encounter.[1,2] Treatment for viral infections includes supportive care with preservative-free artificial tears up to eight times per day, which can be cooled for added comfort, as well as cold compresses and ocular decongestants.[1]

In cases of viral keratitis secondary to herpetic infections as well as epidemic keratoconjunctivitis (EKC) strains, pain and photophobia may be present.[5] A betadine rinse may be useful early on in an EKC infection to reduce the viral load and expedite healing. Furthermore, care must be taken in EKC infections to remove pseudomembranes every few days to prevent symblepharon formation, with lid eversion performed at each visit to detect superiorly located pseudomembranes.

Herpetic infections due to the varicella zoster virus (VZV) may be preceded by vesicular facial lesions along the V1 distribution of the trigeminal nerve.[5] Corneal signs may include pseudodendritic epithelial defects in VZV caused by nerve inflammation (referred to as metaherpetic keratopathy), while true branching dendrites with terminal bulbs are apparent in herpes simplex infections (shedding viral particles, referred to as dendritiform keratopathy). Viral conjunctivitis infections caused by the herpes family of viruses are not as likely to spread as common strains.[1,2] Herpetic ocular infections are treated with systemic and topical antivirals, although topical steroids may also be indicated in certain cases (so long as they are used concurrently with topical antivirals).[5] Metaherpetic keratopathy is often treated with topical antibiotic drops or ointments. Referral to ophthalmology is warranted in cases that do not resolve after a week as well as in suspected herpetic cases.[1]

Bacterial conjunctivitis. This condition secondary to common causative organisms typically presents with mucopurulent discharge and bilateral matting/crusting of the eyelashes, as well as a lack of prior conjunctivitis and itching.[2] However, bacterial conjunctivitis due to *Neisseria gonorrhoeae* is responsible for a sudden, hyperacute presentation and is associated with profuse mucopurulent

Release Date: November 15, 2021

Expiration Date: November 15, 2024

Estimated Time to Complete Activity: 2 hours

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

- Discuss the pathophysiology behind red eye.
- Conduct a careful and comprehensive patient history.
- Recognize what to look for during the clinical exam.
- Identify and diagnose the underlying cause of the red eye.

Target Audience: This activity is intended for optometrists engaged in managing patients who present with red eye.

Accreditation Statement: In support of improving patient care, this activity has been planned and implemented by the Postgraduate Institute for Medicine and Review Education Group. Postgraduate Institute for Medicine is jointly accredited by the Accreditation Council for Continuing Medical Education (ACCME), the Accreditation Council for Pharmacy Education (ACPE) and the American Nurses Credentialing Center (ANCC) to provide continuing education for the healthcare team. Postgraduate Institute for Medicine is accredited by COPE to provide continuing education to optometrists.

Reviewed by: Salus University, Elkins Park, PA

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Credit Statement: This course is COPE approved for 2 hours of CE credit. Activity #122799 and course ID 75277-GO. Check with your local state licensing board to see if this counts toward your CE requirement for relicensure.

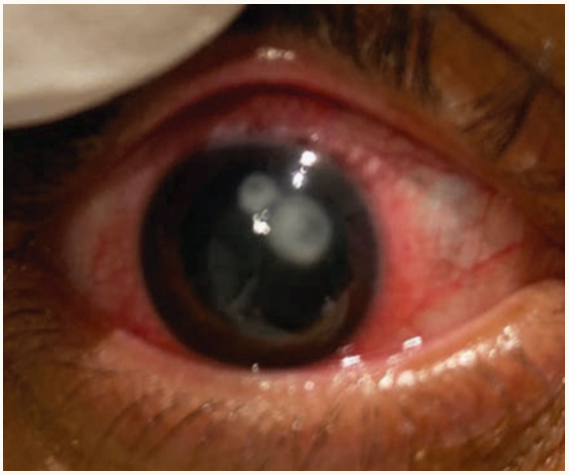
Disclosure Statements: *Authors:* Drs. Sherman and Cherny have no financial interests to disclose. *Managers and Editorial Staff:* The PIM planners and managers have nothing to disclose. The Review Education Group planners, managers and editorial staff have nothing to disclose.

discharge, pain, corneal perforation and vision loss.[1,2]

Signs and symptoms of acute bacterial conjunctivitis generally persist for less than four weeks and are self-limiting, although topical antibiotics may shorten duration.[1-3] Bacterial conjunctivitis is considered highly contagious and spreads through direct contact with infected objects.[1] This condition most commonly occurs during the winter season.[3] Causative organisms are often *Staphylococcus aureus* in adults and *Streptococcus pneumoniae* and *Haemophilus influenza* in children, although cases of *Chlamydia trachomatis*, diphtheria and *Neisseria gonorrhea* can also be seen.[1-3] Treatment for gonococcal conjunctivitis consists of intravenous ceftriaxone, and concurrent treatment of chlamydial conjunctivitis is necessary.[2] Systemic testing for sexually transmitted infections may be indicated for the patient, as well as for their partner(s).

In cases of chronic bacterial conjunctivitis, signs and symptoms may last a minimum of four weeks and can repeatedly relapse.[1] When conjunctivitis signs and symptoms are refractory to standard antibiotic treatment, chlamydial conjunctivitis should be considered, particularly if a chronic follicular response is present.[1] Other characteristic features include an Arlt's line on the superior palpebral conjunctiva as well as Herbert's pits along the superior limbus. Treatment includes topical erythromycin ointment, a single dose of oral azithromycin or a two-week course of doxycycline, as well as treatment of sexual partners. Prompt ophthalmology referral is necessary in cases of suspected gonococcal conjunctivitis and chronic bacterial conjunctivitis, particularly if the patient is refractory to therapy.[1]

Allergic conjunctivitis. This typically presents with symptoms of itching and eye rubbing.[1,3] It occurs in 25% of the United States population and is associated with atopic disease, including rhinitis, asthma and eczema.[1] Allergic conjunctivitis can be seasonspecific or perennial, which continues throughout the year.[1] The seasons most often associated with allergic conjunctivitis are spring and summer (vernal or catarrhal conjunctivitis).[3] Avoidance of a patient's allergen(s) is recommended to alleviate symptoms.[1,3] Additional treatment options include over-the-counter antihistamine or vasoconstrictor drops, prescription anti-allergy drops, such as topical histamine H1 receptor antagonists, mast cell stabilizers and combinations, and mild topical steroids in severe cases.[1,2] Avoidance of eye rubbing should be stressed, as this has been associated with the development of keratoconus, an ectatic corneal condition.[6]



This patient has a presumed *Pseudomonas* ulcer.

Blepharitis. This inflammation of the eyelids may be accompanied by flaking, seborrheic dermatitis and obstructed meibomian gland orifices, as well as redness of the nose and/or cheeks in cases of rosacea.[1,7] Anterior blepharitis involves the eyelashes and is often considered to be infectious, caused by bacterial, viral or parasitic agents, while posterior blepharitis involves the meibomian glands and is considered metabolic.[8] Treatment of blepharitis generally begins with long-term eyelid hygiene including eye scrubs, lid massage and warm compress application.[1,8] In more severe cases, topical ophthalmic antibiotics or steroid/antibiotic combinations may be considered. Meibomian gland dysfunction often requires the addition of oral antibiotics such as doxycycline or tetracycline.[1,8] If *Demodex* mites are present, green tea tree oil and oral ivermectin may be used in addition to lid hygiene.[9]

Dry eye. Also known as keratoconjunctivitis sicca, this is a commonly encountered ocular condition that occurs due to poor quality or decreased quantity of the tear film.[1] Patients may present with complaints of dryness, burning, tearing, stinging, grittiness photophobia and redness.[1,7,9] Some patients experience symptoms that are worse than signs, while others present with significant clinical signs and abnormal diagnostic testing despite minimal symptomology.[1,9] Conjunctival hyperemia in the setting of dry eye has a non-specific pathophysiology, generally stemming from concurrent conjunctival inflammation.[10] This hyperemia may be worsened by topical over-the-counter vasoconstrictor use, which temporarily decreases redness by constricting episcleral vasculature but ultimately results in a rebound effect and further hyperemia.[10]

Characteristic signs of dry eye include punctate epitheliopathy, meibomian gland dysfunction and a short tear breakup time, among others.[9] Risk factors for dry eye include older age and female gender, as well as certain underlying systemic conditions and medications.[1] While dry eye diagnosis is often made based on clinical findings, diagnostic tests can be used to further classify the condition, including Schirmer, phenol red, tear osmolarity and inflammatory biomarker testing.[9]

Treatment of dry eye varies based on etiology (evaporative, tear quantity, mucus deficiency), as well as on severity of signs and symptoms. The initial treatment modality usually begins with frequent ocular

lubrication, such as daily instillation of artificial tears and gel drops or ointments at bedtime.[1] Preservative-free, single-use formulations are often beneficial to minimize the risk of further dryness or irritation.[1] In more advanced dry eye cases, topical ophthalmic treatment with cyclosporine, lifitegrast, corticosteroids or autologous serum tears may be necessary.[1,9] Additional treatments include meibomian gland expression (via application of heat or manual expression), humidifiers, eye shield goggles, punctal occlusion or cautery, systemic omega-3 fatty acid therapy and oral doxycycline.[1,9]

Carotid-cavernous sinus fistula. This occurs when an abnormal communication is formed between the internal carotid artery and the cavernous sinus, and can be direct or indirect (dural).[5,11] This may result in tortuous dilatation of the conjunctival and episcleral vessels, leading to a significant hyperemic appearance to the eye.[5,11]

Clinical signs and symptoms may include an often painless pulsatile exophthalmos, diplopia, strabismus, increased intraocular pressure (IOP), chemosis, orbital congestion, headache, perception of a rushing orbital sound on auscultation (ocular bruit), stasis retinopathy and central retinal vein occlusion in severe cases.[5,11-13] The fistula may be idiopathic or a result of trauma.[5] Imaging such as magnetic resonance angiography is indicated, and the patient should continue long-term care with ophthalmology.[5] Treatment may include observation or endovascular surgical techniques with the aim of preserving the internal carotid artery.[11]

This patient has sectoral episcleritis.

Episcleritis. In this condition, the superficial vascularized tissue between the conjunctiva and sclera—the episclera—becomes inflamed and mildly hyperemic in a localized area due to immune cell activation, release of inflammatory mediators, vasodilation and increased vascular permeability.[1,2,14,15] Patients may be symptomatic for sectoral and interpalpebral redness, mild irritation and pain in cases of nodular episcleritis.[2,14] This condition generally resolves in a self-limiting fashion within several hours to several days without intervention.[14] In more symptomatic cases, treatment includes topical lubrication with artificial tears, oral NSAIDs, topical NSAIDs and topical steroids.[1,2]

Most cases of episcleritis are idiopathic, but further workup for systemic associations is warranted in recurrent or worsening cases.[1] This condition is more common in females in the fifth decade of life and those with underlying autoimmune conditions.[1,2] Episcleritis can be distinguished from scleritis by its response to topical 10% phenylephrine; in the former, redness dissipates after 10 to 15 minutes post-drop instillation due to vascular constriction, with maximum effect at one minute.[1,2,14] Furthermore, the vasculature in episcleritis is mobile, while in scleritis the inflamed vessels do not move with a cotton-tipped applicator.[2]

Subconjunctival hemorrhage. This condition results from ruptured conjunctival blood vessels that lead to accumulation of blood beneath the conjunctiva.[1,2,16] These hemorrhages are typically painless and do not involve vision loss.[2] Although patients may present with a high level of concern due to the acute appearance of blood on the surface of their eye, patient education is essential to convey the benign nature of this condition. This condition is self-limiting, and full blood resorption is expected within a few weeks without intervention, although artificial tear use and warm compresses may help to ameliorate symptoms.[1,2]

Neurotrophic keratopathy. These patients develop reduced or absent corneal sensation with subsequent corneal epitheliopathy.[17] They often present with ocular signs that are disproportionately worse than symptoms and, in many cases, may be asymptomatic.[18] Patient-reported symptoms may include hyperemia and decreased vision, while a spectrum of clinical signs can be evident ranging from mild epithelial and tear film changes to severe corneal ulceration, stromal melting and/or perforation.[17,19] Treatments vary based on severity and can include copious lubrication, topical anti-infective or anti-inflammatory agents, autologous serum tears, bandage contact lenses, amniotic membranes, punctal plugs, tarsorrhaphy and topical cenegermin drops.[17,20]

Conditions With Moderate to Severe Pain

Other conditions—some more common than others—are associated with moderate to severe pain. These include anterior uveitis, scleritis, microbial keratitis, contact lens-induced acute red eye (CLARE), acute angle-closure glaucoma and photokeratitis, to name a few.

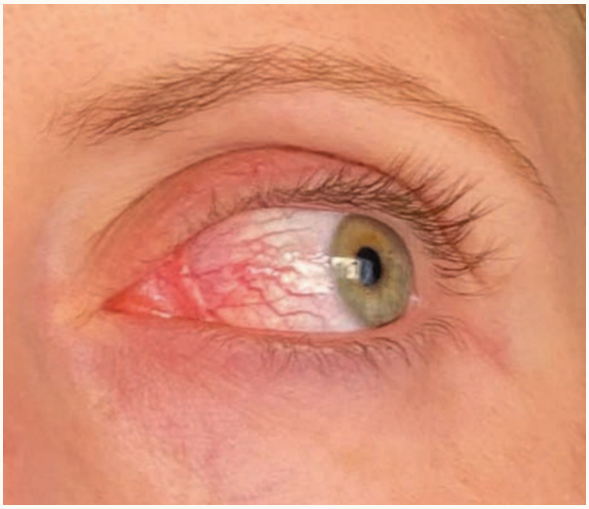
Anterior uveitis. Breakdown of the blood-aqueous barrier leads to inflammation of the uveal tract, including of the iris and/or ciliary body, and is known as anterior uveitis.[2,21,22] Patients are typically symptomatic for moderate to severe ocular pain,

redness, epiphora and photophobia, and signs include presence of cells and flare in the anterior chamber and a circum ciliary flush near the limbus.[2] While first-time occurrences, particularly if unilateral, are typically idiopathic, certain systemic conditions and medications may underlie anterior uveitis and include spondyloarthropathies (with patients often testing positive for HLA-B27), infectious disease (*e.g.*, syphilis, tuberculosis, Lyme, herpes virus) and use of sulfonamides, cidofovir and rifabutin.[2,21]

Treatment of anterior uveitis includes frequent instillation of topical ophthalmic steroids to address local ocular inflammation as well as topical cycloplegic agents to stabilize the permeability of leaky and inflamed iris vessels and paralyze the ciliary body to provide analgesia. A laboratory workup may be considered to elucidate underlying autoimmune or infectious etiologies, particularly in recurrent or bilateral and granulomatous cases.[2,21]

Scleritis. In anterior scleritis, scleral inflammation results in vascular engorgement of the deep episcleral plexus, which is also displaced outward by an edematous sclera.[23] This leads to a characteristic blue-violet tinge to the sclera, redness that does not blanch with the installation of topical phenylephrine, severe and boring ocular pain, which is worse at night and with eye movements, and photophobia.[2,14,24]

Anterior scleritis can be diffuse, nodular or necrotizing. This condition is often associated with autoimmune and systemic diseases including rheumatoid arthritis and granulomatosis with polyangiitis, although infectious etiologies may also be possible.[2,14] In the necrotizing form, peripheral ulcerative keratitis may be present marked by substantial amounts of peripheral subepithelial corneal infiltration.[2] A common cause of this is Stevens-Johnson syndrome, which is often precipitated by recent oral penicillin antibiotic use. Topical cycloplegia and topical steroid use must be coupled with switching the oral antibiotic and systemic anti-inflammatory treatment to prevent scleral melting and globe perforation; close interdisciplinary care with a rheumatologist is essential.[2,14]



Sectoral episcleritis from a different angle in the same patient in the previous photo.

Microbial keratitis. Bacterial and fungal keratitis, also known as corneal ulcers, manifest as corneal epithelial defects that stain with sodium fluorescein overlying stromal infiltrates.[2,25] Symptoms of microbial keratitis include photophobia, moderate to severe pain, conjunctival injection due to concurrent conjunctivitis, tearing and discharge.[2,25] Its impact on vision is minimal if the ulcer is not within the visual axis. An anterior chamber reaction and hypopyon may also be noted, and severe cases may result in corneal perforation.[2]

Microbial keratitis is typically associated with predisposing risk factors, which include contact lens wear, ocular trauma, topical corticosteroid use, ocular surface disease, systemic diseases such as diabetes and agricultural work.[2] Common causative organisms include *Pseudomonas aeruginosa*, *Staphylococcus aureus* and coagulase-negative staphylococci.[2]

Treatment consists of frequent instillation of fortified topical antibiotics and frequent ophthalmological follow-up.[2] Clinical appearance of corneal infections may not always reliably predict the offending pathogen; therefore, specimen cultures may be obtained in order to help guide therapy.[25]

CLARE. Previously referred to as "contact lens overwear syndrome" or "immobile lens syndrome," this is an inflammatory corneal infiltrative event generally associated with soft contact lens overwear.[26] Symptoms generally include mild pain or irritation, moderate to severe hyperemia in a circumferential pattern due to concurrent conjunctivitis, tearing and photophobia.[2] CLARE may consist of multiple small (less than 1mm in size) focal infiltrates or diffuse infiltration without corneal haze, generally found in the midperiphery or periphery of the cornea with minimal punctate staining overlying the infiltrates.[26]

The etiology of CLARE may be related to contact lens care solutions and cases contaminated with microbes, particularly in the setting of contact lens overwear, poor contact lens hygiene practices or tightly fitting lenses secondary to improper design or lens dehydration.[27] Treatment includes temporary discontinuation of contact lens wear until complete resolution of signs and symptoms, copious ocular lubrication with preservative-free artificial tears and instillation of topical antibiotics with or without the use of topical ophthalmic steroids in more severe cases.[28,29]

Patient education is vital; wearing time should be decreased, overnight wear should be discontinued and contact lens hygiene should be stressed, with single-use daily contact lens wear modalities preferred.[29] The fit should be reassessed before use begins again.

Acute angle-closure glaucoma. This occurs when the anterior chamber

angle closes off and a subsequent elevation in IOP results in damage to the optic nerve.[2] The acute IOP spike results in diffuse hyperemia and ciliary flush due to vascular congestion.[30] Additional ocular symptoms include moderate to severe pain, photophobia, decreased vision, a mid-dilated and non-reactive pupil, a shallow anterior chamber angle and perception of halos around lights, along with headache, nausea and vomiting.[2,30] Patients are at greater risk for acute angle-closure glaucoma if they are female, middle-aged, of Asian ethnicity, hyperopic with a shallow anterior chamber or are using certain medications such as topiramate or sulfas.[2]

Prompt treatment is imperative and includes compression gonioscopy, topical beta-blockers, topical brimonidine, topical and oral carbonic anhydrase inhibitors (including acetazolamide IV or oral) and timely pilocarpine, a parasympathomimetic, when IOP is reduced to 30mm Hg or less.[2,30] Medications that can cause further dilation, such as apraclonidine, may be contraindicated.[2] Once IOP stabilizes and the hazy cornea clears, a laser iridotomy is performed in order to facilitate aqueous drainage for the long term.[2,30]

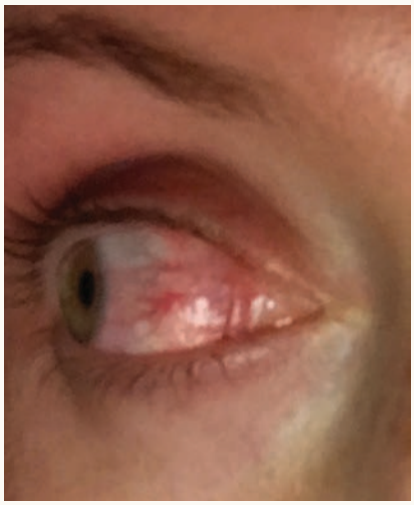
Corneal abrasion and foreign body injury. Corneal abrasions result from breaks to the corneal epithelium and can lead to acute symptoms of moderate to severe pain, discomfort, tearing and photophobia, often resolving within 48 hours.[2,31] Hyperemia occurs from conjunctival inflammation, and vision is affected if the corneal defect is central. Ocular foreign bodies may result in corneal abrasions if they disrupt the corneal epithelium; in particular, foreign bodies trapped under the eyelid may rub along the corneal surface and cause a linear defect.[2,31]

In cases of severe pain and discomfort, a topical anesthetic may be instilled to relieve pain and assist with the eye examination.[1,2] Sodium fluorescein is instilled to assess the pattern and extent of the epithelial defect under a cobalt blue filter.[1,2] When a foreign body is suspected, it is recommended to examine the superior palpebral conjunctiva with lid eversion in order to identify whether there is a retained foreign body under the upper lid so that it may be removed.[1,2]

Treatment of corneal abrasions, after the presence of foreign body has been ruled out, begins with topical antibiotics and may eventually involve the addition of topical lubrication, topical cycloplegics and topical NSAIDS. To resolve residual inflammation or the appearance of subepithelial corneal infiltrates later on, topical steroids may be added. Oral analgesics may also be considered for cases producing significant pain.[1,2]

Eye patching was previously an accepted mode of treatment for corneal abrasions but has since been outmoded following data demonstrated by a corneal abrasion pressure patch study.[1,32] Many still prefer to patch larger abrasions; it reminds patients to remain sedentary during recovery, provides a level of analgesia and allows the corneal epithelium to be free from the risk of eye rubbing over the initial healing period. In severe cases, bandage contact lens wear or amniotic membranes may be considered. Follow-up should occur in 24 hours to ensure no secondary complications exist (microbial keratitis, the discovery of another foreign body, etc.).[1,2]

Photokeratitis. Ocular exposure to ultraviolet rays, because of the cornea's propensity to absorb that wavelength of light, particularly UV-C, can lead to acute epithelial necrosis resulting in photokeratitis.[33] Symptom onset typically occurs six to eight hours after UV exposure and results in severe bilateral pain, photophobia, epiphora, foreign body and blepharospasm.[33,34] Hyperemia will also be present. This condition is more common in patients with occupational exposure, such as welding without adequate eye protection, or patients who are exposed to excessive sunlight in the mountains, particularly on a bright, snowy day.[5,34] Photokeratitis is self-limiting, as the corneal epithelium typically regenerates within 48 hours; however, oral analgesics and topical ophthalmic antibiotic/steroid ointments along with cycloplegia can be used to protect the ocular surface from infection and provide symptom relief.[5,34] In cases where there is significant corneal edema, hypertonic drops and ointments can be added.



Sectoral episcleritis is evident in this eye.

Chemical burns to the ocular surface. This can result in significant vision loss within a short period of time.[35] Symptoms can vary from mild ocular irritation to severe damage of the anterior ocular structures with corneal opacification.[35] Ocular burns from acidic agents tend to be less severe than from alkali agents, although the latter tend to be more common due to their ubiquitous availability in products such as cleaning agents. Emergent treatment is indicated in the setting of an acute ocular burn and includes copious lubrication, such as with a Morgan lens, with intermittent pH assessment, as well as topical steroid, topical antibiotic and topical and oral ascorbate use (vitamin C).[33,35] Additional treatments may include autologous serum tears, bandage contact lenses, amniotic membranes, oral tetracyclines, cycloplegia, tenoplasty, debridement of necrotic tissue, tectonic keratoplasty, tissue adhesives and limbal stem cell transplantation in severe cases.[30,36]

Graft rejection. When corneal health is compromised or irregularities preclude useful vision, corneal transplantation (keratoplasty) may be necessary, in which the host is surgically grafted with donor tissue.[37] As with any transplantation surgery, several risks are involved, including the host's immunological rejection of the donor corneal tissue, which may occur in any corneal layer at any point after keratoplasty and may lead to graft failure.[37,38] Patients may be symptomatic for redness, photophobia, pain, epiphora and/or decreased vision, while clinical signs of immunological rejection include corneal edema, vascularization, keratic precipitates, subepithelial or stromal infiltrates, a Khodadoust line or an epithelial rejection line.[39]

Treatment of graft rejection involves the use of topical immunosuppressants such as steroids, which are generally also used in the long term to prevent rejection episodes. Systemic immunosuppressants may be considered in high-risk grafts.[40]

Conjunctivitis and keratitis with visual manifestations. While most cases of infectious conjunctivitis generally involve minimal pain and vision loss, gonococcal (bacterial) conjunctivitis and EKC (viral) are exceptions. These conditions may present with acute presentations of conjunctivitis involving copious discharge, hyperemia and vision loss.[41,42] Similarly, while microbial keratitis can often spare vision when the ulcer is non-central, ulceration within the visual axis can lead to marked vision loss.[2,25]

Endophthalmitis. This is a microbial infection of the aqueous and vitreous humor.[2,43] This condition results in symptoms of moderate to severe pain, photophobia, decreased vision, eyelid edema and ocular discharge, and signs may include a hypopyon, iris synechiae, fibrinous membranes in the anterior chamber and vitreal inflammation.[2,11,44] Significant conjunctival hyperemia may be seen due to conjunctivitis and circum-corneal congestion.[44] Infection is often exogenous and can occur about 12 hours to seven days after penetrating ocular surgery, trauma or injections, as well as from severe corneal infections, hospitalization with IV, parenteral nutrition or broad-spectrum antibiotic use.[2,43] Emergent referral to ophthalmology is warranted, and treatment may consist of intravitreal antimicrobial injections or vitrectomy, with varied visual outcomes.[2,43]

Takeaways

While patients will often present with a subjective complaint of red eyes, the underlying etiologies are numerous, and an accurate history and clinical examination are vital for appropriate care. Taking a systematic approach to the exam is imperative and will in many cases lead to the correct diagnosis or a narrower list of differentials. ■

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OPTOMETRIC STUDY CENTER QUIZ

To obtain continuing education credit through the Optometric Study Center, complete the test form on the following page and return it with the $35 fee to: Jobson Healthcare Information, LLC, Attn.: CE Processing, 395 Hudson Street, 3rd Floor New York, New York 10014. To be eligible, please return the card within three years of publication. You can also access the test form and submit your answers and payment via credit card online at revieweducationgroup.com. You must achieve a score of 70 or higher to receive credit. Allow four weeks for processing. For each Optometric Study Center course you pass, you earn 2 hours of credit. Please check with your state licensing board to see if this approval counts toward your CE requirement for relicensure.

1. All of the following clinical case history questions are essential to ask for a chief complaint of red eye except:
a. Which eye is affected?
b. Are you experiencing any discharge?
c. How long ago was your last eye exam?
d. When did your symptoms first start?

2. Which symptoms are expected in a patient with garden variety viral conjunctivitis?
a. Hyperemia, serous discharge, severe pain.
b. Hyperemia, headache, itching.
c. Hyperemia, significant vision loss, copious mucopurulent discharge.
d. Hyperemia, serous discharge, burning.

3. Which is a characteristic clinical sign of viral keratitis secondary to herpes simplex virus?
a. Ring infiltrate.
b. Dendritic epitheliopathy.
c. Vesicular rash.
d. Bilateral hyperemia.

4. All may be considered as viable management options for common bacterial conjunctivitis except:
a. Topical ophthalmic antibiotic drops.
b. Observation.
c. Topical ocular lubricants.
d. IV ceftriaxone.

5. Pulsatile exophthalmos is a classic symptom of which condition?
a. Allergic conjunctivitis.
b. Blepharitis.
c. Carotid-cavernous fistula.
d. EKC.

6. Characteristic clinical signs of episcleritis include:
a. Severe, boring pain and sectoral hyperemia.
b. Mild itching and severe vision loss.
c. Copious discharge and moderate pain.
d. Sectoral hyperemia and minor irritation.

7. Which statement is TRUE about subconjunctival hemorrhages?
a. They are considered a medical emergency.
b. Due to their benign nature, systemic workup is never required.
c. Vision loss is rarely seen in most cases of subconjunctival hemorrhages.
d. Subconjunctival hemorrhages present with painful hyperemia.

8. A 54-year-old female with rheumatoid arthritis presents with mild hyperemia OU for several months. Associated symptoms include grittiness and burning. Mild punctate corneal staining is seen in both eyes. Which is the most likely diagnosis?
a. Scleritis.
b. Dry eye.
c. Bacterial conjunctivitis.
d. Herpes simplex keratitis.

9. A reasonable first-line treatment for the patient in question #8 would be:
a. Topical ophthalmic steroid drops.
b. Topical ophthalmic antibiotic drops.
c. Topical preservative-free artificial tears.
d. Oral NSAIDs.

10. The patient in question #8 returns to clinic three months after having started the first-line treatment you selected in question #9 but reports she is still moderately symptomatic. All would be reasonable second-line treatments except:
a. Oral antiviral medications.
b. Punctal occlusion.
c. Topical lifitegrast.
d. Topical ophthalmic ointments at bedtime.

11. Which is TRUE about a patient presenting with a dense, central neurotrophic corneal ulcer?
a. The patient presents with associated symptoms of extreme pain.
b. The patient can be treated with preservative-free artificial tears twice daily.
c. The patient is likely experiencing a decrease in vision.
d. The patient's symptoms are commensurate with your clinical exam findings.

12. Scleritis differs from episcleritis in that:
a. Scleritis blanches with phenylephrine.
b. Scleritis results in sectoral hyperemia and mild burning.
c. Episcleritis is associated with a violet-blue hue of the sclera.
d. Scleritis is associated with deep, boring pain.

13. Which is true regarding CLARE?
a. CLARE is a form of bacterial keratitis.
b. CLARE consists of multiple, small peripheral corneal infiltrates.
c. Contact lenses are safe to wear while actively symptomatic for CLARE.
d. Using the same contact lens case for an entire year is helpful to prevent CLARE.

14. Risk factors for acute angle-closure include:
a. Asian descent, myopia, older age.
b. Topiramate use, miotic pupil size.
c. Deep anterior chamber, hyperopia, female.
d. Hyperopia, female, middle-age.

15. A 35-year-old male presents to your practice with a complaint of severe, bilateral ocular pain and photophobia that began acutely this evening. He reports his eyes felt fine all morning on his skip trip. On clinical exam, you note bilateral, diffuse keratopathy. The proper course of action includes:
a. Prescribing topical proparacaine to use hourly in both eyes for the next three days.
b. Explaining to the patient that this is a severe infection and requires IV antibiotics.
c. Ordering a systemic workup including lab work and imaging.
d. Recommending copious lubrication and educating the patient that symptoms are expected to resolve within 48 hours.

16. All of these clinical signs and symptoms increase suspicion for immunological rejection of a corneal graft except:
a. Diffuse corneal edema.
b. Severe itching.
c. Photophobia.
d. Keratic precipitates.

17. Which is NOT a reasonable treatment option for a patient with a corneal abrasion?
a. Topical ophthalmic steroid drops.
b. Topical ophthalmic antibiotic drops.
c. Oral analgesics.
d. Frequent preservative-free artificial tear instillation.

18. Which are expected in a patient presenting with a bacterial ulcer?
a. Mild irritation, diffuse hyperemia, prior contact lens wear.
b. Moderate to severe pain, photophobia, discharge.
c. Diabetes, contact lens wear, antibiotic use.
d. Diffuse hyperemia, minimal pain.

19. A 27-year-old female presents with a complaint of a painful, red eye and significant photophobia. On clinical exam, 3+ cells and a 2+ flare anterior chamber reaction is noted. Which is not a reasonable treatment option?
a. Topical cycloplegic drop instillation.
b. Topical anti-fungal drop instillation.
c. Oral analgesic use.
d. Topical steroid drop instillation.

20. The patient in question #19 reports that she has experienced several such episodes in the past. This next step is indicated:
a. Systemic lab workup.
b. Discontinue topical steroid use.
c. Discontinue topical cycloplegic use.
d. Educate the patient that recurrences are expected and this is nothing to worry about.

Examination Answer Sheet

When Your Patient Complains of Red Eye

Valid for credit through November 15, 2024

Online: This exam can be taken online at 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.

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Answers to CE exam:

1. Ⓐ Ⓑ Ⓒ Ⓓ
2. Ⓐ Ⓑ Ⓒ Ⓓ
3. Ⓐ Ⓑ Ⓒ Ⓓ
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19. Ⓐ Ⓑ Ⓒ Ⓓ
20. Ⓐ Ⓑ Ⓒ Ⓓ

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. Discuss the pathophysiology behind red eye. ① ② ③ ④ ⑤
22. Conduct a careful and comprehensive patient history. ① ② ③ ④ ⑤
23. Recognize what to look for during the clinical exam. ① ② ③ ④ ⑤
24. Identify and diagnose the underlying cause of the red eye. 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.)

Ⓐ I do plan to implement changes in my practice based on the information presented.

Ⓑ My current practice has been reinforced by the information presented.

Ⓒ 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.)

Ⓐ Apply latest guidelines
Ⓑ Change in diagnostic methods
Ⓒ Choice of management approach
Ⓓ Change in current practice for referral
Ⓔ Change in vision correction offerings
Ⓕ Change in differential diagnosis
Ⓖ More active monitoring and counseling
Ⓗ Other, please specify: _____

28. How confident are you that you will be able to make your intended changes?

Ⓐ Very confident Ⓑ Somewhat confident Ⓒ Unsure Ⓓ Not confident

29. Which of the following do you anticipate will be the primary barrier to implementing these changes?

Ⓐ Formulary restrictions
Ⓑ Time constraints
Ⓒ System constraints
Ⓓ Insurance/financial issues
Ⓔ Lack of interprofessional team support
Ⓕ Treatment related adverse events
Ⓖ Patient adherence/compliance
Ⓗ Other, please specify: _____

30. Additional comments on this course: _____

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Rate the quality of the material provided:

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

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

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 122074 RO-OSC-1121

Scleral Decentration: The Workaround

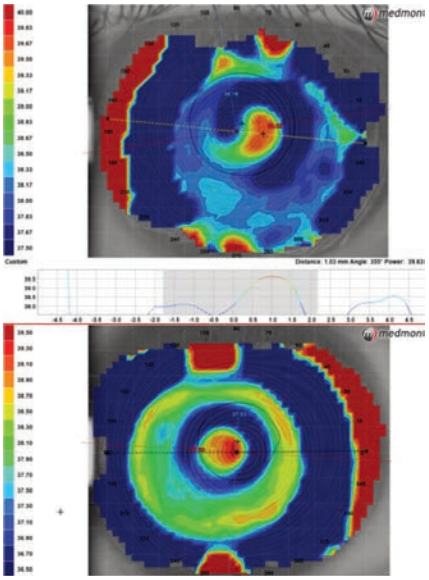
Center-near aspherics help achieve multifocal correction with this modality, but they don't come without problems.

Q I may start fitting scleral lenses for irregular corneas and even presbyopia. How can I best optimize vision with this modality in this patient population?

A "Scleral lenses are a great specialty lens option for a multitude of patients," says Nicholas Gidosh, OD, chief of the Cornea and Contact Lens Service at the Pennsylvania College of Optometry. "With a host of indications, including irregular corneas, ocular surface disease and even high ametropia, they can be customized to work for many of our patients." Dr. Gidosh notes that an exciting area of improvement with these lenses is in presbyopic correction.

Troubleshooting Techniques

Scleral lenses fit stably on most eyes, so the multifocal designs often rely on simultaneous multifocal optics, according to Dr. Gidosh. This can be achieved through center distance or near aspherics, or sometimes through concentric designs. Currently, the most popular method used to achieve multifocal correction in scleral lenses is through center near aspherics, he notes. The issue with these optical designs is that scleral lenses tend to decenter in the inferior-temporal direction. With high amounts of decentration, patients may struggle to obtain adequate near vision. Luckily, there are several techniques that can be used to troubleshoot this issue.



Topography measuring 1mm of temporal lens decentration in a center-near lens (top map) contrasted with a scleral multifocal using decentered optics to align the near zone with the visual axis (bottom).

The first involves improving lens centration and increasing near zone size, says Dr. Gidosh. Ways to improve scleral lens centration include optimizing clearance over the surface of the eye, selecting the most appropriate lens diameter and obtaining a more aligned edge using toric or asymmetric peripheral curves. Another modification involves increasing the size of the near zone, which puts more of the add power into the pupil to allow better vision at near without adversely affecting distance vision.

The second technique is to use a scleral design that incorporates a standardized amount of optical zone decentration, Dr. Gidosh notes. Specialty labs are aware of the issue of lens decentration, and some have determined the average amount typically seen. Knowing this, the labs can include a predetermined amount of near zone decentration to better align the add zone within the patient's visual axis. The zone size can still be modified to further refine the vision to meet the patient's needs.

Dr. Gidosh adds that the final technique is by diagnostic measurement of near zone decentration. This can be done by using a trial lens set with markings to measure the amount and direction of lens decentration. Knowing this value, the lab can then recenter the near zone to align it with the visual axis. An alternative to this is beginning with a standard center near trial lens and measuring the amount of the zone's decentration using topography. These methods help the labs precisely determine the amount and axis of near zone decentration needed for best visual results.

Final Considerations

While near vision can sometimes be difficult to achieve with scleral multifocal lenses, there are several troubleshooting methods to improve visual function. Patients may also benefit from enlarged near zones in their nondominant eye to enhance near performance or a smaller near zone in the dominant eye to aid with distance tasks like driving. Some designs also allow for center distance optics to further improve distance in the dominant eye. Understanding these customizations and when to use them will help providers achieve better results with this modality, Dr. Gidosh says. ■

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 BISANT A. LABIB, OD

Reach for the Dye

Fluorescein is most commonly used for corneal evaluation and, as such, its instillation should be properly understood.

A corneal assessment is a routine and integral part of any ocular examination. Its elaborate and unique organization gives the cornea the necessary transparency to refract and transmit light rays to the retina for vision. This also makes examination difficult—as the cornea is an inherently clear structure, its very nature poses a challenge in determining if corneal pathology is present. There are some tools that can facilitate assessment, one of those being the use of vital dyes.

One Dye, Many Uses

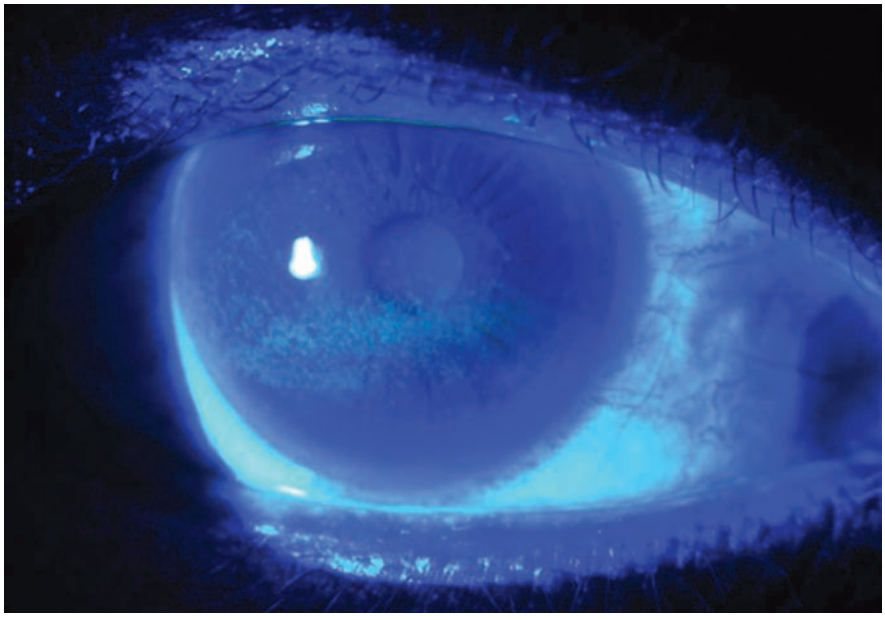
Of the available ophthalmic dyes, fluorescein is most commonly used for corneal evaluation. The agent, fluorescein sodium, is an orange-red hydrocarbon with low molecular weight.[1] It is available in topical and intravenous forms for ocular use. For the evaluation of corneal pathology, it comes impregnated in a paper strip and dissolves when moistened with normal saline solution to be introduced onto the surface of the eye. This is done by placing the moistened strip in the inferior conjunctiva or fornix and having the patient blink multiple times to allow the agent to spread across the ocular surface.

One of its unique properties is that it reacts to wavelengths in the visible spectrum, ranging from 465nm to 490nm. It is most evident under cobalt blue light. Under normal lighting conditions, it appears orange on the ocular surface. However, on observation of fluorescein sodium under the cobalt blue filter, it fluoresces to wavelengths of 520nm to 530nm, appearing bright green to the observer. The charged ends of this compound are attracted to the hydrophilic ends of the cell membrane in the cornea, thus illuminating areas where cells are broken down or missing.[2] These properties allow for its many ophthalmic uses:

• ***Evaporative dry eye assessment.*** The diagnosis of dry eye syndrome, particularly the evaporative form, is made possible through the use of a fluorescein sodium strip and slit lamp. A commonly used diagnostic test called tear breakup time is most optimally performed by placing a fluorescein strip onto the eye, waiting two minutes and then viewing the cornea with the cobalt blue filter under high illumination at 10x magnification. The patient is asked to blink once and then keep their eyes open as long as they can. Simultaneously, the examiner observes the cornea for the first appearance of a dry spot, which presents as a dark area among the otherwise uniformly green appearance of the cornea, and counts the number of seconds that it takes to manifest. Studies have indicated that a measurement of less than 10 seconds is abnormal.[3,4]

• ***Aqueous-deficient dry eye assessment.*** In more aqueous-deficient forms of dry eye syndrome, fluorescein can also be used to illuminate the presence, severity and course of dryness. This is done in a different manner than evaporative dry eye, in that the dye is inserted and observation of the cornea is best performed between four and eight minutes following instillation.

Photo: WR Buie



Punctate epithelial erosions in a dry eye patient as revealed by fluorescein dye.

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

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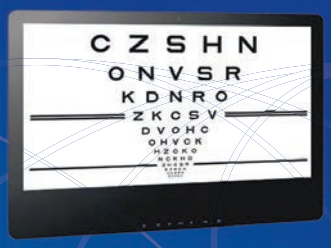

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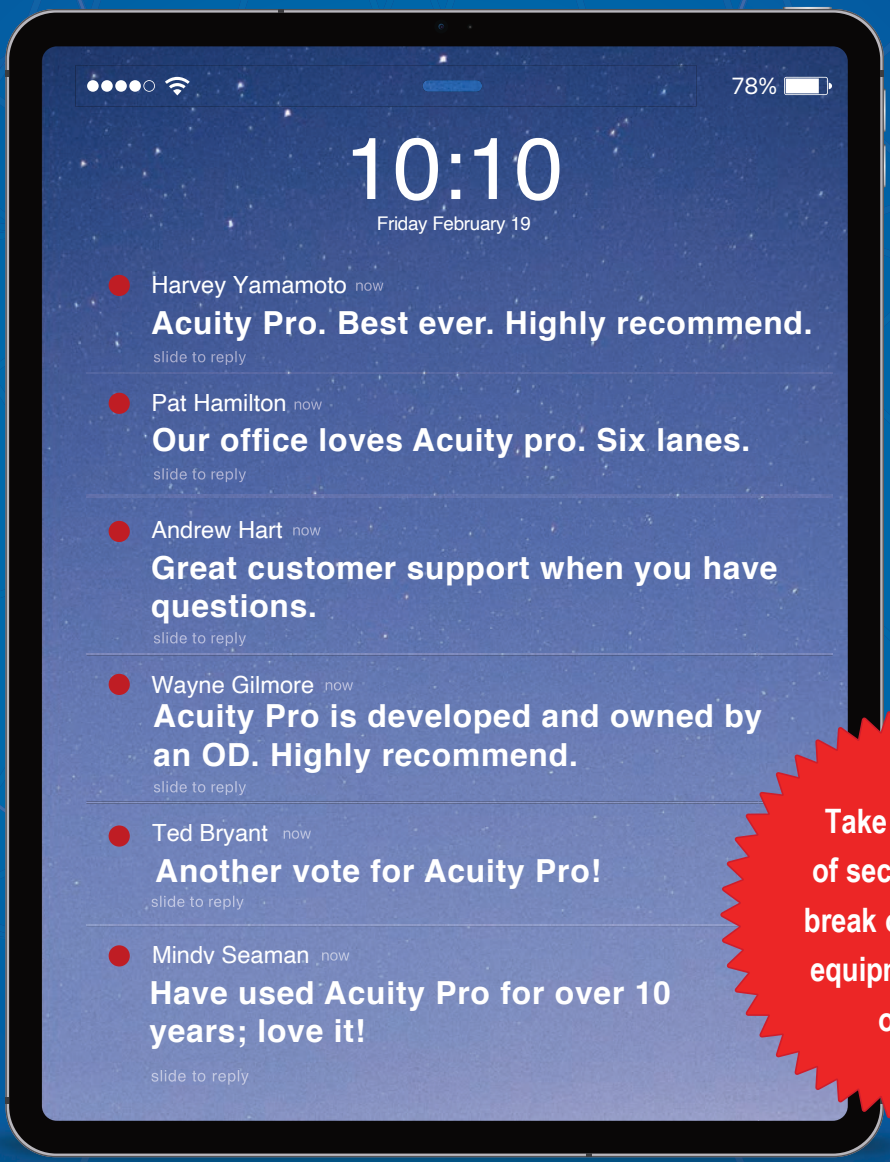

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In these cases, the staining pattern of fluorescein, which appears as bright green punctate lesions on the cornea, is evaluated and given a score. These dot-like, stained green lesions are known as punctate epithelial erosions (PEEs). The absence of PEEs is given a score of zero. If one to five PEEs are observed, it is scored as grade one, six through 30 is scored as two and greater than 30 is given a score of three. Location of the staining and confluent areas are also noted. This observation method using fluorescein and a grading scale aids in determining the severity of dry eye disease, as well as in monitoring the efficacy of treatment.[4]

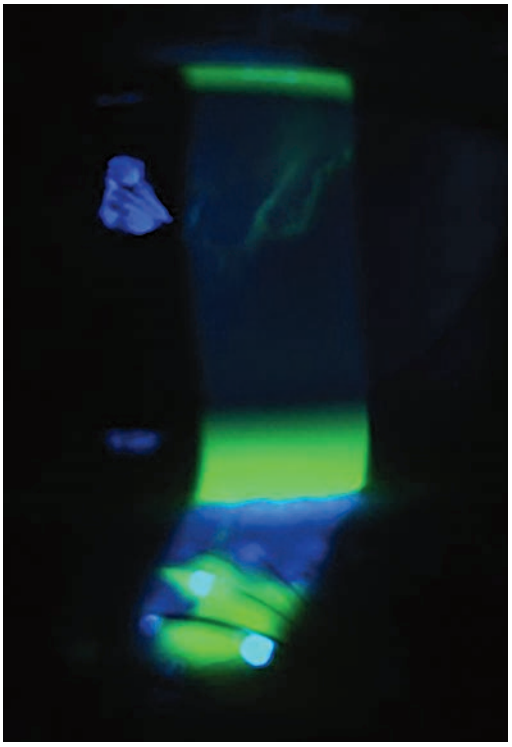
• ***Corneal abrasion.*** This is a routinely encountered condition, and its diagnosis is facilitated by the use of fluorescein dye. Since the dye stains between cells and any exposed areas of basement membrane, it is an easy way to identify epithelial defects of any size. The staining pattern may also provide information on the cause of the abrasion. For example, linear staining may indicate tracking from a foreign body.[5]

• ***Corneal ulcer.*** These are a common cause of permanent vision loss worldwide, requiring accurate and prompt diagnosis to preserve vision. The pattern of fluorescein staining is diagnostic, as it stains the overlying epithelial defect. The size of this defect in comparison to the size of the underlying infiltrate gives the practitioner information regarding the infectious nature of the condition, indicated by an equal one-to-one staining ratio.[5,6]

• ***Herpetic keratitis.*** Another type of infectious keratitis is that which occurs from herpes viruses. Though the precise diagnosis can be made using other ophthalmic dyes, such as rose bengal and lissamine green, the use of fluorescein can give a gross diagnosis of herpes keratitis. This is made through the pattern of staining, which has a characteristic branching, dendritic appearance.[5,7]

• ***Open globe.*** In the context of ocular injury, a necessary part of ocular examination is determining whether there is a defect in the globe. This is assessed through the Seidel test, which necessitates the use of fluorescein dye. The dye is instilled, and the cornea is observed under the usual cobalt blue light.

Under normal circumstances, the cornea displays a uniform, green appearance. In the case of a positive Seidel sign, aqueous percolates through the eye onto the corneal surface, streaming down like a waterfall due to gravity, thus diluting the fluorescein dye. This causes a dark linear stream in contrast to the bright green intact cornea. A positive Seidel test result means there is a full-thickness defect in the globe, which may otherwise be undetectable without the use of fluorescein.[8] A similar principle is also used to evaluate bleb integrity in surgical glaucoma cases.[9]



Superior central staining with fluorescein sodium dye, indicating a break in the corneal epithelium, viewed with a cobalt blue filter.

> **Fluorescein strips are a safe, readily available and cost-effective tool; as such, it is important to understand the dye's unique properties and capabilities to optimize diagnosis and treatment.**

• ***Contact lens evaluation.*** Fluorescein is an essential part of the fitting and evaluation of rigid or scleral contact lenses. Using this dye in conjunction with the lens gives the practitioner information regarding the fit, tear exchange dynamics and potential complications.[10]

Takeaways

The uses of topical fluorescein dye are numerous. It can even be combined with anesthetic for Goldmann applanation tonometry in measuring intraocular pressure. Fluorescein strips are a safe, readily available and cost-effective tool; as such, it is important to understand the dye's unique properties and capabilities to optimize diagnosis and treatment.[2] ■

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Safety First

An open globe can cause vision loss and intraocular infection, but preventing these injuries is completely possible when the proper precautions are taken.

BY KRISTEN WALTON, OD
OMAHA, NE

A 41-year-old white male welding student presented to the clinic for an emergency visit. He had been sharpening tungsten, a type of metal, in class that morning without wearing safety glasses when a fragment pierced his left eye. His vision was severely impacted, and he reported immense pain, which he described as a throbbing, aching sensation, and constant tearing.

The patient had type 2 diabetes, his medications and social history were not pertinent to the case and he had no known drug allergies.

Case

The patient's entering visual acuity was 20/150 with no improvement with pinhole in the left eye. Intraocular pressure was not evaluated. Upon slit lamp exam, a full-thickness corneal laceration was present nasally, extending from five to 10 o'clock with iris prolapse. Upon fundus exam, the posterior pole appeared normal with a limited view of the periphery. There were no signs of an obvious break, hole or tear.

The patient was diagnosed with an open globe secondary to a corneal laceration of the left eye, and urgent repair was recommended. The patient was informed that his visual prognosis would be guarded. Prednisolone acetate and moxifloxacin were initiated following surgery with instructions to take one drop of each eight times daily. The patient was to return to the clinic the following day.

At the one-day post-op exam, the patient presented with a visual acuity of 20/1250 with no improvement with pinhole in the left eye. Intraocular pressure was 12.3mm Hg. The corneal laceration was well apposed, with an overlying epithelial defect. Within the anterior chamber, a small hyphema was present and the pupil was dragged temporally with no apparent signs of entrapment within the wound.

At the two-week mark following globe repair, the patient's visual acuity was 20/300 with a stable intraocular pressure, and the epithelial defect had healed. Upon dilation of the left eye, the optic nerve appeared well perfused with no clinical retinal nerve fiber layer defects. No breaks, holes or tears were observed within the periphery of the retina. Moxifloxacin was discontinued, with prednisolone acetate decreased to one drop four times daily. The patient was scheduled for a follow-up exam in another two weeks.

Four weeks post-open globe repair, the patient was 20/250 with his left eye and pinholed to 20/100. All findings of the anterior and posterior segments were stable with a macular OCT demonstrating normal macular contour. Prednisolone acetate was to be tapered by one drop each week. A four- to six-week follow-up was scheduled to continue monitoring healing, and the patient was asked to return to the clinic sooner if he noticed any changes in his signs or symptoms.

Discussion

Open-globe injuries are not particularly common, occurring in up to five of 100,000 people per year.[1,2] Younger males between the ages of 10 and 30 tend to be the population most at risk.[1,2] Worksite hazards can increase the chances of an open globe injury.[2] The two most common mechanisms that lead to this type of injury include being struck by another individual or an object, followed by a sharp foreign body piercing the eye.[1]

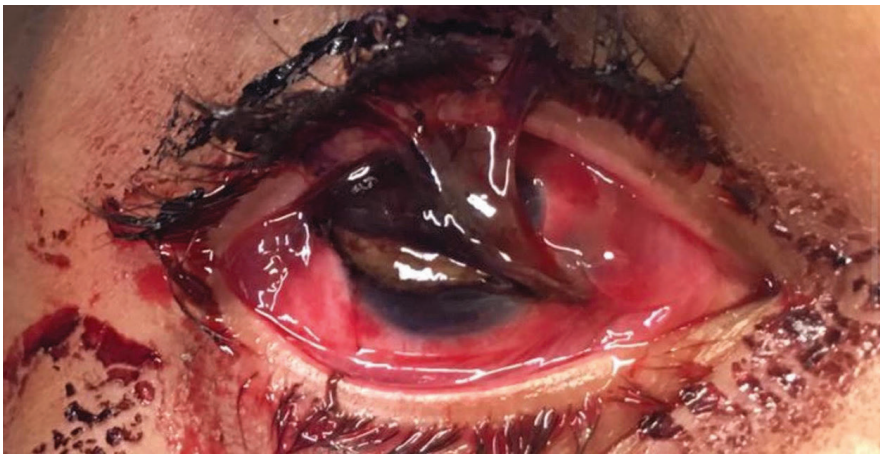

Photo: Brian Shafer, MD

A full-thickness corneal laceration with iris prolapse in a patient with a similar injury to the case described here.

About Dr. Mangan

Dr. Mangan is a board-certified consultative optometrist from Boulder, CO, with a focus on ocular disease and surgical comanagement, as well as a fellow of the American Academy of Optometry. He has recently accepted a position at Sun Pharma; however, the content of this article was created prior to that relationship and had no bearing on its development. Previously, he was an assistant professor in the department of ophthalmology at the University of Colorado School of Medicine.

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A FAREWELL FROM DR. MANGAN

How time flies. After a 30-year career in medical optometry, I finally get to take a few minutes to reflect on my time as an author and board member for *Review of Optometry*. It's hard to believe that it's coming to a close. What a pleasure it has been to collaborate with so many amazing professionals.

I'm honored to have served as a columnist for *Review* for six years. When we first discussed the topic of ocular urgencies and emergencies as a potential column idea, we felt that we might be able to find enough interesting cases to support such a column for maybe three years. I never imagined that the column would still be going strong all these years later, and I'm thrilled to announce that Alison Bozung, OD, a rising star from Bascom Palmer Eye Institute, will be taking over—and taking it to new heights.

There are so many people to thank: First, Editor-in-Chief Jack Persico. Thank you for giving me the opportunity to take on this very important topic for *Review*. Your support over the years is so appreciated. I couldn't have done it without you!

Second, the amazing editorial staff I have had the pleasure of working with for so many years. You are the true artists behind the scenes that make the articles and case presentations come to life!

Third, all of the amazing optometric physicians who have contributed to the column. You have made a tremendous impact in strengthening our ability to understand and manage ocular urgencies and emergencies as they present.

Lastly, and most importantly, *you*, my colleagues who have shown that this is a topic that still resonates. Thank you for being loyal readers of my column and *Review*.

Signing off,
Rich

Upon initial evaluation of these patients, a detailed history should be taken to figure out the nature of the incident and possible worker's compensation paperwork. It is good to know what type of object injured the eye, what speed it was traveling and what environment the patient was in at the time of injury.[2] The environment is essential to know to help predict the chances and nature of possible infection.[2] If the patient reports the involvement of a sharp object, a fast-moving object or blunt force trauma, this should raise immediate suspicion.[2]

In all emergent cases, it is vital to establish a baseline visual acuity to denote damage acquired and determine possible visual recovery.[2,3] With suspected open globes, the eye should be manipulated as little as possible with intraocular pressure measurement and eyelid eversion excluded from the work-up.[2,3] This precaution decreases the risk of any intraocular material being expelled from the eye.[2]

Pupils should be tested to discern any irregularities that may be present.[2,3] A peaked pupil is a strong indicator that the patient has undergone an open-globe injury due to the pupil being pulled toward the wound.[2] A comprehensive slit lamp examination should be performed to look for any remnants of the inflicting foreign body and potential lacerations or penetration sites.[2] If there is any question as to the depth of a wound, Seidel testing should be performed.[2,3]

The anterior chamber should be assessed for adequate depth, presence of hyphema, cells, flare or any vitreous material.[2] With ocular trauma, evaluating the integrity and positioning of the lens becomes important due to the possibility of dislocation.[2] With any possible ruptured globe, be sure to rule out hemorrhaging, retinal detachment and possible intraocular foreign bodies.[2] If an exam is not obtainable at the slit lamp, non-contrast computed tomography is the imaging of choice for open globe injuries, especially in the case of metallic foreign body involvement.[2,3]

When a patient needs to be referred for an open-globe repair, it is crucial to educate them not to eat or drink anything prior to anesthesia, to prevent a delay in care.[2,3] Placing a patch over the affected eye could be considered for protection prior to surgical intervention.[3] Positioning of the patient to avoid bending and lifting is important as well to limit intraocular pressure elevation.[2,3]

One of the most devastating complications that can result from an open globe, besides potential vision loss, is endophthalmitis.[2-4] Because the intraocular contents are exposed, the rate of endophthalmitis is around 6.8%.[2,4] Patients at a higher risk for developing this complication include those who delayed seeking care, who had a lens capsule rupture during the time of injury or who had a wound inflicted with an unsanitary foreign body.[3] Getting the wound repaired as soon as possible, preferably within 24 hours, and initiating prophylactic coverage with a broad-spectrum antibiotic is the best prevention.[2]

Following surgery, the patient should be advised to wear a protective shield while sleeping.[2] Restrictions post-globe repair typically include limiting excessive movement such as exercise and extensive lifting, along with no swimming.[2] These restrictions are put in place to prevent wound dehiscence and to decrease the chance of infection.[2] The best preventative advice to offer is that proper eyewear protection is of the utmost importance to guard the precious gift of sight. ■

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ABOUT THE AUTHOR

Dr. Walton graduated with honors from the Indiana University School of Optometry. She completed her residency at Vance Thompson Vision in Sioux Falls, SD, managing ocular disease, refractive cases and pre- and post-op ocular surgery. She currently works at Vance Thompson Vision in Omaha, NE. She has no financial interests to disclose.

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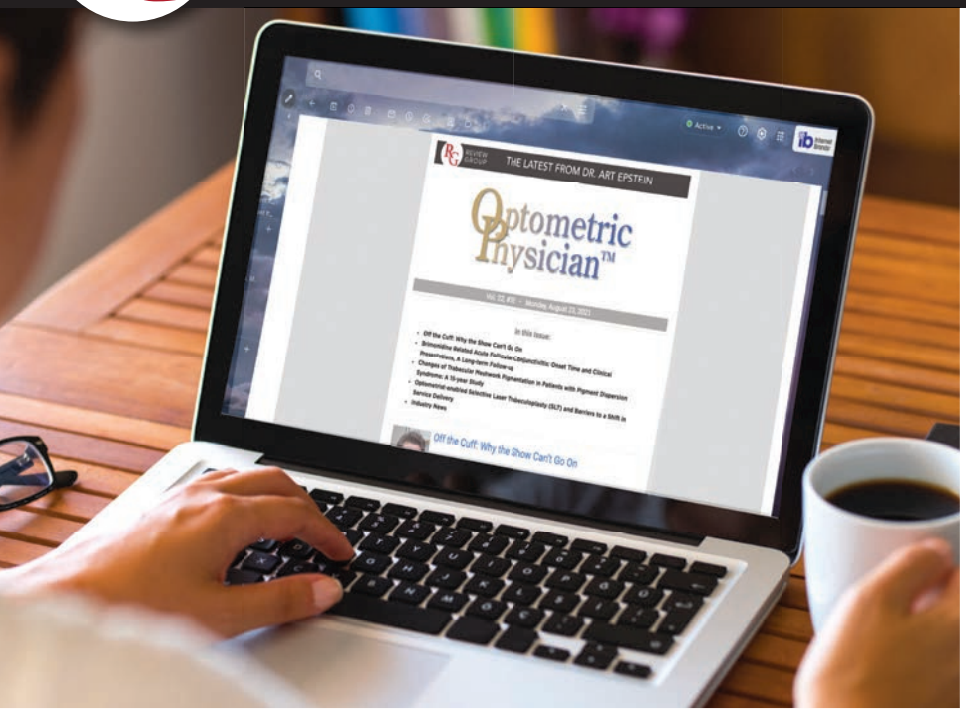

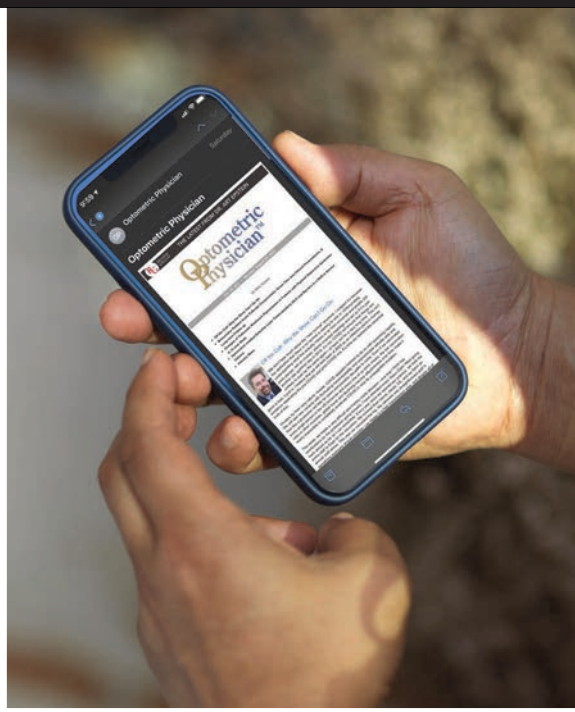

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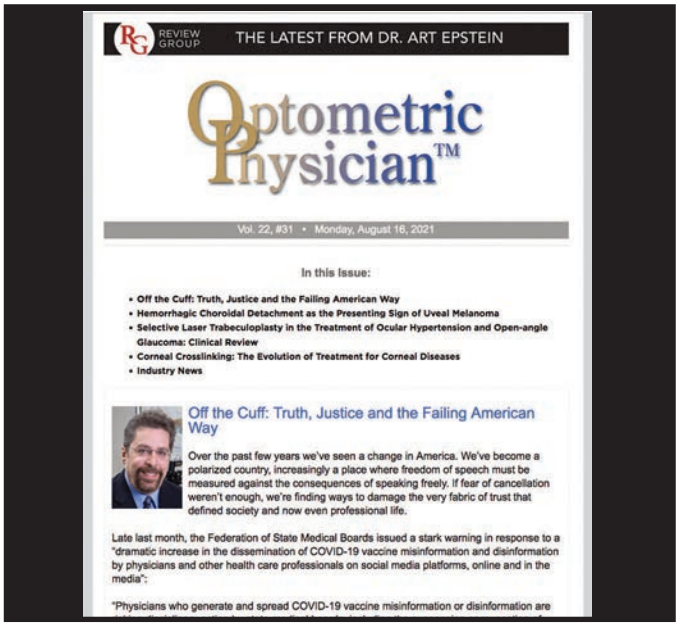

REVIEW GROUP THE LATEST FROM DR. ART EPSTEIN

Optometric Physician™

Vol. 22, #31 • Monday, August 16, 2021

In this Issue:

- Off the Cuff: Truth, Justice and the Failing American Way
- Hemorrhagic Choroidal Detachment as the Presenting Sign of Uveal Melanoma
- Selective Laser Trabeculoplasty in the Treatment of Ocular Hypertension and Open-angle Glaucoma: Clinical Review
- Corneal Crosslinking: The Evolution of Treatment for Corneal Diseases
- Industry News

Off the Cuff: Truth, Justice and the Failing American Way

Over the past few years we've seen a change in America. We've become a polarized country, increasingly a place where freedom of speech must be measured against the consequences of speaking freely. If fear of cancellation weren't enough, we're finding ways to damage the very fabric of trust that defined society and now even professional life.

Late last month, the Federation of State Medical Boards issued a stark warning in response to a "dramatic increase in the dissemination of COVID-19 vaccine misinformation and disinformation by physicians and other health care professionals on social media platforms, online and in the media":

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BY MARK DUNBAR, OD

RETINA QUIZ

A Closer Look

A surprising discovery led to this diagnosis.

A 49-year-old Hispanic male first presented with complaints of blurred vision in his left eye during a telemedicine exam. He also reported a few months earlier seeing "broken glass," or what looked like colored crystals, in his vision in the same eye, which was accompanied by tingling on the left side of his body.

Nothing was seen during the exam but, given his symptoms and history of blurred vision, it was recommended that he come in for an in-person visit the following week, where he underwent a comprehensive eye exam and reaffirmed he thought vision in his left eye was slightly blurry.

His medical history was significant for hypertension and high blood sugar but reported that he is on a vegan diet and lost over 20 pounds. His blood pressure is under control and he takes lisinopril.

Upon exam, his uncorrected distance visual acuities measured 20/20 in each eye. Confrontation visual fields were full to careful counting OU. His pupils were equally round and reactive to light; there was no afferent pupillary defect. His extraocular motility was full and cover test was ortho at distance. His anterior segments and intraocular pressures were unremarkable.

On dilated fundus exam, the vitreous in both eyes was clear. He had small cups with good rim coloration and perfusion in each eye. The fundus exam findings of the right eye were completely normal. In the left eye, there were obvious changes of note (*Figure 1*). Fundus photos, OCT and OCT-A were obtained of the macula and peripheral retina.

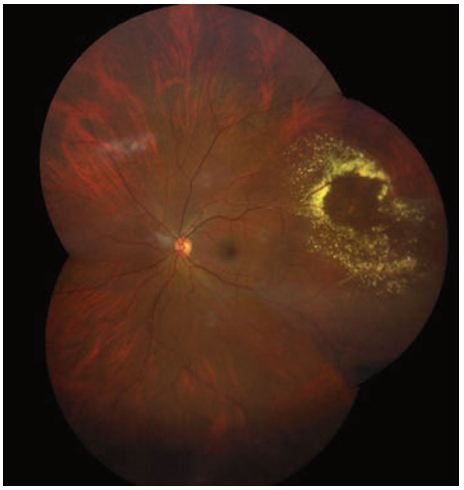

Fig. 1. A widfield fundus image of the retina in the patient. What is the diagnosis?

Take the Retina Quiz

1. What is the most likely diagnosis?

a. Congenital retinal telangiectasis, Type 1.
b. Peripheral choroidal neovascularization.
c. Coats disease.
d. Retinal arterial microaneurysm (RAM).

2. How should this patient be managed?

a. Observation.
b. Focal laser.
c. Anti-VEGF injection.
d. Either B or C.

3. What is the most common underlying condition?

a. Congenital vascular incompetency.
b. Diabetes.
c. Hypertension
d. Hyperlipidemia.

4. Which statement is most accurate for this condition?

a. Mainly develops from dysfunction within the superficial capillary network.
b. Develops from dysfunction with the venous system.
c. Develops from dysfunction of the arterial system.
d. Develops subretinally from increased VEGF expression.

5. Which patient is more likely to develop this condition?

a. Young males.
b. Young females.
c. Middle-aged males.
d. Elderly females.

For answers, see page 114.

Diagnosis

It was a surprise to discover a large area of circinate exudate superotemporally in the left eye of this patient. Within the center of the exudate, there is a yellow-white oval lesion that involves one of the branches of either the central retinal vein or central retinal artery, but which is it? At initial inspection, it looks like the central lesion is from one of the retinal veins, as there is significant sheathing of the veins above and below the lesion. But if you look more closely and follow the lesion back, it actually involves one of the branches of a retinal artery. Indeed, this is a retinal arterial microaneurysm (RAM).

Discussion

RAM represents a focal aneurysmal dilatation of one of the branches of the central retinal artery and usually occurs within the first three bifurcations of

About Dr. Dunbar **Dr. Dunbar** is the director of optometric services and optometry residency supervisor at the Bascom Palmer Eye Institute at the University of Miami. He is a founding member of the Optometric Glaucoma Society and the Optometric Retina Society. Dr. Dunbar is a consultant for Carl Zeiss Meditec, Allergan, Regeneron and Genentech.

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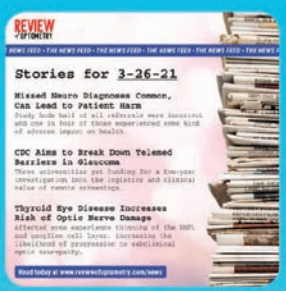

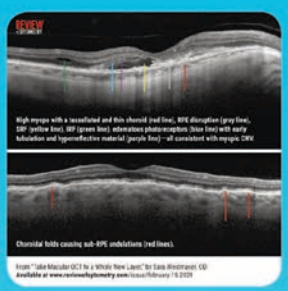

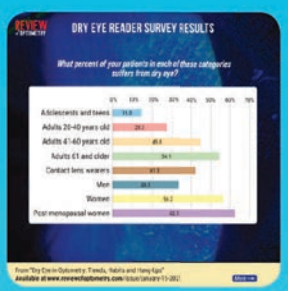

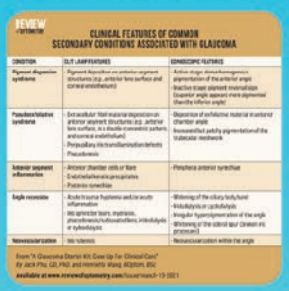

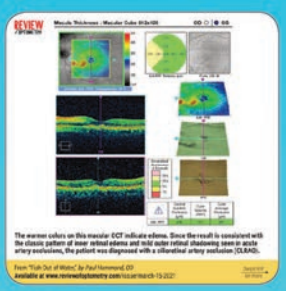

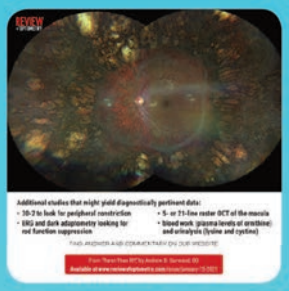

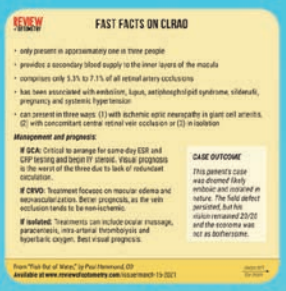

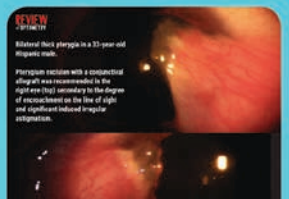

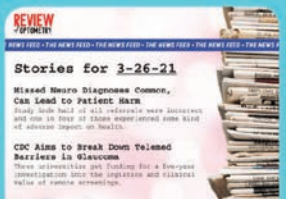

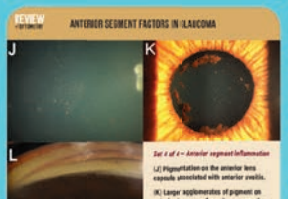

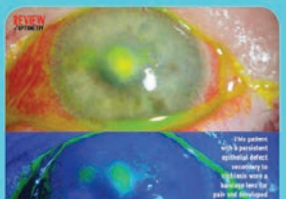

the arterial system or at an arteriovenous crossing. It most commonly takes place in the superotemporal quadrant, as was seen in our patient. RAM has a predilection for elderly hypertensive females, but also occurs in males, as also was seen in our patient. It is typically seen as a single isolated finding, but multiple RAMs can be seen in about 20% of patients.[1]

The pathophysiology of RAM is not well understood, but the underlying theme is hypertension and atherosclerotic disease. With aging, there is atrophy of the muscularis layers of the arteries that leads to thinning, fibrosis and loss of elasticity within the artery. With chronic hypertension, there is an increase in luminal pressure within the walls of the arteries that can lead to an increased susceptibility for these aneurysmal dilations.[2] It's also postulated that damage can occur in the endothelium of the arteries from emboli, which can weaken the vessel walls and be more susceptible to aneurysm formation.[3]

RAM generally takes on three forms: quiescent, hemorrhagic and exudative.[4] The quiescent RAM is found during a routine exam in which an aneurysmal dilation of the retinal artery is discovered without any exudation and hemorrhage. It rarely causes any visual dysfunction and can be monitored without treatment.

In the hemorrhagic form, RAM has ruptured and there can be multilayered hemorrhaging that involves the intraretinal and subretinal space, but can also be in the vitreous as well as preretinal and/or intraretinal layers. This is due to the fact that arteries are high-flow vessels, and when one ruptures, it does so under significant pressure, which can push blood into multiple layers of the retina. If there is extensive hemorrhage, a RAM diagnosis may be difficult to establish if the hemorrhage obscures the RAM. In these instances, imaging becomes important in helping to make a definitive diagnosis.

In the exudative form, a circinate pattern of exudate may surround the lesion, as seen with our patient. With the accumulation of exudate, intraretinal edema can occur. Depending on the location of the fluid, vision loss may also occur if it involves the macula.

Our patient had extensive circinate exudate and it was clear there was retinal thickening and intraretinal fluid, but because it was in the peripheral retina, the fluid had not moved posteriorly and the macula and vision were not affected.

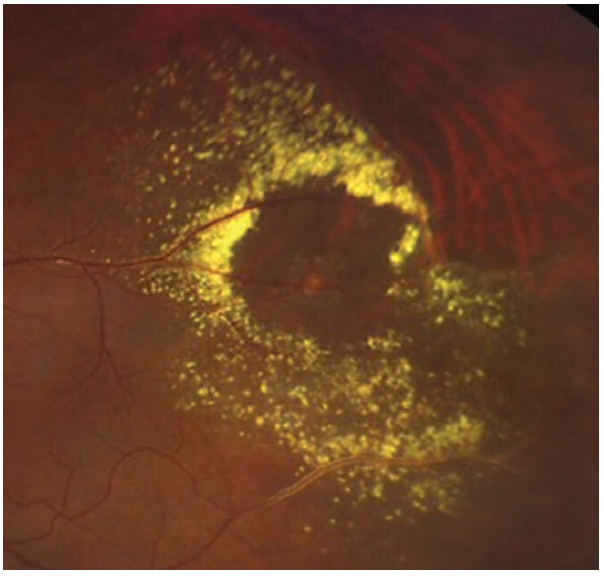

Fig. 2. Take a closer look at the area of interest. Which blood supply is most affected?

Testing and Treatment

Ancillary testing can be helpful in establishing a diagnosis of RAM. Widefield fluorescein angiography will show early hyperfluorescence of the aneurysmal dilation as it fills up uniformly in the early phase of the angiogram, making this the preferred diagnostic test of choice. There may be areas of blocked fluorescence if overlying blood is obscuring the RAM. We did not perform widefield angiography in our patient as was felt the diagnosis was easily made based on our clinical exam. We tried to obtain OCT-A but were not able to get good scans of the RAM. An OCT of the macula was performed as a baseline and to establish the absence of macular involvement.

The natural history of RAM is spontaneous involution of the aneurysmal dilation. Therefore, peripheral lesions that do not involve or threaten the macula can be observed at one- to three-month intervals.

In instances where vision is affected, either because of macular edema or vitreous hemorrhage, treatment is recommended. Argon laser photocoagulation can be applied directly to the RAM, but care must be taken to avoid rupture. The laser is applied with low power, long burn duration and a large spot size.[2] Indirect laser can also be used with the hope of reducing the oxygen consumption and blood flow to the RAM, which in turn would lower the amount of exudation from the RAM to the surrounding retina.

Finally, anti-VEGF injections can be used when macular edema is present in a similar fashion to injections that are routinely performed for other causes of macular edema. In the setting of a vitreous hemorrhage, pars plana vitrectomy may be indicated.

Fortunately, visual function was not affected in this patient. It is difficult to correlate his original symptoms of seeing broken glass or colored crystals two months earlier with the RAM, but it can't be just a coincidence. During a follow-up a few months later, his vision still remained 20/20, but there was even more exudation and retinal edema in the same location. For that reason, he was advised to see a retina subspecialist on the next follow-up visit in two to three months. ■

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▶ CONTACT LENS FITTING

New Contact Lens Offers Simpler, Safer Insertion

A silicone hydrogel contact lens, recently launched from Menicon, aims to improve the experience of lens handling. The Miru 1day UpSide is packaged with the convex front surface facing forward to eliminate contact with the back surface, removing a potential source of infection from fingertip exposure, a press release explains. In the blister pack, the lens rests on a small bump that allows the wearer to more easily grasp it with a pinching motion, a concept Menicon calls "Smart Touch." The Miru 1day Flat Pack uses a similar idea.

The lens is made of midafilcon A material with 56% water content, 91 Dk/t and a low modulus (0.36), which the company says gives it the softness of a hydrogel lens but the handling properties of SiHy. A plasma surface treatment (which the company calls "Nano-Gloss") resists adhesion of debris and reduces friction with the ocular surface, Menicon says. Miru 1day UpSide is available now in half-diopter steps from -13.00D to -6.00D and quarter-diopter steps from -6.00D to +6.00D. The company says it will add a multifocal version in the first half of 2022.

ESP Adds Option to Fit Specialty Lenses

If your practice has an Eye Surface Profiler (ESP) from Eaglet Eye, you may now have the option of fitting certain scleral or ortho-K lenses for patients more easily, following the company's recent addition of three specialty lens algorithms.

The additional scleral designs include the AccuLens Maxim 3D and BostonSight Scleral Smart360. The ortho-K design (the first offered for the ESP) is for CooperVision's Paragon CRT. These three new designs bring the total number of available algorithms on the ESP to 40 across 20 labs, according to a company press release. Eaglet Eye says that the new algorithms will improve doctors' ability to fit complicated eyes, helping to reach more patients in need of specialty lenses.

▶ DIAGNOSTIC TECHNOLOGY

Ultra-widefield Lens for iCare Eidon Camera

Fundus photography does a great job of documenting retinal concerns and establishing a baseline status for future comparison, but most cameras prioritize the posterior pole at the expense of the periphery. To help practices that have an iCare Eidon fundus camera, an ultra-widefield lens was just added to the available retinal imaging modalities.

By capturing 120° images in a single shot or up to 200° in panoramic ("mosaic") mode and outperforming a standard field lens, this module can provide critical diagnostic information about the retinal periphery, a press release explains.

The module features what the company calls "TrueColor Confocal Technology," which allows for sharp image quality capable of detecting small details and signs of pathologies from the center to the periphery of the retina, according to the company. iCare says that the module can be retrofitted to most Eidon fundus imaging systems.

As some early signs of retinal problems can appear first on the periphery, using technology such as ultra-widefield imaging to observe this region can help you detect potential threats to a patient's eye health or vision, iCare says.

Three VR Vision Tests Added to Heru Headset

Following the August launch of Heru's virtual reality-based platform for visual field testing, the company just released a software update that includes three additional testing modalities: color vision, contrast sensitivity and dark adaptation. Plus, all the tests fall under CPT codes and are billable to insurance, according to the company.

Two color vision tests are now offered to screen patients for color blindness—the Ishihara and the Farnsworth D-15—the second of which will begin automatically if patients fail the first, says Heru.

The new contrast sensitivity exam can be done in natural lighting, so you don't have to bother dimming the room for every patient, Heru said in a press release. This kind of test is particularly useful for screening or monitoring patients with age-related macular degeneration (AMD), Heru says, as it helps track subtle and slow-changing effects of diminishing vision.

The third test added to the platform measures dark adaptation, which may also aid in early detection of AMD.

By having the option to screen every patient who walks

into your office for ocular diseases such as AMD, more cases can be detected and treated sooner, the company suggests.

▶ LOW VISION

Lighter and Sleeker Solution for Low Vision

Heavy and cumbersome low vision headsets weighed down by smartphones impose a burden on patients that can undermine their motivation to use them regularly. A new low vision wearable from IrisVision, called Inspire, allows the phone to remain in the wearer's pocket rather than housed inside the headset, reducing its weight to half that of the company's previous model, a press release explains.

The device captures real-world images and remaps them in real time to functional areas of the patient's retina, the company says. Software allows for improved visualization during distance, intermediate and near tasks and offers autofocus and a 70° field of view with up to 14x magnification, according to IrisVision.

The company website also mentions that Inspire comes with unlimited cellular data connectivity and includes a hands-free voice control function to give commands such as "reading mode," "reduce brightness" or "zoom in." The headset features a padded eye guard that can be used for full light blocking or removed for wearers who want a sleeker profile.

The IrisVision Inspire may offer a more patient-friendly solution to those with low vision, the company suggests.

Video Magnifier for Patients with Vision Loss

A new portable device aims to simplify the lives of people with vision loss due to macular degeneration or other eye diseases by improving their ability to read, write and perform hands-free tasks, the manufacturer says. The Smartlux Digital features an HD camera, a five-inch display and a variety of settings to accommodate individual user preferences, a press release explains.

Smartlux has four color-coded buttons below the screen that control its main functions. One of these is a menu button where users can adjust settings such as LED brightness, viewing modes (including 14 color contrast modes), magnification type (step or continuous) and orientation of the underline. Built into the device is a stand that allows it to be used in three different ways: fully retracted for hand-held use, fully extended for placing on reading material and partially extended for writing under the display. A refresh rate of 50 frames per second provides a clear image even when the device is in motion, according to the press release.

The video magnifier has 8GB of internal storage can be connected to an external screen or computer for image upload via an HDMI or USB cable. The company notes that the Smartlux comes with a removable handle and a bumper for drop protection, as well as a zippered case, charger, cleaning cloth and lanyard.

▶ DRY EYE MANAGEMENT

A New Route to Relief

Applying topical eye drops has long been a mainstay of treating dry eye disease (DED), but patient noncompliance and the potential for ocular irritation can dampen enthusiasm for such a regimen. An alternative approach—nasal stimulation of the trigeminal parasympathetic pathway—has been tried before with mechanical devices and now is possible with a pharmaceutical agent, varenicline solution 0.03mg (Tyrvaya) from new company Oyster Point Pharma, recently approved by the FDA.

Tyrvaya, a cholinergic agonist, triggers basal tear production, the company explains. After four weeks of BID administration, about half of patients using the treatment demonstrated a 10mm or greater improvement in Schirmer's scores, according to a company press release. Patient-reported assessment of symptoms on a 1-100 scale also improved, the release says, as treatment reduced the mean score from 59 to about 40, an effect superior to the control group. The most common patient complaint was sneezing, reported in 82% of study participants.

The aqueous spray will be packaged in a carton containing two multidose bottles, each with enough medication for 15 days, and will be available by prescription beginning in November, Oyster Point says.

Brush, Gel for at-home Lid Care

You likely instruct your patients with dry eye disease or meibomian gland dysfunction to clean their eyelids regularly at home to help minimize discomfort and control symptoms. But, as always, compliance is an issue. A new brush and cleanser system from Danelli Ocular Creations aims to help more blepharitis and dry eye patients stay on top of their lid hygiene between office visits. The company says that its first products, the MyboClean eyelid brush and cleansing gel, are easy to use and suitable for those with sensitive skin.

The cleansing brush is made from silicone and features a contoured design, making it easier to grip and maneuver, Danelli suggests. The tapered bristles help remove lid margin scurf and lash collarettes associated with blepharitis, a company press release explains. The brushes will come in a package of four and are made to be replaced quarterly.

The cleansing gel features organic ingredients (*e.g.*, manuka honey, coconut oil, aloe vera, sea salt) with anti-inflammatory and moisturizing properties, the press release states. The solution goes onto the brush as a gel but forms into a foam once massaged onto the eyelid. Clinical trials for this new system are ongoing.

▶ PRESCRIBING INFORMATION

Search Over 2,000 Meds Online

Apple's pitch for the iPod was "1,000 songs in your pocket," a revolutionary idea at the time. Now, eyecare providers with a smartphone can have 2,000 drugs in their pocket, thanks to a new website called EyeDock/Meds. The free resource offers detailed information on over 2,000 prescription and OTC FDA-approved ophthalmic drugs, including select oral medications, a press release announced.

EyeDock/Meds features a search tool with filters for name, active ingredient, category, company, method of action, Rx/OTC, brand/generic, form (*e.g.*, suspension, solution, gel, ung) and preserved/non-preserved. There's also an alphabetical category list where you can choose to view only certain groups of medications (*e.g.*, allergy, antibiotic, glaucoma). After finding the drug you want, the website provides product details such as its active and inactive ingredients, packaging options, usage, dosage and administration, as well as any relevant disclaimers from the FDA.

The online database is designed for easy navigation on both desktops and mobile devices, making it accessible from anywhere at any time, according to its developers. ■

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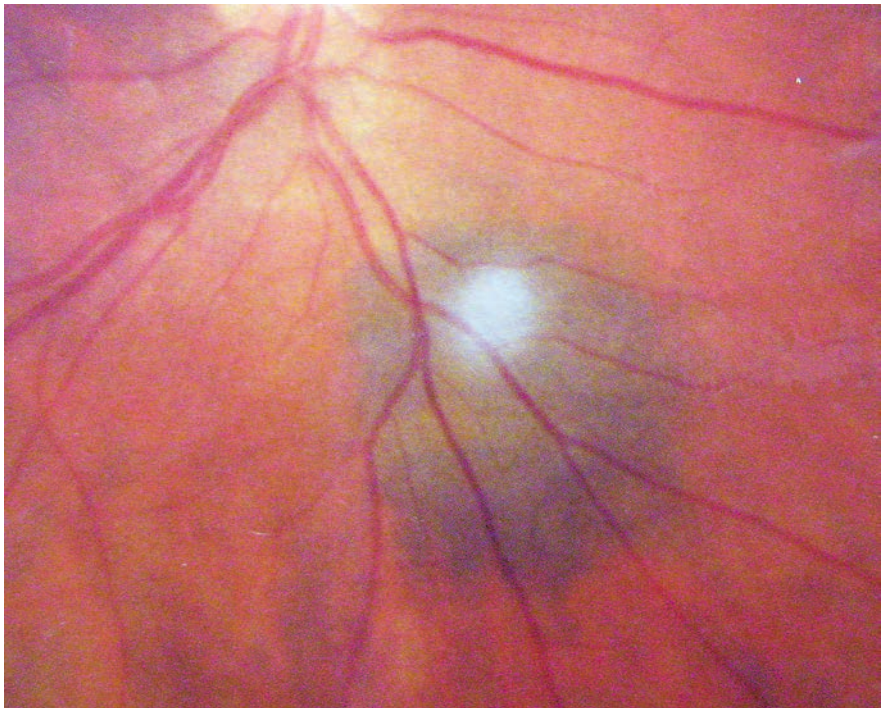
BY ANDREW S. GURWOOD, OD

DIAGNOSTIC QUIZ

A Spot of Trouble

No one wants to see a dark patch in the posterior segment. What factors in this case might help you weigh its significance?

A 45-year-old female reported to the office for a six-month posterior segment follow up without complaints. Her acuity was good, there was no history of glaucoma or blunt trauma, she was neither diabetic nor hypertensive and reported no allergies of any kind. She had an ocular history of a posterior segment finding requiring monitoring (seen in the photograph below).



What do these findings suggest about the patient? How would you approach management?

Diagnostic Data

The patient's best-corrected visual acuities were 20/20 at distance and near in each eye. Her external examination was normal and there was no afferent pupillary defect. Her confrontation fields were full. Refraction demonstrated negligible changes. Biomicroscopy examination found normal anterior segment structures with open angles (by Van Herick technique) and normal applanation pressures of 16mm Hg OU. The only concern was the posterior segment finding.

Additional studies included OCT to further investigate the status of the retinal and subretinal tissues and their relationship to Bruch's membrane and the retinal pigment epithelium (RPE), and OCT angiography (OCT-A) to examine the subretinal/choroidal tissues for choroidal neovascular membrane formation. In addition to the above, a sodium fluorescein angiogram may also be indicated in this case to rule out vascular support, and fundus autofluorescence could be considered to identify the presence or absence of drusen.

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. ■

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.

Retina Quiz Answers (from page 104)—Q1: d, Q2: a, Q3: c, Q4: c, Q5: d

NEXT MONTH IN THE MAG

In December, we present a series on surgical comanagement for the optometrist. Articles will include:

- What to Tell Patients About Refractive Surgery
- Post-op Cataract Care Step-by-Step
- A Look at the Newest IOLs in Action

Also in this issue:

- The Perils of Plaquenil in Practice: How to Be Prepared
- Annual Income Survey: Is Pandemic Pain Behind Us?
- 2022 Conference Planner: Your Essential Guide to CE Events

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