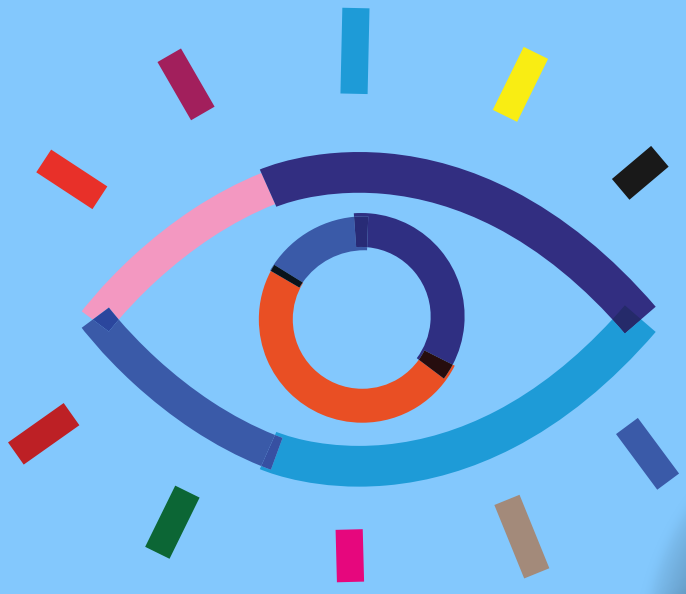

BRIAN SHAFER, MD
- Founder and CEO, Shafer Vision Institute, Plymouth Meeting, Pennsylvania
- brian.shafer@shafervision.com; www.shafervisisioninstitute.com
- Financial disclosure: Consultant and speakers bureau (Alcon, Allergan/AbbVie)

EARLY Surgical Intervention FOR GLAUCOMA

Examining the impact of interventional glaucoma strategies to mitigate the corneal toxicity caused by traditional glaucoma drops.

By Brian Shafer, MD

Glaucoma is a chronic optic neuropathy and the principal cause globally of irreversible blindness. Disease management focuses on decreasing IOP. Topical medical therapy is the traditional first-line treatment. The long-term use of these eye drops, however, can negatively affect the ocular surface.[1] As the options for glaucoma management expand, a reassessment of treatment protocols is in order.

TOPICAL GLAUCOMA THERAPY AND OCULAR SURFACE DISEASE

The prolonged use of topical glaucoma medications can trigger ocular surface disease (OSD). Manifestations range from ocular discomfort and dry eyes to superficial punctate keratitis (SPK) and eyelid inflammation.[2] The incidence of OSD among patients on glaucoma medications has been as high as 59% in some studies.[3]

Many topical glaucoma medications contain preservatives that have been linked to the development of OSD. Benzalkonium chloride, for example, can cause a decrease in goblet cell density and damage the corneal epithelium, leading to SPK. The damage to the corneal surface can cause symptoms such as dryness, grittiness, and blurred vision. Additionally, long-term exposure to drops preserved with benzalkonium chloride can lead to decreased corneal sensitivity, epithelial cell loss, and changes in the tear film—ultimately affecting patients' vision and quality of life.

Several classes of glaucoma medication can cause corneal toxicity directly. Rho kinase inhibitors such as netarsudil have been associated with corneal verticillata, a condition in which whorl-like opacities develop on the cornea. The underlying mechanism for this phenomenon is not completely understood, but the drug's effect on cellular metabolism and keratinization processes is believed to be the cause.[4]

CATARACT SURGERY AND OSD

If not adequately treated, preoperative OSD can lead to suboptimal results and patient dissatisfaction after cataract surgery. Conditions such as dry eye disease, blepharitis, meibomian gland dysfunction, and SPK compromise the integrity of the ocular surface. They can also reduce the accuracy of biometry and keratometry readings, negatively affecting IOL power calculations and increasing the risk of a refractive surprise.

In the postoperative period, patients with OSD may experience increased ocular discomfort, prolonged healing times, and poor visual quality, and they may be less satisfied overall with their surgical outcome. It is important to identify and manage OSD preoperatively to optimize surgical results.

INTERVENTIONAL GLAUCOMA

Interventional glaucoma aims to minimize the drop burden for patients and thereby enhance their long-term outcomes. The approach typically encompasses laser treatment, surgery, and innovative drug delivery systems to lower IOP.

How to talk with patients. Some patients may interpret interventional glaucoma as a more aggressive approach to treatment than topical therapy. Describing the intervention(s) in an honest yet reassuring way can significantly affect patient perception and compliance.

An initial explanation to a new glaucoma patient might go something like the following: "Glaucoma is a disease of high pressure in your eye that causes damage to the optic nerve, potentially leading to vision loss. Our aim is to lower your eye pressure to prevent further damage. We can do this by putting medicine on or in your eye, doing a small or big laser treatment, or doing a small or big surgery. My preference is to reduce your reliance on eye drops, preserving your ocular health for the long term. To achieve this, I'd like to start with Durysta (bimatoprost implant, Allergan), a medicine we place in your eye, or a minor laser procedure known as selective laser trabeculoplasty or SLT."

Words matter. If patients perceive the suggested intervention as a potential threat, they may resist and opt for conventional eye drops. If

> **The prolonged use of topical glaucoma medications can trigger OSD. Manifestations range from ocular discomfort and dry eyes to SPK and eyelid inflammation. The incidence of OSD among patients on glaucoma medications has been as high as 59% in some studies."**

the intervention is presented in a nonthreatening manner, patients are more likely to comprehend and accept the proposed treatment. "We're going to put a needle in your eye to deposit the medication," may be rephrased as "we're going to put medicine in your eye." SLT can be described as a noninvasive laser procedure that is efficacious and requires minimal recovery time. This explanation is reassuring to patients.

Expanding options. The FDA accepted a new drug application for iDose TR (travoprost intraocular implant, Glaukos) in May. The microinvasive intraocular implant is placed in the trabecular meshwork and designed to deliver therapeutic levels of a proprietary formulation of travoprost for an extended time. FDA approval of the implant would allow medication to be delivered directly into the eye instead of requiring it to pass through the corneal epithelium. This would be a major leap forward in drug delivery and interventional glaucoma.

In addition to laser therapy and drug delivery, patients' eye drop burden can be minimized by combining cataract surgery with MIGS. The choice of procedure is dictated in part by glaucoma severity. I tend to select MIGS procedures based on the number of topical glaucoma drops in a patient's preoperative drug regimen. When a patient is administering only one glaucoma medication, I generally combine cataract surgery with the placement of a stent that bypasses the trabecular meshwork. If a patient's preoperative drug regimen consists of more than one drop, I often add canaloplasty and trabeculotomy. For someone with severe, uncontrolled disease, I combine cataract surgery with a subconjunctival procedure such as trabeculectomy or the placement of a Xen Gel Stent (Allergan/AbbVie) or glaucoma drainage device.

Complications. There is a risk whenever an incision is made or energy is instilled in the eye. The risk of treatment must be weighed against its potential benefits. The cost of each intervention also requires consideration.

Innovation is expensive. Physicians must evaluate whether a therapy is simply interesting or a meaningful step forward. As the armamentarium for interventional glaucoma expands, each new product should be safe, efficacious, and cost-effective.

CONCLUSION

In the past, glaucoma was thought to be controlled if disease progression halted. Is stable glaucoma in the presence of a bright red eye, epiphora, and photophobia acceptable? Topical glaucoma therapy can be effective, but it is not benign. Physicians who adopt an interventional glaucoma mindset seek to minimize the burden of glaucoma treatment and maximize patient satisfaction. ■

1. Baudouin C, Labbé A, Liang H, Pauly A, Brignole-Baudouin F. Preservatives in eyedrops: the good, the bad and the ugly. *Prog Retin Eye Res*. 2010;29(4):312-334.
2. Leung EW, Medeiros FA, Weinreb RN. Prevalence of ocular surface disease in glaucoma patients. *J Glaucoma*. 2008;17(5):350-355.
3. Fechtner RD, Godfrey DG, Budenz D, Stewart JA, Stewart WC, Jasek MC. Prevalence of ocular surface complaints in patients with glaucoma using topical intraocular pressure-lowering medications. *Cornea*. 2010;29(6):618-621.
4. Wisely CE, Liu KC, Gupta D, Carlson AN, Asrani SG, Kim T. Reticular bullous epithelial edema in corneas treated with netarsudil: a case series. *Am J Ophthalmol*. 2020;217:20-26.