Glaucoma and ocular surface disease (OSD) often coexist in the elderly population, and both represent a spectrum of diseases, ranging from mild to severe stages. OSD in glaucoma patients is generally underdiagnosed and undertreated. Although treatment of glaucoma with various modalities takes precedence over ocular surface considerations, recognition and effective management of OSD may improve compliance with medical therapy, optimize surgical outcomes, and improve patients’ overall quality of life. In this article, Laura A. Voicu, MD, reviews diagnostic and therapeutic strategies for managing OSD in patients with glaucoma.

OSD AND GLAUCOMA SURGERY

When patients with glaucoma require surgery, outcomes may be affected by preexisting OSD, and OSD can become more severe after surgery because of multiple factors.

A proactive, methodical approach to managing OSD is therefore particularly important.

MIGS procedures are now frequently combined with cataract surgery, making the pretreatment of existing OSD an important consideration for refractive accuracy. Moreover, OSD has been associated with infection after glaucoma surgery and with ocular surface complications such as the formation of dellen after trabeculectomy. Failure of bleb-based glaucoma procedures has been associated with exposure to glaucoma drops containing the preservative benzalkonium chloride (BAK).

EVALUATING THE OCULAR SURFACE

When evaluating OSD in glaucoma patients, point-of-care testing can be a helpful adjunct to the measurement

AT A GLANCE

- As many as 50% of patients with glaucoma report symptoms of ocular surface disease (OSD).
- Surgical outcomes in patients with glaucoma may be affected by preexisting OSD, and OSD can become more severe after surgery.
- Management of OSD exacerbation after glaucoma surgery may include punctal occlusion, the use of preservative-free tears, reduction of exposure to benzalkonium chloride, and avoidance of repeated exposure to antimetabolites.
of tear breakup time and a careful slit-lamp examination. Elevated levels of tear osmolarity and of matrix metalloproteinase 9 in the tears have each been linked to topical glaucoma medications. Matrix metalloproteinase 9 levels can be evaluated with the InFlammaDry (Quidel) point-of-care test, and osmolarity can be measured with the TearLab Osmolarity System (TearLab).

It is particularly important to identify certain ocular surface staining patterns, including those consistent with the following conditions:
- medicamentosa (keratopathy often associated with follicular response);
- allergy (often with papillary conjunctivitis);
- whorled keratopathy;
- replacement of corneal epithelium with conjunctival epithelial cells due to limbal stem cell deficiency; and
- disruptions in tear film circulation or dellen formation related to surgery.

The eyelid margins should be examined for signs of meibomian gland dysfunction (MGD). Periorbital dermatitis and pruritus often indicate allergy.

### Reducing Toxicity on the Ocular Surface

Glaucoma medications containing preservatives can have a significant impact on OSD, with effects ranging from mild dry eye to pseudopemphigoid. Recognizing a link between OSD and glaucoma medications can be difficult because toxicity or allergy may develop weeks to months after the initiation of a medication. Therefore, clinicians should maintain a low threshold for suspicion of medication toxicity.

Glaucoma medications containing BAK in particular have been associated with the presence of proinflammatory cytokines, apoptosis, oxidative stress, and direct interactions with the lipid components of the tear film. Confocal microscopy has demonstrated neuroinflammatory corneal changes in patients using drops that contain BAK. Reduced tear breakup time and Schirmer scores and higher scores on the Ocular Surface Disease Index questionnaire have been documented as well. Chronic conjunctival inflammation related to BAK has been linked to failure of subsequent filtration surgery. Switching to preservative-free drops may allow reversal of some corneal structural changes observed on confocal microscopy.

Reducing preservative exposure before surgery in patients with OSD may at times be achieved through the use of preservative-free formulations, which are increasingly available. In addition, topical cyclosporine may reverse some of the corneal changes associated with BAK exposure, and it can be a helpful adjunctive preoperative treatment for patients with OSD.

Other methods to reduce drop burden in anticipation of surgery include interventions such as laser trabeculoplasty and insertion of a bimatoprost implant 10 µg (Durostyla, Allergan). As MICS procedures become increasingly safe and effective for the management of mild to moderate glaucoma, implementation of these strategies to reduce drop burden may be considered early in the disease course in patients with OSD.

### Management of MGD Before Surgery

MGD is present in up to 80% of patients using glaucoma drops. Patients with MGD have increased bacterial loads on the lid margin, and endophthalmitis after trabeculectomy has been linked to chronic blepharitis. Treatment of lid margin disease before surgery may include the use of warm compresses to heat meibum and lid scrubs to clear debris. The application of hypochlorous acid spray 0.01%, has been shown to reduce in vitro bacterial loads of Staphylococcus aureus and other organisms with efficacy similar to that of povidone-iodine.

Omega-3 fatty acid supplementation has been shown to be effective in treating MGD in patients with glaucoma. Thermopulsation and intense pulsed light therapy are also becoming mainstays in the treatment of MGD.

Introducing procedures for the management of MGD in patients with glaucoma can be particularly useful, in that it may help reduce the burden of their daily eye care routine. A dry eye regimen in addition to a glaucoma medication regimen may become burdensome for some patients.

### Management of OSD After Surgery

For many patients, the glaucoma drop burden may be reduced after successful glaucoma surgery and good IOP control. Additional challenges for the ocular surface, however, such as dellen formation and keratopathy related to antimetabolite exposure, may present postoperatively. Initial management of these conditions may include punctal occlusion, the use of preservative-free tears, reduction of BAK exposure, and avoidance of repeated exposure to antimetabolites postoperatively if possible, especially in the case of limbal stem cell deficiency. In the event of dellen formation, a bandage contact lens may be employed.

Use of preservative-free steroid and antibiotic formulations can also decrease the overall preservative exposure, which may assist in the healing process. For patients with significant or refractory OSD, surgeons may prefer to choose surgical options that are less likely to require multiple postoperative applications of an antimetabolite.

### Conclusion

The management of OSD in patients with glaucoma who require surgery is often complex. It can
present a particular challenge in the care of patients who require expeditious IOP lowering or who already maintain a significant eye care routine. Use of MIGS procedures early on in the treatment algorithm may help reduce the burden of OSD.19,20


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