

Expert Consultations in Diseases of the Aging Eye

Glaucoma, Ocular Surface Disease, and Beyond

Highlights from a CME Symposium held during the
American Academy of Ophthalmology 2012 meeting

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This continuing medical education (CME) activity captures content from a CME symposium held on November 10, 2012, in Chicago, Illinois.

Activity Description

The management of patients with ocular hypertension or glaucoma increases in complexity as comorbid conditions such as ocular surface disease and cataract present. The goal of this program is to improve the knowledge and clinical performance of glaucoma specialists and comprehensive ophthalmologists by disseminating new information on ocular surface health in patients on glaucoma therapy, and providing expert clinical insight on the management of challenging cases.

Target Audience

This educational activity is intended for glaucoma specialists and comprehensive ophthalmologists.

Learning Objectives

Upon completion of this activity, participants should be better able to:

- Identify ocular surface disease in their patients with glaucoma or ocular hypertension
- Describe the effects of preservatives in glaucoma medications on ocular health
- Plan effective medical regimens for patients with glaucoma or ocular hypertension and complex presentations including ocular surface disease

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Introduction

For patients with glaucoma or ocular hypertension, the end goal is preserving vision by medically and/or surgically lowering intraocular pressure (IOP). An underappreciated factor that can affect treatment outcomes is preexisting or concurrent ocular surface disease (OSD).

Recently, 5 leading ophthalmologists convened at a continuing medical education (CME) symposium to present complex clinical cases focusing on the intersection of IOP management and ocular surface health. This CME activity summarizes highlights from the case presentations and includes panel discussion in 2 of the cases, to share with you the particular debate and varied perspectives those cases engendered. We hope the evidence presented and the panel's insight on this topic will be helpful to you in managing patients with glaucoma or ocular hypertension.

—Richard K. Parrish II, MD

EVALUATING THE OCULAR SURFACE IN PATIENTS WITH GLAUCOMA OR OCULAR HYPERTENSION

—Stephen C. Pflugfelder, MD

Case 1: The patient is a 64-year-old female with a several-year history of eye irritation and intermittent tearing that worsens upon awakening. Glaucoma was diagnosed a year ago and she is currently being treated with generic latanoprost preserved with benzalkonium chloride (BAK). Over the past 3 months, redness and burning have been noted throughout the day, with worsening after evening latanoprost instillation.

The patient's tear break-up time (TBUT), as measured by standard fluorescein testing, is 3 seconds. She has inferior corneal fluorescein staining and poorly expressible meibomian glands with ductal keratinization and posterior lid margin neovascularization. External examination with lissamine green dye finds lid parallel conjunctival folds, which is indicative of conjunctivochalasis. (Figure 1A) Anterior segment optical coherence tomography (OCT) shows her tear meniscus height centrally to be 378 μ m, approximately 50% higher than the normal height of 250 μ m. (Figure 1B)

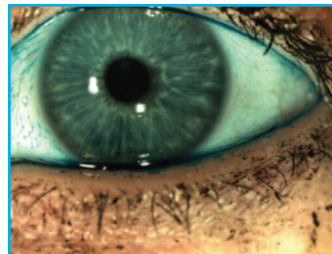


Figure 1A. External examination of Case Patient 1 showing lid parallel conjunctival folds.

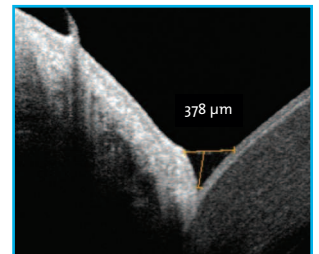


Figure 1B. Increased tear meniscus height in Case Patient 1 visualized by OCT.

Photos Courtesy of Stephen C. Pflugfelder, MD

What are the factors contributing to this patient's presentation of ocular surface signs and symptoms?

There are several factors that may be contributing to the patient's presentation: preexisting and persistent OSD, deleterious effects of BAK, and abnormal tear dynamics and delayed tear clearance.

Preexisting and Persistent OSD

Prior to the initiation of ocular hypotensive therapy, the patient's several-year history of eye irritation and tearing is consistent with OSD. Her current signs and symptoms—reduced TBUT, corneal

fluorescein staining, meibomian gland dysfunction, redness and burning in the eyes—indicate persistent OSD.

Deleterious Effects of BAK on the Ocular Surface

BAK, the most commonly used preservative in ocular medications, is a quaternary ammonium chloride compound with surfactant and detergent properties.¹ The toxicity of BAK has been studied extensively. BAK disrupts corneal epithelial tight junctions,^{1,3} leading to accelerated desquamation, or loss of the apical corneal and conjunctival epithelium.^{3,4} BAK can trigger apoptosis at concentrations of 0.01% and necrosis at concentrations of 0.05%.⁵ BAK also has been found to be proinflammatory, increasing expression of inflammatory markers on the ocular surface epithelial cells,⁶ promoting inflammatory cell infiltration⁶ and goblet cell loss.^{7,8} The disruption of both goblet cell mucin production and meibomian gland secretion of the lipid component of tears results in an unstable tear film and increased tear film evaporation, and thereby contributes to the dry eye often seen in patients with glaucoma.⁹ BAK has been detected in the corneal and conjunctival tissues for 7 days following instillation of a single 30- μ L drop.¹ Chronic use of BAK may lead to an increased risk of corneal complications such as punctate epitheliopathy,¹⁰ a decrease in functional vision, and may affect tasks that require extended concentration, such as reading.¹¹ BAK-induced toxicity may lead to decreased productivity and overall quality of life.¹²

Abnormal Tear Dynamics and Delayed Tear Clearance

This patient has conjunctivochalasis, a condition that increases with age.¹³ Conjunctivochalasis can compartmentalize the tear film in the center of the eye, which results in pooling and stagnation of the central tear meniscus.¹³ Her abnormal tear dynamics is increasing BAK's concentration in the precorneal tear layer, which is likely responsible for the finding of punctate epitheliopathy of the inferior cornea. The conjunctivochalasis also is causing delayed tear clearance, resulting in retention of the ocular hypotensive in the precorneal tear meniscus.

Glaucoma and OSD

This case is representative of the common problem of coexisting OSD in patients with glaucoma. Leung and colleagues found that 59% of patients with glaucoma or ocular hypertension complained of symptoms of OSD.¹⁴ In addition, they found that for each additional BAK-preserved ocular hypotensive used, there were approximately 2 times higher odds of showing abnormal results on corneal and conjunctival lissamine green staining.¹⁴

Identifying patients at risk for ocular hypotensive toxicity

It is prudent to perform an ocular surface assessment in patients with glaucoma in order to determine if the condition of their ocular surface places them at greater risk for ocular surface toxicity with the use of ocular hypotensives. (See *Sidebar*.)

Managing patients with glaucoma and OSD

First, I switch the patient to a BAK-free ocular hypotensive. If the patient's OSD is not improved, I initiate an ocular hypotensive drop holiday, and treat the patient's glaucoma with an *oral* carbonic anhydrase inhibitor. I consider instituting dry eye therapy with a preservative-free, low-dose ocular steroid, such as dexamethasone 0.01%, which can be compounded by a specialty pharmacy. Other dry eye therapies to consider include ocular cyclosporine A 0.05%; low-dose oral doxycycline (20 mg twice a day or 40 mg once daily), which inhibits desquamation in the corneal epithelium^{17,18}; or punctal occlusion plugs (only after the patient has discontinued the BAK-preserved ocular hypotensive). For ocular hypotensive-naïve patients, the decision to avoid ocular hypotensives containing BAK can mitigate the risk of developing ocular surface problems. Rossi and colleagues found that initiating IOP-lowering therapy with a preservative-free ocular hypotensive in ocular hypotensive-naïve patients resulted in no new cases of OSD and maintained the quality of life of treated patients.¹⁹

Dr Pflugfelder's Ocular Surface Assessment

1. Inquire about ocular irritation symptoms:

Although there are many validated questionnaires available, their administration can be quite cumbersome and time consuming. I have found a single question to be just as valuable as a set of many questions. Identifying OSD can be as simple as asking your patients 1 question, "Are you experiencing eye irritation?"

2. Examine the ocular surface:

- *Examine the puncta. Do they have edema or stenosis?*
- *Examine the lid margins. Do they present with meibomian gland disease, ectropion, or conjunctival injection or chalasis? I have found chalasis to be prevalent in patients aged older than 45 years, and I have become much attuned to its presence.*
- *Check tear stability with fluorescein. Instill fluorescein; wait a few seconds; ask the patient to blink, and then check the TBUT.*
- *Consider examining the inferior tear meniscus. Instilling dye in the eye makes it fairly simple to examine the meniscus and will indicate if the tear meniscus is low, normal, elevated, or blocked by conjunctivochalasis.*
- *Consider measuring tear production.*
- *A more sophisticated approach is to measure tear osmolarity. There is now a commercially available osmometer to measure tear osmolarity. The clinical value of this test is still unknown; however, I believe that in the context of prescribing ocular hypotensive therapy, it may be quite valuable. If a patient consistently has a tear osmolarity in the range of 320 mOsm/L or higher, which is greater than the range of 308 to 316 mOsm/L that has been found to be a sensitive predictor of dry eye disease,^{15,16} then that patient should be prescribed an ocular hypotensive without BAK.*

RECOGNIZING THE ISSUE OF POOR ADHERENCE IN PATIENTS TREATED WITH OCULAR HYPOTENSIVES

—Steven L. Mansberger, MD, MPH

Case 2: The patient is an 85-year-old female who reports that she is "doing fine." IOP in both eyes is 10 mm Hg (her baseline IOP in both eyes before beginning IOP-lowering therapy was 18 mm Hg). Her medication regimen includes timolol twice daily, brimonidine 3 times daily, and dorzolamide 3 times daily. Fundoscopy finds evidence of disc hemorrhage inferiorly. (Figure 2)

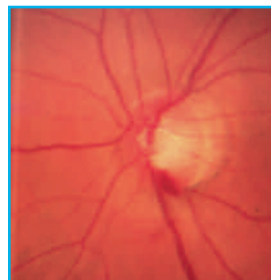


Figure 2. Inferior disc hemorrhage in Case Patient 2.
Photo Courtesy of
Steven L. Mansberger, MD, MPH

Disc hemorrhage in patients with glaucoma

There should be concern when disc hemorrhage is observed in the setting of good IOP readings. Just as hemoglobin A1C may be used as an indicator of glucose control in patients with diabetes, the presence of disc hemorrhage in patients with glaucoma may indicate poor adherence with ocular hypotensives. Disc hemorrhages persist, on average, for 3 to 6 months, and can be a sign that either patients are poorly adherent to their medications or that their glaucoma is worsening. The finding of a disc hemorrhage should prompt ophthalmologists to ask patients about adherence.

How adherent are patients with their prescribed ocular hypotensives?

Examining Adherence Patterns and Persistency of Adherence

When analyzing adherence patterns of patients with their ocular hypotensives, researchers find that patients typically are most adherent immediately after their ophthalmologist appointment and then immediately before they return for another office visit. Therefore, the level of adherence to medications is lower in between visits.²⁰ One way to combat this dip in adherence, especially in patients with suspected poor adherence, is to increase the frequency of office visits.

We also know that with time, we can expect a considerable decrease in our patients' adherence to their ocular hypotensives. Reardon and colleagues examined the persistency of patients with glaucoma in adhering to their ocular hypotensive regimens over time. When they looked at latanoprost refill records, they found that only approximately 50% of patients were refilling their medications at 6 months.²¹

Therapy adherence and visual function

Stewart and colleagues assessed factors associated with decreased or stable visual function in patients with glaucoma and end-stage cupping of the optic disc. Grading patients as either poorly adherent or adherent to glaucoma treatment, the researchers found that of those who were adherent, approximately 90% were graded as stable in their disease progression, whereas only approximately 50% of the poorly adherent group were stable.²² Consequences of poor adherence in these patients can be worsening of the visual field or the requirement of surgical intervention to manage IOP.

Determining adherence to ocular hypotensive therapy

If patients admit they are poorly adherent, they probably are, and interventions should be employed to improve adherence. But what about patients who claim they never miss a drop? The finding of disc hemorrhage in this patient may suggest poor adherence to ocular hypotensive therapy despite a stable IOP reading at the office visit. To obtain a more accurate history, I have found it effective to help patients admit to poor adherence by suggesting an overestimate of nonadherence in a "safe" environment. For example, you might say, "It can be difficult to use eye drops every day. How often do you miss your drops? ...about half the time?" By suggesting this high rate of poor adherence, patients may be more comfortable discussing their difficulty with drop administration.

Improving adherence to ocular hypotensive therapy

A useful tool for determining the factors related to patient adherence to ocular hypotensives is the Health Belief Model. (Figure 3) The factors are broadly classified into 1 of 2 groups:

- 1) Factors that affect individual perception: the patient/doctor relationship, patient demographic features, social supports, patient personality, and patient knowledge of the disease.

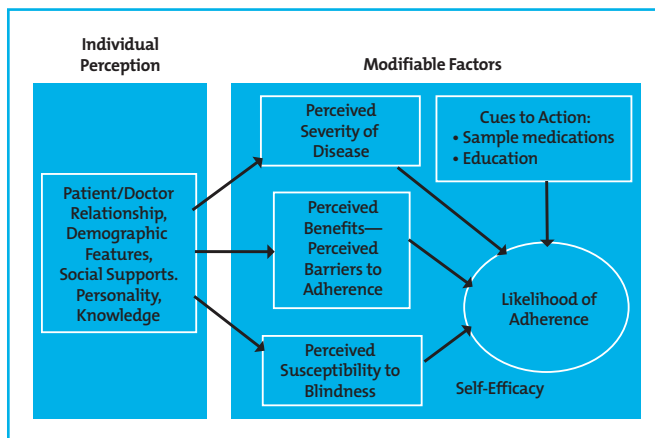


Figure 3. Health Belief Model (developed by the US Public Health Service in the 1950s).

- 2) Modifiable factors: perceived severity of disease, perceived benefits of adherence, perceived barriers to adherence, and perceived susceptibility to blindness. This category includes "Cues to Action" that refer to the external reminders some patients may need to help them remember to use their medication.

By identifying and addressing the following factors, patient adherence may be improved.

- **Patient Demographic Features:** Elderly patients often have poor corneal sensation. Refrigerating their ocular hypotensive may make the drop more obviously felt when hitting their eye, allowing them to know that they were successful in drop administration.
- **Social Supports:** Patients should consider inviting family members into the examination room. Having a family member in the room both reinforces the severity of the disease and provides an opportunity to enlist family members' help with remembering the counseling relevant to medication adherence.
- **Perceived Barriers to Adherence:** Barriers to ocular hypotensives include medication adverse effects and inconvenience of drop administration.²³ Medication adverse effects are a common reason for poor adherence²³; thus, switching to ocular hypotensives that are gentler to the eye, such as those without BAK, may improve adherence. Decreasing the frequency of drop administration, by using once-daily prostaglandin analogs,²¹ or by using fixed-combination drops,²⁴ also could improve adherence.
- **Perceived Susceptibility to Blindness and Perceived Severity of Disease:** If patients neglect their ocular hypotensives because they perceive there is a low risk of vision loss, adherence may be improved through education. Also, patients may be poorly adherent when they do not have a measure for, and therefore cannot quantify, the degree of their susceptibility to blindness. These 2 scenarios may be addressed by keeping patients informed of the results of their glaucoma assessments.
- **Cues to Action:** Consider providing patients with cues to action; suggest they set their container of ocular hypotensive near their toothbrush to help them remember to instill their drops in much the same routine as brushing their teeth.

In summary, poor adherence to ocular hypotensives is common; recognizing and managing the issue may improve patient outcomes.

RECOGNIZING SUBTLE OCULAR SURFACE DISEASE BEFORE MANAGEMENT OF INTRAOCULAR PRESSURE

—Cindy M.L. Hutnik, MD, PhD

Case 3: A 68-year-old male without a significant medical history is referred by an optometrist who had been following him for elevated IOP and was concerned about his recent optic disc changes. The patient felt he was doing well, had no visual or ocular complaints, and was still phakic.

The ocular examination showed the following:

	OD	OS
IOP (mm Hg)	24	22
CCT (microns)	553	550
BCVA	20/25	20/25
Angle	III	III

BCVA=best corrected visual acuity; CCT=central corneal thickness; IOP=intraocular pressure.

The patient's visual fields were noncontributory, but he was diagnosed with open-angle glaucoma based on IOP elevation, optic disc changes, and open angles on gonioscopy. Imaging revealed a thin retinal nerve fiber layer consistent with the diagnosis.

He was started on a BAK-preserved prostaglandin analog. Five days after initiation of therapy, the patient reported discontinuing the ocular hypotensive because of eye discomfort. He admitted that prior

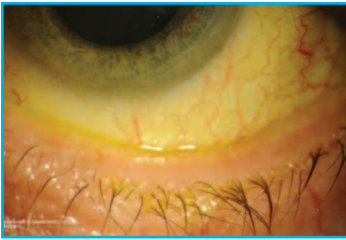


Figure 4. External examination of Case Patient 3 showing numerous collarettes on eyelash bases, inspissation of meibomian glands, and lower lid laxity. Photo Courtesy of Cindy M.L. Hutnik, MD, PhD

to starting the BAK-preserved ocular hypotensive, his eyes were “a bit teary,” but after starting therapy he complained his eyes were “very scratchy and uncomfortable,” and worsened when he read. He described the discomfort as “unbearable.”

Neither a switch to another prostaglandin analog nor a switch to another class of ocular hypotensives helped relieve his eye discomfort. Selective laser trabeculoplasty was offered as an early therapeutic option; the patient, however, refused this procedure.

At the 3-month office visit (after multiple ocular hypotensive trials), a full ocular surface workup was ordered. The clinical test findings were diagnostically borderline of OSD, demonstrating few superficial punctate erosions, an equivocal 9-second TBUT in each eye, 14 mm Schirmer test in each eye, and some reflex tearing. External examination showed numerous collarettes on his eyelash bases, inspissation of his meibomian glands with minimal expression upon compression, and lower lid laxity. (Figure 4)

Treating the patient with equivocal OSD findings

Dr Pflugfelder: I would attempt to quickly rehabilitate the ocular surface with a topical corticosteroid and preservative-free artificial tears, and also to implement longer-term treatment with nutritional supplementation: fish oil (omega-3 fatty acid)^{25,26,27} and gamma-linolenic acid (omega-6 fatty acid).²⁸ Another option is to treat with doxycycline. Doxycycline and other tetracyclines are potent anti-inflammatory agents, protease inhibitors, and metalloprotease inhibitors.^{17,18} Doxycycline is dosed at 20 mg twice daily in the generic strength, or 40 mg once daily in the branded product. I typically treat patients with doxycycline at these dosages for a month, reassess, and then perhaps reduce the dose if improvement is observed.

Dr Francis: I would treat the patient’s blepharitis with warm compresses and his dry eye with artificial tears, and also take the patient off BAK-preserved drops.

Table 1. Ocular Hypotensives Without BAK Available in the United States

Generic Name	Brand Name	Medication Class
Non-BAK-Preserved		
Brimonidine tartrate ophthalmic solution with Purite 0.1% or 0.15%	Alphagan® P	Alpha-adrenergic receptor agonist
Travoprost ophthalmic solution with sofZia® (boric acid, propylene glycol, sorbitol, zinc chloride) 0.004%	Travatan Z®	Prostaglandin analog
Preservative-Free		
Dorzolamide hydrochloride/timolol maleate ophthalmic solution 2%/0.5%	Cosopt® PF	Carbonic anhydrase inhibitor/Beta-adrenergic receptor antagonist
Tafluprost ophthalmic solution 0.0015%	Zioptan™	Prostaglandin analog
Timolol maleate ophthalmic solution 0.25% or 0.5%	Timoptic® in Ocusose®	Beta-adrenergic receptor antagonist

BAK=benzalkonium chloride.

Dr Mansberger: I would ensure the patient is properly hydrated, drinking at least 8 to 12 cups of water per day, because dehydration may be contributing to dry eye. My tendency is to avoid using a steroid unless there are no options remaining. I also would suggest the patient take nutritional supplements, and switch him to a preservative-free ocular hypotensive.

What are the BAK-free ocular hypotensive options available in the United States?

In the United States, there are 2 commercially available non-BAK-preserved ocular hypotensives and 3 preservative-free ocular hypotensives. (Table 1)

Comparative ocular surface effects of ocular hypotensives without BAK vs BAK-preserved ocular hypotensives

Nakagawa and colleagues compared the effects of travoprost with sofZia™ to latanoprost with BAK and to phosphate-buffered saline controls on human corneal epithelial cells. The cell cultures exposed to travoprost with sofZia and those of the controls both exhibited 100% viability at 6 hours, whereas the BAK-exposed cells had 0% viability ($P < .05$ vs control).²⁹

Removing BAK from ocular hypotensives has also been found to be clinically beneficial. Horsley and Kahook evaluated patients’ ocular surface signs and symptoms during latanoprost with BAK therapy, and then reevaluated the patients 8 weeks after switching from latanoprost with BAK to travoprost with sofZia. The authors found improvements in TBUT, inferior corneal staining, and OSDI (OSD index) scores after patients switched to travoprost with sofZia.³⁰ (Table 2) Likewise, Janulevičienė and colleagues found that switching patients from latanoprost with BAK to preservative-free tafluprost led to normalization of tear osmolarity, improved ocular comfort and TBUT, and decreased corneal staining.³¹ (Figure 5, Table 3)

Table 2. Mean TBUT, Inferior Corneal Staining Score, and OSDI Score on Latanoprost With BAK and at 8 Weeks After Switch to Travoprost With sofZia ($P < .001$) in a Prospective, Open-label, Single-center Study Involving 20 Patients (40 Eyes)³⁰

	Latanoprost With BAK	Travoprost With sofZia (8 weeks after switch)	P value (8 weeks after switch)
TBUT (seconds)	2.02 ± 0.71	6.34 ± 1.31	<.001 ^a
Inferior corneal staining	2.40 ± 0.87	1.38 ± 0.59	<.001 ^a
OSDI score	26.31 ± 8.25	16.56 ± 6.19	<.001 ^a

BAK=benzalkonium chloride; OSDI=ocular surface disease index; TBUT=tear break-up time.

^aStudent’s t-test

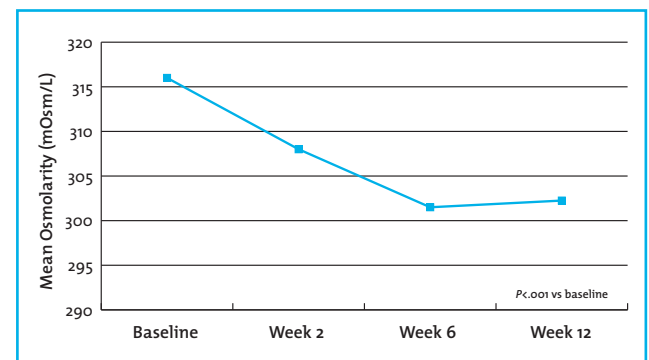


Figure 5. Mean osmolarity at baseline (latanoprost with BAK) and at 2 weeks ($P = .002$ vs baseline), 6 weeks ($P < .001$ vs baseline), and 12 weeks ($P < .001$ vs baseline), after changing medication to preservative-free tafluprost in a prospective, observer-masked study involving 30 patients (60 eyes).³¹

Adapted from Janulevičienė I et al. *Clin Ophthalmol.* 2012;6:103-109.

Table 3. Patients' Dry Eye Complaints, Mean TBUT, and Abnormal Corneal Fluorescein Staining at Baseline (Latanoprost With BAK), and at 2, 6, and 12 Weeks After Changing to Preservative-free Tafluprost in a Prospective, Observer-masked Study Involving 30 Patients (60 Eyes)³¹

	Baseline	Week 2	Week 6	Week 12	P value (12 weeks vs baseline)
Dry eye complaints (n = 30, patients)	30 (100%)	19 (63.3%)	11 (36.7%)	11 (36.7%)	<.05 ^a
TBUT (seconds) (n = 60, eyes)	3.7 ± 1.1	4.1 ± 1.0	5.2 ± 1.5	6.5 ± 1.5	<.001 ^b
Abnormal fluorescein staining of the cornea (n = 60, eyes)	45 (75.0%)	35 (58.3%)	21 (35%)	7 (12%)	<.005 ^a

TBUT=tear break-up time.

^aMcNemar test

^bPaired t-test

Adapted from Janulevičienė I et al. *Clin Ophthalmol.* 2012;6:103-109.

The results of the study by Janulevičienė and colleagues emphasize the importance of setting realistic expectations for patients about when they should expect to see improvements in OSD symptoms after switching from a BAK-preserved to a preservative-free ocular hypotensive. Improvements in all OSD measures began to appear at week 2, although significant improvements were not seen until week 12. (Table 3) Indeed, in this patient, after the recognition and treatment of his subtle OSD, he was started on a preservative-free ocular hypotensive, which he has tolerated well.

MANAGING ADVANCED GLAUCOMA AND SEVERE OCULAR SURFACE DISEASE

—Brian A. Francis, MD, MS

Case 4: The patient is a 79-year-old female with a chief complaint of decreasing vision. She has a history of primary open-angle glaucoma, OSD, non-neovascular age-related macular degeneration, and cataract extraction with intraocular lens implantation in each eye. Her visual fields have progressively worsened over the last 3 years. Her medications, the only 2 ocular hypotensives she can tolerate, include branded latanoprost with BAK at bedtime and dorzolamide twice daily in each eye. She is also using artificial tears during the day and an artificial tear ointment at night.

The ocular examination finds the following:

	OD	OS
IOP (mm Hg)	12	20
BCVA	20/50	20/100
RAPD		+
Gonioscopy	3+ SS	3+ SS with PAS temp

BCVA=best corrected visual acuity; IOP=intraocular pressure; PAS=peripheral anterior synechiae; RAPD=relative afferent papillary defect; SS=scleral spur.

Fundoscopy finds obvious advanced cupping and optic nerve damage in both eyes. She also has conjunctival injection bilaterally. External examination finds advanced OSD and eyelid disease: considerable lagophthalmos, which prevents complete closure of the eyes. She also has exposure keratopathy and pannus inferiorly in the cornea. (Figure 6)

How should this patient with advanced glaucoma and severe OSD be managed?

Dr Hutnik: Certainly, this patient must become less dependent on ocular anihypertensives, particularly agents with BAK. A surgical option may need to be considered. Before undergoing a surgical

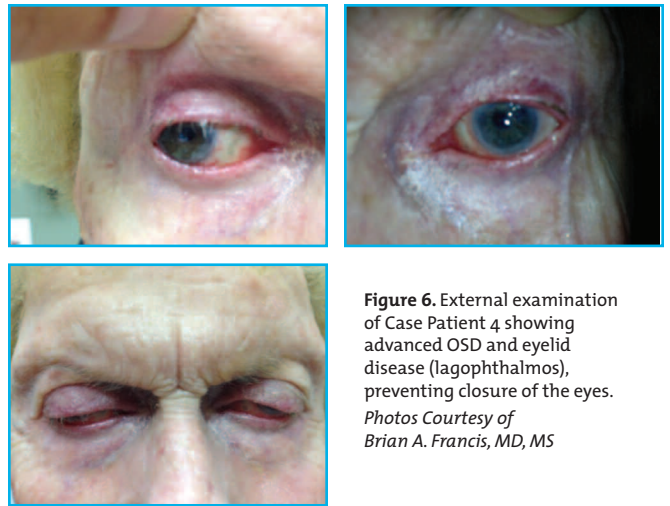


Figure 6. External examination of Case Patient 4 showing advanced OSD and eyelid disease (lagophthalmos), preventing closure of the eyes. Photos Courtesy of Brian A. Francis, MD, MS

procedure, her ocular surface and eyelids need time to heal, and her IOP could be managed with ocular antihypertensives without BAK or with an oral carbonic anhydrase inhibitor while awaiting the procedure.

Dr Mansberger: This patient has a high chance of going blind, based on her presentation of uncontrolled IOP and visual decline. I have not found trabeculoplasty to be effective in patients with implanted anterior chamber lenses. Trabeculectomy also may not be a good option, given the patient's poor lid closure and conjunctival inflammation. Switching ocular hypotensives may be effective, but I would not choose this option because the patient's visual field has been declining despite various attempts at maximal medical therapy. Minimally invasive glaucoma surgery (MIGS) also may not reduce pressures sufficiently. Most of these procedures will lower IOP to the high teens, which is not that different from the patient's current IOP. I would likely consider implanting a tube, a Baerveldt tube or an Ahmed valve implant.

Dr Francis: This patient has reached the end of the line in terms of glaucoma medical treatment. I would avoid trabeculectomy in this case because there is a high risk that the procedure would be associated with poor outcomes because of her considerable OSD.³² Baudouin and colleagues found that long-term use of ocular hypotensives, particularly BAK-preserved ocular hypotensives, induces considerable histopathologic and inflammatory changes in the ocular surface and also in the trabecular meshwork. In addition, the researchers found that as the number of ocular hypotensives increased, so did the inflammatory markers and disruption of the normal conjunctival architecture.³³ I would avoid MIGS-based procedures because of potentially insufficient IOP lowering.

Instead of these surgical options, it was decided to manage this patient with an aqueous tube shunt (Baerveldt implant) because of its efficacy in lowering IOP and the minimal need for postoperative ocular hypotensive use or additional surgical interventions following its implantation.³⁴

CONCLUSION

It is important to be mindful of the deleterious effects of BAK on ocular tissues and its potential to limit medical and surgical interventions in patients with glaucoma or ocular hypertension. Identifying preexisting or coexisting OSD in patients with glaucoma can assist clinicians in determining the therapeutic options that can effectively and safely manage IOP, without compromising ocular surface health. Today, the ophthalmologist's toolbox has expanded to include non-BAK-preserved and preservative-free IOP-lowering therapies that effectively treat patients with or at risk for glaucoma.

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CME Post Test Questions

To obtain AMA PRA Category 1 Credit™ for this activity, complete the CME Post Test by writing the best answer to each question in the Answer Box located on the Activity Evaluation/Credit Request form on the following page. Alternatively, you can complete the CME Post Test online at <http://www.MedEdicus.com>, Educational Activities tab, and click the Post-Test & CME Certificate button.

See detailed instructions at To Obtain AMA PRA Category 1 Credit™ at page 2.

- What is the prevalence of OSD symptoms in patients with glaucoma or ocular hypertension?
 - 29%
 - 39%
 - 49%
 - 59%
- Which of the following is likely the LEAST efficient method of identifying a patient who is at risk for ocular hypotensive toxicity?
 - Examine the puncta
 - Administer an ocular surface assessment questionnaire
 - Examine the lid margin
 - Administer a tear film stability test with fluorescein
- Which of the following is FALSE about BAK?
 - BAK can cause clinically significant IOP elevation
 - BAK can trigger apoptosis at concentrations of 0.01% and necrosis at concentrations of 0.05%
 - BAK has been found in corneal and conjunctival tissues for 7 days following instillation of a single 30-µL drop
 - BAK-induced toxicity can cause decreased patient quality of life
- Which of the following is consistent with conjunctivochalasis?
 - Central tear meniscus height of 225 µm
 - Enhanced tear clearance
 - Pooling of tears
 - Tear osmolality 300 mOsm/L
- According to Reardon and colleagues, approximately what percent of patients refill their latanoprost at 6 months' time?
 - 25%
 - 50%
 - 75%
 - 100%
- Which of the following is an appropriate strategy to improve adherence to ocular hypotensive therapy?
 - Suggest patients attend office visits alone to minimize distraction during counseling
 - Decrease the frequency of drop administration by prescribing fixed-combination drops
 - Avoid providing patients with details of their glaucoma assessments
 - Recommend patients simplify ocular hypotensive administration by avoiding administering the doses close to other routine tasks
- For each additional BAK-preserved eyedrop used, Leung and colleagues found that there were approximately _____ higher odds of showing abnormal results on corneal and conjunctival lissamine green staining.
 - 2 times
 - 3 times
 - 4 times
 - 5 times
- In patients at 8 weeks' post-switch from latanoprost with BAK to travoprost with sofZia, Horsley and Kahook found all of the following, EXCEPT:
 - Increased TBUT
 - Decreased inferior corneal staining
 - Increased tear osmolality
 - Decreased OSDI score
- A 72-year-old male with glaucoma presents with signs and symptoms of OSD. Ocular examination finds an IOP of 12 mm Hg in both eyes and a newly found disc hemorrhage. The patient is treated with timolol twice daily and brimonidine 3 times daily. Which of the following is the most likely cause of this patient's presentation?
 - The patient has undiagnosed hypertension or diabetes that has led to the disc hemorrhage
 - Timolol and brimonidine are not adequately effective to provide the aggressive IOP management necessary to prevent disc hemorrhage
 - BAK-induced OSD has caused the patient to become poorly adherent with his ocular hypotensive, with resulting disc hemorrhage
 - Chronic brimonidine usage has induced disc hemorrhage
- In patients who were switched from BAK-preserved latanoprost to preservative-free tafluprost, Janulevičienė and colleagues found that, at 12 weeks, patients' eyes experienced significantly:
 - Decreased TBUT
 - Increased corneal staining
 - Decreased dry eye complaints
 - Increased tear osmolality

Activity Evaluation/Credit Request

Original Release: March 1, 2013

Last Review: February 15, 2013

Expiration: March 31, 2014

Expert Consultations in Diseases of the Aging Eye—Glaucoma, Ocular Surface Disease, and Beyond

To receive *AMA PRA Category 1 Credit™*, you must complete this **Evaluation** form and the **Post Test**. Record your answers to the **Post Test** in the **Answer Box** located below. Mail or Fax this completed page to **The New York Eye and Ear Infirmary—ICME**, 310 East 14th Street, New York, NY 10003 (Fax: 212-353-5703). Your comments help us to determine the extent to which this educational activity has met its stated objectives, assess future educational needs, and create timely and pertinent future activities. Please provide all the requested information below. This ensures that your certificate is filled out correctly and is mailed to the proper address. It also enables us to contact you about future CME activities. Please print clearly or type. Illegible submissions cannot be processed.

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OUTCOMES MEASUREMENT

Yes No **Did you perceive any commercial bias in any part of this activity? IMPORTANT! If you answered "Yes," we urge you to be specific about where the bias occurred so we can address the perceived bias with the contributor and/or in the subject matter in future activities.**

Circle the number that best reflects your opinion on the degree to which the following learning objectives were met:

5 = Strongly Agree 4 = Agree 3 = Neutral 2 = Disagree 1 = Strongly Disagree

Upon completion of this activity, I am better able to:

• Identify ocular surface disease in my patients with glaucoma or ocular hypertension	5	4	3	2	1
• Describe the effects of preservatives in glaucoma medications on ocular health	5	4	3	2	1
• Plan effective medical regimens for patients with glaucoma or ocular hypertension and complex presentations including ocular surface disease	5	4	3	2	1

1. Please list one or more things, if any, you learned from participating in this educational activity that you did not already know. _____

2. As a result of the knowledge gained in this educational activity, how likely are you to implement changes in your practice?

4=definitely will implement changes 3=likely will implement changes 2=likely will not implement any changes 1=definitely will not make any changes
4 3 2 1

Please describe the change(s) you plan to make: _____

3. Related to what you learned in this activity, what barriers to implementing these changes or achieving better patient outcomes do you face? _____

4. Please check the Core Competencies (as defined by the Accreditation Council for Graduate Medical Education) that were enhanced for you through participation in this activity. Patient Care Practice-Based Learning and Improvement Professionalism

Medical Knowledge Interpersonal and Communication Skills Systems-Based Practice

5. What other topics would you like to see covered in future CME programs? _____

ADDITIONAL COMMENTS

POST TEST ANSWER BOX

1	2	3	4	5	6	7	8	9	10

