CATARACT SURGERY IN THE PRESENCE OF OSD

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How to Improve the Accuracy of Preoperative Measurements and Reduce Postoperative Dry Eye Symptoms

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Surgery should be delayed until the ocular surface is optimized.

A preoperative evaluation of the ocular surface and tear film is imperative before cataract surgery. An estimated 15% of US adults have dry eye disease (DED). The prevalence is higher in the older population, such as patients with age-related cataracts.

DED is an inflammatory disease of the tear film that causes eye pain, blurred vision, and damage to the ocular surface. Corneal haze and scarring may be associated with severe DED, but the damage to the cornea is usually reversible with treatment to optimize the epithelial surface. The tear film complements the cornea in providing optical clarity and refractive power, improves ocular comfort via lubrication, provides antibacterial properties, and contains protein factors for epithelial growth and healing. All these factors are crucial before, during, and after cataract surgery. Minimizing disruption of the corneal surface can have a significant positive impact on vision.

PREOPERATIVE EVALUATION

Cataract surgery and other forms of ocular surgery can cause or exacerbate ocular surface disease (OSD). In recent years, the number of studies on the importance of the preoperative identification and management of coexisting OSD and tear film abnormalities has grown for two main reasons.

First is the notable prevalence of OSD in patients presenting for cataract surgery. Age contributes to the development of both cataracts and DED. In one study, 54% of patients who underwent a cataract surgery evaluation reported DED symptoms, and 39% had clinically significant DED with positive corneal staining.[1] Because vital dye staining is not a routine element of slit-lamp examinations, many individuals presenting for a cataract surgery evaluation may have undiagnosed OSD.

Second is the impact of OSD on preoperative biometry. It affects final lens selection and postoperative residual refractive error (see the sidebar *IOL Selection*). In response, the ASCRS published guidelines in 2018 on the preoperative diagnosis and management of OSD.[2] The algorithm recommends that all

IOL SELECTION

Patients with persistent corneal punctate epithelial erosions–particularly in the central region localized to the visual axis–or instant tear breakup time are poor candidates for premium IOLs. A major reason for postoperative patient dissatisfaction with presbyopia-correcting IOLs is blurry vision due to higher-order aberrations and decreased contrast sensitivity. One study attributed 35% of reduced vision among patients receiving multifocal lenses to OSD.[1]

1. Schallhorn SC, Schallhorn JM, Pelouskova M, et al. Refractive lens exchange in younger and older presbyopes: comparison of complication rates, 3 months clinical and patient-reported outcomes. *Clin Ophthalmol*. 2017;11:1569-1581.

patients—even those who are asymptomatic—be evaluated for OSD because patient-reported symptoms often do not correlate with clinical signs. Evaluation includes questionnaires for patient-reported symptoms and clinical evaluations at the slit lamp with corneal staining and meibomian gland expression.

DED is notably more prevalent and widely studied in women, but the importance of OSD screening in men is worth highlighting. There is growing evidence that men are often underdiagnosed and undertreated and, as a result, may present with worse complications.[3,4] Nearly the same number of men and women present for cataract surgery evaluations, making this an invaluable opportunity to screen for OSD and autoimmune conditions that may affect the ocular surface.

MANAGEMENT

Treatment can follow the Tear Film & Ocular Surface Society's Dry Eye Workshop II (TFOS DEWS II) guidelines when DED is detected during the preoperative evaluation. TFOS DEWS II guidelines recommend a tiered approach.[5] First-line interventions include over-the-counter lubricants and nonmedical modifications such as environment, diet, and lifestyle. Second-line treatments include most prescription topical and systemic medications and in-office procedures such as nonpermanent punctal occlusion and expression of the meibomian glands. Patients usually require a trial of several different types of prescription medications. These typically include topical lifitegrast, various concentrations of cyclosporine, corticosteroids, and other antiinflammatory agents such as oral doxycycline or azithromycin. Third-line treatments include autologous serum eye drops and therapeutic contact lenses. Last-resort treatments include membrane grafts, permanent punctal occlusion, and other surgical approaches such as tarsorrhaphy.

Patients with significant OSD require optimization of the ocular surface and a delay of surgery until the surface has stabilized. Based on our experience, a delay of 3 months or longer is appropriate to allow adequate time for healing and stabilization of the ocular surface. Sometimes, patients require a special contact lens refraction to obtain accurate preoperative keratometry readings.

Postoperatively, the frequent use of preserved postoperative eye drops may further damage the corneal epithelium and tear film. We therefore advise continuing some level of dry eye treatment during the postoperative period even if the surface was optimized during the preoperative period.

CASE EXAMPLE

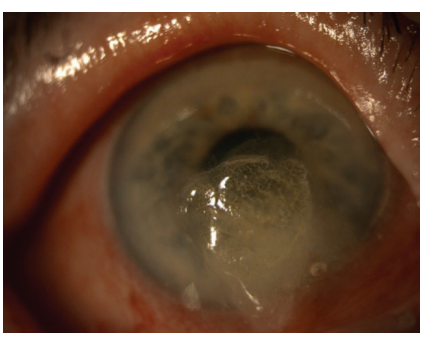
When individuals present with sterile keratolysis and corneal perforation, inflammatory and autoimmune diseases such as Sjögren syndrome must be considered in the etiology. If untreated or undertreated, these conditions can lead to morbidity or even mortality owing to systemic complications.

A man with Sjögren syndrome had severe DED complicated by a corneal perforation (Figure 1). After undergoing several rounds of glue application, he received a partial-thickness corneal patch graft of irradiated human cornea. He also completed systemic treatment with mycophenolate and short-term oral and topical steroids. The cornea stabilized and epithelialized within 6 weeks after the patch graft. During follow-up, however, the patient developed a mature white cataract, which worsened his BCVA to hand motions.

When possible, we avoid penetrating keratoplasty in patients like this one who have complicated OSD. In this case, despite the corneal perforation, we ultimately decided against performing a penetrating keratoplasty because of the severity of the DED and surface inflammation. The patient would not have tolerated the procedure well owing to worsening disruption of the ocular surface and tear film. His risk of failure and needing subsequent transplants would also have increased. We opted instead for cataract surgery alone.

A toric IOL was chosen to correct the astigmatism induced by the patch graft and scarring. Toric lens implantation can improve the visual acuity of patients with corneal opacities by addressing high astigmatism if the opacity is located outside the visual axis.[6] It is important to ensure that the dioptric power of the astigmatism is stable, the axis is consistent when measured with several different modalities, and the axis matches the manifest refraction. Alternatives to a toric IOL include astigmatic keratotomy after cataract surgery and custom-built therapeutic contact lenses.

The patient's uncorrected distance visual acuity was 20/40 at 3 weeks—a



Figures 1 and 2 courtesy of Esen K. Akpek, MD

Figure 1. Slit-lamp image of the left eye of a patient with Sjögren syndrome and DED complicated by corneal perforation inferior to the pupil (status post glue application). The patient eventually received a partial-thickness corneal patch graft to address progression of the melt under the glue.

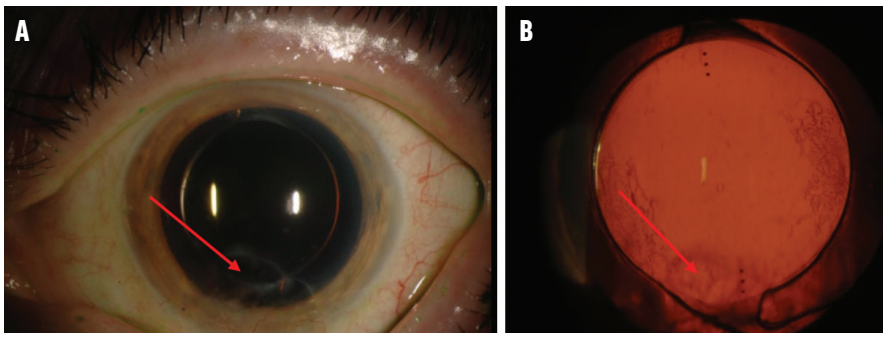


Figure 2. Postoperative slit-lamp photographs of a patient with Sjögren syndrome and DED. The health of the ocular surface has improved. There is no staining with fluorescein and lissamine green dyes (A). Retroillumination demonstrates proper positioning of the toric IOL. The red arrow points toward the inferiorly located corneal patch graft (B).

significant improvement. His BCVA was 20/25- with a manifest refraction of -1.00 D (Figure 2).

CONCLUSION

We follow the ASCRS algorithm for screening patients with OSD who present for a cataract surgery evaluation regardless of their symptoms. The corneal staining score is the best indicator of whether the issue is clinically or visually significant. Cataract surgery should be delayed until the ocular surface has been optimized. Adhering to the TFOS DEWS II guidelines on treatment can improve the accuracy of preoperative measurements and reduce postoperative dry eye symptoms as well as vision-related problems.

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Improving Cataract Surgery Outcomes With Presurgical Optimization of the Ocular Surface

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Despite advances in techniques and technology, some patients experience unsatisfactory visual outcomes after cataract surgery. Preexisting OSD is often to blame.

DED is the most common form of OSD, which also encompasses allergic conjunctivitis, blepharitis, rosacea, ocular chemical burn, epithelial basement membrane dystrophy, and Salzmann nodular degeneration, to name a few.[1] OSD contributes to tear film abnormality and degradation of the corneal surface, leading to distorted vision, irregular astigmatism, and increased higher-order aberrations.[2]

The cornea and air–tear film interface account for about two-thirds of the eye's refractive power; the remaining one-third is associated with the crystalline lens.[3] A compromised tear film (eg, hyperosmolarity) or uneven corneal surface can contribute to inaccurate preoperative keratometry and topography readings,[4] leading to errors in IOL power calculation and suboptimal refractive outcomes. When OSD is not adequately addressed preoperatively, patients may experience worsening symptoms after cataract surgery.[5] Cataract incisions, topical anesthetics, and preservatives in postoperative drops often exacerbate DED symptoms. Some patients may mistakenly associate worsening symptoms with the surgical procedure instead of their preexisting OSD. If not treated, preexisting conditions such as anterior blepharitis can also increase the risk of surgical infection, potentially leading to vision-threatening endophthalmitis.[6]

Optimizing the ocular surface before cataract surgery is essential to minimizing the risk of complications and maximizing postsurgical visual outcomes.

PREVALENCE

The prevalence of OSD increases with age. The condition is common among individuals presenting for cataract surgery,[2,7,8] but many patients are unaware that they are affected. One reason is that OSD and cataracts share some symptoms, including intermittent blurriness or fluctuations in vision.

Undiagnosed OSD is widespread in the elderly population with cataracts[7] and largely undiagnosed in the general cataract population. Gupta and colleagues found that a high percentage of patients with cataracts (80%) had at least one abnormal tear test result but that less than half of them (43.3%) had a previous diagnosis of OSD.[8] Many patients experienced only minor visual symptoms and lacked the typical signs and symptoms of OSD. As a result, the condition is easy to miss during presurgical evaluation.

DIAGNOSIS

High prevalence and low patient awareness puts the burden on clinicians to detect OSD before surgery. Patients at high risk of OSD include those receiving long-term therapy with preservative-containing topical

CRYOPRESERVED AMNIOTIC MEMBRANE

Cryopreserved amniotic membrane (CAM) such as Prokera (BioTissue) is a biologic corneal bandage designed to treat diseases of the ocular surface. Created from the amnion, CAM has natural antiinflammatory and regenerative properties that promote ocular surface healing and improve signs and symptoms of corneal dysfunction. Patients may experience improved vision and corneal sensation, reduced pain, or photophobia after CAM placement.[1,2] Clinically, CAM therapy can reduce ocular surface inflammation and improve corneal staining (Figure).

CAM therapy can significantly improve the health of the ocular surface in a short period. In the Dry Eye Amniotic Membrane (DREAM) study, the ocular surface of most patients with moderate to severe dry eye disease (88%) improved significantly after an average of 5.4 days of CAM treatment.[3]

PRODUCT COMPARISON

Two products derived from AM are cleared by the FDA for in-office use on the ocular surface—CAM and dehydrated AM. Both products physically protect the ocular surface, but CAM's manufacturing process is more effective at preserving the intrinsic healing properties of the AM, including reducing inflammation and preventing scarring (Figure).[4]

Compared to dehydrated AM, CAM retains a unique complex of heavy chain hyaluronic acid and PTX3 protein that has antiinflammatory and antiscarring properties.[5] As a result, dehydrated AM is approved by the FDA for wound coverage, whereas CAM may be used in a wider array of applications with therapeutic benefits. In terms of placement on the ocular surface, CAM includes a self-retaining plastic ring, and dehydrated AM requires a bandage contact lens.

REALISTIC EXPECTATIONS

Before CAM application, it is crucial to set realistic patient expectations.

Additional therapy may be required. CAM treatment can start the process of healing necessary for presurgical measurements and postsurgical recovery. Most patients, however, require additional OSD treatment over the long term.

Discomfort may occur. CAM can cause minor discomfort, such as foreign body sensation and blurred vision, in some patients. Typically, the side effects are tolerable and last only the duration of therapy, which may be shortened with early removal of the membrane. Sometimes, patient comfort may be improved by taping down the upper eyelid to prevent friction with the membrane, patching the eye to keep it closed, or instructing the patient to sleep with a shield to prevent eye rubbing at night.

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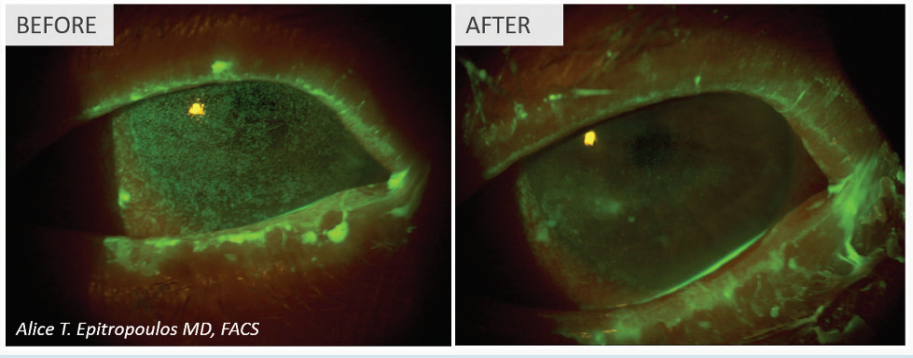

Courtesy of Alice T. Epitropoulos, MD, FACS

Figure. Baseline corneal staining of an eye with significant keratitis (before). Improved corneal staining 6 days after CAM (Prokera) treatment (after).

glaucoma drops, those administering certain systemic medications associated with the development of DED, and those with a history of previous ocular surgery or certain systemic diseases.[9]

I recommend a thorough OSD screening of all candidates considering cataract or refractive surgery with a DED questionnaire and ocular surface examination, which may include evaluation of the eyelids, eyelashes, quality and quantity of meibum, tear breakup time, and corneal staining.[10] A tear osmolarity test can help detect the presence and severity of DED. A point-of-care test (InflammaDry, Quidel) may be used to measure the level in the tear film of matrix metalloproteinase-9, an inflammatory marker that is frequently elevated in patients with DED.[11] Corneal topography can help reveal irregular astigmatism that may be due to DED or corneal dystrophy. The anatomy of the meibomian glands can be evaluated with meibography to aid in the diagnosis of evaporative DED.

MANAGEMENT

It is crucial to educate patients on how OSD can affect presurgical measurements and its potentially deleterious effects on postoperative outcomes.

Treatment varies depending on the type and severity of OSD. It is common to use a combination of therapies, lifestyle changes, and trial and error to find an effective treatment regimen. Therapeutic options include preservative-free artificial tears, high-quality re-esterified omega-3 supplements, topical steroids, immunomodulators, growth factors, nasal neural stimulation, punctal occlusion, amniotic membrane therapy, and other in-office procedures and various modalities.[2,12-14]

Eye drops are the primary treatment modality for OSD. Preservative-free lubricants are routinely used to enhance the quality of the tear film and dilute ocular surface irritants.[13]

Antiinflammatory agents such as cyclosporine and lifitegrast can support ocular surface healing by reducing local inflammation. In certain cases, autologous serum and nerve growth factor treatments may be considered to stimulate epithelium repair and improve epithelial stability.

Nonsurgical procedures should be equally considered to achieve an optimal ocular surface. In-office procedures such as the TearScience LipiFlow Thermal Pulsation System (Johnson & Johnson Vision) or Systane iLux MGD Treatment System (Alcon) and microblepharoexfoliation (Blephex) can relieve dry eye symptoms and improve tear film stability.[15] Punctal occlusion is a common procedure that can reduce tear drainage and prolong the effects of eye drops.[13] Amniotic membrane therapy is another option for reducing inflammation and promoting ocular surface healing.[16] Lastly, intranasal neurostimulation has shown promise as a therapeutic approach for OSD.[17]

Sometimes, therapy is not covered by insurance, placing the financial burden on patients. Treatment, moreover, can be time-consuming and uncomfortable, which may reduce patient compliance.[18] Cryopreserved amniotic membrane may be an attractive option in either situation because improvements can be observed in about 3 to 5 days compared to several weeks or months with conventional drops (see *Cryopreserved Amniotic Membrane Before Cataract Surgery*).

CONCLUSION

Whatever strategies are used, preoperative optimization of the ocular surface is essential to maximizing surgical outcomes. ■

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