Managing Dry Eye in Refractive Surgery Patients

The best way to prevent postoperative problems is to optimize the ocular surface preoperatively.

BY MARGUERITE B. MCDONALD, MD, FACS

Anyone can have dry eye. It overwhelmingly affects middle-aged and older women due to hormonal changes, but it may also appear as an ocular side effect in patients who take systemic medications for treatment of depression, cholesterol, irregular heartbeat, or diabetes. Therefore, it is vital to evaluate every refractive surgery candidate preoperatively for signs and symptoms of dry eye. A thorough patient history and medical examination are necessary to determine the presence and state of the disease. Detection of ocular surface disease preoperatively can prevent complaints and dissatisfied patients postoperatively. Assessing the disease pathology is often as easy as asking the patient, "What time of day do your eyes look and feel their worst?" Blepharitis, a separate disease often mistaken for dry eye, usually affects eyes first thing in the morning, whereas dry eye symptoms come on later in the afternoon or evening. Patients describe dry eyes as feeling dry, scratchy, and uncomfortable. Blepharitis and dry eye are commonly seen in combination, but each must be diagnosed separately to be treated successfully.

IDENTIFYING AT-RISK PATIENTS

The best evidence of the presence and severity of dry eye are the patient's history and symptoms. Key indicators of pathology include fluctuating vision and poor history with contact lenses. Most dry eye symptoms get worse in the afternoon; patients usually feel their eyes getting tired and experience blurred vision.

Dry eye is a leading cause of contact lens intolerance. Patients who discontinued wearing soft contacts due to discomfort generally will manifest external disease. Blepharitis is a close second cause of contact lens intolerance, and determining which condition(s) is/are present requires evaluation of patient history. In addition to obtaining the patient's history, I perform an eye examination with lissamine green dye to determine the disease state. Lissamine green permits one to see cells that are dying but not dead; these cells do not appear on fluorescein staining. Examinations with lissamine green allow me to detect dry eye earlier, so that I can give the patient more treatment options.

FOUR STAGES

In general, and with the very few exceptions noted below, I abide by Behrens' four stages of dry eye, based on the patient's signs and symptoms, and the corresponding treatment recommendations.[1] Behrens led the Dysfunctional Tear Study Group, a panel of 17 surgeons from around the world, to establish standard diagnoses and streamlined treatment recommendations. The dry eye classification arrived at by this study group follows:

Dry eye level 1. The lowest classification of dry eye includes patients whose symptoms present only if they incur an extraordinary environmental or endogenous insult, such as after boating or heavy alcohol intake. Examination with lissamine green can uncover a dot or two on the conjunctiva; however, in most cases no clinical signs are present.

Patients who do not experience symptoms on a regular basis have mild dry eye and most often can be treated by recommending environmental or behavioral modifications along with an artificial tear when necessary.

Dry eye level 2. Moderate dry eye includes anyone who manifests symptoms on a regular basis, even if it is only once daily. One of the first signs of dry eye is fluctuating vision. These patients usually experience some negative impact on vision, such as a time of day when objects are slightly blurry or blinking that is more frequent than normal. Clinically, these patients exhibit conjunctival staining with lissamine green, a reduced tear lake, and a shorter tear break-up time (TBUT). I prescribe a gently preserved artificial tear, such as Blink Tears (Abbott Medical Optics Inc., Santa Ana, California), at least four times a day and a bland over-the-counter ointment (nonprescription, with no active ingredients), such as Refresh PM (Allergan, Inc., Irvine, California) or SteriLube (Sigma Pharmaceuticals, Melbourne, Australia) at night. The goal is to drive as much moisture as possible into the eyes during sleep. I also start patients on a combination of topical cyclosporine-A, such as Restasis (Allergan, Inc.) and a topical steroid such as Lotemax (Bausch + Lomb, Inc., Rochester, New York). The cyclosporine-A therapy is continued for many months if not indefinitely, but the Lotemax (loteprednol etabonate) is prescribed four times daily for 2 weeks, then twice daily for 2 weeks, then stopped.

Cyclosporine causes the patient to produce more of their own tears—and higher quality tears—over time; the loteprednol etabonate gives immediate symptomatic relief and eliminates the initial sting that many patients briefly experience at the induction of cyclosporine therapy. The combination of these two drugs provides the greatest patient relief and treatment compliance. For advanced level 2 patients, I switch them from gently preserved artificial tears in a bottle to unit dose unpreserved tears. Additionally, I add omega-3 nutritional supplements, which are extremely helpful in the treatments of dry eye and blepharitis. Behrens et al[1] recommended secretegogues for patients with level 2 dry eye; however, I save those for patients in severity level 3 due to the number of side effects they induce. Conversely, Behrens' group recommended putting in punctal plugs once the patient reaches dry eye level 3, but I generally use them in my level 2 patients.

Dry eye level 3. A level 3 patient experiences severe dry eye, with severely fluctuating vision and red eyes. These patients use artificial tears continuously throughout the day and may rely too heavily on eye-whitening drops. Clinically, they have marked conjunctival staining with lissamine green as well as corneal staining. Some patients even have filamentary keratitis at this level. In addition to the treatments for all lesser levels of dry eye, I prescribe oral tetracyclines just as I would for blepharitis patients. Low-dose antibiotics work as antiinflammatory agents for the skin. They are often prescribed in patients with chronic acne and rosacea.

Dry eye level 4. Unfortunately, in a tertiary corneal practice, we see this extreme level of dry eye often. The conjunctiva is scarred, and there is severe corneal erosion. These patients have severely decreased vision and recurrent corneal ulcers. They are taking oral cyclosporine, topical acetylcysteine 10% (a potent mucolytic agent that dissolves filaments), and wearing moisture goggles. Patients with such extreme dry eye must have their puncta cauterized.

Patients with level 4 dry eye do not respond to cyclosporine because their lacrimal glands no longer function. At this point, the ophthalmologist should work with the patient's internist or oncologist to begin systemic antiinflammatory therapy. At this level, patients use unpreserved tears every 30 minutes to 2 hours, and some apply ointment hourly in an attempt to save them from corneal perforation and loss of the eye. Patients are in such pain that they are willing to sacrifice vision for comfort and safety.

SURGICAL INTERVENTION, TREATMENTS

A dry eye patient who is undergoing cataract surgery should receive the treatment regimen recommended for

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IMPROVING OPTICAL QUALITY WITH ARTIFICIAL TEARS

BY ROBERT MONTÉS-MICÓ, PHD; ALEJANDRO CERVIÑO, PHD; TERESA FERRER-BLASCO, PHD; SANTIAGO GARCÍA-LÁZARO, MSC; AND SUSANA ORTÍ-NAVARRO, PHD

Dryness of the ocular surface affects the optical quality of the eye. There is considerable evidence that local changes in tear-film thickness and regularity introduce additional optical aberrations in the eye.[1] Dry eye syndrome refers to a spectrum of ocular diseases with diverse etiologies.[2] The common feature of these ocular diseases is an abnormal tear film. Dry eyes show an irregular tear-film distribution across the corneal surface compared with normal eyes. The time course of dynamic aberration changes observed during normal blinking is accelerated in dry eye patients with abnormal tear films.[3,4]

The primary treatment goals for dry eye are to relieve discomfort, provide a smooth optical surface, and prevent corneal damage. Frequent instillation of drops that do not present a risk of toxicity or allergy is the most successful form of therapy. Artificial tears that imitate human tears are currently available. The goals of therapy with these tears are to provide moisture, surface wetting, comfort, and retention of the solution for as long as possible. Meeting these goals should improve tear break-up time (TBUT) values and the optical quality of the air–tear-film interface.

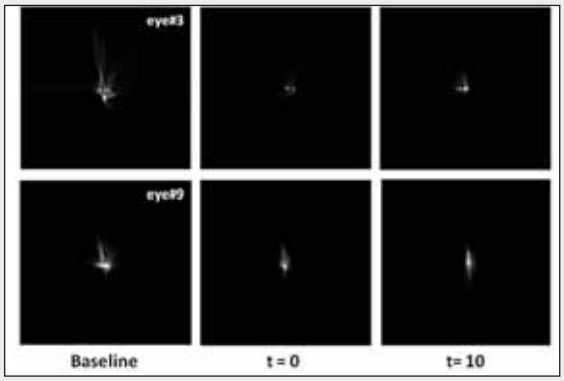

Figure 1. Retinal PSFs for two eyes corresponding to a 5.5-mm pupil size. The poor optical quality at baseline and its improvement after eye drops is seen.

An irregular tear film compromises optical quality in patients with dry eye syndrome. After eye-drop instillation, a reduction in optical aberrations associated with an increasingly regular tear film should be expected. Studies evaluating the effect of

IMPROVING OPTICAL QUALITY WITH ARTIFICIAL TEARS (CONTINUED)

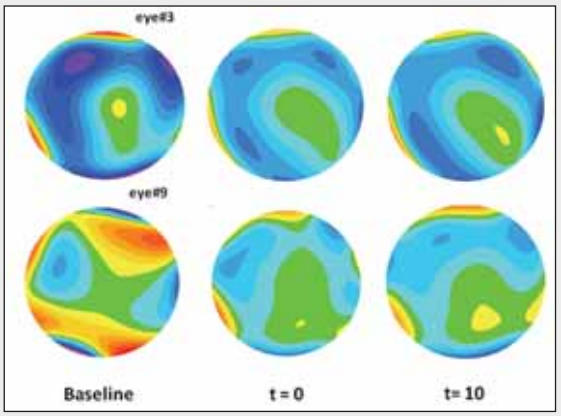

Figure 2. Air–tear-film interface wavefront aberration contour plots at baseline, immediately after, and 10 minutes after eye drop instillation for the same two eyes as in Figure 1. The contour line step is 1 µm. Only higher-order aberrations (third to sixth) are shown.

eye drops on Hartmann-Shack wavefront aberrometry concluded that eye drops improved optical quality in both dry[5,6] and healthy eyes.[2] Because changes occur in the air–tear-film interface after eye drops are administered, wavefront analysis should focus on corneal aberrations after blinking[7] to properly investigate the effect of blinking on healthy[8] and dry eyes.[3,4]

In a nonrandomized masked observational case series (self-controlled), wavefront aberrations of the air–tear-film interface were measured in 40 eyes with dry eye before and after the instillation of Blink Intensive Tears (Abbot Medical Optics Inc., Santa Ana, California) on 3 separate days.[9]

This artificial tear is composed mainly of polyethylene glycol 400 (0.25%), sodium hyaluronate as a viscosity enhancer, and the preservative OcuPure (stabilized oxuchloro complex 0.005%; Abbott Medical Optics Inc.). In all cases, measurements were carried out before instillation (baseline), immediately after instillation (T0), and 10 minutes after instillation (T10). At baseline, mean TBUT was 3.6 ±1.7 seconds. Eye-drop instillation lengthened TBUT values to 5.8 ±1.4 seconds at T0 and 4.9 ±1.3 seconds at T10 (P <.01).

The point spread function (PSF) of the air–tear-film interface improved considerably after instillation, obtaining the best contrast and minimal size of the PSF immediately after eye drops were administered (Figure 1). Higher-order aberrations (HOAs) and spherical-like and coma-like aberrations were significantly reduced by a factor of 2.5 at T0 (Figure 2). In all cases and for all pupil sizes measured, the reduction of HOAs (P =.008), spherical-like aberrations (P =.006) and coma-like aberrations (P =.007) was statistically significant at the 1% level. At T10, HOAs (P =.09), spherical-like aberrations (P =.007), and coma-like aberrations (P =.007) were still statistically significantly lower than at baseline.

Eye drops can have a significant impact on ocular aberrations of the eye.[2,4] Montés-Micó et al,[5] using a Hartmann-Shack wavefront aberrometer to measure ocular aberrations, reported a reduction in optical aberrations after eye drop instillation in dry eyes. These findings agreed with other results recently reported that analyzed only the air–tear film interface, showing a considerable reduction for small and large pupil diameters.

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the next level more severe than his current level of dry eye. If the patient is to undergo LASIK, he should be treated for two levels of dry eye more severe than his current disease.

I have found that, even in patients with apparently healthy eyes, adding a preoperative regimen of artificial tears has resulted in a large reduction of postoperative complaints and retreatments. Normalizing the tear film improves vision, comfort, and patient satisfaction.

For postoperative dry eye patients who are on an aggressive regimen but are still symptomatic, especially disappointed patients who have undergone LASIK or premium IOL implantation, additional treatments are available. Lacriserts (Aton Pharma, Lawrenceville, New Jersey) is a 24-hour sustained release artificial tear product; it is a small pellet that is inserted laterally in the inferior cul de sac where it cannot be seen or felt. It ameliorates dry eye symptoms, increases TBUT, and decreases conjunctival staining. I also recommend Tears Again Advanced Liposome Spray (OcuSoft, Richmond, Texas), which releases liposomes studded with vitamins A, C, and E and is rich in antioxidants. These liposomes reportedly migrate into the tear film, adding to the lipid structure and helping to reduce evaporation.

CONCLUSION

In my experience, patients undergoing refractive surgery expect optimal results. In spite of the most realistic preoperative informed consent process, they are not terribly tolerant of retreatment. Many patients view anything less than 20/20 with no complications as a complete failure on the part of the surgeon, making postoperative dry eye an intolerable side effect of surgery. When surface disease is more serious, patients are likely to complain about blurred or poor vision and photophobia. Optimizing the ocular surface preoperatively is crucial to preventing or decreasing the severity of dry eye complications postoperatively. ■

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