

# Diagnosing and Managing Dry Eye in Corneal Refractive Surgery

It is better to manage a preexisting problem than to potentially create a new postoperative one.

BY ARTHUR B. CUMMINGS, MB CHB, FCS(SA), MMed (OPHTH), FRCS(EDIN)

We have entered an era in which, if it were not for post-LASIK dry eye, we would seldom encounter a complication with LASIK. A small percentage of eyes, in our case less than 0.5% that are treated with the WaveLight Refractive Suite (Alcon Laboratories, Inc. Fort Worth, Texas), require enhancement surgery after LASIK—not that we regard a touch-up as a complication. Additionally, flap complications are rare with femtosecond lasers, and the ablation profiles of most current flying-spot lasers result in very few problems with glare and halos. When these photic phenomena do arise, they are mostly correctable with one of the many customized ablation profiles.

Therefore, in practical terms, post-LASIK dry eyes are the bane of the refractive surgeon's life as well as those of the unfortunate patients who experience it. An article I recently read suggested that 32% of the operated population and 35% of the post-LASIK population experiences dry eyes.<sup>1</sup> Dry eyes are therefore common in our entire surgical patient population, not only in post-LASIK patients. Some years ago, the Dry Eye WorkShop (DEWS) Study Group defined dry eye as “a multifactorial disease of the ocular surface that includes an element of inflammation and is accompanied by increased osmolarity.”<sup>2</sup> I keep this definition in mind whenever I

examine a new patient, and I never forget to tell the LASIK patient about the risk for dry eye syndrome (DES) after surgery.

## THE DIAGNOSIS

I tell patients that it is not possible to predict who will develop dry eyes after LASIK. The most we know is that women over 45 years of age, mothers who recently were pregnant, and patients with rheumatoid arthritis or certain collagen vascular disorders are more likely to develop DES. Beside that, all I can tell patients is that diagnostics of the tear film can inform me of how each patient would cope or manage should DES develop after surgery.

**History.** The use of many commonly prescribed drugs can lead to or exacerbate DES. In fact, all the *antis*—antihypertensives, antihistamines, antidepressants, anti-cholesterol, antifu or anticold remedies (ie, decongestants), and antiacne medications—can cause dry eye symptoms. Rheumatoid arthritis and other collagen vascular disorders such as psoriatic arthritis and systemic lupus erythematosus are also implicated in DES.

Lifestyles and environmental factors can lead to dry eye symptoms as well, even in the absence of any signs of DES. For instance, heat and air-conditioning at work, home, and in the car dry out the air, and staring at computers and other electronic displays, iPads (Apple Inc., Cupertino California) and other tablet computers, and smart phones leads to a reduced blink rate that further diminishes lubrication of the ocular surface. Many people today sleep fewer hours than in the past, and they may also sleep with their eyelids slightly open, thereby exposing a sliver of cornea

### TAKE-HOME MESSAGE

- Always tell patients about the risk for DES after surgery.
- Eyes that stain with lissamine green or rose bengal dye are probably not suitable for corneal refractive surgery.

between the lids. The exposure keratopathy that results can also lead to DES symptoms.

Patients who tell you they can wear contact lenses only for a couple of hours before they have to remove them are also very likely experiencing dry eye. Conversely, someone who can wear contact lenses every day of the week from sun-up to sun-down is unlikely to have DES.

**Diagnostic tests.** Slit-lamp examination is an important part of the dry eye assessment and, in my experience, more reliable than the Schirmer test. Before I put any fluorescein into the eye, I check the height of the tear meniscus, the appearance of the eyelid margins and meibomian gland orifices, the position and size of the punctae, and the quality and clarity of the tear film.

After these examinations, I stain the tear film with fluorescein and I assess tear break-up time (TBUT) and look for superficial punctate keratitis (SPK) and lid-parallel conjunctival folds (LIPCOF; the number of conjunctival folds that stain with fluorescein at the junction of the limbus with the lateral lower lid margin), and the presence of filaments in the tear film. For more information on LIPCOF, see *Using Fluorescein to Assess the Lid-Parallel Conjunctival Folds*. Meibomian glands are assessed for signs of obstruction, the presence of any soapy discharge, and the ease with which the glands release sebum when compressed with a cotton swab. We routinely do a Schirmer 1 test (without anesthesia), although we do not credit it with too much significance. Rather, we consider it in the context of other findings. If the Schirmer test results in reflex tearing, we do a Schirmer 2 test, in which a topical anesthetic is used to anesthetize the eye and eliminate reflex lacrimation.

The use of different stains can be valuable in other areas of ophthalmology; however, they are not relevant for refractive surgery. If the eye stains with lissamine green and rose bengal, it is not suitable for

### USING FLUORESCEIN TO ASSESS THE LID-PARALLEL CONJUNCTIVAL FOLDS

Located in the lower temporal and nasal quadrants of the bulbar conjunctiva, lid-parallel conjunctival folds (LIPCOF) are subclinical folds that can be observed at the slit lamp. These folds can be used as a clinical test for dry eye, as patients with severe dry eye often have bulbar conjunctival folds (ie, conjunctivochalasis). The presence of LIPCOF could also be indicative of the beginning stages of conjunctivochalasis.

corneal refractive surgery in my estimation. The most sophisticated test we currently do is tear osmolarity. The TearLab Osmolarity Test (TearLab Corp., San Diego) correlates best with my clinical impression of tear quality and the postoperative course in relation to DES. The sample is obtained within seconds, and both eyes provide a value that should differ from each other by less than 10 mOsm/L. Ideally, the value should be lower than 308 mOsm/L. I have treated a number of patients with poor Schirmer tests but good tear osmolarity outcomes, and, thus far, the osmolarity test is winning the contest for predicting postoperative DES. The correlation of Schirmer 1 and 2 tests with postoperative DES is poor, but the correlation of tear osmolarity with DES appears to be better. The system is relatively expensive because of the gold tip in the sampling probe, but I have found that the cost is justified, as we are getting better information and can treat eyes that we would previously have turned away due to apparent significant DES.

**Other tests for DES.** The RPS InflammDry Detector (Rapid Pathogen Screening, Sarasota, Florida) is an office-based test that detects raised levels of matrix metalloproteinase-9 (MMP-9) in the tear film. MMP-9 is a nonspecific marker of inflammation that increases in DES. The Optical Quality Analysis System test (OQAS; Visiometrics, Terrassa, Spain) is a double-pass, noninvasive optical assessment of tear film quality. The LipiView OSI (TearScience Inc., Morrisville, North Carolina) can quantify lipid layer thickness; it also works with the LipiFlow Thermal Pulsation System for the treatment of meibomian gland dysfunction with thermal pulsation applied directly to a patient's eyelid. Additionally, the Visante OCT (Carl Zeiss Meditec, Jena, Germany) can be used to assess tear meniscus height, as can the Oculus Keratograph Topographer (Oculus Optikgeräte GmbH, Wetzlar, Germany). The Keratograph Topographer can also be used to measure TBUT noninvasively.

### PREPARATION FOR SURGERY

If we have identified DES or if the patient has any risk factors for DES, such as a history of contact lens intolerance, older female sex, recent pregnancy, extended use of antihist-

(Continued on page 63)

#### WATCH IT NOW AT EYETUBE.NET

Using your smartphone, photograph the QR code to watch the video on Eyetube. If you do not have a QR reader on your phone, you can download one at [www.getscanlife.com](http://www.getscanlife.com).



direct link to video:  
<http://eyetube.net/tofee>



direct link to video:  
<http://eyetube.net/mijaq>



(Continued from page 61)

amines and hyperopic or high myopic laser treatments, we routinely prepare the patient for surgery by trying to improve his or her tear film, especially the lipid layer. We place the patient on either flax seed or fish oil capsules for the omega-3 fatty acid content. Taking a significant amount of a supplement will not help the eyes, however, if the meibomian glands are blocked. We always assess these carefully and recommend warm compresses ([eyetube.net/?v=tofee](http://eyetube.net/?v=tofee)) and direct meibomian gland expression ([eyetube.net/?v=mijaq](http://eyetube.net/?v=mijaq)) if required. Once the glands are open, the omega-3 fatty acids can gain access to the tear film. In addition to its lubricating properties, omega-3 is also a great protector of the tear film against evaporative stress.

We use temporary (3-month) collagen plugs on a regular basis and have also recently begun using permanent plugs when the patient benefitted from temporary plugs but noticed a return of DES symptoms after their disintegration. Restasis (Allergan, Inc., Irvine, California) is not available in Ireland. If it were, we would make use of it preoperatively to prepare the dry eye for LASIK or advanced surface ablation. If a patient has DES and is not responding well to treatment, we tend to avoid LASIK and instead perform either LASEK or PRK. Where appropriate, intraocular solutions are also considered.

## SUMMARY

DES plays a significant role in patient morbidity and often requires chair time from the ophthalmologist or other clinical members of your team. There is no doubt that limiting the extent and duration of DES after refractive surgery or, even better, avoiding it altogether, is a common goal for both patient and surgeon. Diagnosing dry eye prior to surgery indicates surgeon thoroughness to the patient and, instead of inheriting a problem post-LASIK, the surgeon is now simply managing a preexisting problem. This perception is key and helps the patient keep the chin up in the event that he or she indeed experiences the misfortune of postoperative DES. ■

*Arthur B. Cummings, MB ChB, FCS(SA), MMed (Ophth), FRCS(Edin), practices at the Wellington Eye Clinic & UPMC Beacon Hospital, Dublin, Ireland. Dr. Cummings is an Associate Chief Medical Editor of CRST Europe. He states that he is a consultant to and clinical investigator for Alcon/WaveLight. Dr. Cummings may be reached at tel: +353 1 2930470; fax: +353 1 2935978; email: [abc@wellingtoneyeclinic.com](mailto:abc@wellingtoneyeclinic.com).*



1. Solomon KD, Fernandez de Castro LE, Sandoval HP, et al. Joint LASIK Study Task Force. LASIK world literature review: quality of life and patient satisfaction. *Ophthalmology*. 2009;116:691-701.

2. DEWS Definition and Classification Subcommittee. The definition and classification of dry eye disease: Report of the definition and classification subcommittee of the International Dry Eye Workshop (2007). *Ocul Surf*. 2007;5(2):75-92.