

Dry Eye After LASIK

Advice on preventing and managing this common complication.

BY ERIC D. DONNENFELD, MD

Essentially all patients have dry eyes at least transiently after LASIK.¹ Dry eye disease is arguably the most common problem facing refractive surgeons today.²⁻⁴ Because the cornea overlying the flap is significantly anesthetic for 3 to 6 months after LASIK,²⁻⁴ all patients will have a decrease in tear production. For the most part, however, only individuals whose eyes were dry before surgery or who were marginally compensated before surgery will have symptoms. In a meta-analysis of the world literature, 32% of patients undergoing LASIK had dry eye syndrome preoperatively, and 35% of all patients had dry eye after LASIK.⁵ Fortunately, the symptoms of a great majority of these patients resolved during a 2- to 4-week period following surgery.

Ophthalmologists can decrease the risk of post-LASIK dry eye through an intelligent surgical, pharmacologic, and behavioral approach to the LASIK procedure.

THE ETIOLOGY OF POST-LASIK DRY EYE

There are several possible etiologies for the worsening of dry eye syndrome after LASIK. The high pressure induced by suction during LASIK may temporarily damage the conjunctival goblet cells and therefore may compromise the mucin layer of the tear film. Significant changes in the corneal curvature that occur after LASIK alter tear wetting, as the lids move over the modified ocular surface. Medicamentosa caused by antibiotics that are toxic to the epithelium, nonsteroidal anti-inflammatory drops, and preservatives may also temporarily induce dry eye symptoms. Because intact corneal sensation drives tear production, however, the corneal denervation associated with the LASIK procedure is the most likely etiology of postoperative dry eye syndrome.

PREVENTION

History and Examination

Surgeons can take several steps to reduce the incidence of dry eye after LASIK. The FDA task force to investigate the procedure suggested that all patients undergoing LASIK have a thorough dry eye evaluation preoperatively.⁵ Many individuals seeking refractive surgery are actually preselected dry eye patients who are contact lens intolerant. Because



Figure 1. Supravital staining of the conjunctiva with lissamine green in the classic pattern of dry eye syndrome.

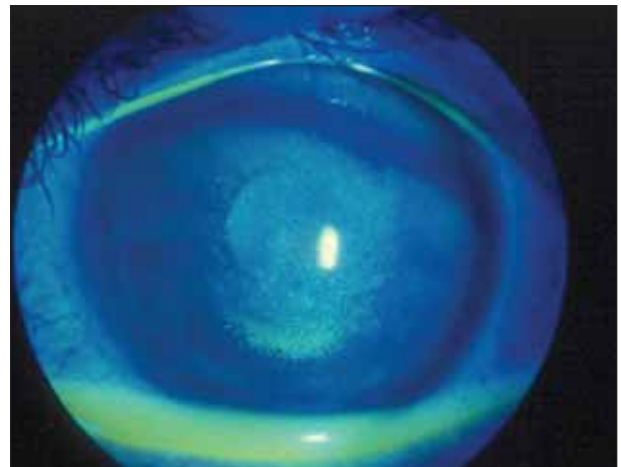


Figure 2. Fluorescein staining of the cornea with the classic pattern of dry eye syndrome.

these patients' preexisting dry eye syndrome makes wearing contact lenses uncomfortable, they will often seek LASIK for visual rehabilitation.

The dry eye history and examination are perhaps the most important part of the refractive surgery patient's workup. I ask all patients whether they experience any ocular irritation, including a sandiness-grittiness, dryness, burn-

ing, or foreign body sensation. I carefully inspect the eyelids of those who experience ocular irritation upon awakening in the morning for signs of meibomitis. I pay close attention to the status of the orifices of the meibomian gland, the width of the palpebral fissure, and the volume of the tear film in patients who report that their symptoms worsen as the day progresses. Stenosis and closure of the meibomian glands, a wide palpebral fissure, and decreased tear production all increase tear film osmolarity and cause dry eye.

In addition to performing basic tear testing, including tear film break-up time, I look for tear debris in the inferior cul-de-sac and perform Schirmer testing with anesthesia. Schirmer testing is fairly unreliable, and I only view it as important if the test is 3 mm or less, especially when the patient has collagen vascular disease. Most important, I perform supravital staining of the conjunctiva with lissamine green or rose bengal and fluorescein staining of the cornea to look for the classic staining pattern of dry eye disease (Figures 1 and 2). I consider conjunctival staining to be a risk factor for postoperative dry eye and corneal staining to be a relative contraindication for surgery. Tear osmolarity is a new test that is being evaluated and, it is to be hoped, will provide important information on the selection of patients. When patients have dry eye symptoms preoperatively, it is important to maximize the health of the ocular surface prior to initiating surgery, because pretreatment is easier than a postoperative reaction.

Preoperative Treatment

All patients with dry eye syndrome who are contemplating LASIK should receive treatment prior to surgery. The options include therapeutic unpreserved tears, a lubricating ointment at night, cyclosporine, and punctal occlusion. I myself prefer the Parasol Punctal Occluder System (Odyssey Medical, Inc., Memphis, TN). Many surgeons prescribe cyclosporine to all patients undergoing LASIK pre- and postoperatively. Certainly, clinicians should consider this drug for patients who are at risk of dry eye after surgery, including individuals with preexisting dry eye, perimenopausal women, people with autoimmune disease (including thyroid disease), hyperopes, and older individuals.

In a controlled study, patients with moderate-to-severe dry eye who underwent LASIK achieved a better visual outcome if they were pretreated with Restasis 0.05% (Allergan, Inc.) b.i.d. for 1 to 3 months and then reassessed before LASIK was performed.⁶ In a retrospective analysis of patients who underwent LASIK for different refractive errors, those who were treated postoperatively with Restasis were significantly more likely to recover better visual acuity than those who did not. Specifically, Restasis users were more likely to have 20/15 vision or 20/20 vision, whereas nonusers were significantly more likely to



Figure 3. Meibomian gland disease.

have a visual outcome worse than 20/20.⁷

The use of topical azithromycin (AzaSite, Inspire Pharmaceuticals, Inc.) daily by patients with meibomian gland disease (Figure 3) has been shown to significantly improve the quality of the lipid layer and the stability of the tear film. It has also dramatically improved ophthalmologists' treatment of this chronic disorder, which greatly affects the ocular surface.⁸ In a recent study, supplementation with the omega-3 fatty acids provided by eicosapentaenoic and docosahexaenoic acid-enriched flaxseed oil (TheraTears Nutrition; Advanced Vision Research, Woburn, MA) significantly improved the signs and symptoms of dry eye disease.⁹

THE CORRELATION BETWEEN CORNEAL SENSATION AND DRY EYE SYNDROME

Corneal sensation is vital for maintaining both the integrity of the corneal epithelium and the function of the tear film. Corneal sensation is decreased after LASIK and PRK, with the tear film's generally recommencing to function over a 6-month period.³ The depth of the corneal ablation affects the extent to which corneal sensitivity is lost and recovers.

After LASIK, corneal sensation is greatest near the hinge; it decreases toward the central cornea and the peripheral cornea away from the hinge.¹⁰ An advantage of the hinge on the LASIK flap is that it provides a conduit for corneal innervation. Investigators have found both dry eye syndrome and a loss of corneal sensation to be less pronounced in corneas with a wide versus a thin nasally hinged flap.¹¹ In addition, smaller flaps, superior flaps, and thin planar flaps are associated with less loss of corneal sensation. Recently, the use of a reverse side cut has been found to provide better apposition of the corneal nerves, a more rapid return of corneal sensation, and a lower incidence of postoperative dry eye.¹²

CONCLUSION

The most common complication of LASIK surgery not related to the keratome—is and potentially one of the most devastating—is dry eye syndrome. Ophthalmologists should take appropriate steps at every stage of the surgical process to optimize the refractive outcome and minimize postoperative dry eye. Specifically, they must identify patients at risk, preoperatively maximize the tear film's stability, and employ intraoperative and postoperative therapeutic interventions. ■

A video on the effects of a flap created with a femtosecond laser on dry eye and corneal sensation is available at <http://eyetube.net/?v=pazam>.



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