

Preparing the Ocular Surface for Refractive Surgery

Eric Donnenfeld, MD

Many dry eye patients can be viable refractive surgery candidates. The key to uneventful recovery and optimum visual outcome is restoring the ocular surface prior to surgery.

For the refractive surgeon, a healthy ocular surface is the foundation upon which a successful outcome rests. A compromised surface, if it goes undetected, can introduce complications, delay healing, diminish the visual outcome, and contribute to uncomfortable postoperative dry eye—any or all of which make for an unhappy patient and doctor.

Rehabilitating Dry Eyes

The most important ocular surface condition to detect preoperatively is ocular surface dryness. Ocu-

lar dryness is particularly problematic because patients with even subtle symptoms are more likely to develop a significant and possibly permanent dry eye syndrome following a refractive procedure, especially LASIK.

Fortunately, there is much that can

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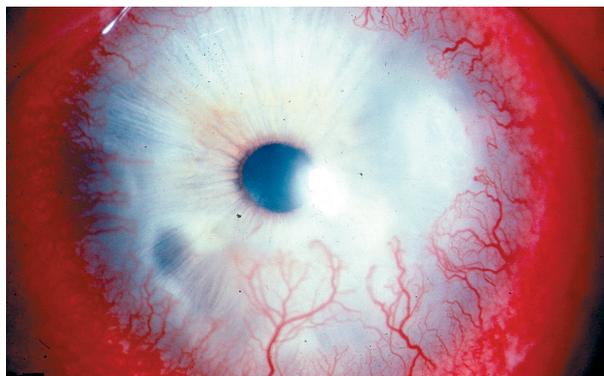


FIGURE 1 Neovascularization impinging on the visual axis is a contraindication to corneal refractive surgery.

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be done preoperatively to turn borderline dry eye patients into viable refractive surgery candidates. Detecting ocular surface risk factors prior to surgery and placing border-

OCULAR SURFACE SCREENING	
<input checked="" type="checkbox"/>	Thorough visual inspection — Ocular surface and surrounding structures — Check for lid abnormalities and other conditions that can compromise tear film
<input checked="" type="checkbox"/>	Staining — Cornea: fluorescein — Conjunctiva: lissamine green
<input checked="" type="checkbox"/>	Schirmer test with anesthetic
<input checked="" type="checkbox"/>	Tear breakup time
<input checked="" type="checkbox"/>	Corneal sensation in suspect cases

line candidates on appropriate therapeutic regimens not only reduces the risk of dry eye following surgery but will enhance visual outcomes as well.

In my experience, visual outcomes are clearly better when the ocular surface is stabilized prior to surgery. Patients with healthy ocular surfaces have fewer complications, faster visual recovery, and less visual fluctuation. Similar results are documented in the literature. For example, work by Marguerite McDonald, MD has shown that patients who had been placed

on a Restasis™ (Allergan) regimen preoperatively had better visual outcomes than a control group.

Preoperative Evaluation

The first step is careful preoperative scrutiny of the ocular surface (i.e., cornea, conjunctiva, lacrimal glands, and associated lid structures) through direct visualization. Next, I use fluorescein staining to evaluate the cornea and lissamine green staining for the conjunctiva to assess ocular surface disease relevant to dry eye or meibomian gland dysfunction. In addition to assessing staining patterns, a Schirmer test, with anesthetic, is standard for every patient, as is a tear breakup time evaluation. If I suspect that decreased corneal sensation may be an issue, that is tested as well. Findings of concern include:

- Ocular dryness,
- Meibomian gland dysfunction or blepharitis in the lids,
- Compromised corneal sensation, particularly in patients with diabetes or a history of herpetic disease,
- Papillary conjunctivitis or conjunctival abnormalities, such as pinguecula or pterygia, which would alter my treatment plan,
- Corneal neovascularization, which impacts ocular surface health or may lead to intraoperative bleeding, and
- Atopy and/or eczema, which are risk factors as they can retard healing, encourage inflammation, and increase risk of diffuse lamellar keratitis (DLK).

I will exclude from surgery patients who have markedly decreased corneal sensation, neovascularization im-

IN PRACTICE**The Glaucoma Patient and LASIK**

When performing laser refractive surgery on qualified glaucoma patients, it is important to remember that topical glaucoma medications are fairly toxic to the ocular surface and have been shown to adversely impact refractive outcomes and postoperative healing. Therefore, to prepare the ocular surface and safeguard it while it's healing, I discontinue glaucoma drops least 2 weeks prior to surgery and place the patient on an oral carbonic anhydrase inhibitor such as Diamox® or Neptazane®. Most patients can return to their topical glaucoma medication 2 weeks after surgery.

ping on the visual axis, severe atopy, or significant corneal ectasia (Figure 1). Patients with corneal staining due to dry eye are temporarily contraindicated from surgery but will be placed on a therapeutic regimen to determine whether their status can be improved (Figure 2). Patients who continue to show corneal staining despite treatment are not candidates for refractive surgery.

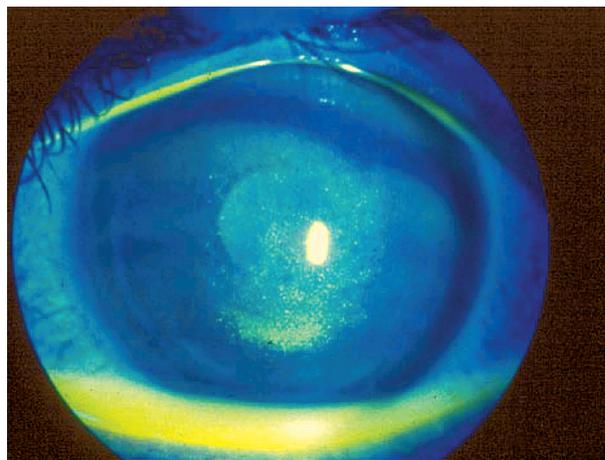


FIGURE 2 Dry eye induced corneal staining (shown here) is a temporary contraindication to surgery. If treatment of the underlying condition doesn't end the corneal staining, the patient is not a candidate for refractive surgery.

Dealing with Dry Eye

If a patient seeking surgical vision correction exhibits signs of ocular surface disease with dry eye, I'll first evaluate the severity and determine whether the problem is related to mucin deficiency, meibomian gland dysfunction, and/or aqueous deficiency (Figure 3). Aqueous deficiency and meibomian gland dysfunction are the most common culprits, often appearing in tandem with one another. Therapy is directed to treating the specific cause; if more than one factor is involved, initial therapy targets the greater of the causative problems.

- **Meibomian Gland Dysfunction** In mild cases of

meibomian gland dysfunction, hot compresses are my first line of therapy. These will be applied for 5-minute spans three times daily for a full week before surgery.

BORDERLINE DRY EYE: TREATING THE CAUSE

✓	Meibomian gland dysfunction— <i>mild</i>
	— Hot compresses for mild cases
	— Fish and flaxseed oil supplements
	— Lubricant drops
✓	Meibomian gland dysfunction— <i>moderate to severe</i>
	— 100 mg doxycycline for more severe cases
	— 0.05% cyclosporine emulsion
	— Fish and flaxseed oil supplements
✓	Aqueous deficiency— <i>mild</i>
	— Transiently preserved lubricating tears at least 4 times daily
✓	Aqueous deficiency— <i>moderate to severe</i>
	— Transiently preserved lubricating tears up to 8 times daily
	— 1-month course of 0.05% cyclosporine emulsion
	— Progress to lubricating ointment and punctal occlusion, if needed

from aqueous deficiency. In fact, my colleagues and I will present a paper at this year's American Academy of Ophthalmology on the effects of Restasis in patients with meibomian gland dysfunction.

- **Aqueous Tear Deficiency** For patients with aqueous-deficient dry eye, I prefer lubricating tears that are nonpreserved or preserved with "disappearing" preservatives. TheraTears, Refresh Tears®, or GenTeal® (Novartis) lubricating eye drops are all effective choices. Patients will be instructed to administer drops at least 4 times a day *religiously*.

For more severe cases, I'll advise dosage up to 8 times a day. If symptoms are not completely resolved, the patient will be placed on Restasis administered for 1 month (a regimen shown to be effective in McDonald's clinical work). Next steps, if needed, are lubricating ointments and punctal occlusion. If patients also have meibomian gland dysfunction, I will employ combined treatment regi-

mens to address both issues.

Surgical Choices and Adjustments

For hyperopic patients with moderate refractive error and cylinder, I prefer conductive keratoplasty (CK) to either PRK or LASIK, as CK is far less likely to induce dry eye symptomatology. For most other rehabilitated dry eye patients, I offer the option of either PRK or LASEK for the same reason. I will not, however, perform surface ablations on atopic individuals because healing is highly problematic in these patients and the likelihood of their developing infiltrates or an infection is too great. I will lean toward LASIK for these patients, although in many cases it is best simply to avoid refractive surgery altogether.

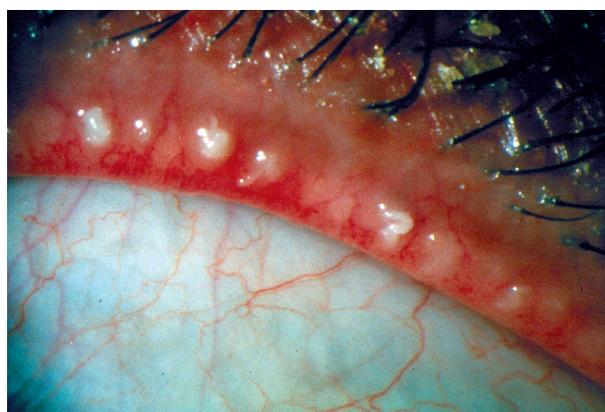


FIGURE 3 Inspissation of the meibomian glands. Meibomian gland dysfunction must be treated and corrected prior to refractive surgery.

Where ocular surface problems exist and the patient is to have LASIK, I make several key adjustments to my normal surgical technique in order to maximize visual results while minimizing the risk of postoperative dry eye. I will opt for a smaller flap with a wide hinge placed nasally rather than superiorly. This configuration severs fewer corneal nerves, thereby preserving corneal sensation and, in my experience, decreasing the risk of LASIK-induced dry eye. This is also my preferred approach for patients with borderline corneal sensation.

Future Therapeutic Options

A number of new products for dry eye therapy are poised for market release and will enhance the refractive surgeon's ability to effectively rehabilitate borderline dry eye patients. For example, CIBA Vision has just brought to market a sodium hyaluronate drop, called AQUify™. While I've no experience with this commercial formulation, I have found hyaluronate drops we've made up ourselves to be very effective.

Inspire Pharmaceuticals, Inc. has filed a New Drug Application for diquafosol tetrasodium ophthalmic solution. This product appears to offer an almost immedi-

ate increase in mucin and tear production. Since it does not control the inflammatory aspects of ocular surface disease, I imagine it will be most useful in combination with a formulation like Restasis.

Currently, I am participating in clinical trials of an oral medication (cevalastine, Diaiichi) that also improves tear production significantly. Preliminary indications are that it works quite well but may cause mild nausea and diarrhea in some patients. In another trial, we're evaluating a topical androgen formulation for treatment of meibomian gland dysfunction; this too looks promising and may have application for LASIK candidates at risk for induced dry eye.

Implications for Refractive Surgery

Some may ask, why not exclude borderline prospects from surgery and, thereby, exclude the extra work involved? The first answer is that more scrupulous screening detects patients who need attention, whether they proceed to surgery or not. Enhancing ocular surface health for any patient is worthwhile. And, it is far easier (and far more pleasant for both patient and physician) to treat ocular surface disease prior to refractive surgery than after.

The second response is that such a course increases the percentage of patients who are viable candidates for

refractive surgery. It also assures the surgeon of a higher percentage of patients overall who will have rapid, uneventful healing, an excellent visual outcome, and ocular comfort. When patients heal, feel, and see better, the clinician fares better as well.

THE BOTTOM LINE

Untreated ocular surface distress is the most frequent cause of complications following refractive surgery. Borderline dry eye patients need not be contraindicated for surgery, however. A therapeutic regimen targeting the causative problem can often stabilize the ocular surface, improving postoperative visual outcomes and reducing the likelihood of permanent dry eye syndrome. When ocular surface disease is present, consideration should also be given to the refractive procedure. When performing LASIK on patients with a history of dry eye and/or meibomian gland dysfunction, a smaller flap with a wide nasal hinge decreases the likelihood of dry eye.

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