Laser vision correction surgery is generally a successful procedure for which a thorough preoperative evaluation is key to success. Patients who are dissatisfied with their outcomes after laser vision correction may have undetected dry eye syndrome, blepharitis, and/or anterior basement membrane dystrophy (ABMD). Preoperative detection and treatment of these conditions will not only improve outcomes but will also increase patient satisfaction. In this article, we review the essential components of the preoperative refractive evaluation, highlighting key points in clinical history, examination, and diagnostic testing. Additionally, we discuss how to manage common corneal conditions encountered in this patient population.

**CLINICAL HISTORY**

Identifying ocular surface disease is vital to the success of refractive surgery. As technology has evolved to wavefront-guided ablations, it has become even more crucial to detect and treat ocular surface abnormalities to avoid treating higher-order aberration artifacts induced by tear film abnormalities.

Significant dry eye syndrome can be easily diagnosed when patients complain that their eyes are always dry, red, and tired. Most patients, however, do not readily report these symptoms, and therefore dry eye syndrome can be overlooked during the preoperative assessment. A simple screening question is to ask your patient how his or her eyes feel without contact lenses. Patients with dry eye syndrome may report that their eyes often feel worse when they are not wearing their contact lenses, which can mask symptoms with chronic use. Others will report having tired eyes at the end of a long day of contact lens wear that improves somewhat with lens removal. A screening tool to determine disease severity is to ask the patient how often he or she uses artificial tears or other lubricants.

Blepharitis, often coincident with dry eye, should be diagnosed and treated preoperatively. Patients with blepharitis may complain of red and irritated eyes, crusting on the eyelids and lashes, frequent stye formation, or having an overall reddish hue to the eyelid margins. Uncontrolled blepharitis alters the lipid composition of the meibomian gland secretions; these oils are essential to maintaining tear viscosity and stability. Alteration in this pathway negatively affects tear film function, therefore impairing overall vision quality.

ABMD is a common condition affecting the corneal epithelium and can be difficult to recognize unless one is specifically looking for it. ABMD can not only induce corneal surface irregularities but can also predispose patients to intraoperative complications such as sloughing...
ing of the epithelium during LASIK. Patients with ABMD often have recurrent corneal erosions, which can be of any magnitude. It is important to ask your patient about eye pain or irritation upon waking up in the morning, which is a common time to experience erosions with ABMD. Although the condition is more common in older patients, young patients with a history of trauma or corneal abrasion may also have ABMD and a history of recurrent erosion symptoms. The presence of ABMD is a relative contraindication to LASIK, as there is an increased risk of epithelial complications including epithelial slippage with resultant diffuse lamellar keratitis (DLK), recurrent erosions, epithelial ingrowth, and ABMD-induced irregular astigmatism.

Finally, it is important to ask patients about their family history of eye diseases. Ectasia after laser vision correction is a devastating complication and most often is a result of unrecognized topographic abnormalities and structural weakness. Keratoconus is a noninflammatory ectatic disorder of the cornea and is a contraindication.

TABLE 1. COMPONENTS OF THE PREOPERATIVE SLIT-LAMP EXAMINATION

| Eyelid Position | • Rule out floppy eyelids and ectropion, which may exacerbate dry eyes  
|                 | • Determine if palpebral fissure is too narrow or tight to achieve adequate suction for performing LASIK  

Meibomian Glands  
• Apply digital pressure to assess secretion quality and flow  
• Look for eyelid margin erythema and vascularity, and determine if there is any degree of blepharitis and/or meibomian gland dysfunction

Tear Film  
• Tear film height less than 1 mm and tear break-up time less than 10 seconds is suggestive of dry eye syndrome  
• Have a low threshold to stain with fluorescein and/or lissamine green

Cornea  
• Epithelium: rule out anterior basement membrane dystrophy, especially in the superior cornea  
• Stroma: rule out scarring that may affect femtosecond laser flap creation; rule out thinning or striae suggestive of ectatic disorders  
• Endothelium: rule out cornea guttata (sign of Fuchs dystrophy and posterior polymorphous corneal dystrophy)

Figure 1. Placido–disc-based topography highlighting an irregular corneal surface with loss of color map information is suggestive of ocular surface disease.

to laser vision correction procedures. Although the genetics of corneal ectatic disorders are variable, a positive family history can be an important clue, prompting greater scrutiny and caution. In our practice, we routinely ask patients about any family history of corneal transplantation and blindness or severe vision loss.

CLINICAL EXAMINATION

Slit-lamp examination. A detailed slit-lamp examination is essential to recognizing many of the conditions discussed above. Table 1 describes the crucial components of the refractive preoperative slit-lamp exam.

Diagnostic testing. Corneal topography and tomography provide both qualitative and quantitative assessments of the cornea. They are vital tools when evaluating a refractive surgery patient, as they can alert the surgeon to check for keratoconus, ocular surface disease, and many other irregularities of the cornea. We routinely perform Placido–disc-based corneal topography (Humphrey Atlas; Carl Zeiss Meditec, Inc., Jena, Germany) in addition to tomographic imaging of the cornea, using either Scheimpflug imaging (Pentacam; Oculus Optikgeräte GmbH, Wetzlar, Germany) or optical slit scanning (Orbscan; Bausch + Lomb, Rochester, New York). Tomographic imaging in particular may reveal subclinical forms of corneal ectasia or structural weakening such as elevated posterior corneal curvature or abnormal patterns of corneal thickness.

The first step in evaluating topography is to ensure that you are aware of the color scale markings. We typically use an axial topography map with 0.50 D intervals, which
provides sufficient screening for significant shape abnormalities. Topography may be the first clue to ocular surface diseases such as dry eye, blepharitis, and ABMD, in which there will be a loss of color information on the topography maps (Figure 1). Next, evaluate for any asymmetry. Ectatic disorders such as keratoconus and pellucid marginal degeneration often show asymmetric maps with inferior steepening (Figure 2). Pentacam and Orbscan tomographic printouts will display the anterior and posterior corneal float, pachymetry, and keratometric maps. We recommend that surgeons look at all four maps to identify abnormalities consistent with structural abnormalities; for example, one should suspect keratoconus in a patient with an inferiorly displaced corneal apex, elevated posterior float, and thin pachymetry (Figure 3).

MANAGEMENT OF COMMON CORNEAL CONDITIONS

Ocular surface disease. It is of utmost importance to aggressively treat any ocular surface disease prior to refractive surgery. In our practice, patients with dry eye syndrome are asked to use artificial tears on a regular basis in addition to cyclosporine 0.05% (Restasis; Allergan, Inc., Irvine, California) twice daily. If the condition is severe, a short course of topical steroids may also be considered. Some patients have reported improved dry eye symptoms with use of omega-3 fatty acid supplements, taken twice daily in doses of 1,500 mg. If there is suspicion of an allergic component to the dry eye syndrome, as in patients with dry eye and papillae in the palpebral conjunctiva, a topical antihistamine and mast cell stabilizer can be used once or twice daily. Blepharitis should be managed with warm compresses and lid scrubs with diluted baby shampoo. Some have found success using topical azithromycin (Azasite; Inspire Pharmaceuticals, Durham, North Carolina) applied directly to the lids once daily to improve blepharitis symptoms. Many patients with blepharitis also have coincident acne rosacea, which can be managed with oral doxycycline. Regardless of the treatment methods chosen, it is crucial to achieve good control of the ocular surface disease prior to proceeding with surgery. This may not be what the patient prefers, as it takes time to treat dry eyes and blepharitis; however, you and your patient will be much happier if the time is taken to address this chronic problem.

ABMD. A refractive surgery patient with ABMD is best treated with surface ablation techniques rather than LASIK, as this treats not only the refractive error but also the underlying ABMD. As mentioned previously, there are a number of intraoperative complications that can be associated with performing LASIK on a patient with ABMD, such as erosions, DLK, and epithelial ingrowth. Careful preoperative recognition of the condition can help to avoid such complications. Techniques that we commonly use to identify subclinical ABMD include identify-
ing negative corneal fluorescein staining, retroillumination to highlight cysts and fingerprints, and looking for superior steepening on topography.

**Cornea guttata.** Cornea guttata are excrescenses along the corneal endothelium that can be normal or abnormal, depending on their location. In younger patients, it is not uncommon to find peripheral guttata that are associated with normal aging and not associated with corneal edema. Central guttata are more commonly observed in patients with Fuchs dystrophy. These pathologic guttata represent endothelial decompensation and have a propensity to form corneal edema over time.

Although cornea guttata are typically found in older individuals, they can be present in middle-aged patients as well. There have been several reports of patients with central guttata developing corneal edema after LASIK, although this complication has not been reported for PRK. Thus, in any patient presenting with guttata, we also perform pachymetry and specular microscopy to determine the endothelial cell count and morphology. A healthy cornea should have 60% or greater hexagonal cells. A high degree of polymegathism should raise suspicion. If a healthy endothelial count is observed, we typically recommend that patients with guttata or endothelial abnormalities undergo PRK rather than LASIK to avoid the small risk of postoperative corneal edema.

**CONCLUSION**

Approaching the refractive surgery patient from the perspective of a corneal specialist reinforces the importance of paying close attention to the ocular surface, corneal stroma, and endothelium. Approaching these patients in a stepwise fashion with careful analysis of key history, exam, and imaging data will prevent the surgeon from overlooking important—and extremely common—comorbid conditions such as dry eye syndrome, blepharitis, ABMD, and cornea guttata. Preoperative diagnosis and management of these conditions will help ensure optimal postoperative outcomes and the happiness of your refractive surgery patients.

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