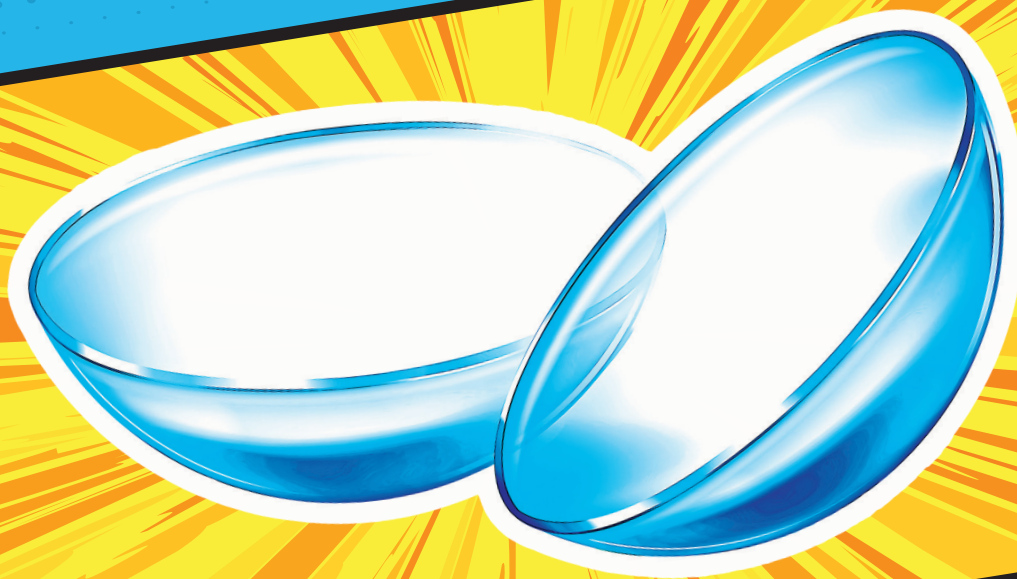




THE ART AND SCIENCE OF MANAGING POST-LASIK KERATECTASIA



When to consider contact lenses versus surgical intervention for the best patient outcomes.

BY JESSICA O. YU, OD, FAAO, FSLs

Laser-assisted in situ keratomileusis (LASIK) is one of the most commonly performed refractive surgeries that provides permanent vision correction.¹ This procedure generally has an excellent safety profile and is highly successful, but a small percentage of patients experience complications postoperatively.¹⁻³ The alteration and compromise of the biomechanical strength of the cornea can lead to instability and the development of keratectasia, a rare but serious complication that results in a high degree of myopic astigmatism, which leads to a decrease in corrected distance visual acuity.² This article discusses the management of post-LASIK keratectasia, specifically with contact lenses.

CORNEAL ECTASIA REFRESHER

Preoperative risk factors for corneal ectasia include abnormal corneal topography, low residual stromal bed thickness, younger patient age, low preoperative corneal thickness, and treated high myopia.³⁻⁵ Despite advances in pre-screening strategies and modern surgical technology, the estimated incidence of post-LASIK ectasia was reported to be 0.033% in 2018.^{4,6,7} This progressive, structural deformation of the cornea causes optical refractive instability and subsequent loss of BCVA.^{3,6,8} With highly variable corneal presentations, coupled with the difficulty and emotional frustration patients experience with

habitual activities, the management of post-LASIK ectasia can be challenging on many levels.

On topography, postoperative ectasias present similarly to keratoconus, showing asymmetric, inferior corneal steepening associated with stromal thinning (Figure 1).^{9,10} Moreover, “multifocal” corneas, central islands, and irregular or decentered ablation profiles can be noted. Other clinical signs of ectasia include significant changes in refractive error, progressive increases in irregular astigmatism, central haze, and anterior and posterior corneal steepening.^{1,6,9-12}

There are multiple potential causes for suboptimal visual

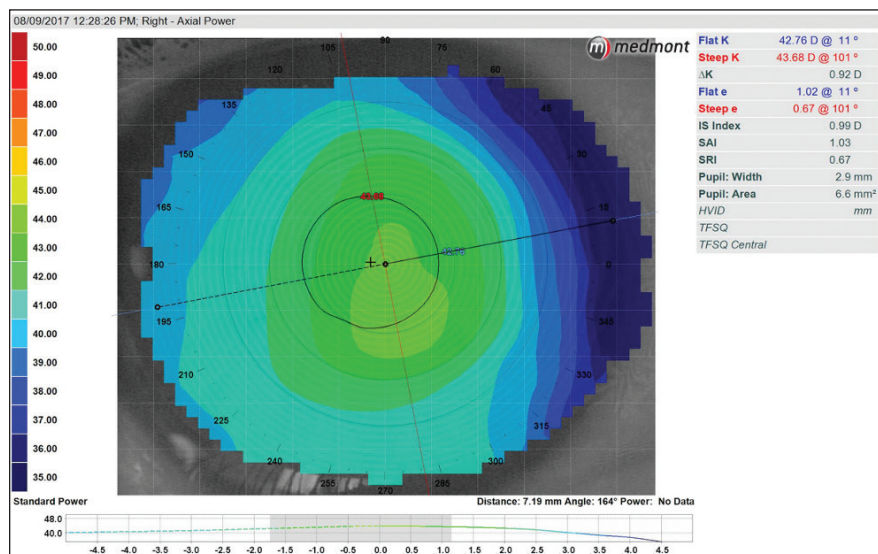


Figure 1. Topography of prolate post-LASIK cornea, previously with moderate hyperopia (+2.25 D).

outcomes with post-LASIK corneal ectasia, including residual refractive error, high or irregular astigmatism, decentration of the optical zone, flap complications, and corneal haze.^{1,3,6,11,13} Patients subjectively experience an array of visual symptoms, such as halos, starbursts, double vision, monocular polyopia, glare and ghosting, or “smeared”

vision.^{1,3,11-15} Poor night vision is among the most common symptoms described by patients, with varying degrees of distortion and loss of contrast.^{14,16} Some patients also present with complications due to dryness or higher-order aberrations (HOAs), which may be caused by flap complications or irregular ablations.^{12,14} These symptoms all

lead to significant subjective dissatisfaction and lifestyle difficulties.

TREATMENT OPTIONS

Surgical Considerations

Various surgically oriented interventions can be considered for the treatment of post-LASIK ectasia, especially when progression is noted. Corneal collagen crosslinking is the preferred procedure when the primary goal is to halt the ectatic progression by stabilizing the collagen framework and improving the biomechanical strength of the cornea.^{4,10} Moreover, the prevalence of corneal collagen crosslinking combined with wavefront or topography-guided photorefractive keratectomy has gained widespread acceptance to help modulate and stabilize the ectatic cornea and improve visual acuity.^{4,6} Other surgical treatment options include implantation of intracorneal ring segments to decrease ectasia, corneal tissue addition for keratoplasty (CTAK, CorneaGen), and lamellar keratoplasty.^{4,8,9,17}

When retreatment is possible, customized ablations and combination strategies have proven effective.¹⁶ However, when further surgical intervention may no longer be desired or deemed a clinical possibility, contact lenses, specifically rigid gas permeable (RGP) lenses, can offer significant therapeutic vision rehabilitation.¹⁵

Postoperative Contact Lens Fitting

In some cases, the goal of fitting postoperative corneas is not only to improve BCVA, but also to reduce HOAs under scotopic and mesopic conditions, where low luminance and nighttime conditions present extraordinary subjective challenges. The alterations in corneal architecture after a LASIK procedure present intricate complexities, as different factors dictate the fitting approach. The topography, refractive error,

AT A GLANCE

- ▶ When further surgical intervention may no longer be desired or deemed a clinical possibility, contact lenses can offer significant therapeutic vision rehabilitation.
- ▶ Rigid gas permeable lenses can mask and neutralize significant amounts of irregular astigmatism and improve visual acuity, as a new spherical refraction surface is essentially created.
- ▶ Scleral lenses are ideally positioned to simultaneously treat refractive error and ocular surface issues; however, monitoring for any potential hypoxia and hypoxic stress-induced corneal edema after long periods of wear is of utmost importance.
- ▶ A challenge of postoperative contact lens fitting is continued patient education and management of psycho-social expectations.

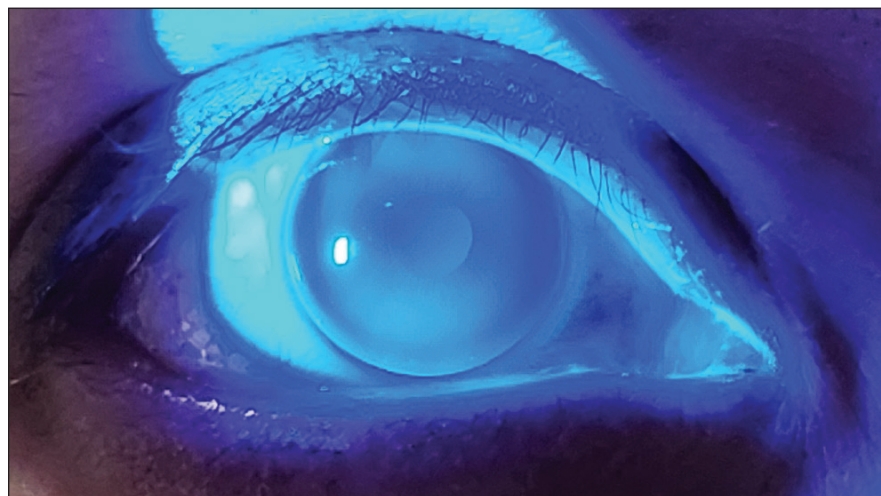


Figure 2. Fluorescein pattern showing good centration and alignment of a larger-diameter RGP.

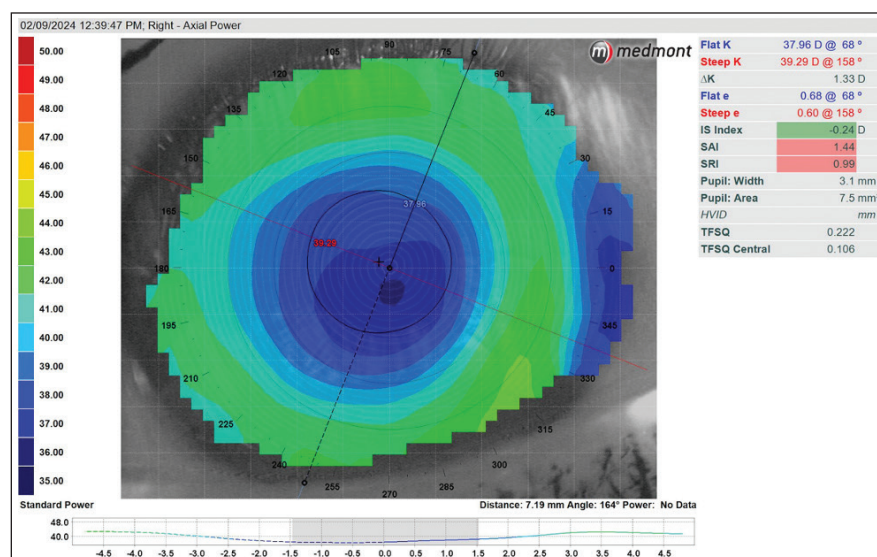


Figure 3. Topography of oblate post-LASIK cornea, previously with high myopia (-9.00 D).

contact lens tolerance, and patient mindset must be considered.

With low and more central ectasias, the refractive error can initially be managed with either spectacles or various soft contact lenses. Spectacles, however, typically offer very limited correction of irregular astigmatism and anisometropia. Newer silicone hydrogel (SiHy) daily disposable lenses with water surface treatments can offer a comfortable way to correct straightforward refractive errors,

and aspheric soft contact lenses may help mask certain aberrations to improve subjective vision. Toric soft lenses can be an option for fitting ectatic patients with more regular astigmatism, as soft contact lenses provide excellent comfort, multiple replacement options for ease and cost reduction, and are readily accessible.^{9,13,18} These benefits, along with acceptable vision, can make soft contact lenses an appealing option over a more complex or less comfortable lens system.

However, as topographic differences increase between the central and peripheral cornea, atypical rotation with toric soft contact lenses can cause unstable alignment issues. With more progressive post-LASIK ectasias exhibiting paracentral thinning, irregular astigmatism, and poorer BCVA, fitting RGPs, hybrid lenses, and scleral lenses has continued to be the gold standard for visual rehabilitation.^{9,14,16} RGPs can mask and neutralize significant amounts of irregular astigmatism and improve visual acuity, as a new spherical refraction surface is essentially created.¹⁹ This more regular profile created by the RGP and the tear film between the posterior lens surface and the anterior corneal surface has the capability to mask HOAs, offering invaluable benefits to aid in subjective visual symptoms.^{9,19}

The Case for RGPs

In many cases, an irregular cornea can be fit with spherical, multi-curve, or aspheric RGP designs, as aspheric lenses with high eccentricity values can be employed for more peripheral ablations.^{16,19} When the ablation areas are more prolate, keratoconic designs can sometimes be helpful. The goal in fitting these types of corneas is to achieve even pressure distribution and maintain adequate lens movement while maintaining optimal pupil coverage. With fluorescein pattern analysis, the RGP should center well or ride slightly superiorly to achieve lid attachment for maximum comfort, with apical alignment and sufficient edge lift to allow tear exchange (Figure 2). Decentered ablation zones or misaligned flaps with asymmetrical slopes can complicate lens centration, creating excessive movement and edge lift, thereby causing subjective discomfort and visual fluctuation.¹¹

For corneas with decentered ablations or elevated islands, RGPs

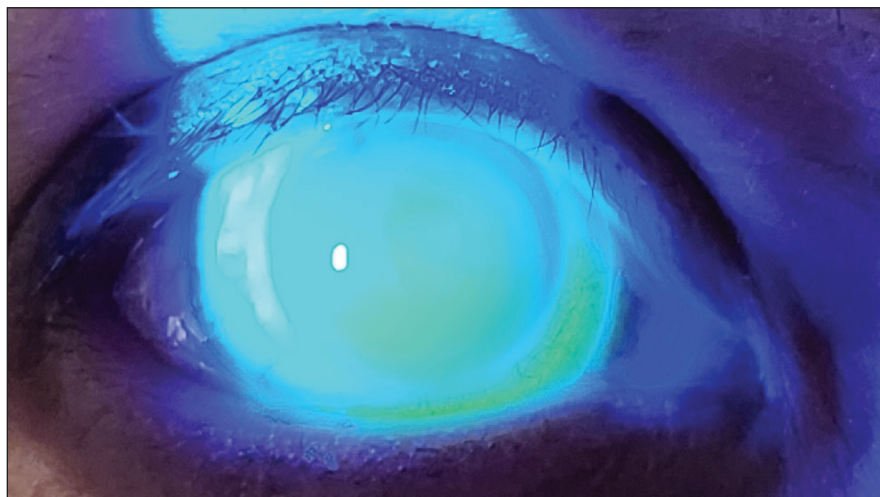


Figure 4. Broad-beam diffuse fluorescein pattern to evaluate overall scleral lens fit.

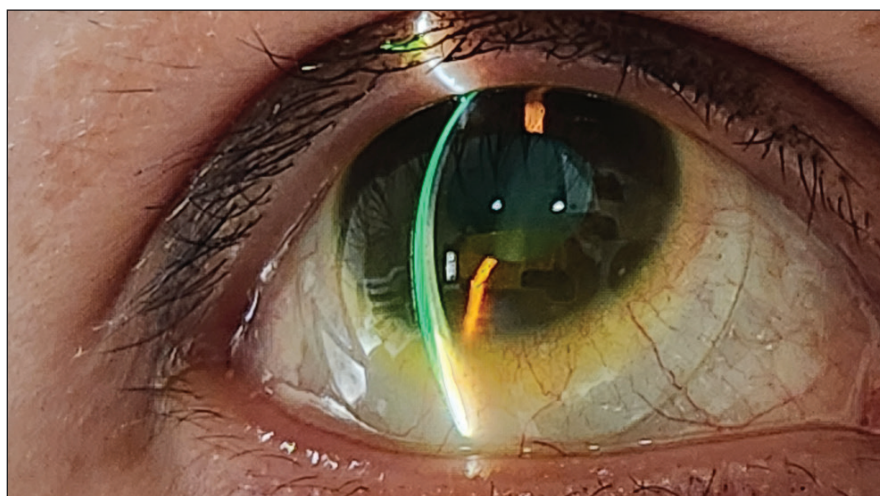


Figure 5. Optic section evaluating all quadrants of scleral lens to ensure there is adequate clearance and no vessel impingement for a healthy fit for a post-surgical cornea.

will naturally follow the contour of the irregular cornea and decenter, causing discomfort and increasing HOAs.¹⁴ When spherical designs fail due to poor fitting, other, more specialized RGP designs should be considered. Back-surface toric and bitoric designs are most useful when corneal topography depicts large amounts of astigmatism.¹⁹ With more oblate corneas where the central myopic ablation area is significantly flatter than the periphery, reverse geometry RGPs offer better centration, particularly in larger diameters for increased stability

(Figure 3). High Dk/t materials are not always ideal because less rigid materials tend to cause unwanted lens flexure and visual instability.

In cases of RGP intolerance, transitioning to a hybrid lens, piggyback system, or scleral lens may be necessary. Using a piggyback system combines the sharper acuity offered by RGPs with the comfort of a soft contact lens placed underneath the RGP to help cushion the cornea. SiHy daily disposable lenses can be a healthy and convenient option, increasing on-eye comfort and yielding stable visual quality.²⁰

As the post-surgical cornea is often flatter centrally, a plus-powered lens, which is thicker in the center, can offer better centration and stability for the RGP and improve visual function favorably.^{9,21}

Where Scleral Lenses Shine

Scleral lens prescribing and use has increased in recent years due to significant advantages with their larger diameters, which aid in subjective comfort, better centration, and enhanced stability.^{6,9,14} Tear film instability and dry eye syndrome, a common postoperative complaint, should also be considered part of the post-LASIK fitting process.^{12,22} Designed to vault over the cornea and limbus, scleral lenses create a fluid reservoir between the lens and the cornea, neutralizing ectatic irregularities and significant elevation variations. Scleral lenses are ideally positioned to simultaneously treat refractive error and ocular surface issues because of the fluid reservoir between the cornea and the lens that continuously bathes the cornea.¹² Scleral lenses are made with high oxygen permeability and are extremely customizable. With a more stable fit, decreased HOAs improve high-contrast BCVA and reduce shadows and glare.^{6,14}

Although scleral lenses offer many advantages, there can also be some complications and barriers to overcome. Research continues to indicate issues of corneal hypoxia due to the lens and thickening of the fluid chamber reservoir.^{6,23} As post-surgical corneas may already be compromised, monitoring for any potential hypoxia and hypoxic stress-induced corneal edema after long periods of wear is of utmost importance (Figures 4 and 5).^{6,14} Additionally, if there is too much suction created with the fit itself or upon lens removal, there may

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be undesirable force exerted on an already vulnerable cornea.²³

WELL WORTH THE EFFORT

One of the most difficult aspects of postoperative contact lens fitting is continued patient education and management of psycho-social expectations. The concept of contact lens wear is not always welcomed by patients, either due to additional hassle, previous contact lens intolerance, or inability to accept the necessity of contact lens correction after undergoing refractive surgery. Alterations in corneal sensitivity postoperatively can also affect contact lens comfort. It is important to continually remind frustrated patients that the fitting process is constantly evolving to create the healthiest and most comfortable lens-to-cornea relationship. Chair time and

costs should be set realistically.

Although keratectasia remains a potentially devastating complication after refractive surgery, most patients can regain functional visual acuity with appropriate management. Fitting contact lenses after LASIK can be a safe and reliable way to help improve visual acuity and reduce visual distortions and complications that arise from the irregular corneal surface. RGPs can be challenging and time-consuming, but with the appropriate knowledge and some creative flexibility using various specialty RGP lens options, the ability to restore a patient's visual function and quality of life is immeasurably rewarding. ■

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