Managing Post-LASIK Ectasia

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Corneal ectasia is a devastating sequel to LASIK, but now most patients can be treated, and functional vision restored, without resort to a corneal transplant.

Cornea ectasia—characterized by progressive thinning and steepening of the cornea, irregular astigmatism, and loss of best spectacle-corrected visual acuity (BSCVA)—is a rare, but serious, complication of LASIK. Although exact statistics are unknown, the incidence of corneal ectasia following LASIK has been reported as about 1 in 2,500.¹ We can expect the incidence to decline as the risk factors for ectasia become more clearly defined. The condition usually presents between 6 and 24 months after surgery; by 24 months after surgery, 75 to 80% of patients who will eventually develop ectasia have been identified.

Loss of uncorrected visual acuity is the first clue that a problem is present, and this is typically the symptom that brings ectasia patients back to their eyecare provider’s office. Compared with a postsurgical regression effect or natural increase in myopia, progressive decrease in spectacle corrected visual acuity may represent a corneal ectasia that has advanced to the point of becoming symptomatic.

FIGURE 1 Dr. Hersh uses corneal collagen crosslinking to physically strengthen the cornea in a patient with post-LASIK ectasia.

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**Diagnostic Clues**

When a post-LASIK patient presents with decreased visual acuity, the examiner needs to perform a meticulous refraction, looking especially for increased myopia and/or cylinder. It is important to note changes in manual keratometry, particularly after surgery. Ideally, data from this device will show us patients who are susceptible to, or have subclinical, ectasia prior to surgery.

Although further study is needed, it is an exciting prospect, as the existence of predictive biomechanical indices would allow us to better identify at-risk patients preoperatively and also diagnose postoperative corneal ectasia earlier. While early diagnosis was a small advantage prior to the advent of collagen crosslinking, with this technology, which has the potential to halt ectatic progression, there is significant incentive to diagnose and treat this condition as early as possible. Indeed, if it becomes possible to spot at-risk patients with the Ocular Response Analyzer before LASIK, it might even allow treatment with collagen crosslinking before the onset of significant visual deterioration from keratoconus itself.

**Restoring Vision**

There are two goals in the management of corneal ectasia: stopping progression and restoring visual acuity. The loss of visual acuity can be quite frightening for patients, as well as deeply frustrating, since these are patients who chose LASIK specifically to obtain excellent vision without correction. Therefore, restoring or getting close to patients’ preoperative BCVA is a key component to successful ectasia management. We now have several options to restore visual acuity, and, in most patients, we can do this without a corneal graft. Patients generally find this news reassuring, as they may have heard or read that corneal ectasia can only be treated with a corneal transplant.

Our primary tool for improving BCVA is contact lens fitting. The most effective options are: rigid gas permeable (GP) contact lenses, hybrid contact lenses (which have a GP center surrounded by a hydrogel “skirt”), and specialty keratoconus lenses (which are designed to accommodate a corneal protruberance). With the exception of certain custom-made lenses, soft lenses do not mask the irregular astigmatism and so don’t provide these patients with adequate acuity.

Other modalities that can improve vision in these patients include corneal ring segments (eg, Intacs®) and conductive keratoplasty (CK). Corneal ring implants—Intacs and, outside of the US, the Ferrara Ring—can frequently improve corneal topography and reduce visual distortion caused by corneal ectasia. The goal of implanting these devices is to regularize the ocular surface topography in order to obtain a more comfortable and effective contact lens fit or better spectacle corrected visual acuity. For patients who are contact lens intolerant, corneal implants may obviate the need for corneal transplantation.

**The Intacs Procedure**

Intacs 150-degree inserts are placed within channels made with
either a manual dissector or an IntraLase™ femtosecond laser. The inserts come in three thicknesses: 250, 300, and 350 microns. The inserts are generally placed to create an optical zone of approximately 7 mm. Placed within the mid-peripheral corneal stroma, the rings diminish the height and steepness of the corneal cone, essentially causing secondary flattening of the central cornea and improvement in corneal optical irregularity.

Placement of the inserts can affect corneal astigmatism, so the incision site should be selected based on refractive, keratometric, and topographic astigmatism. The incision site is typically placed at the steep corneal axis. Two corneal inserts can be implanted in a symmetric pattern or, in some cases, a single insert may be placed below the steep area to improve the corneal topography.

In some of these patients, CK can also be used. Approved by the FDA for the treatment of hyperopia and presbyopia, CK can be used on an off-label basis to steepen a flatter hemi-meridian. If placed below the steep area in an ectatic patient, CK by itself can help center the steep area and thereby regularize the topography. CK can also be used adventitiously with corneal inserts to minimize astigmatism. For pellucid-style topography (sagging cones), CK can be effective in mitigating against-the-rule astigmatism.

**Corneal Crosslinking**

As noted above, the second arm of ectasia management is preventing further progression of the disease. Until recently, we had no means to do this effectively, but a new therapy, corneal collagen crosslinking (CXL), is being used successfully abroad and has shown early promise in a US multicenter clinical trial. CXL uses riboflavin plus 365-nm ultraviolet light to induce covalent crosslinks amongst corneal collagen fibers (Figure 1). The goal of treatment is to strengthen the cornea (making it physically stiffer) in order prevent further biomechanical deformation.

The US study in which we are participating, run by R. Doyle Stulting at Emory Eye Center, is looking at the safety and effectiveness of CXL for progressive keratoconus and corneal ectasia following LASIK. Early results, as well as longer-term results from overseas where the therapy has been used for several years, indicate that the treatment is effective in limiting progression of ectasia.

**THE BOTTOM LINE**

Corneal ectasia is a rare but serious complication of LASIK. In the condition, the cornea thins and deforms, bulging outward. This irreg-