Crosslinking for iatrogenic keratectasia after LASIK and for keratoconus

In their article describing successful riboflavin–ultraviolet A (UVA) corneal crosslinking to arrest and partially reverse the progression of laser in situ keratomileusis (LASIK)-induced iatrogenic keratectasia, Hafezi et al.[1] have demonstrated that this technique is capable of increasing the biomechanical stability of these corneas. It would of course be of even greater benefit if the ectatic problem could be completely reversed. To accomplish this, I have performed the following procedure in a patient who developed ectasia after LASIK and another who had hyperopic automated lamellar keratomileusis.

The preexisting corneal flap was elevated, then sutured snugly in place using continuous and interrupted 10-0 nylon sutures. A paracentesis was performed during the procedure to soften the globe and permit the flap to be appropriately flattened. Postoperatively, topical medications (travoprost [Travatan] and timolol and dorzolamide [Cosopt]) were used to maintain the intraocular pressure in the 10 to 15 mm Hg range.

At the conclusion of each procedure, the keratectasia was completely eliminated and did not return as long as the continuous suture remained in place (interrupted sutures were selectively removed to eliminate astigmatism caused by their presence). Unfortunately, in both cases, the keratectasia rapidly returned after removal of the continuous suture approximately 1 year after surgery. (This was done because of suture erosion/exposure in both patients.)

Based on this experience, I would recommend that the authors consider performing suture elimination of corneal ectasia prior to riboflavin–UVA crosslinking treatment. It is hoped that this sequential combination would restore the cornea to a pre-ectatic state that would persist after suture removal. Because riboflavin treatment for keratectasia is not a U.S. Food and Drug Administration–approved procedure, our European colleagues who are able to perform this treatment might be able to prove the above to be a successful means to eliminate this rare but serious complication of LASIK.

With regard to eyes with keratoconus, thermokeratoplasty (TKP) as orginally described by Antonio Gossett could be used to flatten the cornea (it is virtually always successful in doing so, but unfortunately the effect is transient), followed immediately by riboflavin-UVA cross-linking treatment. Hopefully the latter would result in permanent flattening of the cornea.

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REFERENCE

1. Hafezi F, Kanellopoulos J, Wiltfang R, Seiler T. Corneal collagen crosslinking with riboflavin and ultraviolet A to treat induced keratectasia after laser in situ keratomileusis. J Cataract Refract Surg 2007; 33:2035–2040

REPLY: In his letter, Mackool suggests relifting the flap and suturing it with tension so the keratectasia disappears topographically. Furthermore, he proposes performing crosslinking at a later stage. We thank the author for this highly interesting idea and are delighted that our article finds such splendid resonance among corneal surgeons.

Krumeich et al. (personal communication) proposed suturing in 1998, and we performed such a running suture in several patients in 1999. We saw good immediate central flattening but recurrence of the steep island after 2 to 3 months. Obviously, the tension needed for flattening is built up by the sutures but leads to suture erosion over time.

Furthermore, iatrogenic keratectasia occurs months and even years after the initial LASIK procedure. By that time, the flap is again contributing to corneal biomechanics, even if this support does not influence the occurrence of iatrogenic keratectasia. Removing the flap from the underlying corneal bed, as suggested by Mackool, will biomechanically weaken the partially healed cornea.

Finally, the crosslinking procedure only reinforces interfibrillar and intrafibrillar crosslinks between collagen fibers but cannot provide the horizontal forces necessary to stretch the flap sufficiently.—*Farhad Hafezi, MD, PhD, Theo Seiler, MD, PhD*

New uses for collagen crosslinking

In their article,[1] Wollensak et al. demonstrated that collagen crosslinking using riboflavin and ultraviolet A (UVA) led to less edema in the crosslinked portion of the cornea than in the untreated control area. Their study propelled me to think about the potential clinical uses of this change in the swelling behavior of the corneal stroma. One potential use was discussed by Natarajan et al.,[2] who suggested the possible application in corneas with borderline endothelial function not yet decompensated, such as in corneal guttata patients. I would like to suggest other potential uses for this new technology (crosslinking using riboflavin and UVA).

Crosslinking with riboflavin–UVA could be used in bullous keratopathy (BK). In BK patients, corneal edema has already occurred. Consequently, I suggest 2 steps: application of topical glycerin to dehydrate the cornea, followed by glycerin removal (washing).

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