## Post-LASIK Ectasia

Dear Editor:

I report a patient who had post-LASIK ectasia and was managed in a novel fashion, without keratoplasty.

A 29-year-old male underwent uniocular LASIK 38 months ago. Little detail was available from the patient and the surgeon. His original uncorrected visual acuity (UCVA) before LASIK was 20/80, and his spectacle-corrected visual acuity (BSCVA) was 20/20 with refraction of sphere being $-2.00-175\times85$. Initially after the LASIK procedure, the patient reported that vision was good. During the following months, vision in that eye deteriorated. The original LASIK surgeon diagnosed ectasia and recommended the placement of Intacs (Addition Technology, Des Plaines, IL). After Intacs placement, his vision did not improve, and the patient developed severe night vision halos.

The treating LASIK surgeon then recommended penetrating keratoplasty (PK) as the next step, and the patient came for a second opinion for PK, 11 months after the original LASIK procedure and 3 months after Intacs implantation. Corneal topography is shown in Figure 1 (available at http://aaojournal.org); the central corneal thickness was 410 $\mu$m, and the endothelial cell count was 2750 cells/mm$^2$ (Conan, Boston, MA). I discussed with the patient the following:

1. The poor long-term experience with Intacs in post-LASIK ectasia that I have reported.[1]
2. The benefits and risks of PK.
3. Combined ultraviolet radiation and riboflavin treatment to achieve collagen cross-linking and biomechanical stabilization of the ectasia.

After informed consent was given, I removed the Intacs. Two weeks later, I treated the ecstatic cornea with a single application of combined ultraviolet radiation and riboflavin treatment to achieve collagen cross-linking at 3 mW/cm$^2$ for 30 minutes (KeraCure, Priavision, Menlo Park, CA) combined with the use of 0.1% riboflavin ophthalmic solution in 20% dextran T-500.

The treatment was performed after 20% alcohol-assisted epithelial removal. The riboflavin solution was then applied for approximately 2 minutes to soak the stromal bed and protect the iris, crystalline lens, and retina from the ultraviolet A irradiation, and then 1 drop every 2 minutes for a total of 30 minutes. A bandage contact lens was placed onto the cornea for 5 days and the patient treated with topical ofloxacin 1% (Ocuflox, Allergan, Irvine, CA) and prednisolone acetate 1% (Predforte, Allergan) 4 times a day for 10 days.

At 3 months, his UCVA improved from 20/400 to 20/70 and his BSCVA from 20/200 to 20/40. Refraction changed from $-4.50-4.50\times120$ to $-4.00-3.50\times115$, and corneal topography changed as seen in Figure 1. The stability of these parameters and the corneal topography between months 1 and 3 of this treatment encouraged me to proceed with topography-guided photorefractive keratectomy (PRK) to reduce the irregular astigmatism and try to provide the patient with a visual acuity not requiring the use of spectacles or a soft contact lens.

The corneal thickness at that point of 420 $\mu$m enabled a PRK of his full spectacle correction with a topography-guided customized ablation on top of the LASIK flap (T-CAT software, Wavelight excimer laser, Wavelight, Erlangen, Germany). At the first post-PRK month, UCVA was 20/20$^-$ and BSCVA 20/20, with a refraction of $+0.50-0.50\times160$. There was no corneal endothelium count change. It is now 24 months after the operation and the patient enjoys UCVA of 20/20, although there are some mild night vision problems. Postoperative corneal topography is shown on Figure 1.

The most frequent management for post-LASIK ectasia has been PK.[2] Previous reports of the use of combined ultraviolet radiation and riboflavin treatment to achieve collagen cross-linking mention a slowing down of keratoconus.[3] We have reported the management of extreme cornea irregularity with topography-guided ablations.[4] This is the first report of management of post-LASIK ectasia with combined ultraviolet radiation and riboflavin treatment to achieve collagen cross-linking followed by customized PRK for visual rehabilitation. The apparent corneal stabilization, along with the successful visual rehabilitation, suggests that this approach may have a wider application as an alternative to therapeutic PK.[5]

Larger comparative studies and longer follow-up are obviously necessary to validate the long-term efficacy of this combined ultraviolet radiation and riboflavin treatment followed by a surface excimer laser treatment. Nevertheless, the refractive and topographic stability for 2 years appears to validate this minimally invasive treatment of iatrogenic keratectasia and leads me to believe that it may have an even wider application in the near future.

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### References

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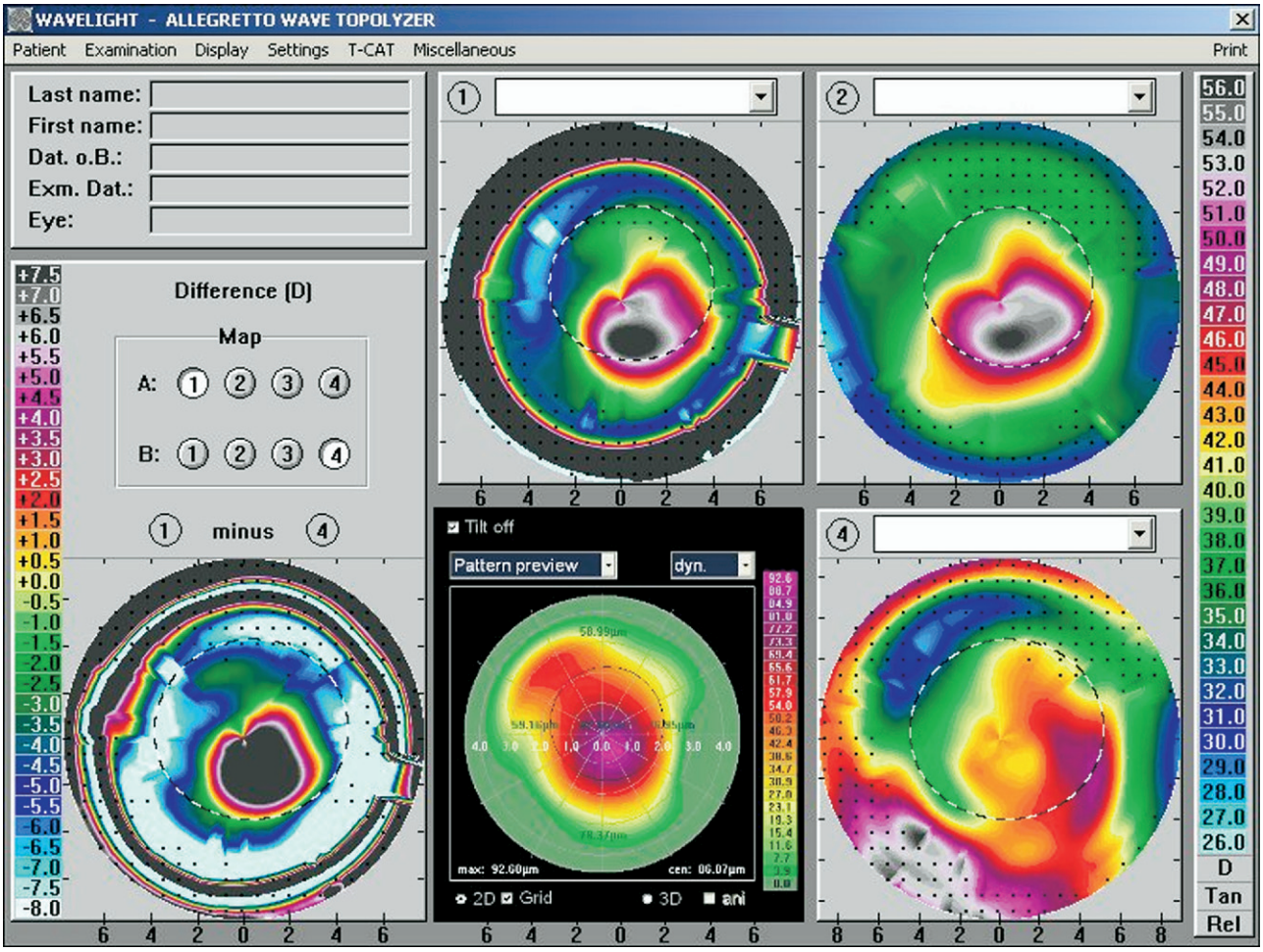


**Figure 1.** Display of topographies. **1**, Corneal topography of this case when first seen by the authors, with central cornea ectasia and midperiphery flattening as an effect of the Intacs that were present. At this point, best spectacle-corrected visual acuity (BSCVA) is 20/200. **2**, Corneal topography 2 months after the removal of Intacs and 1 month after combined ultraviolet radiation and riboflavin treatment to achieve collagen cross-linking. The central steepening is still present, and the effect of the Intacs removal relative to the previous image is appreciated mostly at the midperiphery, which appears steeper now. At this point, BSCVA is 20/200. **Bottom center**, An estimated corneal topographic ablation pattern as a laser treatment plan of the topography-guided procedure. It is notable that this ablation pattern is highly irregular, with a deeper ablation plan just inferior to and right of the center, which matches, however, the central cornea irregularity in the previous topographies. **4**, Corneal topography 6 months after topography-guided photorefractive keratectomy. The central cornea appears more regular and much flatter. At this point, BSCVA and UCVA are $20/20^{-}$. **Bottom left**, Comparison map depicting the result of subtraction of corneal topography 4 (final result) from corneal topography 1 (state of the complication when we encountered it). Impressively, the difference resembles the topography-guided ablation pattern (bottom center), demonstrating effectively the specificity of this treatment in reducing the pathogenic cornea irregularity, which, we theorize, contributed to the drastic improvement in BSCVA.