

Irregular Astigmatism and Recurrent Epithelial Ingrowth

BY DAVID R. HARDTEN, MD; JEFFREY WHITMAN, MD;
GASTON O. LACAYO III, MD; AND JONATHAN B. RUBENSTEIN, MD

CASE PRESENTATION

A 52-year-old male underwent bilateral RK in 1997 for -6.50 D of myopia. He developed a progressive hyperopic drift in his left eye and subsequently underwent LASIK in that eye with a Hansatome microkeratome (Bausch & Lomb, Rochester, NY) and the Visx Star S4 excimer laser (Advanced Medical Optics, Inc., Santa Ana, CA) in October 2007.

The patient developed mild, central, diffuse lamellar keratitis, which cleared after intensive treatment with topical steroids. By 6 weeks postoperatively, the surgeon noted mild epithelial ingrowth under the central aspect of the radial incision between the 4- and 5-o'clock positions. The patient's visual acuity was 20/25 with a mildly myopic refraction of -1.50 +0.75 X 41. By 6 months postoperatively, he was complaining of decreased reading vision. His uncorrected distance vision was still 20/25, but the refraction had changed to -1.25 +2.50 X 41. The surgeon decided to lift the flap and remove the epithelial ingrowth. He applied mitomycin C (MMC) 0.02% to the stromal bed for 30 seconds.

Two weeks after the flap-lift procedure, the patient presents to your office for a second opinion. His chief complaint is blurred vision in his left eye. He is taking prednisolone acetate 1% and Restasis (Allergan, Inc., Irvine, CA) b.i.d. along with artificial tears. His UCVA is 20/50 OS. The external examination, his pupils, and his ocular motility are normal. The refraction for his left eye is -1.75 +2.25 X 30 = 20/40-1. The slit-lamp examination shows a superior-hinge LASIK flap and an eight-incision RK with astigmatic arcuate incisions at the 150° meridian. There is an island of

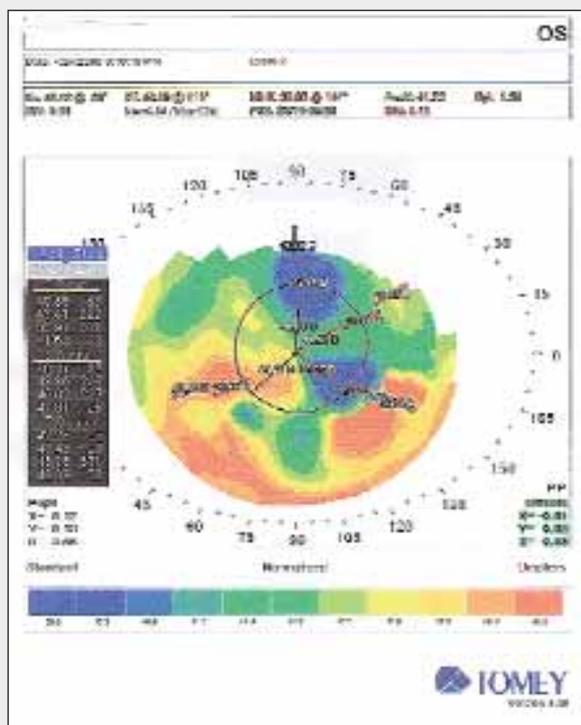


Figure 1. Corneal topography of the patient's left eye 2 weeks after a flap-lift procedure to remove post-LASIK epithelial ingrowth.

epithelial cells under the RK incision at the 4-o'clock position. Fluorescein staining of the cornea reveals no staining of the radial incision or of the flap's edge. Figure 1 shows the corneal topography.

The patient is interested in improving his visual acuity. How would you counsel and manage him?

DAVID R. HARDTEN, MD

The issue still seems to be irregular astigmatism from the epithelial ingrowth present at the 4-o'clock position. The patient did relatively well visually before the epithelial ingrowth developed after the initial LASIK procedure. His most recent surgery to remove the epithelial ingrowth was only 2 weeks ago, and the epithelium is already back under the flap. Although it is tempting to wait for full resolution of the typical postoperative edema, it is unlikely that this epithelial ingrowth will resolve on its own. If the area of ingrowth is smaller than what was present before this most recent surgery, then you could wait to see if it does not progress. It is possible that, once the edema resolves from the surgery, the patient's vision will be adequate. This scenario is doubtful, however, so I think it is necessary to remove the epithelial ingrowth once again.

"It is necessary to remove the epithelial ingrowth once again."

—David R. Hardten, MD

There are many adjunctive procedures that surgeons use in an attempt to minimize the recurrence of epithelial ingrowth after its removal. I am not aware of any strong evidence that MMC would be successful, so I probably would not use that therapy again in this case.

Ayala et al recently reported successfully using the Nd:YAG laser to cause a resorption of epithelial ingrowth.¹ If the ingrowth in this case is far enough in the periphery and localized to just this one area at the 4-o'clock position, then Nd:YAG therapy could be useful. Ayala et al focused the Nd:YAG laser energy on the epithelial ingrowth, starting in the center of the area of epithelial ingrowth. They focused the laser such that the bubbles formed in the region of the ingrowth. Laser spots were shot until the entire area of the epithelial ingrowth was encompassed. The investigators used minimal effective energy (average, 0.6 mJ) to produce the corneal vacuoles. I have used similar settings in two cases and observed resolution with minimal scarring in the area of the ingrowth. Ayala et al reported minimal scarring, even in the central visual axis. The amount of additional scarring I have seen in the area where the Nd:YAG energy was applied, however, makes me prefer to remove the ingrowth mechanically first if it is located in the central 6-mm zone of the cornea.

The other method I have used in similar situations of recurrent ingrowth is to block the return of the epithelium in the gutter for 1 to 2 weeks by means of fibrin glue. The epithelium is removed from the top of the flap, the gutters and edges of the RK incisions, and the underlying back of the flap and stromal bed. After repositioning the flap, I place fibrin glue on the gutters and the RK incisions in hopes of allowing the flap to become sufficiently adherent to the underlying stromal bed to prevent recurrent epithelial ingrowth. After publishing the results of our original three cases,² my colleague and I have used this technique in more than 30 eyes and achieved good results in over 90% of these difficult cases. If the full extent of the ingrowth is not yet known, then I would favor the use of fibrin glue over an Nd:YAG treatment.

JEFFREY WHITMAN, MD

This case of epithelial ingrowth after LASIK is further complicated by epithelium growing in the area of an RK incision. I tend to let areas of limited ingrowth alone if they are not causing refractive changes. In this case, comparing refractions and topography demonstrates an increasing refractive change, particularly in astigmatism, along the area of the affected RK incision. Treatment is therefore imperative.

After a careful examination to make sure that the epithelium is not coming from a damaged peripheral edge of the flap, I would carefully lift the flap while trying to maintain a smooth edge so as not to invite further ingrowth once the case is concluded. I would be meticulous in the debridement of the stromal bed and the stromal side of the flap. I prefer a 6900 blade and lint-free sponges for debridement. Next, I would open the affected RK incision with blunt dissection and thoroughly scrape it clean. Because the epithelial ingrowth has recurred since the initial debridement with MMC application, I would now apply 20% ethanol for approximately 30 seconds, both within the RK wound and on the surrounding stroma. After performing profuse irrigation with balanced salt solution, I would reposition the flap and allow it to dry. If a lack of a peripheral seal might have contributed to the original epithelial ingrowth, I would suture the flap.

I would prescribe hourly steroid drops for the first night and fluoroquinolone antibiotic drops q.i.d. Because the incidence of diffuse lamellar keratitis after ethanol treatment is high, I would also prescribe an oral Medrol dose pack (Pfizer Inc., New York, NY). Steroids would be tapered as dictated by the clinical situation.

GASTON O. LACAYO III, MD

This case illustrates the "joy" of RK. A progressive hyperopic shift caused an unwanted refractive error, which led

this patient to seek newer alternative options to improve his vision. When presented with previous RK cases, I prefer to correct the refractive errors with surface ablation and prophylactic MMC. Surface ablation eliminates complications that are inherent in creating a flap in a previously dissected cornea.

The patient's eye has irregular astigmatism, both from the previous RK/astigmatic keratotomy (AK) and likely from an epithelial plug below the flap. Because the flap was recently lifted, I would closely monitor the patient for a few more weeks until I could establish a stable manifest refraction and topography with no evidence of spreading ingrowth. I would also remind the patient that there is no perfect solution, especially in RK/AK patients with irregular astigmatism. The goal would be to help improve his vision with the least risk.

“Surface ablation eliminates complications that are inherent in creating a flap in a previously dissected cornea.”

—Gaston O. Lacayo III, MD

If the ingrowth and refraction stabilize, I would offer the patient two options. The conservative approach would be to use a rigid gas permeable lens to reduce the irregular astigmatism. The second option would be to relift the flap. I would scrape both the cornea and flap, place an ethanol-soaked sponge for 30 seconds, and suture the flap for 1 month to reduce the incidence of new or progressive epithelial ingrowth. If a residual refractive error were present 3 months after the suture's removal, I would then offer a wavefront- or topography-guided surface laser treatment to help reduce the degree of astigmatism and induced higher-order aberrations.

JONATHAN B. RUBENSTEIN, MD

This patient has 2.25 to 2.50 D of induced astigmatism at 30° to 40°. It has probably resulted from corneal flattening over an area of epithelial ingrowth adjacent to an old 4- to 5-o'clock radial RK incision that corresponds to the 130° axis. The epithelial ingrowth combined with the MMC treatment has caused a localized flattening at the 4-o'clock position, as illustrated by the area of deep blue color on the corneal topographic map (Figure 1). The flattening at 130° has produced steepening along the 30°-to-40° axis, resulting in the -1.75 +2.25 X 30° refractive error.

The patient is still taking 1% prednisolone acetate and Restasis b.i.d. 2 weeks after his MMC treatment.

Both medications slow wound healing and could potentiate flattening at the 130° axis. I would therefore instruct the patient to stop the prednisolone acetate and the Restasis eye drops but continue the artificial tears. I would then observe the patient for 3 months, at which time I would repeat the topography and refraction and perform wavefront testing. If the patient had a significant, persistent, and stable refractive error, I would suggest wavefront-guided surface ablation. I would avoid further AK or LASIK incisions in a cornea that has already been destabilized by previous RK incisions, AK incisions, the creation of a LASIK flap, and MMC treatment. ■

Section editor Karl G. Stonecipher, MD, is Director of Refractive Surgery at TLC in Greensboro, North Carolina. Parag A. Majmudar, MD, is Associate Professor, Cornea Service, Rush University Medical Center, Chicago Cornea Consultants, Ltd. Stephen Coleman, MD, is Director of Coleman Vision in Albuquerque, New Mexico. They may be reached at (847) 882-5900; pamajmudar@chicagocornea.com.

David R. Hardten, MD, is Director of Refractive Surgery at Minnesota Eye Consultants in Minneapolis. He is a consultant to Advanced Medical Optics, Inc., and TLCVision. Dr. Hardten may be reached at (612) 813-3632; drhardten@mneye.com.



Gaston O. Lacayo III, MD, is Assistant Professor, Rush University Medical Center, Chicago Eye Consultants in Berwyn, Illinois. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Lacayo may be reached at (708) 788-3400; gaston_lacayo@rush.edu.



Jonathan B. Rubenstein, MD, is Vice Chairman and The Deutsch Family Professor of Ophthalmology, and he is Director of Refractive Surgery for Rush University Medical Center in Chicago. He has lectured for Alcon Laboratories, Inc. Dr. Rubenstein may be reached at (312) 942-2734; jonathan_rubenstein@rush.edu.



Jeffrey Whitman, MD, is President and Chief Surgeon of Key-Whitman Eye Center in Dallas. He acknowledged no financial interest in the products or companies mentioned herein. Dr. Whitman may be reached at (214) 754-0000; whitman@keywhitman.com.



1. Ayala MJ, Alió JL, Mulet ME, De La Hoz F. Treatment of laser in situ keratomileusis interface epithelial ingrowth with neodymium:yttrium-aluminum-garnet laser. *Am J Ophthalmol.* 2008;145:630-634.

2. Anderson NJ, Hardten DR. Fibrin glue for the prevention of epithelial ingrowth after laser in situ keratomileusis. *J Cataract Refract Surg.* 2003;29:1425-1429.