Epithelial Ingrowth Associated With LASIK

Most cases can be managed with observation alone.

BY RICHARD E. BRAUNSTEIN, MD; AND ANNE S. STEINER, MD

Laser vision correction is a popular treatment for patients who desire spectacle independence. There are currently two main options for such patients: PRK and LASIK. As a surface procedure, PRK eliminates the risks associated with the creation of a stromal flap but requires longer visual recovery and increases patient discomfort. LASIK offers faster recovery and improved patient comfort; however, inherent in the LASIK procedure are the risks of creating a stromal flap, including the possibilities of flap infection, dehiscence, buttonhole, diffuse lamellar keratitis, and epithelial ingrowth.

Epithelial ingrowth under a LASIK flap is a rare complication, with varied rates reported in the literature;[1-2] Farah et al[1] reported a 4.3% incidence of ingrowth, whereas Stulting et al[2] reported that epithelial ingrowth occurred in 9.1% of cases. Both studies were published in the late 1990s, shortly after LASIK became popular.

There are three possible sources of epithelial cells under the LASIK flap. One is the microkeratome blade, which can drag epithelial cells through the stromal flap during flap creation. The second is injection of epithelial cells under the flap during flap irrigation, when they can become trapped in the interface. The third source is central migration of epithelial cells from the peripheral cornea under the flap. Theoretically, the cells that are inserted or injected during flap creation have limited capacity to replicate and are therefore limited in their viability. However, the migrating cells have the potential to cause progressive and more significant complications.

Epithelial cells may migrate centrally, causing a decrease in BCVA, astigmatism, photophobia, glare, foreign body sensation, scarring, and flap necrosis.

DIAGNOSE CORRECTLY

On slit-lamp exam, epithelial ingrowth may appear as isolated islands of epithelial cells, usually with limited potential for proliferation, or as a line of migratory cells continuous with the peripheral flap. Retroillumination may be useful to identify the presence and extent of ingrowth. Clinically, epithelial ingrowth is most commonly asymptomatic and limited to the flap periphery. However, these epithelial cells may migrate centrally, becoming clinically significant and causing a decrease in BCVA, astigmatism, photophobia, glare, foreign body sensation, scarring, and, rarely, flap necrosis.

Epithelial cells may incite a large inflammatory response, mimicking diffuse lamellar keratitis or infectious keratitis. Although these complications are rare, they can be devastating. For this reason, it is prudent to minimize the incidence of epithelial ingrowth and diagnose it correctly when possible.

The incidence of epithelial ingrowth is greater in eyes with postoperative epithelial defects, poor flap adherence, anterior basement membrane dystrophy, thin flaps or flap perforation, with increasing age, and in patients with dia-

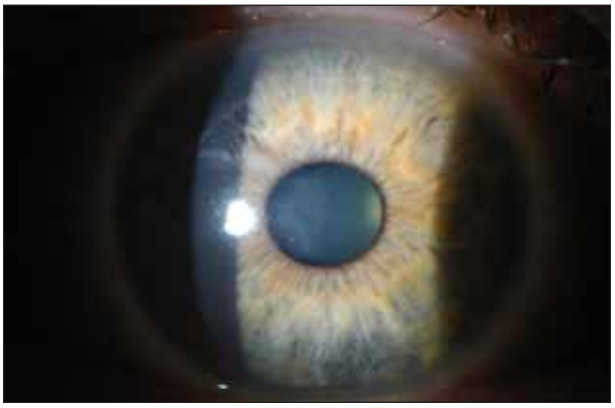

Figure 1. Clinically significant epithelial ingrowth after LASIK enhancement.

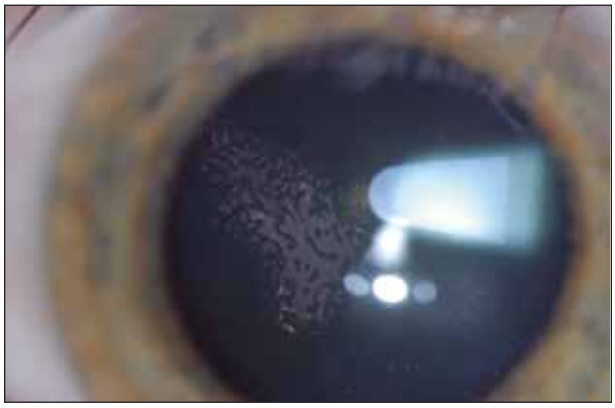

Figure 2. Same eye after flap lift and debridement of epithelial ingrowth at 2 months postoperative.

betes.[3-5] Good surgical technique at the time of the primary procedure helps decrease this risk. Some authors recommend that the stromal bed be well irrigated prior to lowering the flap, although excessive irrigation may cause stromal swelling and reduced flap adhesion.[5] It is also recommended that adequate time be taken at the end of the procedure to allow the flap to dry and ensure its adhesion.

In addition to the factors that increase the risk of epithelial ingrowth during the primary procedure, postoperative flap lift is the main maneuver that significantly increases the risk of epithelial ingrowth. Although the rates of clinically significant epithelial ingrowth in association with primary LASIK surgery are low, they increase dramatically in retreated eyes. Stulting et al[2] reported an overall rate of epithelial ingrowth of 9.1%, but only 1.3% of primary LASIK cases required surgical intervention for epithelial ingrowth. In eyes that had undergone flap lift, the rate of ingrowth was 3.2%. Recently, Caster et al[3] reported 0% and 2.3% of clinically significant epithelial ingrowth cases in primary LASIK and retreatment eyes (Figure 1), respectively. Additionally, the authors noted that the rate of clinically significant ingrowth increased when flap lift was performed more than 3 years after the original treatment.

TAKE-HOME MESSAGE

- The three possible sources of epithelial ingrowth are the microkeratome blade, flap irrigation, and cell migration under the flap.
- It is prudent to minimize the incidence of epithelial ingrowth and diagnose it correctly.
- Incidence of clinically significant epithelial ingrowth increases in eyes that undergo retreatment.
- Appropriate prevention and prompt diagnosis and treatment yield the best clinical outcomes.

MINIMIZING THE RISK, TREATMENT OPTIONS

Numerous surgeons have proposed flap-lift techniques to minimize the risk of epithelial ingrowth. Using 0.12-mm forceps instead of a spatula to initiate the flap lift may decrease the incidence of ingrowth because a spatula can drag epithelial cells into the interface. Chan et al[6] compared the rate of postoperative epithelial ingrowth after flap lift using a forceps lift alone, a spatula alone, and a forceps lift with subsequent contact lens placement. Patients treated with the contact lens had increased incidence of epithelial ingrowth compared with the other groups. The forceps group had a slightly higher incidence of ingrowth; however, none of these differences were statistically significant.

The treatment of epithelial ingrowth varies depending on the clinical presentation. The vast majority of cases have mild epithelial ingrowth (ie, less than 1 mm from the peripheral edge of the flap), which requires nothing more than safe observation. Treatment is indicated when the area of epithelial ingrowth increases to more than 1 to 2 mm from the peripheral margin of the flap; when the ingrowth appears to undergo significant progression; or when clinically significant astigmatism, decreased vision, inflammation, or corneal melt occur.

Several options exist for the treatment of epithelial ingrowth. First, the surgeon can lift the flap and mechanically debride the epithelial cells (Figure 2). This is done using a blunt instrument, scraping both the stromal bed and the flap, followed by irrigation with balanced saline solution. Haw et al[7] reported the adjunctive use of 50% ethanol at the time of debridement and irrigation in cases of aggressive ingrowth. No eyes in this series required further surgical intervention. One eye developed recurrent nonprogressive epithelial ingrowth.

The application of fibrin glue at the flap edge and suturing of the flap are adjunctive treatments that have

been reported to decrease the rate of recurrent epithelial ingrowth;[8,9] however, these techniques are usually reserved for cases of severe, aggressive ingrowth or recurrent episodes. Fagerholm et al[10] reported the use of excimer laser phototherapeutic keratectomy (PTK) to treat both primary and recurrent epithelial ingrowth. After mechanical debridement, PTK was used on the stromal bed and the cap. Although there were no cases of central recurrence, one eye required additional surgical intervention for peripheral recurrence.

CONCLUSION

Epithelial ingrowth is a relatively infrequent complication of LASIK that can result in poor surgical outcomes, but the vast majority of cases can be managed conservatively with observation alone. In cases of severe epithelial ingrowth, usually associated with flap-lift enhancement surgery, surgical techniques have been described to appropriately treat the patient and decrease the possibility of further complication. Although good surgical technique cannot eliminate the risk of epithelial ingrowth, appropriate preventive steps, prompt diagnosis, and treatment as necessary will yield the best clinical outcomes. ■

Richard E. Braunstein, MD, is the Miranda Wong Tang Professor of Clinical Ophthalmology and Chief of the Division of Anterior Segment and Refractive Surgery, Columbia University Medical Center, New York. Dr. Braunstein states that he has no financial interest in the products or companies mentioned. He may be reached at tel: +1 212 305 3015; e-mail: reb10@columbia.edu.

Anne S. Steiner, MD, is a cornea fellow at Columbia University Medical Center, New York. Dr. Steiner states that she has no financial interest in the products or companies mentioned. She may be reached at tel: +1 212 305 3015; e-mail: anniesteinermd@yahoo.com.

1. Farah SG, Azar DT, Gurdal C, et al. Laser in situ keratomileusis: literature review of a developing technique. *J Cataract Refract Surg.* 1998;24:989-1006.
2. Stulting RD, Carr JD, Thompson KP, et al. Complications of laser in situ keratomileusis for the correction of myopia. *Ophthalmology.* 1999;106:13-20.
3. Caster AI, Friess DW, Schwendeman FJ. Incidence of epithelial ingrowth in primary and retreatment laser in situ keratomileusis. *J Cataract Refract Surg.* 2010;36:97-101.
4. Rapuano CJ. Management of epithelial ingrowth after laser in situ keratomileusis on a tertiary care cornea service. *Cornea.* 2010;29:307-313.
5. Farah SG, Ghanem RC, Azar DT. LASIK complications and their management. In: Gatinel D, Hoang-Xuan T, Azar DT. Refractive Surgery. 2nd ed. Maryland Heights, Missouri: Elsevier; 2007;195-221.
6. Chan CCK, Boxer Wachler BS. Comparison of the effects of LASIK retreatment techniques on epithelial ingrowth rates. *Ophthalmology.* 2007;114:640-642.
7. Haw WW, Manche EE. Treatment of progressive or recurrent epithelial ingrowth with ethanol forllowing laser in situ keratomileusis. *J Refract Surg.* 2001;17:63-68.
8. Rojas MC, Lumba JD, Manche EE. Treatment of epithelial ingrowth after laser in situ keratomileusis with mechanical debridement and flap suturing. *Arch Ophthalmol.* 2004;122(7):997-1001.
9. Narváez J, Chakrabarty A, Chang K. Treatment of epithelial ingrowth after LASIK enhancement with a combined technique of mechanical debridement, flap suturing and fibrin glue application. *Cornea.* 2006;25(9):1115-1117.
10. Fagerholm P, Molander N, Podskochy A, et al. Epithelial ingrowth after LASIK treatment with scraping and phototherapeutic keratectomy. *Acta Ophthalmol Scand.* 2004;82:707-713.