Use of a hydrogel sealant in epithelial ingrowth removal after laser in situ keratomileusis

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We describe 2 cases in which clinically significant epithelial ingrowth was removed by debridement and followed by the use of a hydrogel sealant (Resure) to seal the flap edge. In both cases, the epithelial ingrowth was seen after otherwise uneventful laser in situ keratomileusis retreatment. The visual outcomes were good with no recrudescence of interface epithelium.

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The reported incidence of epithelial ingrowth after laser in situ keratomileusis (LASIK) varies from 0.4% to 9.1%.¹ Epithelial ingrowth should be removed when it induces astigmatism or corneal melting; approaches the pupillary margin; or causes decreased vision, glare at night, or a foreign-body sensation.¹,² Removal entails lifting the LASIK flap partially or completely, removing the ingrown cells, and often securing the flap edge with sutures. We present 2 cases in which a hydrogel sealant (Resure, Ocular Therapeutix, Inc.) was used to secure the flap in lieu of sutures.

CASE REPORTS

Case 1

A 62-year-old man reported blurry vision in his right eye 1 month after LASIK retreatment of both eyes. Uneventful bilateral microkeratome-assisted LASIK had been performed in 1999 for moderate myopic astigmatic correction. During retreatment, a manual flap-lift approach was used.

At presentation, the uncorrected distance visual acuity (UDVA) in the right eye was 20/50. Biomicroscopy showed evidence of clinically significant epithelial ingrowth (Figure 1). Optical coherence tomography confirmed the presence of epithelial ingrowth under the flap at a depth of 150 μm (Figure 2).

The flap was lifted and the epithelial ingrowth removed using cellulose sponges with a peeling and stripping technique on both the stromal bed and the underside of the flap. The flap was repositioned and irrigated. The flap edge was dried, and the hydrogel sealant was prepared and applied to the edges. We present 2 cases in which a hydrogel sealant (Resure, Ocular Therapeutix, Inc.) was used to secure the flap in lieu of sutures.

The flap was positioned and irrigated. The flap edge was dried, and the hydrogel sealant was prepared and applied to the edges. After polymerization of the adhesives, a bandage contact lens (Acuvue Oasys) was placed. Difluprednate ophthalmic (Durezol), ofloxacin 0.3%, and bromfenac sodium (Prolensa) drops were administered before the patient left the operating room. A postoperative regimen of gatifloxacin 0.5% and difluprednate ophthalmic 4 times daily as well as artificial tears (preservative-free Refresh Optive) every hour was prescribed.

Two weeks after ingrowth removal, the bandage contact lens was removed and the gatifloxacin discontinued. A 1-month tapered course of difluprednate ophthalmic was started. The UDVA in the right eye stabilized to 20/30 (Figure 3). At the 1-month examination, biomicroscopy showed no evidence of recurrent epithelial ingrowth.

Case 2

A 58-year-old man reported foreign-body sensation in his right eye after LASIK retreatment. Uneventful unilateral femtosecond laser-assisted LASIK had been performed in 2014. Approximately 1 year later, a retreatment was performed using a manual flap-lift technique.

At presentation, the UDVA was 20/100. Biomicroscopy showed clinically significant epithelial ingrowth in the
inferior portion of the flap, as well as early tear breakup time overlying the ingrowth area. Cyclosporine 0.05% (Restasis) twice a day was started in both eyes.

After the epithelium was removed using the technique described in Case 1, the hydrogel sealant was prepared and applied to the inferior edges of the flap. A bandage contact lens was applied. Difluprednate ophthalmic, ofloxacin 0.3%, and bromfenac sodium drops were administered before the patient left the operating room (Figure 4). Postoperative medications included gatifloxacin 0.5% 4 times daily and difluprednate ophthalmic 4 times daily, with the cyclosporine continued twice daily.

At the 2-week examination, the bandage contact lens was removed. Gatifloxacin was discontinued, difluprednate ophthalmic was tapered over 1 month, and cyclosporine was continued twice daily in both eyes. The patient reported resolution of the previously reported foreign-body sensation in the right eye.

At 2-month examination, the UDVA in the right eye was 20/100, correctable to 20/30. No recurrent epithelial ingrowth was evident on slitlamp examination (Figure 5), and the flap edge–corneal junction was smooth.

**DISCUSSION**

The mechanism of epithelial ingrowth after LASIK is unclear. Epithelial ingrowth is thought to be more common in patients with primary hyperopic correction, as well as patients who had primary microkeratome-assisted treatment and those who had a subsequent flap lift for LASIK retreatment. Wang and Maloney

**Figure 1.** Case 1: Epithelial ingrowth in the right eye approaching the pupillary margin.

**Figure 2.** Case 1: Epithelial ingrowth seen at the interface of the flap and the stromal bed. Note the irregularity in the epithelial map.
propose 2 hypotheses for ingrowth occurrences. The first is that epithelial cells are carried under the flap along with fluid intraoperatively. The second is that epithelial cells invade from the edge of the flap. Regardless of the origin, when the epithelial ingrowth becomes clinically significant, it should be surgically removed.

Naoumidis et al.5 suggest that treatment should be initiated as soon as epithelial ingrowth is diagnosed or within 1 month of diagnosis to prevent progression and stromal melting. The authors found that epithelial cells that had invaded the interface eventually die, likely due to hypoxia. However, because the cornea does not contain phagocytic cells, the epithelial cell remnants persist in the interface. This can result in disruption of collagen fibrils, inducing light scattering and corneal haze. Ingrowth was found to be more common after retreatment, particularly when the original flap was created using a microkeratome.5

Several techniques to prevent the recurrence of epithelial ingrowth have been described. They include corneal sutures, fibrin adhesive, and cyanoacrylate. Although cyanoacrylate has been used to repair wound leaks after surgery, perforated corneal ulcers, and other problems, it is not U.S. Food and Drug Administration (FDA) approved for these purposes. Cyanoacrylate may also be bulky on the cornea and uncomfortable to the patient. Fibrin adhesive can be used to seal the flap against epithelial ingrowth but requires 8 minutes to cure before a bandage contact lens can be placed and is difficult to manipulate over the flap margin.5 The use of sutures to secure the flap margin has been successful in mitigating recurrence of epithelial ingrowth but may induce corneal irregularity. Hydrogel sealant has recently been FDA approved for management of clear corneal incisions.6

Treatment of epithelial ingrowth typically results in a good visual outcome.5 Henry et al.3 reported that 78% of treated eyes had a corrected distance visual acuity of 20/25 or better by the 3-month follow-up. Reported recurrence after treatment ranges from 5% to 68%.2,3

We present the application of the hydrogel sealant as an alternative to sutures for securing the flap after epithelial ingrowth removal in post-LASIK patients. Both of our patients experienced improved visual acuity and no recurrence of ingrowth. The sealant is readily applied and its application easy to control. Since the polymerized sealant film is thin, it is comfortable for the patient. Unlike traditional sutures, hydrogel sealants do not require removal, affording better patient comfort; in addition, their use might prevent the striae and astigmatism induced by sutures. Further follow-up and experience with this technique is needed to fully define the effectiveness of the sealant technique for epithelial ingrowth after LASIK.
REFERENCES


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