Surgical management of a calzone-like posttraumatic infolding of a 10-year-old LASIK flap

Sina Elahi, MD, Adrien Mazharian, MD, Damien Gatinel, MD, PhD

Introduction: The popularity of femtosecond laser–assisted in situ keratomileusis (LASIK) has increased due to its predictability, success, repeatability, safety, and possibility to effectively treat almost all refractive errors.1–5 However, the management of flap-related complications ranging from microfolds, optical aberrations, ectasias, epithelial cell ingrowth, perforation, infection, to even necrosis may still be challenging.6 Although complications in LASIK surgery remain fortunately rare and are most often benign, flap trauma and resulting displacement remains a feared-on complication of LASIK because of the weak flap adhesion and possibility of flap displacement even years after the surgery.7–9 Visual prognosis in cases of flap dislocation is usually reported to be good, but complications such as striae, diffuse lamellar keratitis, and epithelial ingrowth may have to be addressed.10,11

Patient Consent Statement
As all data were anonymized and the patient is not identifiable, no consent form were necessary for publication as per institutional review board guidelines.

Diagnosis, Intervention and Outcomes: Emergency flap surgical revision was performed using a technique of mechanical debridement and a 20% alcohol-dipped sponge application to help with epithelial cells lysis, and fibrin glue was applied on the flap. Uncorrected distance visual acuity was restored and examination revealed a stable, well-apposed flap, without epithelial cell ingrowth, and an otherwise unremarkable examination.

Conclusions: This study showed the 10-month-efficacy of a combined approach of mechanical debridement, ethanol-based cell lysis, and fibrin glue in traumatic 10-year-old-flap management with infolding or invagination and extensive epithelial ingrowth.

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A 45-year-old woman with no known medical history except a 10-year-long myopic (−3.5 D) femto-LASIK correction, presented to our tertiary center a week after a traumatic injury of the right eye involving a plastic envelope. The patient initially consulted outside and was managed conservatively with topical azithromycin, vitamin A ointment, and lubricants. Corrected distance visual acuity (CDVA) then was 20/25 (0, −2.25 at 35 degrees). A slitlamp examination revealed an inferotemporal infolding of the LASIK flap in the right eye, with epithelial ingrowth. Referral to our center was delayed to day 10 after the initial trauma, and CDVA decreased to 20/30 (0, −2.25 at 35 degrees) due to the epithelial ingrowth now involving the visual axis. The external third of the flap was rolled inward (calzone-like), exposing the underlying edematous stroma associated with dense fibrosis at the level of the roll.

CASE REPORT

A 45-year-old woman with no known medical history except a 10-year-long bilateral myopic (−3.5 D) femto-LASIK correction, presented to our tertiary center a week after a traumatic injury of the right eye involving a plastic envelope. The patient initially consulted outside and was managed conservatively with topical azithromycin, vitamin A ointment, and lubricants. Corrected distance visual acuity (CDVA) then was 20/25 (0, −2.25 at 35 degrees). A slitlamp examination revealed an inferotemporal infolding of the LASIK flap in the right eye, with epithelial ingrowth.

Referral to our center was delayed to day 10 after the initial trauma, and CDVA decreased to 20/30 (0, −2.25 at 35 degrees) due to the epithelial ingrowth now involving the visual axis. The external third of the flap was rolled inward, exposing the underlying stroma—which was edematous—and was associated with dense fibrosis at the level of the roll as seen on corneal optical coherence tomography (OCT) (Figure 1). The flap hinge was intact. Emergency flap surgical revision was performed the following day under local anesthesia.

CASE REPORT

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Introduction: The popularity of femtosecond laser–assisted in situ keratomileusis (LASIK) has increased, but flap-related complications such as trauma and possibility of displacement, even years after surgery with complications such as striae, diffuse lamellar keratitis, and epithelial ingrowth, may still be challenging.

Patient and Clinical Findings: A 45-year-old woman was referred a week after trauma and flap displacement on a 10-year-long myopic LASIK correction. Corrected distance visual acuity was 20/30 (0, −2.25 at 35 degrees) due to epithelial ingrowth involving the visual axis. The external third of the flap was rolled inward (calzone-like), exposing the underlying edematous stroma associated with dense fibrosis at the level of the roll.

Diagnosis, Intervention and Outcomes: Emergency flap surgical revision was performed using a technique of mechanical debridement and a 20% alcohol-dipped sponge application to help with epithelial cells lysis, and fibrin glue was applied on the flap. Uncorrected distance visual acuity was restored and examination revealed a stable, well-apposed flap, without epithelial cell ingrowth, and an otherwise unremarkable examination.

Conclusions: This study showed the 10-month-efficacy of a combined approach of mechanical debridement, ethanol-based cell lysis, and fibrin glue in traumatic 10-year-old-flap management with infolding or invagination and extensive epithelial ingrowth.
Surgical Revision
Under abundant corneal irrigation, the 10-year-old flap borders were demarcated using a Sinskey hook and then carefully lifted and placed on wet soft sponges, exposing the interface (Figure 2). Mechanical debridement was attempted with wet sponges on both flap undersurface and corneal stroma but resistance due to fibrosis and epithelial ingrowth prevented flap smoothening (Figure 2, A). A 20% alcohol-dipped sponge (Merocel; Medtronic, Inc.) was applied to the corneal stroma and the flap undersurface for 20 seconds and then abundantly washed off to help with epithelial cells lysis (Figure 2, B and C). Successful epithelial cell removal and stromal smoothening was then achieved with a Desmarres blade on the corneal stroma and with wet sponges on the flap undersurface.

Then, the flap was replaced back on the stroma, and residual persisting folds were observed (Figure 2, D). Focal epithelial debridement was performed with a 20% alcohol-dipped sponge, and mechanical smoothening of the residual folds along with mechanical debridement of the borders of the flap were achieved (Figure 2, E). Fibrin glue was then spread on the flap edges with gentle swab strokes and excess glue wiped off (Figure 2, F). A soft contact bandage lens was applied after waiting approximately 1 minute for the glue to dry off. Postoperative treatment included corneal rinsing, lubricants, topical antiseptics, and combined corticoids and antibiotics (tobramycin–dexamethasone, 8 times daily).

On day 1 postoperatively, a slitlamp examination revealed a correctly placed flap with clean borders and rare remnants of epithelial ingrowth inferiorly. The protective lens was removed on day 3, during when CDVA was 20/25 (−1.00, −1.50 at 110 degrees). Examination findings were unchanged apart from a dry cornea with punctate keratitis.

On day 10 postoperatively, uncorrected distance visual acuity was restored to 20/20, and a slitlamp examination results were unchanged apart from reduced corneal dryness. Corneal OCT showed fibrosis and edema improvement, and topical corticoids and antibiotics were decreased to 6 times daily for a month and, then, gradually decreased to complete cessation (Figure 3).

Ten months postoperatively, uncorrected distance visual acuity and CDVA were 20/20 (+0.25, −0.75 at 115 degrees). A slitlamp examination revealed a stable, well-apposed flap, without epithelial cell ingrowth, and an
otherwise unremarkable examination (Figure 4). Corneal OCT showed absence of fibrosis, with resolved corneal edema, while pachymetry (Oculus Pentacam, OCULUS Optikgeräte GmbH) maps showed irregular astigmatism and minimal irregularities skewed inferotemporally (Figure 5).

DISCUSSION

Late traumatic LASIK flaps are often challenging cases even among experienced surgeons both because the trauma potentially alters the flap or corneal integrity, making the technical aspects of the revision more difficult, and because of the higher risk for complications such as optical abnormalities, haze, perforations, infections, and epithelial ingrowth recurrence.12,13

In this case, the flap was solely displaced and infolded; no steps were required to restore flap integrity, apart from debridement, epithelial cell lysis, and smoothening. Conversely, the challenges resided in reducing postoperative optical abnormalities and epithelial ingrowth recurrences. Theoretically, late traumatic flap displacement should seldom happen a specific set of circumstances must occur, such as a type or direction of trauma that results in displacement instead of perforation or shredding. However, reports exist with almost any kind of trauma such as blunt, air bag deployment, and wood/plant-induced, fingernail-induced, or sharp instrument trauma.9,14–16

Risk factors for epithelial ingrowth recurrence are majorly related to flap/interface irregularities.17 Irregularities can occur during surgery in case of microkeratome use, for example, flap misalignment, microfolds, or trauma. Although the prevalence is <5% in case of primary surgery, it raises to up to 20% to 40% in case of revisions, each repeated manipulation further increasing the risk.17,18

Treatment consists of the removal of the ingrowing cells, with either mechanical debridement, laser (Nd-YAG or excimer), or ethanol-based solution cell lysis and can be combined with flap suturing, fibrin glue, or mitomycin-C use to reduce recurrence.18

No clear guidelines exist to guide the management; however, regardless of the preferred technique, near-perfect smoothening of flap undersurface and interface along with careful edges’ alignment should be aimed. Because of its efficacy in sealing the flap edges without invasive additional steps such as suturing, fibrin glue delays epithelial cell migration with minimized risks.19 In their review on epithelial cell ingrowth recurrence, Ting et al. compared various management techniques.17 As the review consisted of several case reports or small case series, outcome analysis may be biased, but they concluded that mechanical debridement of the flap followed by the application of fibrin glue seemed to have the lowest recurrence rate of epithelial ingrowth.

In our case, both fibrin glue and an alcohol solution were used for flap fixation and cell lysis, respectively. Compared with mechanical debridement, alcohol has shown to be effective when as an adjunct during mechanical scraping of the flap undersurface and stromal bed, but due to reports of flap melting, its usage is limited to aggressive or severe cases of epithelial ingrowth.20,21 Hence, in our case specifically, mechanical debridement was first attempted briefly but because of the extensive epithelial ingrowth and stromal fibrosis, an alcohol-based solution was required as a secondary measure.

We reported the 10-month efficacy of a combined approach of mechanical debridement, ethanol-based cell lysis, and fibrin glue in traumatic 10-year-old-flap management with infolding or invagination and extensive epithelial ingrowth.
WHAT WAS KNOWN
- Late traumatic flap displacement can occur but no consensus exists regarding treatment.
- Complications may severely affect the visual acuity of an otherwise healthy patient (with likely already high visual acuity expectations).

WHAT THIS PAPER ADDS
- Mechanical debridement, ethanol-based cell lysis, fibrin glue, and mitomycin-C have all been described with good results, but studies are scarce and consist of case series.
- The combination of several of these techniques might improve the results. In the reported case, mechanical debridement, ethanol-based cell lysis, and fibrin glue were all tried consecutively to finally reach a satisfactory outcome.

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