Epithelial Ingrowth Within the Interface Following Traumatic Corneal Lamellar Laceration

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ABSTRACT
A 45-year-old patient with a traumatic corneal lamellar laceration who was treated conservatively initially developed an epithelial ingrowth within the flap–stroma interface, causing diminished vision. Confocal microscopy revealed highly refractive bodies without cellular elements at the flap–stroma interface. Treatment comprised surgical debridement of the epithelial sheet from the interface with a thorough irrigation of the stromal bed followed by careful realignment of the flap. The diagnosis was confirmed by histologic examination of the scraped specimen. At the last follow-up examination, vision had improved and there was no recurrence of epithelial ingrowth. Proper primary management of a traumatic corneal lamellar laceration can provide good visual outcome and prevent rare complications such as epithelial ingrowth. [Ophthalmic Surg Lasers Imaging 2008;39:217-220.]

INTRODUCTION
Epithelial ingrowth is used to describe an infrequent complication that may be related to corneal flap surgery or intraocular surgery followed by a breach in the surface integrity. Epithelial ingrowth following laser in situ keratomileusis (LASIK) is well known. However, a traumatic corneal lamellar laceration complicated by an epithelial ingrowth in the postoperative period has not been previously reported. Although a self-limiting condition, the epithelial cells may progress and encroach over the visual axis. Early treatment is often successful. Some cases may show recurrence despite treatment. Uncontrolled progression can lead to flap melting. We report the first case of epithelial ingrowth at the flap–stroma interface occurring after primary conservative management of a traumatic lamellar laceration of the cornea.

CASE REPORT
A 45-year-old woman presented complaining of decreased vision and haloes in the left eye for 2 months. The patient had a history of trauma to the left eye by an iron wire 2 months previously. She was diagnosed as having traumatic corneal lamellar laceration, for which she was treated conservatively elsewhere. When her vision in the affected eye started declining, she was referred to our center.

On examination, the best-corrected visual acuity was 6/6 in the right eye and 6/12 in the left eye. Intraocular pressure was 15 mm Hg in the right eye and 16 mm Hg in the left eye. The tear film break-up time was 12 seconds in the right eye and 14 seconds in the left eye. The anterior segment examination in the right eye was unremarkable. The left eye had mild conjunctival congestion. A tongue-shaped lamellar corneal flap oriented horizontally and extending into the pupillary area was seen. The slit-lamp showed diffuse interface haze with fine, discrete granular opacities (Fig. 1A). This haze occupied approximately 90% of the laceration flap–stroma interface. The anterior chamber was quiet. The rest of the ocular examination was normal. Fluorescein staining was negative.

A diagnosis of post-traumatic corneal lamellar laceration with epithelial ingrowth was made. Scanning
slit confocal microscopy (Confoscan 2; Nidek, Tokyo, Japan) was performed. It revealed clumps of highly refractile bodies, without cellular components at the flap–stroma interface (Figs. 1B and 1C). The maximum thickness of the flap estimated by confocal microscopy was 200 µm at the hinge.

Surgery was performed under topical anesthesia to remove the epithelial ingrowth. The edge of the corneal flap was grasped with an atraumatic forceps and the flap was lifted near the limbus using a Sinskey hook under the operating microscope. The epithelial sheet was removed from the stromal bed. Both the stromal bed and the undersurface of the flap were scraped with Merocel (Ivalon; Fabco, Dominican Republic) to remove the remaining epithelial cell nests. This area was irrigated carefully and the flap was repositioned. No alcohol was used. A bandage contact lens was applied and the speculum was removed. The scraped specimen was sent for histopathologic analysis. The patient was prescribed tobramycin (0.3%) and dexamethasone (0.1%) combination eye drops four times daily and carboxymethylcellulose sodium (0.5%) eye drops four times daily.

On the first postoperative day, there was an epithelial defect on the surface of the flap (Fig. 2A) that healed by the fourth postoperative day. Two weeks postoperatively, best-corrected visual acuity was 6/9 and intraocular pressure was 14 mm Hg in the left eye. The edges of the lamellar laceration were well apposed to the adjacent cornea. The interface was clear (Fig. 2B). There was no recurrence of epithelial ingrowth at the 1-year follow-up examination.

Cytohistopathologic examination revealed scanty cellularity comprising a few anucleated squamous cells. The findings were consistent with the histopathologic findings of epithelial ingrowth after LASIK surgery described in the literature.1

DISCUSSION

Epithelial ingrowth is characterized by migration and growth of the surface epithelial cells of the cornea into the intrastromal plane of the cornea itself or into the anterior chamber of the eye through a breach in the surface. It has been described as an infrequent complication of LASIK.2,3 We describe the first case of epithelial ingrowth following traumatic corneal lamellar laceration that led to visual impairment.

The risk and mechanism of epithelial ingrowth have been described in the literature in relation to LASIK surgery.4-7 Factors that increase the risk of epithelial ingrowth are poor apposition of the flap, epithelial defect adjacent to the flap, dislocated or decentered
Most isolated nests of epithelial cells regress within a few months with no adverse consequences.\textsuperscript{1} However, occasionally the epithelial cells progress centrally from the flap edge and encroach on the central visual axis, resulting in flap melting and irregular astigmatism.\textsuperscript{6,8-10} A combination of nutritional and inflammatory mechanisms may be responsible for this condition.\textsuperscript{5}

The epithelial ingrowth typically presents as a tongue-shaped opacity in the superficial layers of the cornea,\textsuperscript{5} which may be separated from the outside epithelium by a clear zone on the slit lamp. The patient may present with foreign body sensation, diminished vision, glare, ghosting, or haloes.

The indications of treatment in the current case were diminished vision and the presence of haloes. No case of epithelial ingrowth after traumatic lamellar laceration of the cornea has been described in the literature, although the mechanism of epithelial ingrowth is likely to remain the same as that following LASIK surgery. The triggering factors in our case could have been the close proximity of the free edge of the lamellar flap to the limbus, the extremely thin flap, and the flap being left unsutured during the primary treatment elsewhere.

Various modalities for treating epithelial ingrowths and preventing their recurrence include suturing, alcohol debridement, phototherapeutic keratectomy,\textsuperscript{11,12} and placement of fibrin glue at the flap edges.\textsuperscript{13}

Epithelial ingrowth has been classified into three grades morphologically.\textsuperscript{5} Grade 1 denotes a non-progressive, thin ingrowth (one to two cells thick) that is limited to within 2 mm of the flap edge and is usually difficult to detect. Grade 2 is thicker and extends more than 2 mm from the flap edge; it is easily detected by slit lamp and needs non-urgent intervention. Grade 3 is a deep, thickened ingrowth with white geographic areas of necrotic epithelial cells that leads to flap melting if it is not treated urgently. Histopathologically, epithelial ingrowth has been divided into two stages\textsuperscript{1}: the early stage comprises multilayered squamous epithelium resembling normal corneal epithelium and the late stage shows clumps containing amorphous materials with scarce cellular elements.

In this case, grade 2 epithelial ingrowth occurred. Certain preventive measures have been proposed to decrease the risk of epithelial ingrowth associated with LASIK surgery.\textsuperscript{5} Similar precautions should be taken during primary repair of traumatic lamellar corneal laceration. These include the careful irrigation of the interface and sponging of the bed and undersurface of the flap; the careful handling of the flap edge using atraumatic forceps; the use of a bandage contact lens to avoid microtrauma to the flap edge by lid movements; the application of a bandage contact lens to treat epithelial defects adjacent to the flap; the adequate use of lubricants postoperatively to protect the epithelium; and the placement of fibrin glue at the flap edges.

The complication of epithelial ingrowth following lamellar corneal laceration is rare. While managing such cases, close attention should be paid to repair the laceration in terms of flap alignment, adherence to the lacerated corneal bed, and maintaining the integrity of the adjacent corneal epithelium.

*Figure 2.* First postoperative day. (A) Epithelial defect on the flap surface. (B) Well-apposed edges of the lamellar laceration with a clear interface.
REFERENCES


