Clinical Case Report

Medicine®

OPEN

# Management of recalcitrant epithelial ingrowth after laser in situ keratomileusis

## A case report

Mingxia Tian, MD*

**Abstract**

**Rationale:** Surgically lifting and scraping, mitomycin C, fibrin glue, Nd:YAG laser, hydrogel ocular sealant, and amniotic membrane patch are the reported methods for treating epithelial ingrowth after laser in situ keratomileusis (LASIK). Here we report the management of a rare case of recalcitrant epithelial ingrowth using a combined scraping/laser ablation that occurred after LASIK.

**Patient concerns:** A female patient underwent uncomplicated bilateral LASIK 10 years before incurring trauma to the right eye. Approximately 2.5 years later, she presented with a complaint of blurred vision and a foreign body sensation.

**Diagnoses:** The patient was diagnosed with epithelial ingrowth because of the presence of corneal melting, wrinkling, and scarring. Approximately 6 months after injury, the patient underwent corneal scraping to remove the epithelial ingrowth. Even after 2 more scraping procedures, the epithelial ingrowth recurred. Corneal densitometry was performed (Oculus Pentacam), which revealed a maximum corneal densitometry value of 87.4 gray scale units (GSUs) in the inferonasal quadrant. This reading highly elevated compared to readings from normal cornea (approximately 20 GSU).

**Interventions:** We used a combination scraping/laser ablation procedure to correct astigmatism and eliminate any undetected residual corneal epithelial cells.

**Outcomes:** Two days following the procedure, the patient developed a mild corneal opacity in the area where the epithelial ingrowth had been located. At this time, visual acuity was 20/40, refractive error (manifest refraction) was −0.50 Diopter (D) sph, and the maximum corneal densitometry value was 79.2 GSU. After 2 months, the central cornea remained slightly blurred, but visual acuity was 20/25. No signs of recurrent epithelial ingrowth were present and the maximum corneal densitometry reading had decreased to 55.4 GSU.

**Lessons:** This case demonstrates that epithelial ingrowth should be treated as soon as possible after trauma and that thorough scraping combined with laser ablation is effective for treating recalcitrant epithelial ingrowth. Additionally, corneal densitometry can be used to assess epithelial ingrowth severity and treatment efficacy.

**Abbreviations:** D = diopter, GSU = gray scale units, LASIK = laser in situ keratomileusis.

**Keywords:** corneal densitometry, diagnosis, epithelial ingrowth, laser in situ keratomileusis, treatment

## 1. Introduction

Laser in situ keratomileusis (LASIK) is the most widely performed laser refractive surgery worldwide. Nonetheless, the creation of an interface between the flap and the underlying corneal stroma can lead to flap-related and flap-stromal interface complications such as flap dislocation, infectious keratitis, diffuse lamellar keratitis, and epithelial ingrowth. Epithelial ingrowth, the ingrowth of epithelial cells into the stromal bed/corneal flap interface, is a relatively uncommon postoperative complication of LASIK. The prevalence of epithelial ingrowth following primary LASIK is very low, estimated between 0% and 3.9%.[1] The condition is often treated by surgically lifting the corneal flap and scraping away the unwanted epithelial cells. Unfortunately, epithelial ingrowth can recur after intervention. Therefore, mitomycin C, fibrin glue,[2] Nd:YAG laser,[3] hydrogel ocular sealant,[4] amniotic membrane patch,[5] and corneal collagen crosslinking[6] have all been used to eliminate corneal epithelial cells that have grown between the corneal flap and stromal bed. This case report presents a rare case of epithelial ingrowth that was diagnosed with slit-lamp microscopy and Pentacam imaging. The condition recurred 3 times but was ultimately treated with a combined scraping/laser ablation.

## 2. Case report

Reporting this case was approved by the Ethics Committee of the First People's Hospital of Jining, affiliated to Jining Medical

Editor: N/A.

This study was supported by doctoral research startup foundation of Jining No 1 People's Hospital.

The authors have no conflicts of interest to disclose.

Department of Ophthalmology, The First People's Hospital of Jining, Affiliated to Jining Medical College, Jining, China.

* Correspondence: Mingxia Tian, Department of Ophthalmology, The First People's Hospital of Jining, Affiliated to Jining Medical College, No 6, Jiankang Road, Jining 272001, Shandong Province, China (e-mail: juliatian@yeah.net).



Medicine (2018) 97:43(e13024)

Received: 30 May 2018 / Accepted: 25 September 2018

http://dx.doi.org/10.1097/MD.0000000000013024

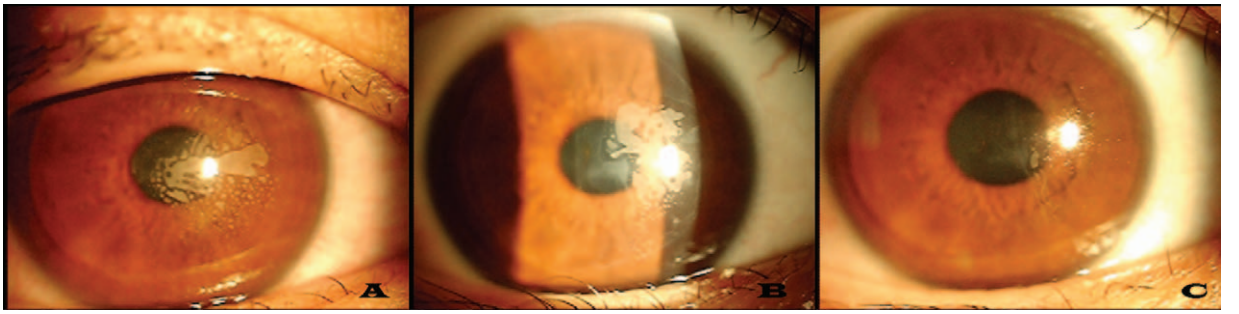


**Figure 1.** (A) Corneal epithelial ingrowth before the initial scraping surgery. (B) Recurrent epithelial ingrowth before the second scraping surgery. (C) Recurrent epithelial ingrowth before the third scraping surgery. Mitomycin C was also applied.

College (Jining, China). Written informed consent was obtained from the patient to publish case information and the accompanying images.

A 29-year-old woman presented with a complaint of a decline in vision. The patient had a history of injury to her right eye 2.5 years earlier and uncomplicated LASIK in both eyes 10 years earlier. Approximately 2 months after injury, the women sought medical care with another doctor because of blurred vision and a foreign body sensation in her right eye. At that time, she was diagnosed with epithelial ingrowth, but declined surgical intervention because her visual acuity was nearly 20/20. Unfortunately, her vision continued to deteriorate and, approximately 4 months later, her distance visual acuity was 20/63. Therefore, the patient underwent a lifting and scraping procedure at that time. The epithelial ingrowth recurred twice over the next 2 years and was treated with scraping each time. Mitomycin C was also applied at the third time (Fig. 1A–C).

The epithelial ingrowth recurred again despite the interventions. At the time of presentation to our clinic, uncorrected visual acuity was 20/100, best-corrected visual acuity was 20/25, and cylindrical refractive error was −3.00 Dioptor (D) with an axis of 145°. Epithelial ingrowths were located in the central cornea and in the inferonasal quadrant. Additionally, the corneal flap above the epithelial ingrowths was wrinkled and scarred. Pentacam (Oculus Optikgeräte GmbH, Frankfurt, Germany) imaging showed a maximum corneal densitometry value of 87.4 gray scale units (GSU) in the inferonasal quadrant. The corneal densitometry value of healthy cornea was 20 GSU (Fig. 2A, B).

The patient signed a consent form for and underwent a 4th lifting and scraping procedure. After a thorough mechanical debridement of the corneal stromal bed and posterior flap surfaces, the area was thoroughly irrigated with a balanced salt solution. The area was dried off and an excimer laser (Schwind Amaris 500E, Germany) was used to correct the −1.00 D astigmatism (axis of 145°, 7.0 mm optical zone) and to eliminate residual epithelial cells and debris on the stromal bed. The corneal flap was then repositioned and the corneal flap edge was dried for 3 minutes with a cellulose sponge. Tobramycin/dexamethasone combination eye drops (Alcon, Novartis, USA) and a bandage contact lens (PureVision, Bausch&Lomb) were placed in the eye. The patient continued to use the topical tobramycin/dexamethasone over a 1-month taper. Additionally, artificial tears were placed 4 times a day and topical betaxolol (Alcon, Novartis) was used twice a day for 1 month.

The patient returned to our clinic 2 days after surgery. At this time, the corneal epithelium was integrated and the contact lens

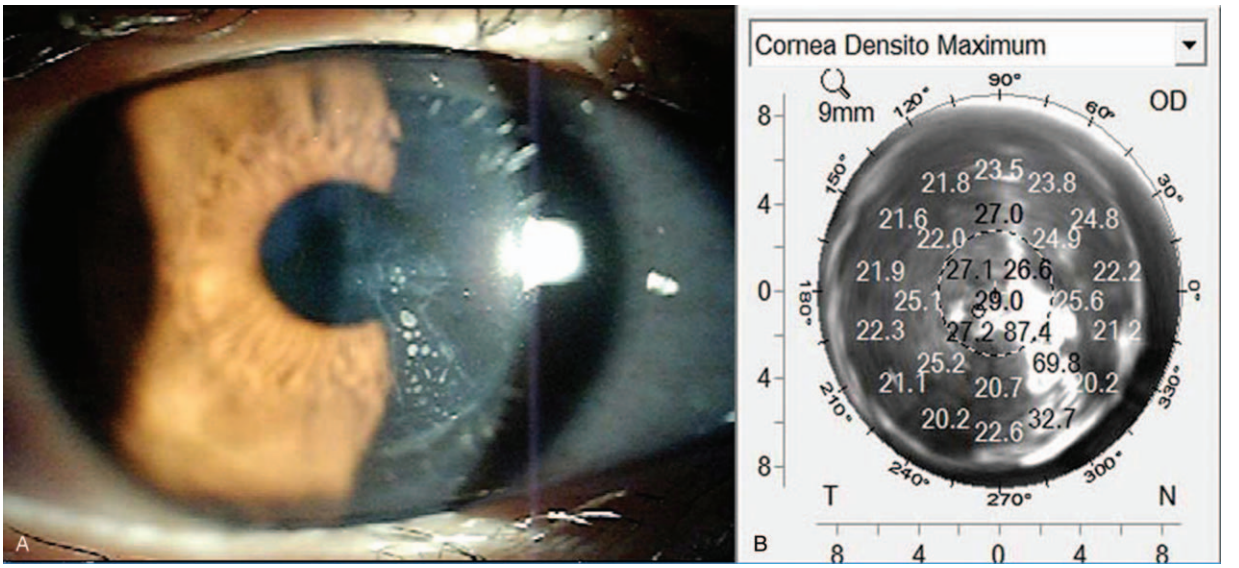


**Figure 2.** (A) Relapsed corneal epithelial ingrowth after the third surgery (scraping procedure with mitomycin C application). (B) Oculus Pentacam imaging showed a maximum corneal densitometry value of 87.4 gray scale units.

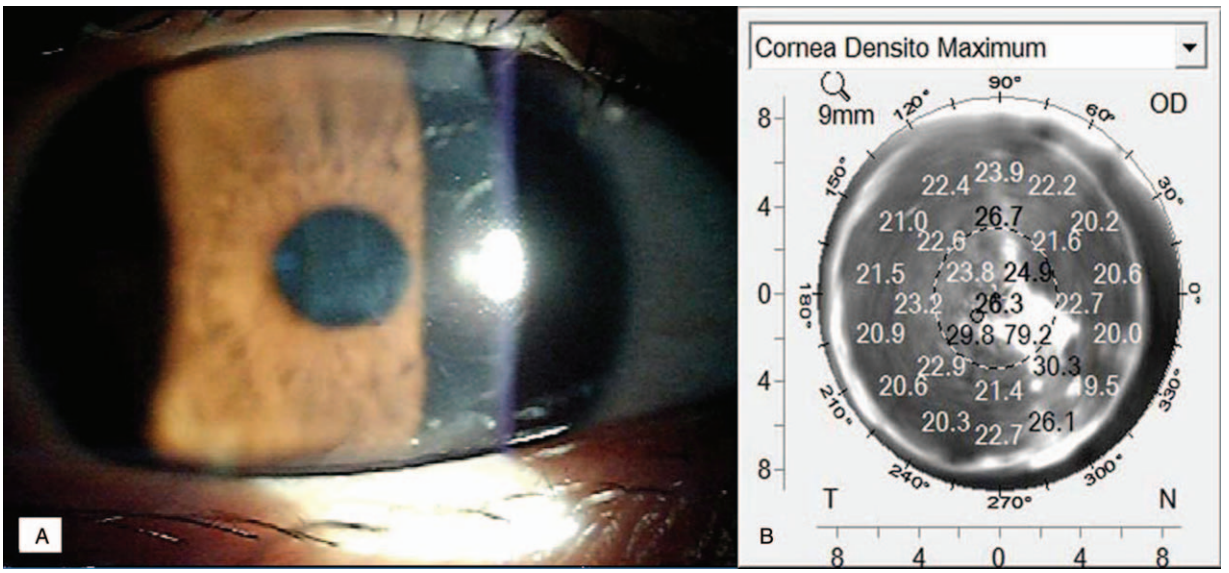


**Figure 3.** (A) Two days after the 4th and final procedure of scraping and laser ablation, there were no epithelial cells under the corneal flap. The cornea was slightly obscure. (B) Oculus Pentacam imaging showed that the maximum corneal densitometry value had decreased to 79.2 gray scale units.

was removed. Visual acuity was 20/40, refractive error (manifest refraction) was −0.50 D sph. The cornea was slightly opaque and the maximum corneal densitometry value was 79.2 GSU (Fig. 3A, B). Two months after surgery, slit-lamp examination revealed that the cornea was less opaque. Visual acuity was 20/25 and the patient had no refractive error (plano refraction). No signs of recurrent epithelial ingrowth were present. Additionally, the maximum corneal densitometry value had decreased to 55.4 GSU. Until now, it has been followed for 2 years and no signs of recurrent epithelial ingrowth are present.

## 3. Discussion

This case report describes a patient with repeated relapses of epithelial ingrowth after LASIK that was usually observable on slit-lamp examination. Adran et al[7] found that corneal densitometry is likely an objective measure of epithelial ingrowth severity and progression after LASIK. Epithelial ingrowth severity and development in the current case were well observed and assessed using slit-lamp biomicroscopy and Pentacam imaging. Healthy corneas have a maximum densitometry value of $19 \pm 4.4$.[8] Additionally, maximum densitometry values on the Pentacam densitometry map likely correlate with the degree of opacity observed on slit-lamp examination. This is important because once epithelial ingrowth progresses, it should be treated as soon as possible. When epithelial ingrowths are left untreated, the cornea can melt and become obscured and wrinkled. Once this happens, visual acuity markedly decreases and treatment becomes more difficult. In the case presented here, epithelial ingrowth was treated 6 months after a trauma, making it challenging to thoroughly eliminate ingrown cells. As a result, epithelial ingrowth repeatedly recurred.

The epithelial ingrowth in the current case happened after a trauma, which is the most common cause for epithelial ingrowth after LASIK. The overall incidence of epithelial ingrowth after LASIK has been reported to be 0% to 20%.[9] Friehmann et al found that, in addition to trauma, risk factors for epithelial ingrowth include early postoperative flap slippage that requires repositioning, enhancement surgery, long treatment times, smaller optical zones, greater maximum ablation depth, and low surgeon experience.[10]

Epithelial ingrowth occurs when epithelial cells migrate into the corneal stoma (via the corneal flap interface) and proliferate. Treatment success and recurrence prevention depend upon the complete removal of ingrown epithelial cells. Despite lifting and scraping, many methods have been used to eliminate corneal epithelial cells that have grown between the corneal flap and stromal bed. Yesilirmak et al found that scraping alone provided significantly better initial visual outcomes but higher epithelial ingrowth recurrence rates compared with scrape-suturing.[11] In the current case, epithelial ingrowth recurred several times after scraping surgery. Therefore, we used a combined scraping/excimer laser procedure to simultaneously clear ingrown cells and correct astigmatism.

This case shows that epithelial ingrowth should be treated as soon as possible after a trauma and that thorough scraping combined with laser ablation is an effective treatment for recalcitrant cases. Additionally, corneal densitometry is useful for assessing epithelial ingrowth severity and treatment efficacy.

## Author contributions

**Data curation:** Mingxia Tian.
**Formal analysis:** Mingxia Tian.
**Funding acquisition:** Mingxia Tian.
**Investigation:** Mingxia Tian.
**Methodology:** Mingxia Tian.
**Writing – original draft:** Mingxia Tian.
**Writing – review & editing:** Mingxia Tian.

## References

[1] Ting DSJ, Srinivasan S, Danjoux JP. Epithelial ingrowth following laser in situ keratomileusis (LASIK): prevalence, risk factors, management and visual outcomes. BMJ Open Ophthalmol 2018;3:e000133.
[2] Wilde C, Messina M, Dua HS. Management of recurrent epithelial ingrowth following laser in situ keratomileusis with mechanical debridement, alcohol, mitomycin-C, and fibrin glue. J Cataract Refract Surg 2017;43:980–4.

[3] Lindfield D, Ansari G, Poole T. Nd:YAG laser treatment for epithelial ingrowth after laser refractive surgery. Ophthalmic Surg Lasers Imaging 2012;43:247–9.
[4] Thulasi P, Kim SW, Shetty R, et al. Recalcitrant epithelial ingrowth after SMILE treated with a hydrogel ocular sealant. J Refract Surg 2015;31:847–50.
[5] Kwon KY, Ji YW, Lee J, et al. Inhibition of recurrence of epithelial ingrowth with an amniotic membrane pressure patch to a laser in situ keratomileusis flap with a central stellate laceration: a case report. BMC Ophthalmol 2016;16:111.
[6] Chan TC, Cheng GP, Jhanji V, et al. Adjuvant collagen crosslinking for treatment of epithelial ingrowth after small-incision lenticule extraction. Clin Exp Ophthalmol 2018;46:554–6.
[7] Adran D, Vaillancourt L, Harissi-Dagher M, et al. Corneal densitometry as a tool to measure epithelial ingrowth after laser in situ keratomileusis. Cornea 2017;36:406–10.
[8] Otri AM, Fares U, Al-Aqaba MA, et al. Corneal densitometry as an indicator of corneal health. Ophthalmology 2012;119:501–8.
[9] Wang MY, Maloney RK. Epithelial ingrowth after laser in situ keratomileusis. Am J Ophthalmol 2000;129:746–51.
[10] Friehmann A, Mimouni M, Nemet AY, et al. Risk factors for epithelial ingrowth following microkeratome-assisted LASIK. J Refract Surg 2018;34:10–5.
[11] Yesilirmak N, Chhadva P, Cabot F, et al. Post-laser in situ keratomileusis epithelial ingrowth: treatment, recurrence, and long-term results. Cornea 2018;Sep 14. doi:10.1097/ICO.0000000000001760. [Epub ahead of print].