Traumatic laser in situ keratomileusis flap dislocation with epithelial ingrowth, Propionibacterium acnes infection, and diffuse lamellar keratitis

A case report

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Abstract

Rationale: Traumatic flap dislocation might occur anytime after laser in situ keratomileusis (LASIK), but it is rarely concomitantly complicated with epithelial ingrowth, infectious keratitis, and diffuse lamellar keratitis altogether. Here we report a case of traumatic LASIK flap inversion with epithelial ingrowth, Propionibacterium acnes infection, and diffuse lamellar keratitis.

Patient concerns: A 42-year-old man receiving bilateral LASIK surgery 10 years ago complained of right eye pain for 6 days after twig injury. Temporal flap inversion with epithelial ingrowth and dense infiltration at the interface were noted.

Diagnoses: Traumatic LASIK flap inversion with epithelial ingrowth, Propionibacterium acnes infection and diffuse lamellar keratitis.

Interventions: Removal of corneal epithelium around the flap inversion site, flap lifting, scraping of epithelial ingrowth, removal of the dense infiltrate, alcohol soaking, interface irrigation with antibiotics, and flap reposition were performed. Diffuse lamellar keratitis was noted postoperatively. Culture of the infiltrate revealed P. acnes. The infiltrate subsided and the cornea cleared up under topical antibiotics and steroid.

Outcomes: The visual acuity returned to 20/20. No recurrent epithelial ingrowth or infiltrate was noted during the follow-up.

Lessons: This is the first report of Propionibacterium acnes keratitis after traumatic flap inversion. Although epithelial ingrowth, infectious keratitis, and diffuse lamellar keratitis all developed after the flap inversion, early recognition and proper intervention lead to a good result without sequels.

Abbreviations: BCVA = best-corrected visual acuity, LASIK = laser in situ keratomileusis.

Keywords: LASIK, flap dislocation, epithelial ingrowth, Propionibacterium acnes, infectious keratitis, diffuse lamellar keratitis, case report

1. Introduction

The laser in situ keratomileusis (LASIK) procedure for correcting refractive errors consists of the creation of a corneal flap, ablation of the stroma by excimer laser, and reposition of the flap.
the interface were demonstrated (Fig. 1A, B). Wide removal of corneal epithelium around the flap inversion site (at least 1 mm peripheral to the original LASIK wound), flap lifting, scraping of ingrowth epithelial cells on both stromal bed and under surface of the flap, removal of the 2 dense infiltrates for culture, 70% alcohol soaking for 20 seconds, interface irrigation with vancomycin (0.4 mg/mL) and voriconazole (0.16 mg/mL), and flap reposition with bandage contact lens were smoothly performed (Fig. 1C–H). Diffuse lamellar keratitis with sands of Sahara pattern was noted on the first postoperative day. Topical 1% Voriconazole, 0.5% Levofloxacin, and 0.1% Betamethasone were given every hour around the clock. Later, the culture of the 2 dense infiltrates revealed P. acnes, and topical antibiotics were shifted to 0.5% levofloxacin and 3% vancomycin Q2H around the clock. The cornea cleared up under topical antibiotics and steroids. Topography revealed symmetric smooth surface. The visual acuity returned to 20/20. No recurrent epithelial ingrowth or infiltrate was noted in the following year.

3. Discussion
LASIK is a generally safe and predictable procedure for correction of refractive errors. Early flap slippages usually
occurred within the first day or 2 after surgery;21; while late LASIK flap dislocations are less common but may happen at any time after LASIK due to the diminished wound healing.22 Late flap dislocations have been reported to be caused by sharp objects such as screwdriver4 or fingernail,5 or high-velocity blunt ocular trauma such as basketball6 or falling pecan.7 The strength of trauma might be violent as airbag7 or as mild as self-removal with soft contact lens.8 The flap dislocation in our case was caused by a twig 10 years after the LASIK procedure.

Epithelial ingrowth into the interface between the flap and stromal bed is a complication of LASIK dislocation.9 Epithelial ingrowth with direct communication and supply from peripheral regenerating epithelium could lead to progressive ingrowth under the flap. A broad area of epithelial ingrowth could hinder the exchange of nutrients and metabolites. Hence a delay in treatment could result in flap melting, increased scarring, and induction of irregular astigmatism.1 On seeing our patient, there was no epithelial defect stained with fluorescein. Instead, the epithelial cells grow not only into the interface but over the inverted flap. To prevent the continuous supply from the peripheral regenerating epithelium, a wider debridement of the epithelium more peripheral to the original LASIK wound, and those on the bare stroma bed, inverted flap, and both sides of the interface were performed. 70% alcohol to the bed and the undersurface of the flap for 20 seconds and bandage contact lens after reposition of the flap were performed to prevent the recurrence of flap dislocation and epithelial ingrowth.

Infectious keratitis is a potentially sight-threatening interface complication following LASIK. Atypical mycobacteria are most notorious and responsible for some outbreaks.10-13 Gram-positive coccis are also common etiology in recent years.14-16 However, these infectious keratitides are mostly introduced intraoperatively. A literature search of infectious keratitis following traumatic flap dislocation revealed etiologies of Nocardia17 and Enterobacter.18 In contrast, P. acnes keratitis following flap dislocation, like that in our patient, has not been reported before. P. acnes is a relatively slow-growing, anaerobic, gram-positive bacillus. It is often a normal flora of the skin, hair follicles, and conjunctiva.19-21 P. acnes is the most frequently isolated bacteria from the conjunctival sac,20 and may be responsible for about one-tenth of infectious keratitis.21,22 However, delayed or confused diagnosis on presentation is possible because of its prolonged incubation period and small and deep stromal infiltration.23 P. acnes infection has once been reported 2 days after presbyopic LASIK,23 in which a delayed diagnosis was noted. The authors reflected on their treatment and suggested lifting the flap, irrigation, cleaning, and scraping for cultures.23 Our case, fortunately, was treated with lifting the flap, irrigation with vancomycin, and scraping for culture. The positive culture result was available on day 11, like the average incubation period of P. acnes.22

Diffuse lamellar keratitis was described in the late traumatic displacement of LASIK flaps following reposition of flaps on early postoperative days.24-26 Flap lift and irrigation might be needed in severe cases to prevent flap necrosis or permanent scarring if inflammation worsens.16 In our patient, diffuse lamellar keratitis developed within the first postoperative day and responded well to aggressive frequent topical steroid use in the early stage.

In conclusion, we reported a traumatic flap dislocation complicated with epithelial ingrowth, P. acnes keratitis and sand of Sahara syndrome. Early recognition, prompt surgical intervention, and sufficient topical treatment could still lead to a good visual outcome.

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References
[1] Holt DG, Sikder S, Mifflin MD. Surgical management of traumatic LASIK flap dislocation with macrostriae and epithelial ingrowth 14 years postoperatively. J Cataract Refract Surg 2012;38:837-61.
[2] Lin RT, Maloney RK. Flap complications associated with lamellar refractive surgery. Am J Ophthalmol 1999;127:129-36.
[3] Tsai TH, Peng KL, Lin CJ. Traumatic corneal flap displacement after laser in situ keratomileusis (LASIK). Int Med Case Rep J 2017;10:143-8.
[4] Rodriguez NA, Acsanf EJ. Images in clinical medicine. Corneal-flap dehiscence after screwdriver trauma. N Engl J Med 2013;368:e1.
[5] Patel CK, Hanson R, McDonald B, et al. Case reports and small case series: late dislocation of a LASIK flap caused by a fingernail. Arch Ophthalmol 2001;119:447-9.
[6] Melki SA, Talamo JH, Demetriades AM, et al. Late traumatic dislocation of laser in situ keratomileusis corneal flaps. Ophthalmology 2000;107:2136-9.
[7] Iskander NG, Peters NT, Anderson Penno E, et al. Late traumatic flap dislocation after laser in situ keratomileusis. J Cataract Refract Surg 2001;27:1111-4.
[8] Srudhar MS, Rapuano CJ, Cohen EJ. Accidental self-removal of a flap-a rare complication of laser in situ keratomileusis surgery. Am J Ophthalmol 2001;132:780-2.
[9] Ting DSJ, Sinivasan S, Danjoux JP. Epithelial ingrowth following laser in situ keratomileusis (LASIK): prevalence, risk factors, management and visual outcomes. BMJ Open Ophthalmol 2018;3:e000133.
[10] Freitas D, Alvarenga LA, Sampayo J, et al. An outbreak of Mycobacterium chelonae infection after LASIK. Ophthalmology 2003;110:276-85.
[11] Yamaguchi T, Bissen-Miyajima H, Hori-Komai Y, et al. Infectious keratitis after laser in situ keratomileusis corneal flaps. Int Med Case Rep J 2017;10:265-7.
[12] Chandra NS, Torres MF, Winthrop KL, et al. Cluster of Mycobacterium chelonae keratitis cases following laser in-situ keratomileusis. Am J Ophthalmol 2001;132:819-30.
[13] Solomon A, Karp CL, Miller D, et al. Mycobacterium interface keratitis after laser in situ keratomileusis. Ophthalmology 2001;108: 2201-8.
[14] Llovet F, de Rojas V, Interlandi E, et al. Infectious keratitis in 204 586 laser in situ keratomileusis surgery. BMJ Open 2016;6:e010733.
[21] Ovodenko B, Seedor JA, Ritterband DC, et al. The prevalence and pathogenicity of Propionibacterium acnes keratitis. Cornea 2009;28:36–9.
[22] Lim SA, Na KS, Joo CK. Clinical features of infectious keratitis caused by Propionibacterium Acnes. Eye Contact Lens 2017;43:330–3.
[23] Semoun O, Bourcier T, Dupas B, et al. Early bacterial keratitis after presbyopic LASIK. Cornea 2008;27:114–6.
[24] Tumbocon JA, Paul R, Slomovic A, et al. Late traumatic displacement of laser in situ keratomileusis flaps. Cornea 2003;22:66–9.
[25] Schwartz GS, Park DH, Schloff S, et al. Traumatic flap displacement and subsequent diffuse lamellar keratitis after laser in situ keratomileusis. J Cataract Refract Surg 2001;27:781–3.
[26] Aldave AJ, Hollander DA, Abbott RL. Late-onset traumatic flap dislocation and diffuse lamellar inflammation after laser in situ keratomileusis. Cornea 2002;21:604–7.