



Unusual presentation of corneal laceration in a post-LASIK eye following blunt trauma

Shiva Pirhadi^{a,b}, Seyede-Yasamin Adnani^a, Khosrow Jadidi^{a,*}

^a Vision Health Research Center, Semnan University of Medical Sciences, Semnan, Iran

^b Department of Biomedical Engineering, Science and Research Branch, Islamic Azad University, Tehran, Iran

ARTICLE INFO

Keywords:

LASIK
Blunt trauma
Anterior segment optical coherence tomography
Corneal rupture

ABSTRACT

Purpose: To report a case with full thickness corneal laceration behind the intact LASIK flap after blunt trauma. **Observations:** A 48-year-old man with a history of LASIK surgery was hit by a shovel. Slit-lamp examination showed 4+ corneal edema. The anterior chamber (AC) was deep and the Seidel test was negative. Uncorrected distance visual acuity (UDVA) was hand motion. A more accurate evaluation was performed with an anterior segment optical coherence tomography (OCT) and it was found that the paracentral corneal tissue was ruptured while the flap remained completely intact. Under the surgical procedure, the rupture site was sutured, and then the flap was replaced, and two U-shaped sutures were performed to ensure the flap stability. Three months after surgery, corrected distance visual acuity (CDVA) was 9/10 decimal with a manifest refraction of +1–3 x 60°. **Conclusions and importance:** In a traumatic post-LASIK eye, the posterior part of the flap should be carefully evaluated. The role of the OCT device in the diagnosis and management of complication is also very valuable.

1. Introduction

Laser in situ keratomileusis (LASIK), first approved in 1999, is one of the most common refractive surgery procedures today due to its effectiveness, visual recovery and refractive stability.¹ Despite these advantages, there are always concerns about the consequences of trauma to the eyes that have undergone LASIK surgery. Flap dislocation,² diffuse lamellar keratitis,³ flap striae,⁴ partial unfolding,⁵ epithelial ingrowth⁶ and corneal rupture⁷ are among the side effects reported following post-LASIK eye trauma. We report a case in which the full thickness corneal laceration occurred behind the intact LASIK flap following blunt trauma.

2. Case report

A 48-year-old man was hit by a shovel and this incident decreased his left eye vision three days later. He had a history of LASIK surgery 17 years ago. At an ophthalmological center, he was diagnosed with an endothelial dysfunction after blunt trauma and prescribed NaCl 5% drop (Natrisalt, Sina Darou Pharm. Co., Tehran, Iran) every 6 hours and ointment for nights, betamethasone 0.1% drop (Betasonite, Sina Darou Pharm. Co., Tehran, Iran) every 4 hours, timolol 0.5% drop (Optimol,

Sina Darou Pharm. Co., Tehran, Iran) every 12 hours. Ten days later, due to the ineffectiveness of the prescribed drugs, the patient came to our clinic. Although LASIK surgery information was not available, the thickness of the flap in fellow eye indicated that LASIK was performed with a microkeratome. Uncorrected distance visual acuity (UDVA) was hand motion (HM) and intraocular pressure (IOP) was 6 mmHg measured by Goldmann applanation tonometer. The written informed consent was signed by the patient to have the case details and any accompanying images published. Examination of the slit-lamp showed 4+ corneal edema (Fig. 1-a). The anterior chamber (AC) was deep and the details inside were not visible. The Seidel test was negative. The pupil was round and reactive to light and the crystalline lens looked clear. The retinal examination was unremarkable. Anterior segment optical coherence tomography (OCT) (Optovue, Fremont, CA, USA) revealed corneal rupture underneath the LASIK flap associated with double chamber formation (Fig. 1-C). As the cornea ruptured, a communication path formed between the AC and the area under the LASIK flap. In other words, a double chamber was created. Corneal tomography (Pentacam HR, Oculus Optikgerate, Wetzlar, Germany) was also taken. The central corneal thickness (CCT) and the amount of corneal astigmatism were 1527 µm (Fig. 1-D) and 6 diopters (Fig. 1-E), respectively.

* Corresponding author. Vision Health Research Center, 8th, 2nd Alley, Gandhi St, Tehran, Iran.

E-mail address: Khosrow.jadidi@yahoo.com (K. Jadidi).

<https://doi.org/10.1016/j.ajoc.2022.101419>

Received 1 June 2021; Received in revised form 5 February 2022; Accepted 9 February 2022

Available online 10 February 2022

2451-9936/© 2022 Published by Elsevier Inc. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

The next day under general anesthesia, the flap was gently lifted and the site of the rupture underneath the flap involving the residual stromal bed was closed using 10–0 nylon sutures and then the flap was repositioned in place and was secured using 2 U-shaped sutures. At the end of the surgery, a contact lens was placed. The surgical procedure is shown in Fig. 2.

The day after surgery, corrected distance visual acuity (CDVA) was 1/10 decimal with a manifest refraction of +3–6 x 70°. On slit-lamp examination, the anterior chamber was deep and showed one plus cell. The flap was well-attached, aligned without striae. Postoperative topical medications included ciprofloxacin 0.3% (Ciplex, Sina Darou Pharm. Co., Tehran, Iran) one drop every 4 hours for a week and betamethasone 0.1% (Betasonite, Sina Darou Pharm. Co., Tehran, Iran) one drop every 4 hours tapered over one month. Three days later, the contact lens was removed and two weeks later, the U-shaped sutures were removed.

On examination three months after surgery, sutures were in place and the cornea was completely clear (Fig. 3-A). AC was deep and clear. OCT imaging was performed to show the absence of fluid behind the flap (Fig. 3-B). CDVA was 9/10 decimal with a manifest refraction of +1–3 x 60°. Due to reduced amount of astigmatism (Fig. 3-E) and preventing ectasia, the sutures underneath the flap were not removed.

3. Discussion

After LASIK surgery, the epithelial layer begins to regenerate at the flap border. This process continues over several weeks with the formation of a collagen scar at the flap margin between the incised edges of the Bowman layer.⁸ There are two types of responses to stromal wound healing after LASIK: One response is the hypercellular fibrotic scar at the flap wound margin that holds the flap in place, and the other one is the

hypocellular primitive scar in central/paracentral lamellar wound.¹ The primitive scar forms without the incised collagen lamellae reconnecting and restores only 2.4% of the strength of the normal corneal stroma. Flap wound margin heals more completely and achieves an average of 28.1% of normal stromal strength.¹ In a study, the force required to cause corneal rupture in LASIK and normal cadaver eyes was investigated using a trauma delivery device. It has been shown that there is no significant difference between the energy required for rupture of LASIK and normal eyes,⁹ and rupture occurs similarly in the limbal and corneoscleral locations in these two groups.¹⁰

Literature shows that corneal rupture after blunt trauma is relatively rare in post-LASIK eyes, unlike radial keratotomy (RK) eyes. Cheung et al. report corneal rupture following blunt trauma in which the patient's cornea had a history of post-LASIK ectasia, the anterior chamber was flattened, the aqueous humor leaked out of the eye, and the corneal rupture was in the paracentral area underneath the LASIK flap.⁷ Although in our patient, a similar rupture site occurred in the paracentral area of the stromal bed, our reported case has significant differences. There was no leakage of fluid outwards in our case; the fact the cornea did not have ectasia should have played significant role on that. Patient management has also been different. In Cheung's study, a thin layer of cyanoacrylate glue was used over a large area along the inferior flap edge and a bandage contact lens was placed, but because the AC was flattened again, the patient underwent penetrating keratoplasty (PK) surgery. Although lifting the flap and suturing the posterior corneal rupture, is a more appropriate approach, it was not used in Cheung's study. Because it was believed that the ectatic posterior cornea was too thin to retain sutures.

To the best of our knowledge, there has been no report of full thickness corneal rupture behind a LASIK flap following blunt trauma. This case was reported to show a careful examination of the LASIK eyes

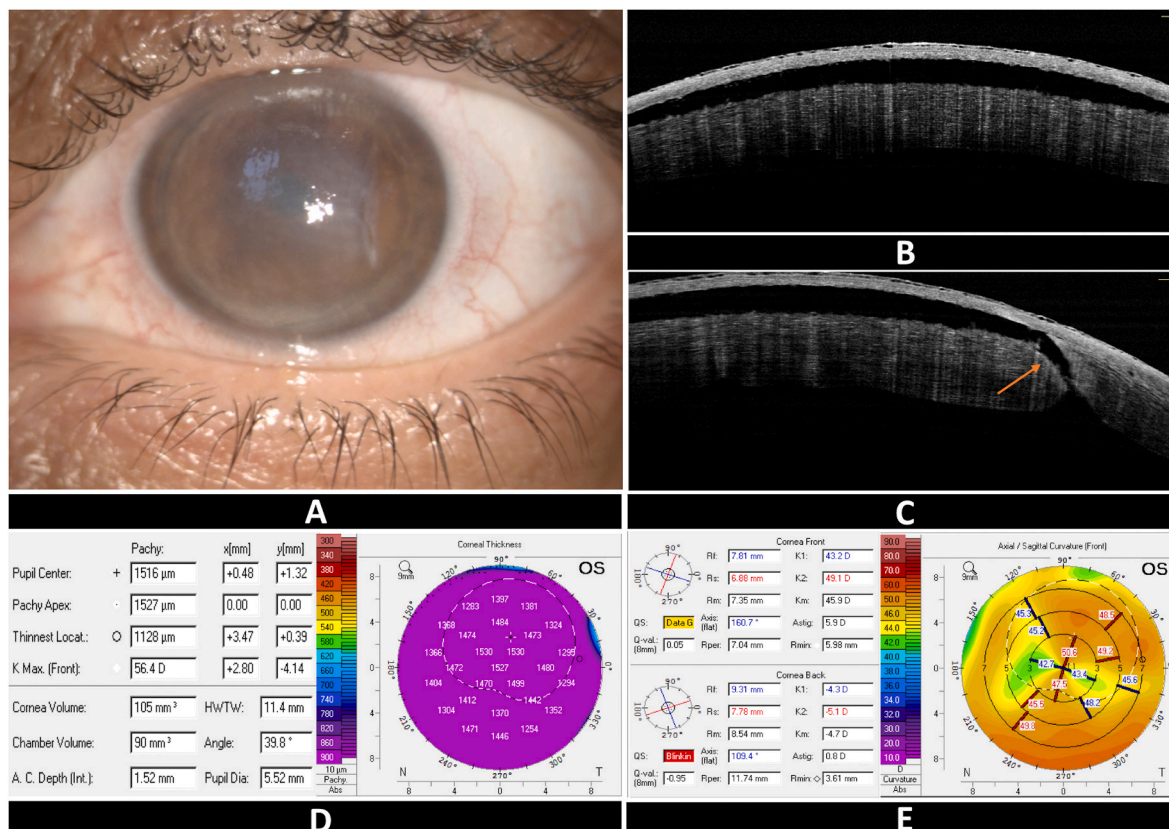


Fig. 1. Preoperative examination. A) Slit-lamp image, B) OCT image and observation of fluid accumulation under the LASIK flap, C) OCT image and observation of corneal tissue rupture in the paracentral area and flap tissue remaining intact, D) Map and specifications of corneal thickness, E) Map and specifications of corneal keratometry from corneal tomography measurement.

Contributions

All authors conceived the idea for the case study and followed the patient. SP and SYA wrote the article and all authors revised it critically for important intellectual content. SYA edited the surgery video and photos. All authors read and approved the final manuscript.

Ethics approval and consent to participate

The study was approved by the ethics committee of Semnan University of Medical Sciences, Iran.

Declaration of competing interest

There is no Conflict of Interest to Disclose.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.ajoc.2022.101419>.

References

1. Kaufman SC, Lazzaro DR. *Textbook of Ocular Trauma*. Springer; 2017.
2. Melki SA, Talamo JH, Demetriades A-M, et al. Late traumatic dislocation of laser in situ keratomileusis corneal flaps. *Ophthalmology*. 2000;107:2136–2139.
3. Bouveret B, Orucoglu F. Late-onset diffuse lamellar keratitis after blunt trauma without epithelial or flap damage. *JCRS Online Case Reports*. 2015;3:32–34.
4. Ursea R, Feng MT. Traumatic flap striae 6 years after LASIK: case report and literature review. *J Refract Surg*. 2010;26:899–905.
5. Leung AT, Rao SK, Lam DS. Traumatic partial unfolding of laser in situ keratomileusis flap with severe epithelial ingrowth. *J Cataract Refract Surg*. 2000;26:135–139.
6. Aboumerhi H, Shultz C, Erzurum S. Traumatic epithelial ingrowth despite nondisplaced lasik flap. *J Eye Cat Surg*. 2015;5:1–5.
7. Cheung AY, Heidemann DG. Globe Rupture of a post-LASIK keratectasia eye from blunt trauma. *Cornea*. 2016;35:1662–1664.
8. Dawson DG, Kramer TR, Grossniklaus HE, Waring GO, Edelhauser HF. Histologic, ultrastructural, and immunofluorescent evaluation of human laser-assisted in situ keratomileusis corneal wounds. *Arch Ophthalmol*. 2005;123:741–756.
9. Peacock LW, Slade SG, Martiz J, Chuang A, Yee RW. Ocular integrity after refractive procedures. *Ophthalmology*. 1997;104:1079–1083.
10. Vinger PF, Mieler WF, Oestreicher JH, Easterbrook M. Ruptured globes following radial and hexagonal keratotomy surgery. *Arch Ophthalmol*. 1996;114:129–134.