

## Photorefractive Keratectomy After Late Traumatic LASIK Flap Loss

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### ABSTRACT

**PURPOSE:** To present a case of photorefractive keratectomy (PRK) after late traumatic LASIK flap loss.

**METHODS:** The initial LASIK procedure was performed in 2003 with a Moria M2 microkeratome and NIDEK EC-5000 excimer laser using a 5.0/9.0-mm aspheric ablation pattern, resulting in 20/20<sup>+</sup> uncorrected distance visual acuity (UDVA) and plano refraction. Traumatic flap loss of the right eye occurred in 2007. The patient was treated for the trauma, and PRK with  $-5.00 -1.25 \times 090^\circ$  was performed 2 months later.

**RESULTS:** Posttraumatic flap loss UDVA was 20/200 in the right eye, with corrected distance visual acuity (CDVA) of 20/25<sup>+2</sup>. After PRK with mitomycin C (MMC), UDVA was 20/15 2 months postoperatively and was maintained through the last postoperative follow-up in 2010 (approximately 3 years after PRK).

**CONCLUSIONS:** Treating a patient with traumatic LASIK flap loss can be done by careful, conservative treatment of the abrasion followed by correction of the refractive error using PRK with MMC. [*J Refract Surg.* 2011;27(7):542-544.] doi:10.3928/1081597X-20110210-02

Loss of LASIK flap after treatment is a rare complication and usually occurs within days of the original procedure.<sup>1</sup> Late traumatic flap loss is an even rarer complication. This case study is one of the few reports discussing late traumatic flap loss<sup>2</sup> and its refractive management.

### CASE REPORT

Initial bilateral LASIK was performed at Motwani Lasik Institute in San Diego, California in 2003. The patient was 31 years old and had corneal thickness measurements of 560  $\mu\text{m}$  in the right eye and 550  $\mu\text{m}$  in the left eye. Keratometry was 43.98 diopters (D) and 43.97 D in the right and left eyes, respectively. Preoperative refraction was  $-5.25 -0.50 \times 180^\circ$  in the right eye and  $-5.50 -0.75 \times 175^\circ$  in the left eye.

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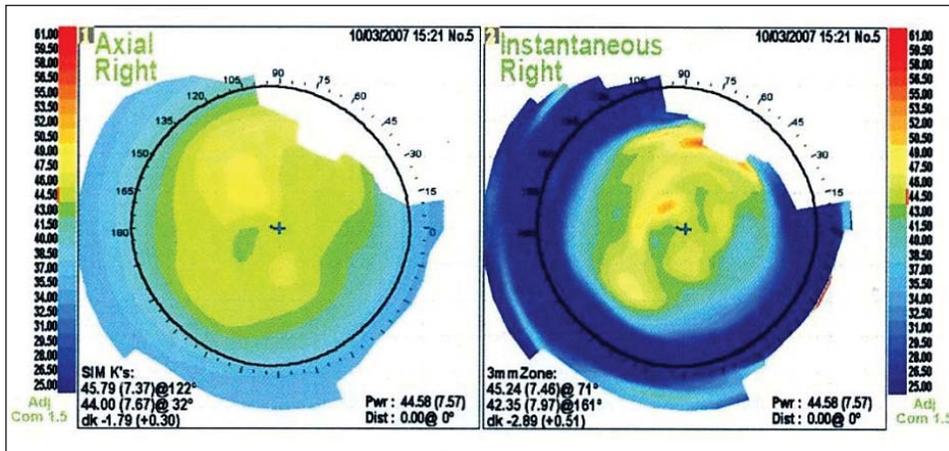
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Bilateral LASIK was performed using the Moria M2 microkeratome (Moria, Antony, France) and NIDEK EC-5000 excimer laser (NIDEK Co Ltd, Gamagori, Japan). The ablation pattern had an optical zone of 5.0 mm and transition zone of 9.0 mm. This aspheric ablation pattern, similar to the optimized aspheric transition zone (OATz) profile, was designed specifically to create a prolate corneal profile.<sup>3,4</sup> One week postoperatively, uncorrected distance visual acuity (UDVA) was 20/20<sup>+</sup> in each eye. The patient was lost to follow-up until 1 week after suffering traumatic injury to the right eye in 2007. The patient, a firefighter who was now 35 years old, walked into a shovel with his right eye during the 2007 San Diego Firestorm, cleaving the corneal flap off completely. The patient was taken to the emergency room and treated with a soft bandage contact lens for the abrasion, moxifloxacin hydrochloride ophthalmic solution (Vigamox; Alcon Laboratories Inc, Ft Worth, Texas) three times daily, and atropine ophthalmic solution four times daily.

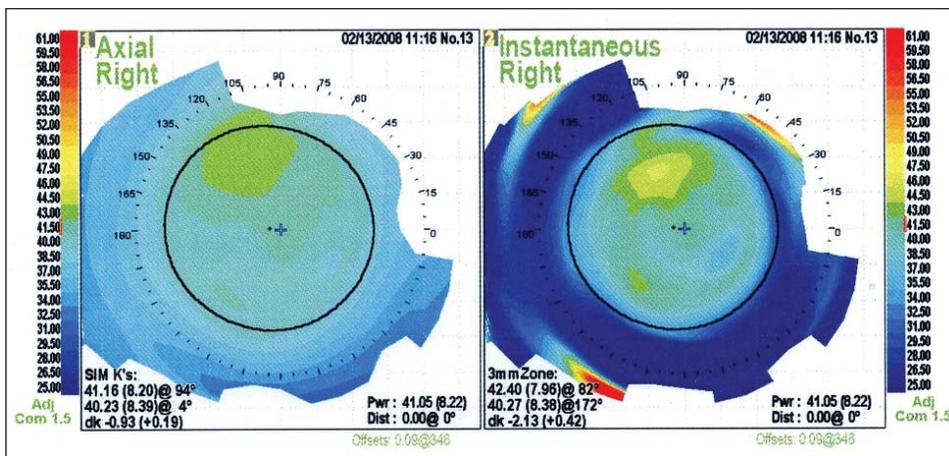
The patient presented with a reepithelialized cornea and UDVA of 20/200 in the right eye. The left eye was undamaged and had UDVA of 20/20. Figure 1 shows corneal topography of the right eye after traumatic flap loss. Atropine ophthalmic and moxifloxacin hydrochloride ophthalmic were discontinued, and fluorometholone ophthalmic (FML; Allergan, Irvine, California) was administered four times daily to counter the formation of trace haze. Two months later, the patient was refracted to 20/25<sup>+2</sup> corrected distance visual acuity (CDVA) with a refractive error of  $-5.00 -1.25 \times 090^\circ$ . Corneal thickness in the right eye was 462  $\mu\text{m}$  at the thinnest point and average corneal curvature was 44.07 D.

Photorefractive keratectomy was performed in 2007 with the NIDEK EC-5000 excimer laser using a 5.0-mm optical zone and 9.0-mm transition zone, which created an aspheric profile. Manual 8.0-mm phototherapeutic keratectomy ablation was used to remove the epithelium. Residual epithelium was removed via manual scraping. Refractive correction of  $-5.00 -1.25 \times 090^\circ$  with an ablation depth of 85.3  $\mu\text{m}$  was performed in the right eye without complications. After the refractive correction, 0.2 mg/mL mitomycin C (MMC) was applied to the cornea via a 5-mm sterile sponge for 20 seconds followed by irrigation with cold balanced salt solution. A bandage contact lens was applied and removed upon complete closure of the corneal abrasion. Figure 2 shows corneal topography of the right eye after PRK.

After the procedure, the patient was treated for pain with ketorolac ophthalmic (Acular, Allergan) four times daily and ibuprofen 400 mg every four hours for 7 days until the abrasion healed. The patient was also treated with prednisolone acetate 1% (Pred Forte, Allergan) and



**Figure 1.** Left) Axial and right) instantaneous NIDEK OPD-Scan of the right eye after posttraumatic LASIK flap loss before photorefractive keratectomy. Notice the aspheric shape still present in the corneal bed due to the aspheric corneal ablation. Total wavefront (not shown) also showed an even profile.



**Figure 2.** Left) Axial and right) instantaneous NIDEK OPD-Scan of the right eye after photorefractive keratectomy.

gatifloxacin ophthalmic solution (Zymar, Allergan) four times daily for 10 days, followed by fluorometholone four times daily to treat mild haze for 6 weeks. One week postoperatively, UDVA was 20/60 in the right eye with mild haze formation. During 1- and 2-month follow-up, UDVA was 20/30 and 20/15, respectively, and the patient was happy with his vision.

The patient was again lost to follow-up until 2010, at which time UDVA remained 20/15 in the right eye. Final corneal thickness was 359  $\mu\text{m}$  at the thinnest point and final average curvature was 40.13 D. Most recent UDVA was 20/15<sup>-1</sup> with a plano refraction. No epithelial abnormalities were noted, although the outline of where the flap edges had been was still faintly visible.

## DISCUSSION

Traumatic corneal flap dislocation after LASIK has been reported previously,<sup>5-9</sup> but flap loss has been a rare occurrence after refractive surgery. The case presented herein is noteworthy as the trauma induced was highly improbable. The only way the shovel could have amputated the flap was to strike it at a particular angle.

The trauma and resultant inflammation put the patient at risk for significant haze; however, this was

controlled using fluorometholone. Although a longer recovery period was considered, the eye was sufficiently quiet and the refraction was stable, therefore PRK was performed 2 months after the trauma to treat the resultant refractive error. The cornea was treated with an aspheric, prolate profile, which reduces the amount of oblate spherical aberration that would result from further flattening of the cornea with laser vision correction. Postoperative corneal thickness was sufficient to ensure corneal stability. The generally accepted minimal amount of residual stromal bed remaining after refractive surgery is 250  $\mu\text{m}$ .<sup>10</sup> With the addition of 50 to 60  $\mu\text{m}$  of epithelium, we determined that our postoperative PRK goal would be to leave the central cornea with at least 350  $\mu\text{m}$  of tissue for corneal stability.

After flap loss, the resultant refractive error was similar to the patient's original prescription. The original flap thickness was not measured specifically, but average flap thickness at the time of LASIK was approximately 120  $\mu\text{m}$ . Taking into account that epithelium usually is approximately 50  $\mu\text{m}$  thick, approximately 60  $\mu\text{m}$  of stromal tissue were lost, which accounts for the >5.00-D loss. Little haze was present even after

PRK. Although healing time was slower, the final visual outcome was excellent. It took 1 week for the abrasion to heal and 2 months for the patient to achieve full visual rehabilitation.

Some ophthalmologists have been proponents of performing lamellar keratoplasty in cases of flap loss or flap removal.<sup>1</sup> However, issues with suturing and induced refractive error may occur. Our case report shows that excellent visual results can be obtained without adding tissue. However, enough tissue must be available to safely perform refractive correction after flap loss. This also holds true for cases in which flap removal is indicated because of scarring or other damage to the flap.

The long-term outlook for this patient appears favorable, as stable 20/15 uncorrected vision in the right eye was noted at the last postoperative examination 2.5 years after PRK.

#### AUTHOR CONTRIBUTIONS

Study concept and design (M.M.); data collection (M.M., G.J.L.); analysis and interpretation of data (M.M., K.Y., C.E.); drafting of the manuscript (M.M., G.J.L., K.Y., C.E.); critical revision of the manuscript (M.M., K.Y., C.E.); administrative, technical, or material support (M.M., G.J.L.); supervision (M.M.)

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