Late-onset diffuse lamellar keratitis after surface ablation

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A 65-year-old white woman with a history of bilateral laser in situ keratomileusis (LASIK) had retreatment of her right eye status after cataract extraction. Thirteen years after the primary LASIK procedure, the patient developed florid diffuse lamellar keratitis (DLK) within 4 days of the retreatment. This case report presents an unusual occurrence of DLK years after LASIK surgery and stresses the importance of early vigilant inspection of the stromal space in LASIK patients having retreatment with surface ablation.

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One postoperative complication of laser in situ keratomileusis (LASIK) is diffuse lamellar keratitis (DLK). Diffuse lamellar keratitis occurs when neutrophils infiltrate the potential space between the surgical corneal flap and the stromal bed.1 Although the exact etiology is unknown, it is speculated to be multifactorial, including inducing factors such as corneal epithelial defects, microkeratome blade deposits, bacterial endotoxins, iodine solution, and lubricating oil.2

Photorefractive keratectomy (PRK), however, is not associated with DLK. No flap is created, thereby preventing the development of a potential space for epithelial growth and neutrophilic infiltration. To our knowledge, there has been no report in the literature of DLK after PRK or other surface ablation.

It is well known that LASIK patients may need retreatment for a residual refractive error early or many years after the primary procedure, sometimes following cataract surgery. Intraocular lens power calculation can be difficult to predict after LASIK surgery, and patients may require additional surgical manipulation to achieve the best uncorrected distance visual acuity (UDVA). However, lifting the flap many years after LASIK surgery can be accompanied by increased complications of epithelial ingrowth and flap wrinkles. Photorefractive keratectomy has been shown to be a safe and effective approach to surface ablation retreatment for patients previously treated with LASIK.3

In this report, we present a patient with a history of LASIK who had successful cataract surgery in both eyes but required PRK in her right eye for a residual refractive error. She developed an acute episode of DLK within days of the laser procedure. The DLK was diagnosed as stage 3 disease due to the clumping of cells in the central cornea.4

CASE REPORT

A 65-year-old white woman was first seen in July 2000 for a LASIK evaluation. The preoperative refraction was $/C_{0}6.00 \ C_{0}0.50 \ C_{2}88$ in the right eye and $/C_{0}6.25 \ C_{0}1.25 \ C_{2}86$ in the left eye. The corrected distance visual acuity (CDVA) was 20/20 in each eye. Laser in situ keratomileusis was performed with the Visx Star S2 laser and the Amadeus microkeratome (Ziemer Group) aiming for plano in the right eye and monovision of $/C_{0}1.25$ sphere in the left eye. The postoperative course was uneventful. At 1 month, the uncorrected distance visual acuity (UDVA) was 20/20 in the right eye and 20/40 in the left eye and the corneal interfaces were clear.

In 2013, the patient returned with bilateral progressive visual blurring and glare. The slitlamp examination was unremarkable except for clear corneas with excellent flap position and bilateral significant cortical cataracts. Uneventful phacoemulsification was performed in both eyes with an excellent postoperative refractive outcome in the left eye. The right eye, however, had a refraction of $-2.25 \ +0.75 \times 72$. The patient requested correction of the residual refractive error, and surface ablation was recommended. The procedure was performed using a 20% alcohol solution applied for 30 seconds to the surface of the cornea and the epithelium...
was discarded. No disruption was created in the previous LASIK flap. The Visx Star S4 laser was used to perform the refractive correction. Mitomycin-C was not used; a bandage contact lens was applied to the eye and topical fluorometholone, ofloxacin, and ketorolac were prescribed.

Four days after the procedure, the patient presented for the scheduled appointment with increasing pain in the right eye as well as blurring of both near and far vision. Physical examination demonstrated a UDVA of 20/400 in the right eye with minimal improvement on pinhole to 20/200; the left eye was 20/20. Slitlamp examination of the right eye revealed an intact nasal hinged LASIK flap with minimal injection of the conjunctiva, mild central epithelial defect, 2+ Descemet folds, and centrally located stromal cells clumped in waves confined to the interface without stromal edema. No cells or flare was noted. The left eye was normal.

Stage 3 DLK was diagnosed, and aggressive topical steroid treatment was prescribed 4 times a day. The patient was treated carefully over a 3-week period, with complete resolution of symptoms. The infiltrate improved, and a final UDVA of 20/30 was achieved. This was an isolated case; no other patients from the same operative day were diagnosed with DLK.

**DISCUSSION**

To our knowledge, this is the latest onset of DLK after an epithelial disturbance remote from the original LASIK procedure by 13 years. It is also the first case, to our knowledge, of DLK occurring after surface ablation. There was no discharge or anterior chamber reaction, and the patient responded to topical steroid treatment, all of which were indicative of DLK. Diffuse lamellar keratitis is a dreaded complication after LASIK surgery that is often caught and successfully treated due to vigilant observation of patients in the early postoperative period. Photorefractive keratectomy has not been associated with DLK, and this complication is not usually considered.

Late-onset DLK is a rare but known condition; sometimes stimulated by even a mild epithelial defect. Relapsing DLK has been associated with recurrent corneal erosions and anterior basement membrane dystrophy. Based on the cases described, DLK can occur many months after primary LASIK or retreatment. Most of the delayed-onset cases follow an event that disrupts the corneal epithelium.

Our patient is unusual because DLK developed more than 13 years after the primary procedure. She had surface ablation, and the DLK developed rapidly within the first week postoperatively. The proximity of the complication to the surgical procedure implies a correlation in causation. The surface ablation disrupting the corneal epithelium may have instigated the inflammatory component. The etiology of DLK, however, remains unclear.

Because this complication is not considered after PRK, there may be a delay in diagnosis, resulting in significant damage including corneal melt and irreversible astigmatism. This case highlights the importance of monitoring LASIK patients carefully after any procedure that may irritate the corneal epithelium. Consideration should be given to prophylactic precautions including patient education and more vigilant follow-up, as well as more aggressive topical corticosteroid treatment. The case highlights the importance of scrutinizing the stromal space of LASIK patients having additional refractive procedures and underscores the need for further research regarding DLK and its etiology.

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