Diffuse Lamellar Keratitis Associated With Recurrent Corneal Erosions After Laser in situ Keratomileusis

Devin A. Harrison, MD; Laura M. Periman, MD

ABSTRACT

PURPOSE: Diffuse lamellar keratitis (DLK) is marked by the presence of diffuse or multifocal infiltrates confined to the laser in situ keratomileusis (LASIK) interface. These infiltrates are culture-negative, and the etiology is thought to be noninfectious. Most cases of DLK occur within the first week or two following surgery.

METHODS: We describe one case of diffuse lamellar keratitis that occurred 3 months after LASIK. The patient developed a spontaneous corneal erosion in one eye. Over the next 2 days while the erosion was being treated, there was rapid development of DLK. Slit-lamp biomicroscopy and in vivo scanning slit confocal microscopy were performed. The patient was treated with intensive topical corticosteroids.

RESULTS: Scanning slit confocal microscopy revealed numerous, highly-reflective round bodies consistent with a polymorphonuclear infiltrate located at the flap interface. Treatment with topical 1.0% prednisolone acetate was instituted, with rapid improvement in patient symptoms, visual acuity, and slit-lamp biomicroscopy.

CONCLUSIONS: Diffuse lamellar keratitis may occur months after LASIK as a result of a spontaneous recurrent corneal epithelial erosion.

[J Refract Surg 2001;17:463-465]

Diffuse lamellar keratitis (DLK) was reported by Smith and Maloney in 12 patients following laser in situ keratomileusis (LASIK) in 1998.1 The authors described the occurrence of diffuse or multifocal infiltrates confined to the LASIK interface at 2 to 6 days following surgery. Cultures were negative in two cases that had microbial analysis. The etiology was thought to be noninfectious.

Since the original report of DLK, there have been numerous other publications on this new disease. Possible etiologies include metallic debris from the microkeratome or blade, meibomian gland oils, bacterial endotoxins, debris from absorbent sponges, and epithelial defects or epithelial debris containing pro-inflammatory cytokines.2-4

CASE REPORT

A 49-year-old man underwent uneventful bilateral simultaneous LASIK in Vancouver, British Columbia, 3 months before presentation. Approximately 1 month after surgery, the patient spontaneously developed a corneal epithelial erosion of the left eye and was examined by his local ophthalmologist. The erosion was treated successfully with a bandage contact lens, and topical Tobradex (tobramycin 0.3% combined with dexamethasone 0.1%, Alcon Laboratories, Ft. Worth, TX). The epithelial erosion healed within 2 days, and no DLK was noted.

At 3 months following surgery, a painful spontaneous corneal epithelial erosion occurred on the right eye. The patient was again examined by his local ophthalmologist, and the eye was patched. The epithelial defect was larger the following day, so the loose epithelium was mechanically scraped and a bandage contact lens was applied. The epithelial defect had not improved by the third day, and there was a diffuse infiltrate at the flap interface. The patient was referred for evaluation.

The patient’s visual acuity without correction was 1/200 in the right eye, and 20/20 in the left eye. Slit-lamp microscopy of the right eye revealed an epithelial defect measuring 4.5 mm by 4.0 mm and a fine diffuse infiltrate at the flap interface (Fig 1). The
Diffuse Lamellar Keratitis After LASIK/Harrison and Periman

Figure 1. Slit-lamp micrograph demonstrates epithelial defect stained with fluorescein, and DLK present. Arrow points to edge of LASIK flap.

Figure 2. Confocal microscope scan of lamellar interface demonstrates highly reflective round bodies, 9 to 11 μm in diameter.

The anterior chamber was deep, with cells occasionally visible. Scanning slit confocal microscopy (Confoscan 2, Fortune Technologies, Padova, Italy) of the left eye was remarkable for a dense accumulation of highly reflective, round bodies measuring 9 to 11 μm located at the flap interface (Fig 2).

Treatment was initiated with topical 1% prednisolone acetate twice daily, topical fluoroquinolone four times daily, erythromycin ointment at bedtime, and cyclogel drops twice daily. The following day, visual acuity had improved to 20/400 and the epithelial defect had decreased to 3 by 4 mm. The prednisolone acetate drops were increased to every 2 hours and the cyclogel was discontinued. Five days later, the patient returned with visual acuity of 20/80 in the right eye and pinhole to 20/50. Slit-lamp microscopy revealed complete healing of the epithelial defect, with only trace grainy infiltrate remaining at the interface. The fluoroquinolone was discontinued and the corticosteroid drops were tapered. On follow-up 1 month later, visual acuity had returned to 20/20 without correction.

DISCUSSION

Recurrent corneal erosions can occur following photorefractive keratectomy (PRK), and less
commonly after LASIK. After PRK, recurrent erosions are likely attributable to poor adhesion of the epithelial cells to the anterior stromal bed following laser ablation. After LASIK, recurrent corneal erosions may be due to the neuropathy that occurs after cutting the flap, in addition to the epithelial manipulation at the edge of the flap. Undiagnosed corneal trauma or LASIK-induced neurotropic epitheliopathy may also predispose an eye to developing an epithelial defect or recurrent erosions.

Corneal epithelial wounding leads to the production of cytokines such as hepatocyte growth factor (HGF), and keratinocyte growth factor (KGF). These and other cytokines likely play an important role in subsequent epithelial and stromal wound healing and recruitment of inflammatory cells. DLK associated with recurrent corneal erosions following LASIK may be due to the outpouring of these cytokines that occurs with injury to the epithelium. The inflammatory cells recruited from the corneal limbus collect in the potential space of the flap interface, possibly because this is the path of least resistance. Alternatively, cytokines released from the epithelium through injury stimulate keratocytes to produce cytokines like monocyte chemotactic and activating factor (MCAF) that attract inflammatory cells (Hong, Liu, Lee, and Wilson, unpublished data, 2000). Another possibility is that the epithelial scraping disrupts the flap edge, which allows the inflammatory cells access to the interface.

Confocal microscopy revealed the presence of highly reflective round bodies 9 to 11 μm in diameter consistent with a polymophonuclear infiltrate thought to occur with DLK. Confocal microscopy may become useful for differentiating DLK from microbial keratitis. Since the treatment of DLK requires topical corticosteroids, infectious causes of keratitis should be ruled out.

Previous studies have shown that filamentous fungi and Acanthamoeba can be detected by confocal microscopy. In these studies, the Acanthamoeba organisms measured from 10 to 25 μm, were highly reflective, and occasionally were distinguished as double-walled cysts. However, there are limitations to confocal microscopy, such as difficulty in returning to an area of interest for serial exams, and the lack of resolution to identify pathogens such as bacteria or Candida. In the future, fluorescent probes may aid detection of these smaller organisms, but at present they remain undetectable.

It is unknown whether confocal microscopy will become clinically useful in differentiating infectious from noninfectious causes of lamellar keratitis. Fortunately, we have had no cases of infectious keratitis after LASIK with which to make a direct comparison. As with any new technology, only time and experience will provide definitive answers to the specificity and sensitivity of the instrument.

The diagnosis of DLK should be made based on clinical appearance and history. If there is a dense white infiltrate, and a bacterial pathogen is suspected, the flap should be lifted and the infiltrate cultured and treated with fortified topical antibiotics. However, if the appearance is consistent with that of DLK with diffuse inflammation and an intact epithelium, then the diagnosis of DLK may be made, and the more aggressive toxic treatment of a bacterial infection avoided. In cases such as ours, when DLK occurs months after LASIK, and there is an epithelial defect, confocal microscopy was useful in ruling out some infectious possibilities. This report confirms that DLK can occur after LASIK, in which there is late epithelial injury.

REFERENCES