Short communication

Transepithelial phototherapeutic keratectomy to treat chronic laser in situ keratomileusis-flap macrostriae. A case review

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ABSTRACT

Objective: To describe the use of transepithelial phototherapeutic keratectomy for the long-term treatment of post-laser in situ keratomileusis (LASIK) flap macrostriae.

Method: We present the case of a 22 year old male with visual loss in the left eye due to chronic flap macrostriae that was treated with transepithelial PTK.

Results: Striae and haze were no longer visible, with a significant improvement of best corrected visual acuity. Refraction in the third month was +9.75–4.00 × 170°. A phakic intraocular lens was implanted one year later with an uncorrected visual acuity of 0.8.

Conclusions: PTK can solve chronic flap striae, but refraction outcome is unpredictable.

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Tratamiento a largo plazo de macroestrias post-laser in situ keratomileusis mediante queratectomía fototerapéutica transepitelial. Caso clínico

RESUMEN

Objetivo: Describir el tratamiento a largo plazo de macroestrias en el flap tras laser in situ keratomileusis (LASIK) mediante queratectomía fototerapéutica transepitelial (PTK), a propósito de un caso clínico.

Método: Presentamos el caso de un varón de 22 años que presenta macroestrias crónicas en el flap con pérdida de visión en un ojo al que se realiza un tratamiento mediante PTK transepitelial.

Resultados: Las estrías y el haze se resuelven completamente con una importante mejora de la agudeza visual mejor corregida pero con una refracción en el tercer mes de +9,75–4.00 × 170°. Un año después se implanta una lente fáquica con una agudeza visual final sin corrección de 0.8.


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Introduction

The appearance of optically significant striae in the flap after laser in situ keratomileusis (LASIK) refractive surgery is one of the most difficult complications to resolve, particularly in the chronic stage. The symptoms usually referred by patients include diminished uncorrected visual acuity, light blindness, halos and loss of contrast sensitivity. To date there is no general agreement about the best treatment for this complication.

The case of a patient who visited our service exhibiting diminished vision and various visual symptoms associated to the presence of macro striae in the flap of an eye intervened one year before is described. The cause of said striae is unknown. The exploration suggested a certain degree of central flap necrosis. The objective is to describe the results of phototherapeutic keratectomy (PTK) with mitomycin-C in the treatment of chronic flap macro striae after LASIK.

Clinical case

Male, 21, who visited our center referring hypermetropic LASIK surgery one year before, with diminished visual acuity in the left eye since early post-surgery and a diagnostic of macrofolds by the surgeon. The patient appeared to have been treated again after which he suffered flap edematization in said eye. There is no known history of traumatism or diffuse lamellar keratitis (DLK).

Presurgery assessment included uncorrected visual acuity and best corrected visual acuity measurement, manifest refraction and under cycloplegia, corneal topography (CSO Topgrapher CM O2. Scandianacci Firenze, Italy), ultrasound pachymetry (DGH 5100. Exton, PA, USA), slit lamp assessment, pupil size measured under mesopic conditions, Goldmann applanation tonometry and funduscopy under dilatation. Keratometry was obtained using an autorefractometer (Nidek ARK-700. Nidek, Gamagori, Japan) to assess presurgery corneal curvature.

Slit lamp biomicroscopic exploration revealed multiple central folds in the flap together with a cicatrization strip (Fig. 1). Uncorrected visual acuity was of 0.85 in the right eye and 0.15 in the left eye. The patient referred slight amblyopia in the left eye. Refraction was +0.75–1.50 at 10° in right eye and +4.00–2.25 at 150° in left eye with visual acuity 1.0 and 0.3 respectively. Keratometry was of 43.25 at 175° and 44.50 at 85° in right eye and 42.25 at 170° and 45.00 at 80° in left eye, while the pachymetric thickness was of 521 microns. Intraocular pressure was 11 and 10 mmHg in the right and left eye respectively.

It was decided to intervene with transepithelial phototherapeutic keratectomy (PTK). Prior to the operation, antibiotic prophylaxis was performed with ofloxacin. Ablation was performed through the epithelium utilizing the PTK option of the Esiris Excimer Laser software (Schwind Eye-Tech-Solutions, Kleinostheim, Germany), in an optical area of 6 mm with 1 mm transition until the striae were no longer visible. Mitomycin C 0.02% was applied during 1 min. The ablation depth was of 119 microns (approximately 50 microns of epithelium and 70 microns of stroma). Subsequently, the surgical site was irrigated and a therapeutic Bausch & Lomb Pure Vision TM, Balaficon A contact lens was placed, instilling ofloxacin and diclofenac drops during the first 2 days to preempt excessive discomfort. The assessment carried out one week after the treatment revealed an uncorrected visual acuity of 0.05 with therapeutic contact lenses. These were withdrawn due to the favorable appearance of the new epithelium. The striae were no longer visible (Fig. 2). Antibiotic treatment was suspended and dexamethasone was substituted by fluorometholone 3 times a day for 3 weeks, followed by a descending dosage to termination after 5 weeks.
At month 3, refraction was of +9.75–4.00 at 170°, uncorrected vision of 0.05, although it reached 0.75 with best correction. In addition, the patient exhibited irregular astigmatism toward the rule (Fig. 3) in topography. Posts treatment keratometry was of 39.5 at 80° and 34.75 at 170°, while pachymetry was of 404 microns. In slit lamp the cornea appeared transparent and without striae.

One year after surgery, refraction remained stable (+9.50–3.75 to 170°) with good corrected visual acuity (0.8). Biometric data (axial length of 22.85 mm, anterior chamber length of 3.33 mm and white–white distance of 12 mm), and normal endothelial count (3000 cells/mm²), enabled the implant of a phakic intraocular lens of the PRL type having +8.00 diopters to resolve the refractive problem. Previous prophylactic iridotomy was performed with Neodimium-Yag laser. Surgery was completed without complications. Uncorrected visual acuity one month after the implant is of 0.7.

Discussion

The LASIK flap striae can be present but invisible, although they can be detected with confocal microscopic and optic coherence tomography. It is believed that this can be due to lack of coupling between the flap posterior surface and the ablated stroma, causing the flap to compress when the treatment is for myopia due to residual site flattening. A positive correlation has been described between the magnitude of the myopic ablation and the appearance of striae. Flap striae can also be the result of proteoglycan hyper-hydration which leads to flap edematization. When dehydration occurs in the post surgery period, Bowman’s membrane can shrink and give rise to striae, which can lead to permanent damage if not treated immediately. Striae are differentiated from folds because they affect the flap thickness only partially. These can be classified in central (in myopic ablations), peripheral (hypermetropic) or random when they are due to hyper-hydration. Some authors point out that in the folds the total flap thickness is affected. This is generally due to poor alignment of the flap on the residual site. Generally, they are horizontal when the hinge is nasal and vertical when it is superior.

Striae and folds must be treated immediately if visual acuity is impaired. The usual procedure for treating short-term symptomatic striae and folds frequently involves flap dissection and hyper-hydration with various substances (hypertonic solution, distilled water, 80% balanced saline, deionized water), followed by sandwich-type compression with forceps to dehydrate and stretch the flap. If this maneuver is performed in the first 24 h the epithelium would be preserved, but after the first week de-epithelization must be performed previously. Flap flattening has been described with a surgical sponge in slit lamp as an option to flap dissection.3

Long-term treatment of folds, as in this case, is more complicated. Various techniques have been described: hyper-hydration, sandwich type compression and subsequent PTK, withdrawing epithelium,2 flap stitching, application of contact lenses, flap amputation with or without lamellar keratoplasty or transepithelial PTK. In what concerns the results obtained by the authors that utilized PTK as a treatment method, some treated only myopic patients with transepithelial technique without utilizing mitomycin C and carrying out ablation until striae are less visible (mean of 10 microns) but not completely eliminated. None of these patients developed haze above 1+. The patients of this case did not develop haze either. The mean net refractive result obtained is of +0.80 diopters, with a range of −2.13 to +3.88 diopters. In our case, the depth of ablation (70 microns of the stromal tissue) was justified by the depth of the stroma that was affected by the striae. In fact, it is possible that the flap may have experienced a certain degree of necrosis because the biomicroscopic image was very similar to that reported by the authors in case of central flap necrosis (“Mercedes Benz” sign). For this reason, ablation had to be deep in order to reach the transparency of the corneal tissue, possibly at the expense of the refractive result. In similar cases, other authors opted for amputating the flap, applying mitomycin C to avoid the appearance of haze and performing surface treatment of the photorefractive keratotomy type in the event of residual refraction. Accordingly, this was another of the treatment options in this case. As the patient had visited our center one year after surgery, we did not know the initial evolution of the case and if whether it was a primary flap necrosis or more superficial central striae necrosis. For this reason, we opted for what we considered to be the most conservative therapeutic option. Our patient started from the previous high hypermetropic refraction (+4.00–2.25 to 150°) and the final refraction was much higher due to the excessive amount of ablated tissue, which lead us to implant a phakic lens with satisfactory final evolution.

To conclude, we believe that transepithelial PTK is an efficient method for the biomicroscopic removal of flap striae but with unforeseeable refractive results when the ablation depth is excessive. This type of treatment can be an alternative to flap amputation due to the central necrosis or striae with deep involvement despite the unpredictability of the refractive results.

Conflict of interests

No conflict of interests has been declared by the authors.
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REFERENCES


