Double lenticule as a complication of SMILE refractive surgery

Doble lentículo como complicación de cirugía refractiva tipo SMILE

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Abstract

This is the case of a 39-year-old patient, in whom a Small Incision Lenticule Extraction (SMILE) resulted in a perioperative complication of a second lenticule at the interface. We present here the sequence of events with their outcomes and a review of the literature.

Key words: Complications. SMILE. Refractive surgery. Astigmatism.

Resumen

Se presenta el caso de un paciente masculino de 39 años, al cual se le realizó cirugía refractiva del tipo extracción lenticular por pequeña incisión (SMILE); como complicación se presentó la formación de un segundo lentículo en la interfaz. Presentamos la secuencia de eventos con sus resultados y una revisión de la literatura médica.

Palabras clave: Complicaciones. SMILE. Cirugía refractiva. Astigmatismo.

Introduction

Small incision lenticule extraction (SMILE) is a relatively new technique that involves the use of femtosecond laser to generate a stromal lenticule and thereby correct a refractive error¹.

The mechanism by which the femtosecond laser interacts with stromal cells is photodisruption, which is described as plasma-mediated ablation or optical rupture. Its mechanism is based on the non-linear absorption of laser energy and is characterized by three successive events: plasma formation, shock waves and cavitation².

The temperature rise creates a highly localized tensile stress that exceeds the critical stress of mechanical damage, resulting in tissue disruption and the formation of cavitation bubbles^{2,3}. If the interface is not interrupted mechanically, the cavitation bubbles are reabsorbed, and the stroma remains intact.

Several perioperative complications have been described with the SMILE technique, such as suction loss, selection of an incorrect plane, inability to extract the lenticule due to attachment to the anterior stroma, as well as retained fragments, epithelial abrasions, tears in the incision area, difficulty to extract the lenticule or perforated ceiling⁴. In the postoperative period haze,

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dry eye and inflammation at the interface have been reported, which can negatively impact final visual acuity⁵.

Here we present a perioperative complication in a SMILE patient, with the sequence of events and their outcomes.

Summary of the case

We present the case of a 39-year-old male patient, who requested refractive surgery at the Fundación Hospital Nuestra Señora de la Luz. He had no relevant pathological or ophthalmological history.

Ophthalmological examination showed that visual acuity (VA) of the right eye was 20/200 (.) 20/30, with a refraction (Rfx) of -3.00 sphere and a best corrected visual acuity of 20/20, with a cycloplegic refraction of -2.50 sphere. In the left eye, VA was 20/200 (.) 20/60, Rfx was -4.00 sphere and cycloplegic Rfx was -3.50 sphere.

Examination showed appendages without alterations, clear conjunctiva, clear cornea with formed anterior chamber, reflective pupils and clear lens. Dilated fundoscopic examination of both eyes was normal, without peripheral retinal lesions.

Corneal topography was normal, with keratometries in the right eye (RE) of 42.00 × 175/42.9 × 85, and a central pachymetry of 555 with a thinnest value of 546 (Fig. 1, topographic data). Left eye (OS) showed values

of 42.00 × 28/42.9 × 118 and a central pachymetry of 558 with a thinnest value of 549 (Fig. 1, topographic data); the rest of the topographic values were within normal limits.

The patient was scheduled for SMILE and during the procedure there was a suction loss in OD, so the treatment concluded for the posterior and anterior planes of the lenticule, observing a displacement towards the lenticule's edge without finishing the lateral incision for the extraction of the lenticule. Therefore, surgery was terminated and rescheduled a week later.

A week after the episode, SMILE was attempted, observing the formation of a "double lenticule" (Fig. 2, femtosecond image). We proceeded to extract just one lenticule, and the moon-shaped second lenticule remained in the interface. The second eye was operated on without complications. A Scheimpflug image was taken that showed the interface irregularity.

On the first postoperative day he presented a binocular VA of 20/30 with the remainder of the second lenticule in the lower sector, with a Rfx in OD of + 3.75-3.25 × 76, a corneal topography without significant differences between both eyes, only the differentials at 3 mm and 5 mm greater than 2.0 D. Gatifloxacin/prednisolone + carboxymethylcellulose were prescribed every 4 hours.

In the examination a week later, the patient had a VA in OD of 20/40 with a slight haze in the pericentral

Figure 1. Topographic data of the right and left eyes showing normal patterns suitable for refractive surgery.

sector, and a crescent-shaped image in the lower temporal sector (Fig. 3, clinical image), with a Rfx of $+3.25-2.75 \times 78$. The patient continued with prednisolone and carboxymethylcellulose every 4 hours.

In the follow-up at one month, the patient reported poor vision in the OD with a VA of 20/30, a Rfx of $+3.25-2.75 \times 75$, clear cornea, without haze, and the crescent-shaped image was still visible. Prednisolone was prescribed in a tapered regimen, and carboxymethylcellulose was continued every 4 h. An attempt was made to measure intraocular pressure, observing important subepithelial edema that made it impossible to take a topography, so it was performed 12 days after the resolution of edema, without finding relevant alterations.

In his last review 3 months after surgery, the patient remained under follow-up with a VA of 20/30 in OD. He reported a slightly decreased vision in the OD, and on examination we found a stable Rfx of $+3.50-2.75 \times 75$ and remains of the second lenticule in the mentioned sector (Fig. 4, clinical image) as well as low contrast sensitivity. The patient continued with carboxymethylcellulose on an as needed basis.

Discussion

The SMILE technique involves photodisruption of stromal tissue, so the recovery time is usually shorter compared to Laser assisted in Situ Keratomileusis (LASIK).

Suction loss is an uncommon complication⁶, but it can still lead to other unreported adverse effects such as in this patient in whom, despite waiting for a longer period of time than that recommended by the manufacturer (20 min), a different plane was created.

The refractive result of our patient, with hyperopic astigmatism, could make us think that the double lenticule was made up of superimposed tissue, so a greater amount of corneal stroma was extracted. This assumption can be corroborated by pachymetry that, in spite of being underestimated in postoperative LASIK patients⁷, in our patient it was of 409 in the postoperative, and of 546 preoperatively, with a thickness of the lenticule of 75 microns; therefore, the expected postoperative thickness would be approximately 471 microns, which shows that the patient's current refraction is completely induced by the double lenticule.

In femto LASIK treatment, a retreatment can be performed after lifting the flap⁸. However, retreatment after refractive lenticule extraction (ReLex) SMILE is more complicated. Possible alternatives are the performance of photorefractive keratectomy (PRK) or LASIK, since

Figure 2. Femtosecond image showing a double lenticule and interface.

Figure 3. Clinical photograph of the right eye in which a half-moon image is evident in the lower and temporal sector, corresponding to remains of the second lenticule.

Figure 4. Clinical photograph of the right eye, showing the interface of the second lenticule in the periphery.

repeating the SMILE technique can be more unpredictable and induce multiple planes of dissection within the cornea.

There are studies about topography-guided PRK in patients with irregular astigmatism⁶, and one that has reported successful results with femtosecond LASIK in a patient with perioperative suction loss⁹.

The conversion of SMILE to femtosecond lenticule extraction (FLEX) has also been demonstrated, allowing a subsequent intrastromal photoablation¹⁰, with the aid of a new technology called "CIRCLE", which aims to perform a flap by femtosecond laser and then correcting the refractive error with LASIK.

Conclusions

Currently there is no specific technique to correct residual or induced refractive errors secondary to the SMILE technique. Our patient suffered a seldom reported complication in the medical literature that induced a significant postoperative refraction; even so the question arises about the optimal time to perform a retreatment in SMILE and which is the best technique to achieve best results.

Ethical disclosures

Protection of human and animal subjects. The authors declare that the procedures followed were in accordance with the regulations of the relevant clinical research ethics committee and with those of the Code of Ethics of the World Medical Association (Declaration of Helsinki).

Confidentiality of data. The authors declare that they have followed the protocols of their work center on the publication of patient data.

Right to privacy and informed consent. The authors have obtained the written informed consent of the patients or subjects mentioned in the article. The corresponding author is in possession of this document.

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Conflicts of interest

There is no conflict of interest.

References

1. Kugler LJ, Wang M. Intrastromal laser refractive surgery. *Cataract and refractive surgery today*. 2010;10:68–70.
2. Krueger RR, et al. *Lasser ASsisted Cataract-surgery ReLACS*. 1.a ed. New York: Ed. Springer-Verlag; 2013.
3. Rojas E, González J. Laser eximer y microscopía confocal: plataformas tecnológicas de la visión del futuro. *MEDISAN*. 2013;17.
4. Shah R, et al. All-in-One Femtosecond Laser Refractive. *Surgery. Techniques in Ophthalmology*. 2010;8:35–42.
5. Shah R. Results of small incision lenticule extraction. All-in-one femtosecond laser refractive surgery. *J Cataract Refract Surg*. 2011;37:127–37.
6. Ivarsen A, Asp S, Hjortdal J. Safety and complications of more than 1500 small-incision lenticule extraction procedures. *Ophthalmology*. 2014;121:822–8.
7. Matsuda J. Comparison of central Thickness Measurements by Orbscan II and Pentacam After Corneal Refractive Surgery. *Jpn J Ophthalmol*. 2008;52:245–9.
8. Netto MV, Wilson SE. Flap lift for LASIK retreatment in eyes with myopia. *Ophthalmology*. 2004;111:1362–7.
9. Sharma R, Vaddavalli PK. Implications and management of suction loss during refractive lenticule extraction (ReLEX). *J Refract Surg*. 2013;29:502–3.
10. Riau AK, Ang HP, Lwin NC, et al. Comparison of four different VisuMax circle patterns for flap creation after small incision lenticule extraction. *J Refract Surg*. 2013;29:236–44.