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Original article

Long-term results of lasik refractive error correction after penetrating keratoplasty in patients with keratoconus[☆]



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ABSTRACT

Objective: To evaluate the long term results of Lasik for residual refractive errors (RE) after penetrating keratoplasty (PKP) for keratoconus (KC).

Design: Retrospective cohort.

Method: Records of 14 consecutive patients (19 eyes) who had Lasik after PKP for KC were retrospectively reviewed. In all eyes with refractive stability and suture removed before Lasik, far distance Visual Acuity with (AVCC) and without correction (AVSC), spherical equivalent (EE), refractive (Ast) and keratometric (dK) astigmatism were analyzed pre- and post-operatively before and after one year of follow up. Data were analyzed using Shapiro–Wilk normality test, Student t test and Mann–Whitney test. A *p*-value of <0.05 was considered statistically significant.

Results: The mean follow-up time was 3.16 months for the follow-up before one year post-operative and 5.8 years for the follow-up after one year postoperative. The best spectacle corrected visual acuity of 0.11 LogMAR (DE 0.07) before Lasik remained stable throughout the study. The SE decreased from -2.6 (DE 3.53) to -0.36 D (DE 1.33) ($p < .05$) for the follow-up before one year postoperative and -1.28 D (DE 1.63) ($p = .07$) for the follow-up after one year postop. The refractive cylinder was reduced from -3.43 (DE 1.35) preoperative to -1.37 D (DE 1.24) ($p < .05$) and -3.21 D (DE 2.29) ($p = .36$) in the long term after one year of follow-up.

Conclusions: Lasik refractive results regress one year after the operation; therefore it is not an effective long-term surgical refractive procedure for residual refractive errors after PKP for KC.

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Resultados a largo plazo de lasik para ametropía residual en queraplastia penetrante en pacientes con queratocono

R E S U M E N

Palabras clave:

Queratocono
Lasik
Queratoplastia penetrante
Error refractivo
Astigmatismo

Objetivo: Evaluar la efectividad a largo plazo del Lasik en la corrección de ametropías residuales a la queratoplastia (QP) en pacientes con queratocono (QC).

Diseño: Cohorte retrospectiva.

Métodos: Análisis retrospectivo de fichas clínicas de 19 ojos (14 pacientes) operados de Lasik post-QP por QC. En todos los ojos, con estabilidad refractiva y remoción de suturas previas al Lasik, se evaluaron y compararon los siguientes resultados pre- y post-Lasik, de antes de un año de seguimiento y después de un año de seguimiento: agudeza visual corregida (AVCC) y sin corrección (AVSC), equivalente esférico (EE), astigmatismo refractivo (Ast.) y queratométrico (dK). Los datos fueron analizados con test de normalidad Shapiro-Wilk, t de Student y Mann-Whitney para grupos independientes. Se consideró significativo un valor $p < 0,05$.

Resultados: Tiempo promedio de seguimiento post-Lasik fue de 3,16 meses (DE 3,8) para grupo antes de un año de seguimiento y 5,8 años (DE 2,4) para grupo después de un año de seguimiento. La AVCC 0,11 LogMAR (DE 0,07) pre Lasik, se mantuvo estable en ambos grupos, mientras que el EE disminuyó de $-2,6$ (DE 3,53) pre Lasik a $-0,36$ D (1,33) ($p < 0,05$) en el grupo antes de un año de seguimiento y a $-1,28$ D (DE 1,63) ($p = 0,07$) en el grupo después de un año de seguimiento. El Ast. bajó de $-3,43$ (DE 1,35) a $-1,37$ D (DE 1,24) ($p < 0,05$) a corto plazo antes del año, para aumentar a $-3,21$ D (DE 2,29) ($p = 0,36$) después del año postoperatorio.

Conclusión: Los resultados refractivos del Lasik desaparecen después del año, por lo tanto no es una cirugía refractiva efectiva a largo plazo para corregir los ER residuales en QP después del QC.

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Introduction

Even though in the past few years a number of new therapeutic alternatives for managing keratoconus have appeared (cross-linking, intra-stromal rings), a still significant number of patients end up with keratoplasty, either penetrating (PK) or ideally deep lamellar keratoplasty (DLK). Visual rehabilitation after PK continues to be a challenge due to the high level of residual astigmatism and ametropia occurring in an important percentage of patients.¹ Management of post-PK residual ametropia would have a special characteristic in patients with keratoconus (KC) because in this condition the receiving cornea has a less stable structure due to its altered biomechanics. After PK, slight to moderate residual ametropia generally respond positively to the use of contact lenses.² However, many patients are not able to use these lenses due to handling difficulties, intolerance or discomfort.¹ Several surgical techniques have been applied to resolve the refractive problem in these cases. Of these, relaxing limbar incisions, astigmatic keratotomies and the use of sutures have demonstrated very low predictability and slow and insufficient results.³ Photorefractive keratectomy (PRK), with or without mitomycin, has also been attempted but insufficient correction, high stromal haze rates or corneal scars have set it aside as a first choice for this group of patients.³ Subsequently, LASIK has demonstrated slightly better results in this group of patients, with shorter recovery times and slower corneal haze risk but with complications related to the flap and the

disappearance of the refractive defect.³ The small number of available clinical reports on the use of LASIK in this group of patients suggest good results in the short and medium term and PRK has been defined as a safe and effective alternative by most of said reports.⁴⁻¹⁰ Unfortunately, most published papers do not include follow-up periods over 12 months and there is sufficient clinical evidence to consider that post-LASIK stability criteria in the long-term are not the same in a patient with KC. Accordingly, the objective of this work is to present and assess the authors' long-term post-LASIK experience in patients with KC.

Methods

A retrospective cohort study with the objective of analyzing the efficacy and safety of LASIK in managing residual ametropia in patients with KC treated with PK. Of patients with KC treated with PK between 1999 and 2011, we selected eyes treated with LASIK for correcting residual ametropia. Nineteen eyes corresponding to 14 patients fulfilled the inclusion criteria, i.e., contact lens intolerance and refractive graft stability (defined as a change under 0.50 D sphere, 1.00 D cylinder or 10° in the axis in a one-year period). The study excluded patients who exhibited PK with follow-up under one year or incomplete data when LASIK was performed. All PK and LASIK procedures were carried out by the same surgeon utilizing the same surgical technique. The PK technique was standard: trephination of the donor corneal button 0.25 mm above the

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