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Corneal morphometric predictive models from ametropia to excimer laser treatment[☆]

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ABSTRACT

Objective: To develop corneal morphometric models with refractive error in excimer laser surgery.

Method: A prospective-longitudinal study was conducted on 78 patients (151 eyes) using the LASIK surgical technique, and 56 patients (111 eyes) with myopic astigmatism using ESIRIS (Schwind-Germany) equipment with pendulous microkeratome. The results were analyzed using descriptive statistics. A NIDEK Confoscan microscope was used to obtain and study the images.

Results: After LASIK treatment 84.3% of the variations in epithelium thickness variations were due to the magnitude of refractive error and the epithelium thickness before LASIK treatment. More than two-thirds (68.8%) of the variations in keratocyte density variations in posterior flap and 48.2% of the variations in the anterior retroablation zone were due to the magnitude of the refractive error. Variations of 90% were found in the corneal thickness after LASEK, which were due to the magnitude of the refractive error before LASEK.

Conclusions: Predictive models reveal that morphometrical variations depend on the magnitude of the refractive error. These models are very important in the selection of patient for refractive surgery, and also for the specific technique to use.

Modelos predictivos de morfometría corneal a partir de la ametropía a tratar con láser excímer

R E S U M E N

Palabras clave:
Morfometría
Córnea
Excímer láser
Modelos predictivos
Cirugía refractiva

Objetivo: Desarrollar modelos predictivos de morfometría corneal en cirugía refractiva con láser excímer para la corrección de ametropías.

Método: Se realizó una investigación longitudinal y prospectiva con 78 pacientes (151 ojos) operados con LASIK y 56 pacientes (111 ojos) operados con LASEK. Se utilizó el microscopio confocal ConfoScan 4 de NIDEK. Se aplicó el ANOVA de un factor con corrección de Bonferroni, correlación de Pearson y análisis de regresión lineal múltiple con validación cruzada.

Resultados: Tras el LASIK, el 84,3% de las variaciones del grosor epitelial se deben a la magnitud de la ametropía tratada y al grosor epitelial preoperatorio. El 68,8 y el 48,2% de las variaciones de la densidad de queratocitos en el colgajo posterior y zona de retroablación anterior, respectivamente, se deben a los valores de estas variables antes de LASIK y a la magnitud de la ametropía tratada. Tras el LASEK el 90 y el 53% de las variaciones de paquimetría corneal y densidad de queratocitos al año, respectivamente, se deben al valor de esta variable en el preoperatorio y a la magnitud de la ametropía tratada.

Conclusiones: Los modelos predictivos obtenidos revelan que las variaciones de las variables morfométricas al año del tratamiento dependen en gran medida de sus valores preoperatorios y de la magnitud de la ametropía a tratar. Estos modelos constituyen herramientas a tener en cuenta como criterios de selección de pacientes candidatos a cirugía con láser excímer para tratamiento de ametropías, y para la elección óptima de la técnica quirúrgica.

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Introduction

Refraction disorders (myopia, farsightedness, astigmatism) are among the most frequent vision alterations, with prevalence rates varying with age, country, ethnic group, education level and occupation.[1] Some articles report that 30% of the population in Western countries exhibit myopia.[2] However, higher percentages are reported in Asian countries, reaching up to 50%.[3,4] In the United States, 25% of the population between 15 and 24 exhibit some refractive defect.[5,6] In Segovia, the prevalence of myopia reaches 23% and in other cities of northern Europe it rises to 40%. Several studies suggest the possibility that this defect may increase in the next few years.[7,8]

A study carried out in Cuba revealed a higher frequency of compound myopic astigmatism among ametropia.[9] In Pinar del Río, 23% of the population exhibits a refractive defect according to data obtained during *Misión Milagro*.[10]

The significant scientific and technological developments in ophthalmology, particularly in refractive surgery, and the existence of new high impact laser devices together with progress made in optic microscopes, have enabled a new dimension of morphophysiological concepts on corneal tissues facilitating the study of conditions which a few years ago were unknown.

The success of said procedures is undeniable in what concerns visual results, quick recovery and diminished possibilities of trans- and post-surgery complications. However, when the curvature of the cornea is modified, a new architecture is created which, even though it may achieve high vision standards for patients, tissue response must be taken into account as well as the morphometric modifications occurring in cornea that have received such treatment. This is of great importance as it represents a fundamental variable for evaluating the safety, effectiveness and predictability of this technology, even more so taking into account that in the development of the scientific and technological breakthroughs leading to said surgical techniques, some have been set aside due to their collateral results.

At the international level, several researchers have published the morphometric changes occurring after treatment with Excimer laser, but no predictive models of variables have been developed. These would enable ophthalmologists to determine beforehand the corneal morphometry in order to guarantee the evaluation and safety of ametropia correction with Excimer laser. The present research aims at developing predictive models of morphometric variables based on the magnitude of the ametropia to be treated.

Subjects, material and methods

An observational, descriptive, longitudinal and prospective research was carried out in the Ophthalmology Department of the Abel Santamaría Cuadrado Hospital in Pinar del Río. The study comprised patients who visited the refractive surgery practice and fulfilled the study criteria. The research comprises 2 universes:

- Universe 1: Patients intervened with the LASIK surgery technique.