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ORIGINAL ARTICLE

Analysis of seasonal changes in residual refraction 1-year after corneal laser refractive surgery: a retrospective study

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KEYWORDS
Seasonal changes;
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Abstract
Purpose: To analyze the effect of seasonal changes in residual refraction 1-year after corneal refractive surgery using the SCHWIND AMARIS laser system.
Methods: 5740 consecutive treatments have been retrospectively reviewed. For all eyes, aspheric treatments were planned with the Custom Ablation Manager software and the ablations were performed with the SCHWIND AMARIS system (SCHWIND eye-tech-solutions). Seasonal outcomes were evaluated in terms of residual refraction stratified per treatment month, as well as stratified per year season. Student's *T* test comparing stratified values with global ones was used for the statistical analysis.
Results: Treatments performed in April, June, August, September, and October showed relative undercorrections of the spherical equivalent (SE) (−0.09D), whereas treatments performed in January, February, and March showed relative overcorrections of the SE (+0.13D). Similarly, treatments performed in spring and summer showed relative undercorrections of the SE (−0.04D), whereas treatments performed in winter showed relative overcorrections of the SE (+0.10D).
Conclusions: Seasonal differences in refractive outcomes were observed among a large scale population. The effect of these environmental variables on refractive outcomes warrants further evaluation.

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PALABRAS CLAVE
Cambios estacionales;
Postoperatorio;
Resultados clínicos

Análisis de los cambios estacionales en la refracción residual un año tras cirugía refractiva de la córnea con láser: un estudio retrospectivo

Resumen
Objetivo: Analizar el efecto de los cambios estacionales en la refracción residual, transcurrido un año tras cirugía refractiva corneal empleando el sistema láser SCHWIND AMARIS.
Métodos: Se revisaron retrospectivamente 5.740 tratamientos consecutivos. En todos los casos se planificaron los tratamientos asféricos con el software Custom Ablation Manager, realizándose las ablaciones con el láser excímer SCHWIND AMARIS (SCHWIND eye-tech-solutions). Se evaluaron los resultados estacionales en términos de refracción residual, estratificada por mes de tratamiento, y por estación del año. Se utilizó la prueba de t de Student para comparar los valores estratificados con los globales en el análisis estadístico.
Resultados: Los tratamientos realizados en abril, junio, agosto, septiembre y octubre reflejaron infracorrecciones relativas del equivalente esférico (EE) (-0,09D), mientras que los tratamientos realizados en enero, febrero y marzo mostraron unas sobrecorrecciones relativas del EE (+0,13D). De igual modo, los tratamientos realizados en primavera y verano reflejaron infracorrecciones relativas del EE (-0,04D), mientras que los tratamientos realizados en invierno mostraron sobrecorrecciones relativas del EE (+0,10D).
Conclusiones: Se observaron diferencias estacionales en los resultados refractivos en una población a gran escala. El efecto de estas variables ambientales sobre los resultados refractivos justifica una evaluación adicional.

De Souza et al.[1] evaluated the influence of temperature and humidity on laser in situ keratomileusis (LASIK) outcomes and concluded that operating room environment may influence LASIK outcomes; humidity may be more significant than temperature.

Walter and Stevenson[2] determined whether environmental factors affect laser in situ keratomileusis (LASIK) enhancement rates and found out that the 2-week-preoperative mean outdoor relative humidity, procedure room relative humidity, outdoor temperature, and procedure room temperature may have to be considered during LASIK planning.

Schena et al.[3] presented and discussed a theoretical model of the water vapor absorption at 193 nm wavelength in order to quantitatively assess the influence of environmental parameters on the laser energy that actually reaches the corneal surface. Model simulations show that laser energy absorption (up to 7% of the available energy) occurs along the path of laser beam, into the existent space between the laser beam source and the patient's eye, and is caused by environmental temperature and relative humidity (35 °C and 95%, respectively). Their findings suggest that this energy loss reduces the ablation rate, producing a significant under-correction of the treated corneas.

Dantas et al.[4] evaluated excimer laser fluence after experimentally induced changes in room temperature and relative air humidity and concluded that in a setting with controlled temperature and relative air humidity, subtle changes in environmental factors do not appear to influence laser fluence and efficacy, but acknowledge that the variations seen in PMMA test ablations may not translate completely into clinical changes. Regarding tissue characteristics and specificity, stromal tissue may be more sensitive to environmental changes than PMMA because of the differences in ablation thresholds and the effects of dehydration.

Randleman et al.[5] analyzed and compared retreatment rates after wavefront-optimized photorefractive keratectomy (PRK) and LASIK and determine risk factors for retreatment and found out that the retreatment rate of 6.3% in their cohort was not influenced by age, sex, corneal characteristics, or environmental factors.

Seider et al.[6] determined whether procedure room temperature or humidity during LASIK affects the refractive outcomes in a large patient sample and concluded that neither procedure room temperature nor humidity during LASIK were found to have a clinically significant relationship with postoperative manifest refraction in their population. However, they stated that when evaluating all eyes in the population together, procedure room temperature and humidity did not show a clinically significant relationship with postoperative manifest refraction, although as expected, the relationships were statistically significant (P=.0094 for temperature and P<.0001 for humidity). Specifically, in the subgroup with a preoperative refractive error of +2.00 to +4.00D and aged 18–30 years, an increase in 1 °C during LASIK was associated with a decrease in 1-month postoperative refractive error (more correction) of 0.048D.

We explore another approach to study the effect of temperature and humidity on refractive surgery outcomes. Studying the effects of variations in temperature and humidity during different seasons of a year, can shine more light on the statistical significance of the effect of these parameters on refractive surgery outcomes.

This retrospective chart review attempts to compare the postoperative refractive outcomes among a large population of patients that have undergone refractive surgery treatments using the SCHWIND AMARIS laser system performed