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ORIGINAL ARTICLE

Corneal-Wavefront guided transepithelial photorefractive keratectomy after corneal collagen cross linking in keratoconus

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KEYWORDS

Transepithelial photorefractive keratectomy;
Corneal-Wavefront guided;
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Keratoconus;
Refracto-therapeutic

Abstract

Purpose: To evaluate the efficacy and safety of Corneal-Wavefront guided transepithelial photorefractive keratectomy (TransPRK) after corneal collagen cross linking (CXL) in keratoconic patients.

Methods: In this retrospective, non-comparative, consecutive case series, 39 keratoconic eyes underwent Corneal-Wavefront guided TransPRK for the correction of aberrations at least 4 months after conventional CXL at SEKAL Rovigo Microsurgery Centre, Rovigo, Italy. Two eyes (5%) underwent a secondary laser retreatment for the improvement of post-operative visual acuity and were not included in this retrospective analysis. The mean age of the patients was 35 ± 12 years (19–64 years) at the time of the surgery. Keratron-Scout (Optikon) topographer was used for diagnostic tests and a flying-spot laser (AMARIS; SCHWIND eye-tech-solutions) was used for the refractive surgery. Complete ophthalmic examinations were performed before and after the surgery (4–36 months postoperatively with a mean follow up time of 10 ± 8 months). **Results:** Preoperatively, eyes showed irregular astigmatism up to 8D. At last postoperative follow-up, 21 eyes (57%) had UDVA better than 20/40, and six eyes (16%) had UDVA of 20/20. Twenty-three eyes (62%) were within 1.50D of attempted correction in spherical equivalent (mean deviation from target was $+1.09 \pm 2.36D$, range -2.50 to $+7.38D$). No eye lost 2 Snellen lines of CDVA, and 15 eyes (41%) had an increase of more than 2 lines.

Conclusions: Corneal-Wavefront guided transepithelial PRK ablation profiles after conventional CXL yields to good visual, optical, and refractive results. These treatments are safe and efficacious for the correction of refracto-therapeutic problems in keratoconic patients.

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PALABRAS CLAVE

Queratectomía fotorrefractiva transepitelial; frente de onda corneal; Entrecruzamiento del colágeno corneal; Queratocono; Problemas refracto-terapéuticos

Queratectomía fotorrefractiva transepitelial guiada por frente de onda corneal tras entrecruzamiento del colágeno corneal en pacientes con queratocono

Resumen

Objetivo: Evaluar la eficacia y seguridad de la queratectomía fotorrefractiva transepitelial (TransPRK) guiada por frente de onda corneal tras entrecruzamiento del colágeno corneal (CXL) en pacientes con queratocono.

Métodos: En esta serie de casos consecutiva, retrospectiva y no comparativa, se realizó queratectomía fotorrefractiva transepitelial (TransPRK) guiada por frente de onda corneal a 39 ojos con queratocono para la corrección de aberraciones transcurridos al menos 4 meses desde la realización de un CXL convencional en el SEKAL Rovigo Microsurgery Centre, de Rovigo, Italia. Dos ojos (5%) fueron sometidos a un re-tratamiento secundario de láser para mejorar la agudeza visual postoperatoria, y no fueron incluidos en este análisis retrospectivo. La edad media de los pacientes fue de 35 ± 12 años (de 19 a 64 años) en el momento de la intervención. Se utilizó el topógrafo Keratron-Scout (Optikon) en las pruebas diagnósticas, y un láser de punto flotante (AMARIS; SCHWIND eye-tech-solutions) para la cirugía refractiva. Se realizaron exámenes oftálmicos completos con anterioridad y posterioridad a la intervención (de 4 a 36 meses postoperatorios, con un tiempo de seguimiento medio de 10 ± 8 meses).

Resultados: Preoperatoriamente, los ojos presentaban un astigmatismo irregular de hasta 8 D. Durante el último seguimiento postoperatorio, 21 ojos (57%) alcanzaron una agudeza visual de lejos sin corrección (UDVA) superior a 20/40, y seis ojos (16%) una UDVA de 20/20. Veintitrés ojos (62%) se mantuvieron en el rango de 1,50 D con respecto al equivalente esférico planeada (la desviación media fue de $+1,09 \pm 2,36$ D, rango de $-2,50$ a $+7,38$ D). Ninguno de los ojos perdió dos líneas de Snellen de agudeza visual a distancia corregida (CDVA), y 15 ojos (41%) reflejaron un incremento de más de dos líneas.

Conclusiones: Los perfiles de la ablación PRK transepitelial guiados por frente de onda corneal tras un CXL convencional proporcionan unos buenos resultados a nivel visual, óptico, y refractivo. Estos tratamientos son seguros y eficaces en la corrección de los problemas refracto-terapéuticos en pacientes con queratocono.

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Introduction

Refracto-therapeutic surgery with excimer laser has evolved rapidly in the last decade¹ to correct severe, disabling irregular astigmatism in corneal pathologies. In one of the earliest attempts to treat irregular cornea using a custom excimer laser ablations, visual symptoms were reported to resolve or decrease with both manual adjustment of laser beam placement and contoured ablation patterns.² The initial procedures were based on Photo refractive keratectomy (PRK) and reported limited effectiveness.³ In more recent reports, Alpíns and Stamatelatos⁴ reported that the incorporation of the corneal astigmatism data into the applied treatment parameters may improve visual and total astigmatism results in eyes with forme fruste and mild keratoconus. The correction of classical ametropias (myopia and astigmatism) in keratoconus using transepithelial PRK has been reported as less effective and less predictable than conventional PRK for naturally occurring myopia and astigmatism.³ Refracto-therapeutic ablations have evolved to the more sophisticated topography-guided⁵ and corneal wavefront-guided⁶ customized corneal ablations for irregular corneal astigmatism in keratoconus. In a latest pilot study, Shaheen et al.⁷ evaluated the visual,

refractive, corneal topographic, and aberrometric changes after wavefront-guided Laser-in situ-keratomileusis (LASIK) or PRK using a high-resolution aberrometer to calculate the treatment for aberrated eyes. They differentiated the patients in three groups: keratoconus post-CXL group including 11 keratoconic eyes (10 patients), post-LASIK group including 5 eyes (5 patients) with previous decentered LASIK treatments, and post-RK group including 4 eyes (3 patients) with previous radial keratotomy. They reported an improvement in uncorrected and corrected distance visual acuity (UDVA and CDVA respectively) associated with a reduction in the spherical equivalent in all three groups, but was only statistically significant in the keratoconus post-CXL and post-LASIK groups ($P \leq .04$). Similarly improvements in contrast sensitivity were observed in all three groups, but they were only statistically significant in the keratoconus post-CXL and post-LASIK groups ($P \leq .04$).

Several combinations of therapeutic and refractive surgery approaches have been advocated. A 2-step sequential approach was proposed in the form of CXL + customized PRK. This is in comparison to the simultaneous procedures done in the form of same day phototherapeutic keratectomy (PTK) + customized PRK followed by a CXL procedure to control the progression of keratoconus.⁸ Another

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