Post-LASIK ectasia: PRK following previous stabilization and effective management with Riboflavin / ultraviolet A-induced collagen cross-linking

Jeffrey Wong MD, A.D. Papakostas, Laurence T. Sperber, A. John Kanellopoulos

Department of Ophthalmology, New York University & Manhattan Eye, Ear, and Throat Hospital, New York, NY

Program#: 557

PURPOSE
To evaluate the clinical safety and efficacy of PRK in the visual rehabilitation of eyes previously treated with riboflavin/UVA induced collagen crosslinking for the stabilization of the progression of post-LASIK ectasia and keratoconus.

BACKGROUND
• A new technique of collagen crosslinking by the photosensitizer, similar to photopolymerization in polymers, has been described.
• Experimental studies in rabbit and porcine eyes showed a significant increase in corneal rigidity by approximately 70% after collagen cross-linking by the combined riboflavin/UVA treatment, as well as the cytoprotective and apoptotic effect on the keratocyte and corneal endothelium.
• An in-vitro study showed that after four years the progression of keratoconus was stopped in all 22 patients, while in 70% of cases, regression of D of UVA during the cone plane and 1.14 D of the refractive error was described. Corneal and lens transparency, as well as endothelial cell density and intraocular pressure remained unchanged, while visual acuity improved slightly in 65% of the eyes.

METHODS
This was a prospective, non-randomized clinical pilot study. Seven eyes of 5 patients with moderate to advanced ectasia following LASIK were included. After pre-treatment with UVA collagen cross-linking, and at the 3 month interval 6 eyes were further treated with topography-guided PRK, utilizing the WaveLight, Allegretto TCAT platform in order to facilitate visual rehabilitation.

SURGICAL TECHNIQUE
UVA CCL
• Corneal epithelium removed with 20% ETCH solution placed for 20 minutes
• Single treatment of UVA of 370 nm wavelength and 3mW/cm2 radiation with the Keracure device (Prisavas, CA, USA) for 30 minutes
• 5% riboflavin ophthalmic solution (Prisavas, CA, USA) one drop every two minutes to protect the Iris, crystalline lens and retina
• Bandage contact lens, 0.1% agrin & prednisolone acetate 1% QID for 10 days. The contact lens was removed at day 4 following complete re-epithelization

TOPO-GUIDED PRK
• Treatment was limited in regard to total cornea stroma removed by decreasing the effective optical zone and by treating only partially the sphere in order not to exceed 50 microns in projected stromal tissue removal
• Adjusted nomogram of 80% of sphere and cylinder used to avoid overcorrection
• The cornea thickness enabled us to treat the full correction based on 5.5mm optical zone
• This treatment was performed with the Allegretto-WaveEye topography-guided customized program

RESULTS
In all treated eyes, the progression of keratoconus appeared to stabilize. In 5 eyes regression was evident of 3.01 D of the refractive error by 2.34 D was found. Corneal and lens transparency, EOC and IOP were unchanged. Cornea elasticity measurements changed from an average 15.75 m/sec pre-op to 32.25 post-op. Visual acuity, both UCVA (20/100 to 20/40) and BSCVA (20/90 to 20/23) improved drastically in all 6 eyes treated further with PRK.

CONCLUSION
Collagen crosslinking may offer promise in the stabilization of progression of keratoconus following LASIK by increasing corneal rigidity. This strategy may enable excimer refractive surgery correction, which has been traditionally contra-indicated. Long term results are necessary to evaluate the duration of the stiffening effect and exclude long term side effects.