

# Customized Pattern Myopic, Astigmatic, and Hyperopic Refractive Correction with Transepithelial, Very High-fluence Collagen Crosslinking: Early Clinical Results of a Novel Application



A. V. Moustou, OD<sup>1</sup>  
John Kanellopoulos, MD<sup>1,2</sup>  
G. Asimellis, PhD<sup>1</sup>  
C. Karabatsas, MD<sup>1</sup>

Laservision.gr Institute, Athens, Greece<sup>1</sup>

Clinical Professor, NYU Langone Medical School, New York, NY<sup>2</sup>

Financial Disclosure

Moustou, Asimellis: none, Karabatsas: Allergan,

Kanellopoulos: Consultant for Alcon, Avedro, Allergan, i-Optics, Optovue



# Purpose

To report safety and efficacy of a customizable application of high-fluence collagen crosslinking (CXL) through the intact epithelium (transepithelial) with a novel device, aiming in refractive myopic, astigmatic, and hyperopic changes in virgin corneas.



# Methods

20 cases were treated with a novel device employing very high-fluence CXL, applied in a customized pattern aiming to achieve myopic (10 cases), hyperopic (5 cases), and astigmatic (5 cases) predictable refractive changes. Riboflavin penetration through the intact epithelium was applied with specially formulated solutions in a two-step process. The CXL device (KXL II, Avedro, Waltham MA) was employed to deliver a total of 12 joules/cm<sup>2</sup>, in pre-determined pattern. One year postoperatively we evaluated cornea clarity, cornea keratometry, cornea topography, both with Placido disc and Scheimpflug imaging, as well as cornea anterior segment Optical Coherence Tomography (OCT) and endothelial cell counts (ECC).



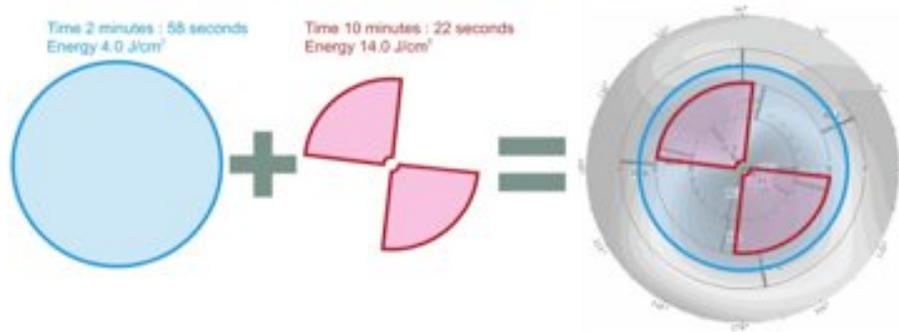
# Results

Of the 10 myopic cases an average of 2.3 D (diopters) was achieved at the first week. There was a slight regression to 1.44 D at one month, which stayed stable up until the sixth month follow-up interval. The mean keratometry change was from the mean 44.90 D to 43.46 D. There was no significant change in endothelial cell counts, nor was any change in the cornea clarity. There was some mild change in the epithelial thickness distribution, with the treated area having a slight reduction in average epithelial thickness, a very homogeneous reduction from the average of 52  $\mu\text{m}$  to 44  $\mu\text{m}$ .

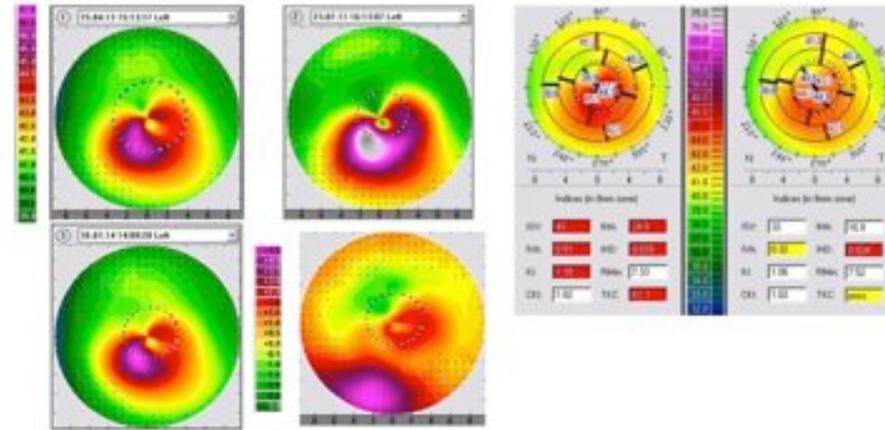
Of the 5 astigmatic cases treated, a mean astigmatic reduction of 1.8 D, and significant cornea surface normalization was achieved, along with modest normalization in epithelial thickness distribution. Of the 5 hyperopic cases treated, a mean hyperopic refractive increase of +1.2 D was achieved one year postoperatively.



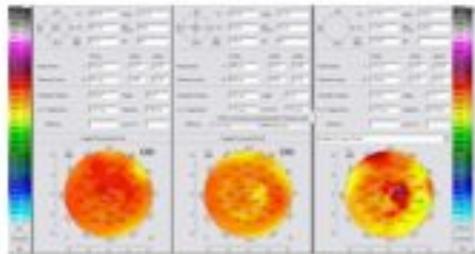
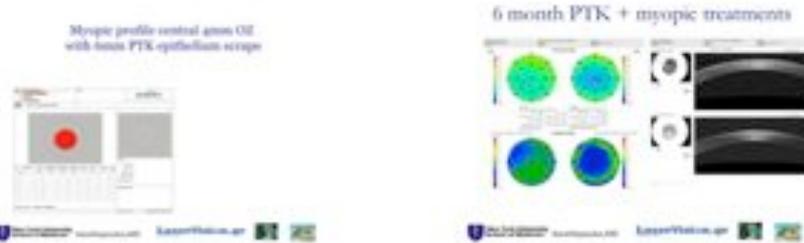
# 8 month topography-customised tran-epithelial CXL treatment



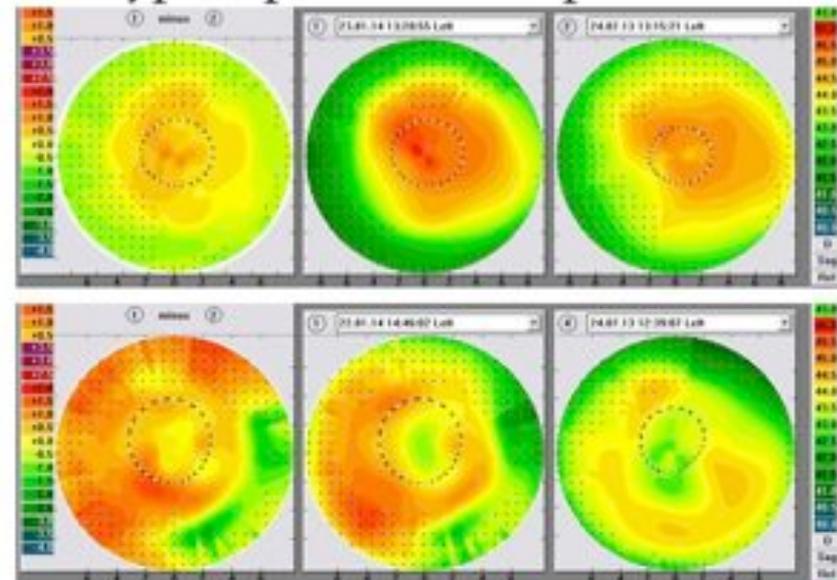
# Customized astigmatism correction



# Myopic PiXL treatment



# Hyperopic PiXL: topo data



# Conclusions

We introduce herein the novel application of very high-fluence CXL with a predictable well-defined myopic refractive (flattening), astigmatic, and hyperopic (steepening) corneal effect. This novel technique carries the advantage of essentially no post-operative morbidity, immediate visual rehabilitation and a potential for it to be tapered until the desired result is reached.

