

Stromal Scarring and Visual Acuity Loss After Combined PRK and CXL for Keratoconus

We read with great interest the article by Moraes et al. in the February issue regarding significant corneal stromal haze and subsequent loss of corrected distance visual acuity (CDVA) after sequential photorefractive keratectomy (PRK) and corneal cross-linking (CXL) for keratoconus.¹ The authors concluded that combined PRK-CXL may not be as safe as initially thought, even though several other studies have already shown the safety of this combined procedure.¹⁻³

In their case series of 26 eyes, the authors performed considerable variations of the current published PRK-CXL treatment protocols for several subsets of eyes without clarifying the number of them subjected to each modified technique.¹ PRK was performed with either topography-guided or aspheric ablation, whereas epithelium was removed either mechanically or using the excimer laser.¹ The stromal ablation depth was determined based on targeting emmetropia, but the authors did not recommend a maximum value.¹ Although there is some diversity for the PRK-CXL technique in the literature, including epithelial removal and maximum stromal ablation depth with or without mitomycin C (MMC), each of the treatment protocols should follow some specific guidelines. In particular, both Kymionis et al.² and Kanellopoulos,³ who were the first to describe this combined procedure, proposed a maximum stromal ablation depth of 50 μm . In the case series of Moraes et al.,¹ there was a wide range and high values of the ablation depth (7.8 to 96.2 μm), almost double the proposed limit. The development and duration of corneal haze increase proportionally with increasing stromal ablation depth, whereas the authors did not report any subset analysis to correlate the haze formation with any of the variables used.^{1,4}

In addition, there was loss of CDVA in 50% of the eyes included in this case series due to the postoperative significant corneal stromal scarring.¹ Although the stromal scarring described by the authors seems to be a more significant type of the posterior stromal haze typically seen after CXL and different from the stromal haze observed after PRK, all of the variations of the treatment plan that the authors reported (mainly

the increased stromal ablation depth) could induce respectively different effects on corneal pathophysiology and therefore on scar formation. Furthermore, the authors did not clarify whether CDVA was assessed using a rigid contact lens or glasses to exclude the possibility of better CDVA. They did not prescribe steroids for longer than 1 postoperative month or assess their efficacy on the corneal stromal haze at the third postoperative month, although Güell et al. described improvement of stromal scarring after PRK-CXL in a similar case.⁵

The authors did not follow the guidelines of the current established PRK-CXL protocols (especially the limit of the stromal ablation depth) in their series of patients and came to conclusions and arbitrary claims for an already well-established procedure.

George D. Kymionis, MD, PhD
Michael A. Grentzelos, MD, PhD
Nafsika Voulgari, MD
 Lausanne, Switzerland

REFERENCES

1. Moraes RLB, Ghanem RC, Ghanem VC, Santhiago MR. Haze and visual acuity loss after sequential photorefractive keratectomy and corneal cross-linking for keratoconus. *J Refract Surg.* 2019;35(2):109-114. doi:10.3928/1081597X-20190114-01
2. Kymionis GD, Kontadakis GA, Kounis GA, et al. Simultaneous topography-guided PRK followed by corneal collagen cross-linking for keratoconus. *J Refract Surg.* 2009;25:S807-S811.
3. Kanellopoulos AJ. Comparison of sequential vs same-day simultaneous collagen cross-linking and topography-guided PRK for treatment of keratoconus. *J Refract Surg.* 2009;25:S812-S818.
4. Moller-Pedersen T, Cavanagh HD, Petroll WM, Jester JV. Corneal haze development after PRK is regulated by volume of stromal tissue removal. *Cornea.* 1998;17:627-639.
5. Güell JL, Verdaguer P, Elies D, Gris O, Manero F. Late onset of a persistent, deep stromal scarring after PRK and corneal cross-linking in a patient with forme fruste keratoconus. *J Refract Surg.* 2014;30:286-288.

Editor's Note: At the time of publication, the authors could not be reached for a response.

The authors have no financial or proprietary interest in the materials presented herein.

doi:10.3928/1081597X-20190520-02