

# NEW FRONTIERS IN CXL



Research points to ways to broaden the pool of candidates.

BY JILLIAN K. CHONG, MD, AND A. JAMES KHODABAKSH, MD

## INDIVIDUALIZED CORNEAL CROSS-LINKING WITH RIBOFLAVIN AND UV-A IN ULTRATHIN CORNEAS: THE SUB400 PROTOCOL

Hafezi F, Kling S, Gilardoni F, et al<sup>1</sup>

Industry support: None

### ABSTRACT SUMMARY

Hafezi et al developed a novel, customizable CXL protocol for patients with corneas too thin to receive treatment with the standard Dresden protocol. The sub400 protocol uses the classic 3 mW/cm<sup>2</sup> UV-A irradiance, but fluence is reduced by decreasing the duration of exposure based on corneal pachymetry after hypotonic (0.1%) riboflavin treatment.

Investigators performed CXL using the sub400 protocol on 39 eyes with progressive keratoconus and corneas that were 214 to 398 µm thick. One year after treatment, tomography was stable in 90% of the eyes, and no eye had experienced endothelial decompensation.

### DISCUSSION

CXL remains the only form of treatment proven to halt keratoconus progression.<sup>2,3</sup> The Dresden protocol

## STUDY IN BRIEF

- The sub400 protocol is a novel approach to CXL that maintains a fixed riboflavin dose and irradiance but customizes the duration of UV-A treatment based on corneal thickness. CXL using this protocol was effective for corneas as thin as 214 µm.

### WHY IT MATTERS

Various methods have been proposed for CXL on thin corneas, but the sub400 protocol is the first to apply a verified algorithm for the rate of CXL, allowing a standardized approach to the treatment of thin corneas and expanding the pool of candidates eligible for this procedure.

defines the lower limit of safety as a corneal thickness of 400 µm after epithelial debridement. Many people with advanced keratoconus are therefore beyond the reach of preventive care.<sup>2</sup> Several mechanisms for expanding the range of conventional treatment have been proposed in the literature, but each has been associated with an unacceptable degree of unpredictability, a reduction in efficacy, or both.<sup>4-6</sup>

Hafezi et al proposed a mechanism based on a rigorously tested and verified algorithm to determine the availability of riboflavin, oxygen, and UV-A radiation in corneal tissue.<sup>1</sup> By modifying fluence by

the duration of UV-A exposure only, the sub400 protocol remains simple without appearing to sacrifice efficacy. An efficacy rate of 90% in 39 eyes of 32 patients may not seem to merit a change in practice patterns, but it is worth noting that, in this population of patients with extremely thin corneas experiencing active progression, disease severity would have been expected to worsen in 100% of untreated eyes.

Advantages of the sub400 protocol included a broader range of candidates for treatment than with the Dresden protocol and greater personalization for improved safety and efficacy for each of the corneas treated.

## LONG-TERM FOLLOW-UP OF COMBINED PHOTOREFRACTIVE KERATECTOMY AND CORNEAL CROSSLINKING IN KERATOCONUS SUSPECTS

Kymionis G, Kontadakis G, Grentzelos M, Petrelli M<sup>7</sup>

Industry support: None

### ABSTRACT SUMMARY

In this case series, 10 eyes of five individuals with suspected keratoconus underwent conventional PRK followed by CXL with an accelerated protocol. Preoperatively, each patient had low to moderate myopia and exhibited suspicious findings on tomography, all of them at a risk score of 3 using the

Ectasia Risk Score System. The choice to combine PRK with accelerated CXL was based on evidence of a reduced flattening effect with this protocol compared to with the traditional Dresden protocol.<sup>8</sup>

Patients' spherical equivalent, uncorrected distance visual acuity (UDVA), and corrected distance

## STUDY IN BRIEF

- Five-year data from a small case series indicated that combining PRK and prophylactic CXL is safe in individuals with findings suspicious for keratoconus.

### WHY IT MATTERS

This study presents the longest-term data supporting the safety of simultaneous PRK and CXL for the treatment of myopia in patients with suspected keratoconus.

visual acuity were monitored for 5 years. Excellent visual outcomes and refractive stability were demonstrated throughout the follow-up. Corrected distance visual acuity was stable or improved in all eyes. UDVA was 20/20 in all but one eye, which achieved and maintained 20/25 UDVA.

### DISCUSSION

In terms of corneal biomechanics, PRK is a relatively benign refractive procedure, but it carries a risk of ectasia for patients in whom keratoconus is suspected.<sup>9,10</sup> It has been suggested that performing a limited PRK procedure and CXL simultaneously or sequentially is safe and effective in patients with early keratoconus, but the published literature on the full myopic treatment of individuals with suspected keratoconus is limited.<sup>11-15</sup>

The case series by Kymionis et al suggests that combining PRK and CXL can safely and effectively be used to treat patients with borderline findings of keratoconus.<sup>7</sup> More robust evidence is required before practice patterns change. ■

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