Comparative Efficacy and Safety of Standard Versus Accelerated Corneal Crosslinking for Keratoconus: 1-Year Outcomes From the Save Sight Keratoconus Registry Study

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Purpose: The aim of this study was to compare the efficacy and safety of standard [Ultraviolet (UV) light power: 3 mW/cm^2, duration: 30 minutes] versus accelerated (UV power: 9 mW/cm^2, duration: 10 minutes) corneal crosslinking (CXL) for stabilizing keratoconus.

Methods: A total of 684 eyes (555 patients; mean age ± SD, 25.0 ± 7.9 years; women, 30.6%) from 24 international sites with epithelium-off CXL for keratoconus had follow-up data at 1-year and met the inclusion criteria. Two hundred sixty-six eyes (228 patients) had undergone standard CXL, and 418 eyes (327 patients) had undergone accelerated CXL. The outcome measures included changes in visual acuity, keratometry, minimum corneal thickness, and frequency of adverse events. The outcomes were compared using mixed-effects regression models adjusted for age, sex, visual acuity, keratometry, pachymetry, doctor, practice, and eye laterality.

Results: The adjusted mean changes (95% confidence interval) in outcomes were similar in standard and accelerated CXL in visual acuity [6.5 (2.0, 11.1) versus 5.5 (0.4, 10.6) logMAR letters, respectively], Kmax [−0.9 (−1.4, −0.3) D versus −1.2 (−1.9, −0.4) D, respectively], K2 [−0.4 (−0.9, 0.2) D versus −0.4 (−1.1, 0.3), D respectively], or minimum corneal thickness [−13.3 (−20.3, −6.3) μm versus −16.6 (−24.5, −8.6) μm, respectively] (all $P > 0.05$). The frequency of adverse events at the 12-month visit was also similar between the CXL groups (standard, 8.3% vs. accelerated, 5.5%; $P = 0.21$).

Conclusions: This real-world observational study found that both standard and accelerated CXL were similarly safe and effective in stabilizing keratoconus at 1-year postsurgery in the real-world setting. The findings support the adoption of accelerated CXL for time and convenience.

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Keratoconus is a chronic, progressive corneal disorder usually diagnosed in young adults, which leads to poor quality vision and reduction in quality of life.[1,2] Corneal crosslinking (CXL), the only treatment to slow or halt keratoconus progression, has transformed the management of keratoconus. CXL is a minimally invasive procedure for stabilizing progressive keratoconus.[3] It is a photochemical process, in which ultraviolet A (UVA) and riboflavin induce bonds in the corneal stroma to increase biomechanical strength and stability.[4,5]

The standard (Dresden or conventional) protocol for CXL consists of irradiance of the corneal stroma with a cumulative energy dose of 5.4 J/cm^2 with 370 nm UVA wavelength at 3 mW/cm^2 intensity for 30 minutes.[4,6] Recently, accelerated methods are in practice based on the Bunsen–Roscoe rule of reciprocity, which states that regardless of the time at which the energy dose is administered, a photochemical reaction is directly proportional to the total energy dose.[4,6] However, biochemical change may not be the same as photochemical change.[6]

Accelerated CXL may improve patient comfort and reduce the rate of complications.[4,7] However, the literature on its comparative effectiveness is somewhat divided. In a recent metanalysis, Wen et al[4] reported standard crosslinking to be more effective in flattening Kmax but with a greater reduction in endothelial cell density and central corneal thickness than the accelerated protocol. However, in another review, Konstantopoulos and Mehta[8] suggested similar efficacy of standard and accelerated protocols. There are only a few clinical trials that have compared the effectiveness of different protocols, and those studies are limited in sample size and follow-up duration.[4,6,8] Besides, the clinical trials may not reflect the real-world situations; therefore, the results may not be directly applicable to routine clinical practice.[9] The aim of this study was to compare the efficacy and safety of standard versus accelerated corneal CXL procedures for the treatment

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further research is required to compare the long-term efficacy and safety of the 2 procedures.

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