Corneal Collagen Cross-linking Outcomes in Pediatric Keratoconus Patients in the United States

Julia Yu, BS
Beeran B. Meghpara, MD
Zeba A. Syed, MD
Christopher J. Rapuano, MD

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Disclosures

Dr. Beeran Meghpara is a consultant for Glaukos and Oculus.

Dr. Christopher Rapuano is a consultant for Glaukos.

Background

Corneal collagen crosslinking (CXL) is a minimally invasive treatment that has become the standard of care in patients with progressive keratoconus (KCN).

However, KCN patients younger than 14 years old were not included in the multicenter phase III study that led to FDA approval for epithelium-off CXL in 2016.

Thus, there is limited available data on the safety and efficacy of CXL for pediatric KCN, which is more aggressive and faster progressing, to date in the United States.

Purpose

This study seeks to investigate the effects of FDA-approved epithelium-off (epi-off) CXL in pediatric KCN patients (≤ 17 years old) on a variety of outcome factors such as keratometry readings, corneal thickness, and higher-order aberrations.

Methods

01

Patient Selection

- Pediatric patients (≤ 17 years old)
- Received epi-off CXL treatments (KXL, Glaukos, Burlington, MA) for progressive KCN
- From 04/2016 to 03/2021

02

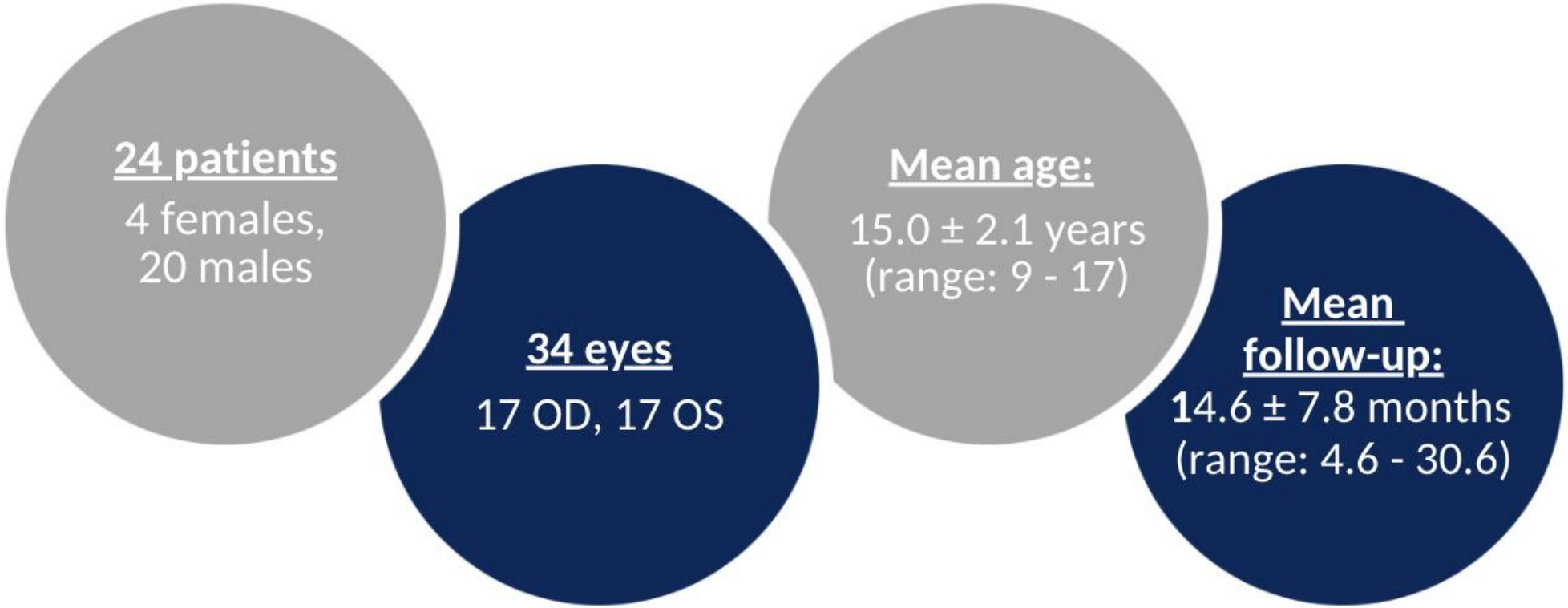
Data Extraction (pre-CXL, 6-month, and 1-year follow-up)

- Demographic data
- Pentacam keratometry data
- Pentacam Belin ABCD keratoconus staging data
- Pentacam Zernike coefficients for higher-order aberrations

03

Statistical Analysis

Demographics



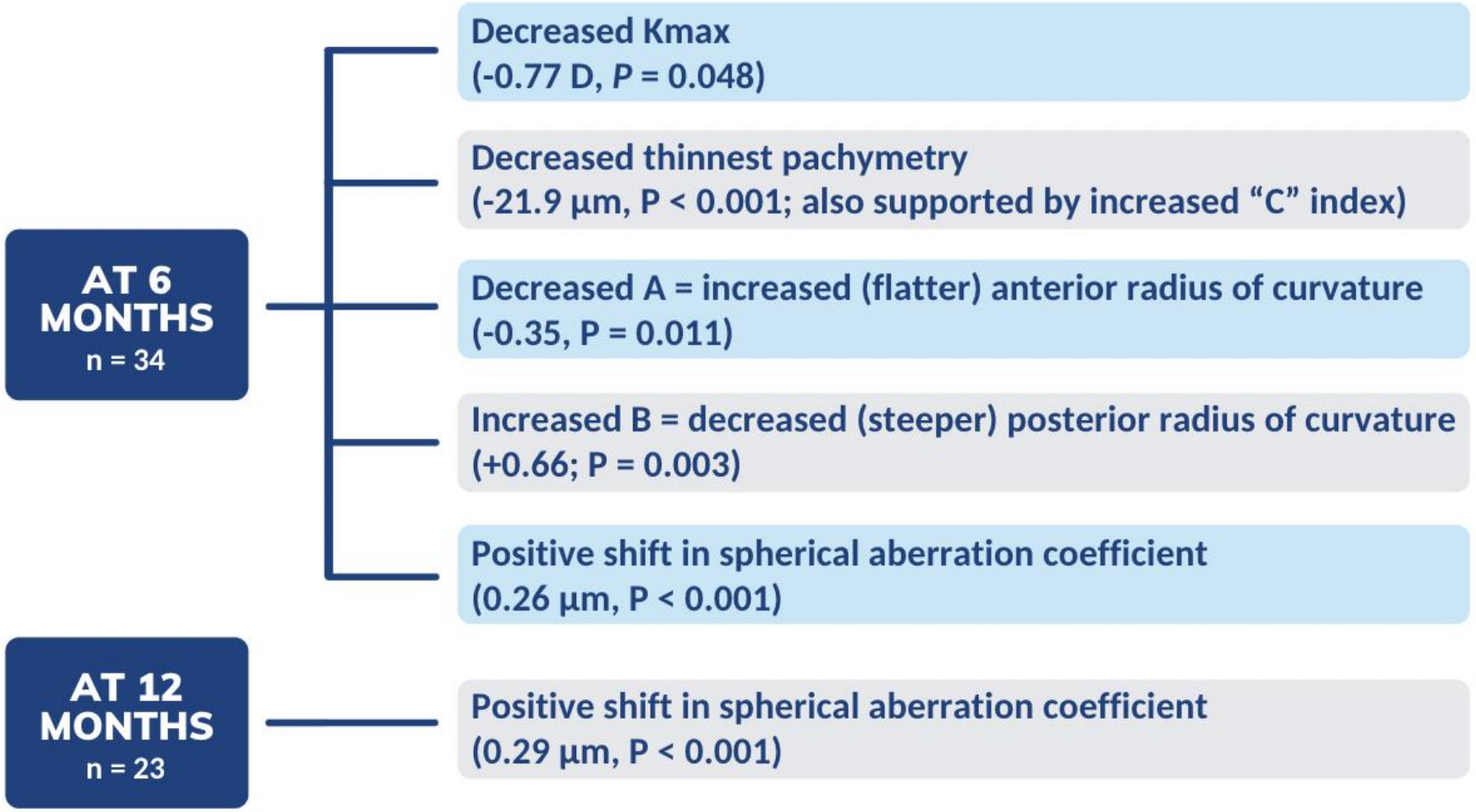
Summary Data

Baseline Characteristics	mean ± SD
Pentacam K_{max} (D)	59.7 ± 11.5
Pentacam cylinder (D)	4.46 ± 2.86
Pentacam Belin Staging System	
A	3.61 ± 3.25
B	4.75 ± 3.33
C	1.94 ± 0.73
Pentacam thinnest pachymetry (µm)	449.8 ± 37.6
Pentacam Zernike coefficients (µm)	
Horizontal Coma (Z_3^1)	0.0019
Vertical Coma (Z_3^{-1})	-2.3820
Spherical Aberrations (Z_4^0)	-1.0099
Total RMS HOA†	3.2215

- **A**: anterior radius of curvature in the 3.0 mm zone centered on the thinnest location of the cornea
- **B**: posterior radius of curvature in the 3.0 mm zone centered on the thinnest location of the cornea
- **C**: normalized thinnest pachymetry

† Root mean square higher order aberration

Outcomes


AT 6 MONTHS
n = 34
Decreased Kmax
(-0.77 D, P = 0.048)
Decreased thinnest pachymetry
(-21.9 µm, P < 0.001; also supported by increased "C" index)
Decreased A = increased (flatter) anterior radius of curvature
(-0.35, P = 0.011)
Increased B = decreased (steeper) posterior radius of curvature
(+0.66; P = 0.003)
Positive shift in spherical aberration coefficient
(0.26 µm, P < 0.001)
AT 12 MONTHS
n = 23
Positive shift in spherical aberration coefficient
(0.29 µm, P < 0.001)

Results

Figure 1.

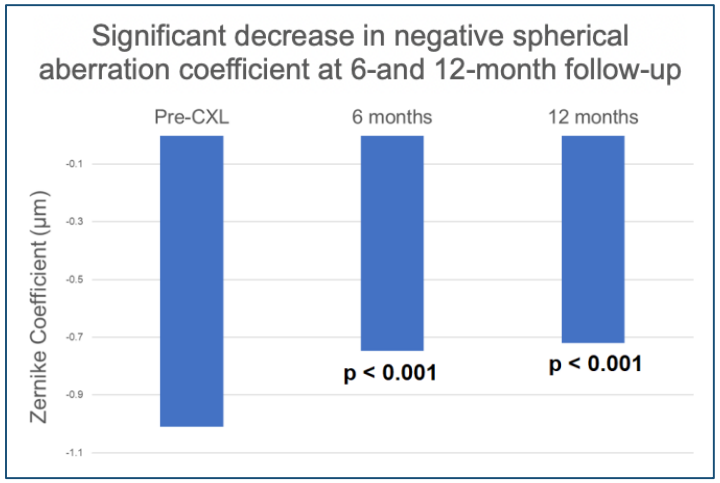


Figure 2.

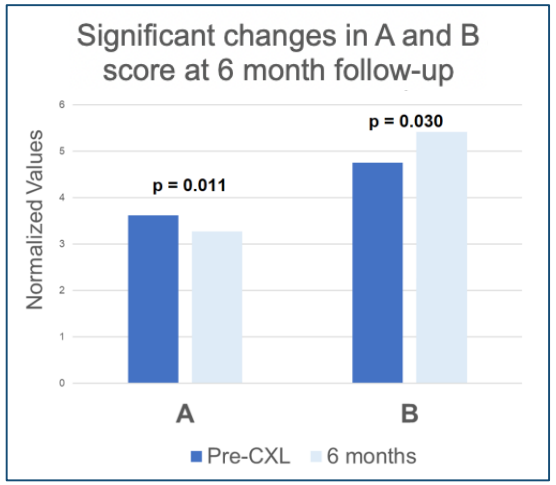
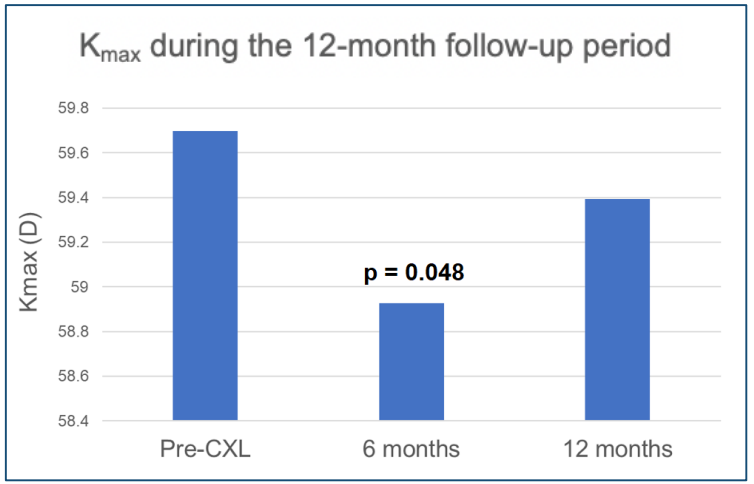


Figure 3.



Summary and Conclusions

- ✓ This study tracked the efficacy and safety results of FDA-approved epi-off CXL in pediatric patients (≤ 17 years) at 6 and 12 months.
- ✓ Epi-off CXL is well-tolerated in pediatric patients without the use of general anesthesia as there were no adverse events observed at 6 or 12 months in our study.
- ✓ FDA-approved epi-off CXL can effectively stabilize pediatric KCN patients, but a longer follow-up will be needed to assess long-term outcomes of pediatric patients in the US.
- ✓ This study also demonstrated the clinical utilization of the Belin ABCD staging software as a new clinical monitoring tool in KCN patients after undergoing CXL.
  - Of interest, the mean B value was shown to be increased but without evidence of progression from conventional metrics such as K_{max}.

Thank You!

Sources

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