

Femtosecond-assisted Myopic LASIK: Long-term Comparison of LASIK Combined with Prophylactic Cross-Linking (CXL) to Stand-alone.



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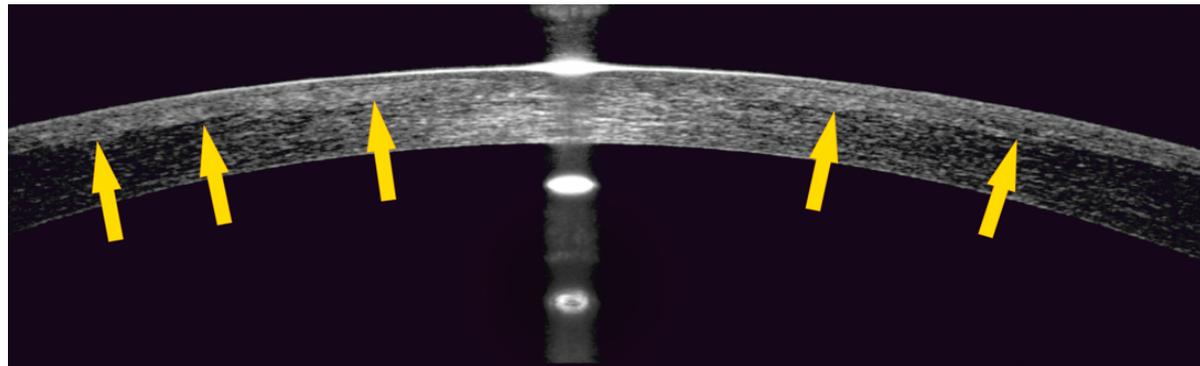
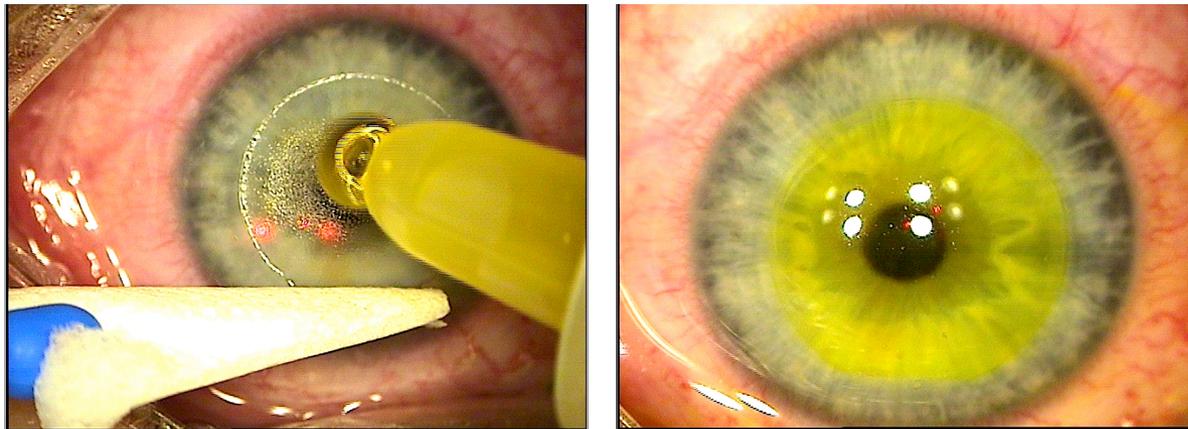
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Financial disclosure:

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



To evaluate safety, efficacy, and refractive, keratometric and epithelial stability of myopic femtosecond-LASIK with concurrent prophylactic CXL in comparison to standard femtosecond LASIK.

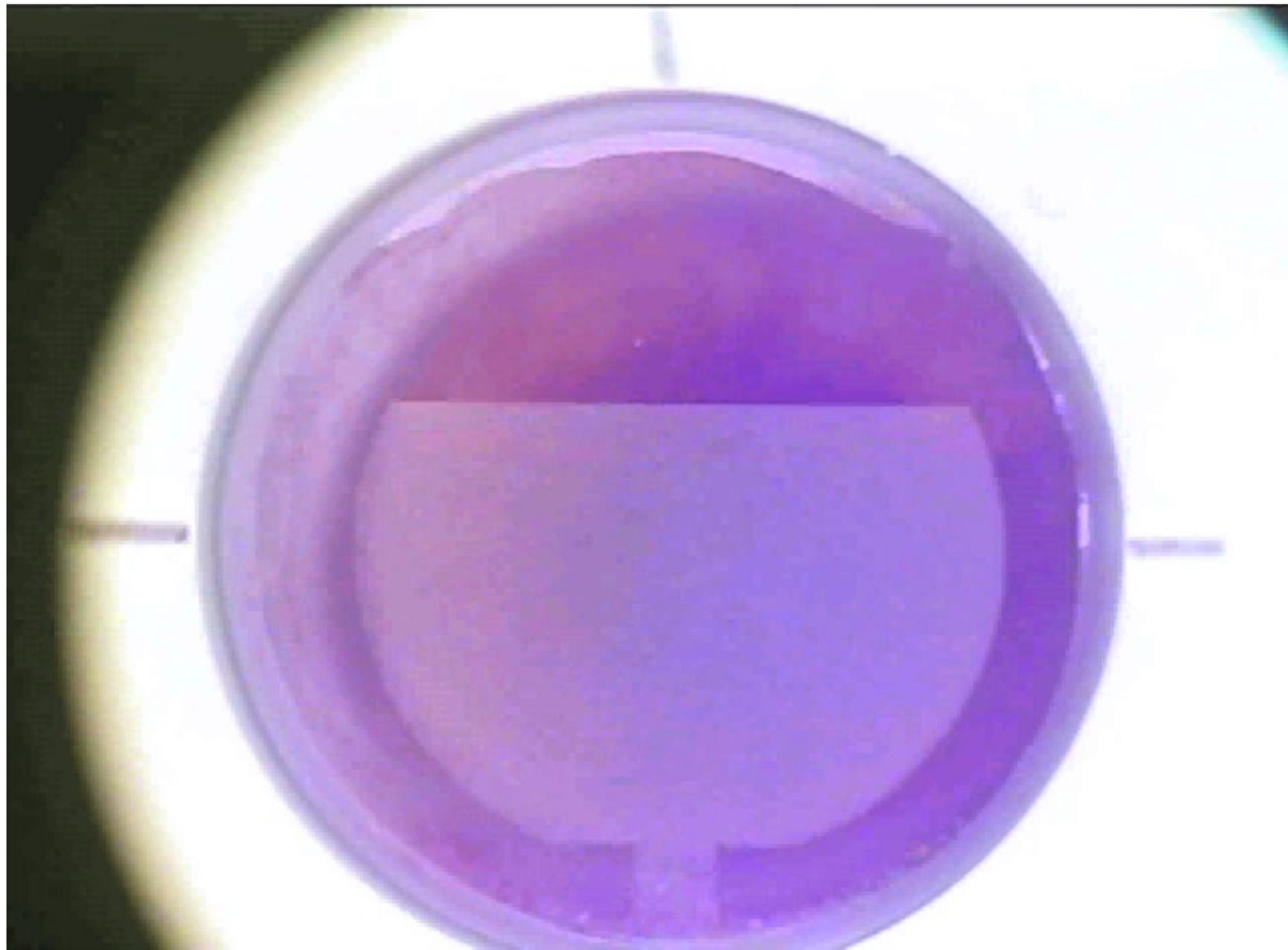


Methods

140 eyes of consecutive patients with myopic LASIK were recruited. Group-A represents 65 eyes treated additionally with concurrent prophylactic high fluence CXL (LASIK-CXL); group-B represents 75 eyes subjected to stand-alone procedure.

The following parameters were evaluated pre-operatively and one-year post-operatively: **manifest refractive spherical error (MRSE), refractive astigmatism, spectacle-corrected distance visual acuity (CDVA), uncorrected distance visual acuity (UDVA), corneal keratometry via Scheimpflug imaging, autorefraction keratometry and epithelial mapping with anterior segment OCT.**





Results

Group-A (LASIK+CXL) post refraction average -0.25 D at 12-months, compared to -6.75 ± 1.75 D preoperatively. SteepK was 38.37 D at 12-months, compared to 45.15 D preoperatively. Predictability had a correlation coefficient of 0.975 . The mid-peripheral epithelial thickness increase was $+3.79\mu\text{m}$ and $+3.95\mu\text{m}$ for the (-8.00D to -9.00D) and (-7.00D to -8.00D) subgroups, which compare to increased thickness in group-B, of $+9.75\mu\text{m}$ ($p = 0.032$) and $+7.14\mu\text{m}$ ($p = 0.041$), respectively.

Group-B (standalone LASIK) post refraction average: -0.27 D at 12-months, compared to -5.33 ± 2.34 D preoperatively. SteepK was 38.66 D at 12-months, compared to 44.03 D preoperatively. Predictability had a correlation coefficient of 0.968 .



Corneal Collagen Cross-linking Combined With Simulation of Femtosecond Laser–Assisted Refractive Lens Extraction: An Ex Vivo Biomechanical Effect Evaluation

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TABLE 1. Biomechanical Comparative Measurements Between the 2 Groups

	Stress, kPa				Young's Shear Modulus, MPa			
	10% strain		20% strain		10% strain		20% strain	
		Δ		Δ		Δ		Δ
Group A (CXL)	305.04	±23.30	1284.79	±34.20	6.98	±1.12	11.46	±0.75
Group B (control)	147.39	±10.72	874.38	±29.40	4.04	±0.85	8.80	±0.72
Δ	107		47		73		30	
P	0.021		0.043		0.036		0.047	

Δ, Relative difference (%) between metrics; P, Student test P value.



Longitudinal Postoperative LASIK Epithelial Thickness Profile Changes in Correlation With Degree of Myopia Correction

Anastasios John Kanellopoulos, MD; George Asimellis, PhD

Epithelial Thickness Profile Changes/Kanellopoulos & Asimellis

TABLE 2

Descriptive Statistics for the Postoperative Epithelium Thickness Changes (μm)

Parameter	1 Day			1 Week			1 Month			12 Months		
	Center	Mean	Mid									
Average	-0.08	-0.34	-0.39	-0.30	1.07	1.35	1.58	2.88	3.31	1.42	2.90	3.19
SD	± 3.12	± 3.40	± 3.49	± 2.52	± 2.28	± 2.38	± 2.73	± 3.15	± 3.25	± 2.62	± 2.73	± 2.82
Maximum	7	7.33	7.4	5	6.75	7.7	10	11.25	12	7	9.23	11.21
Minimum	-6	-8.33	-8.8	-6	-3.25	-3.2	-4	-2.33	-2.2	-5	-2.79	-2.10
P^a	.897	.587	.534	.522	.037	.0125	.0036	< .001	< .001	.0146	< .001	< .001

Mid = mid-periphery; SD = standard deviation
^aPaired Student's t test.

in **Figure 2**, there is a correlation between the degree of myopic ablation and increase of epithelial thickness. Specifically for the mid-peripheral epithelial thickness increase, the linear fit trend line describing this correlation had a Pearson product-moment correlation coefficient $r = 0.831$, and was described by the equation derived from our results: increase in epithelial thickness (y, in μm) = $-1.39 \times$ myopic ablation (x in D) + $9.77 \mu\text{m}$.

For each degree of myopic ablation, the corresponding increase of epithelial thickness on the mid-periphery was on the scale of $1 \mu\text{m}$. Similar results, but with a lesser degree of correlation, were obtained for the center and the mean epithelial thickness increase ($r = 0.631$ and 0.519 , respectively).

DISCUSSION

Accurate and repeatable quantitative assessment of corneal epithelial thickness distribution has been

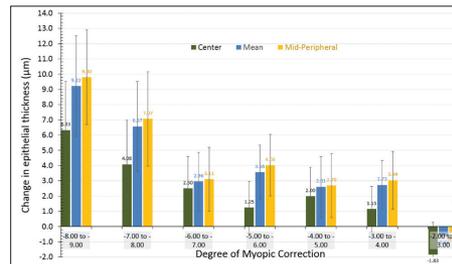
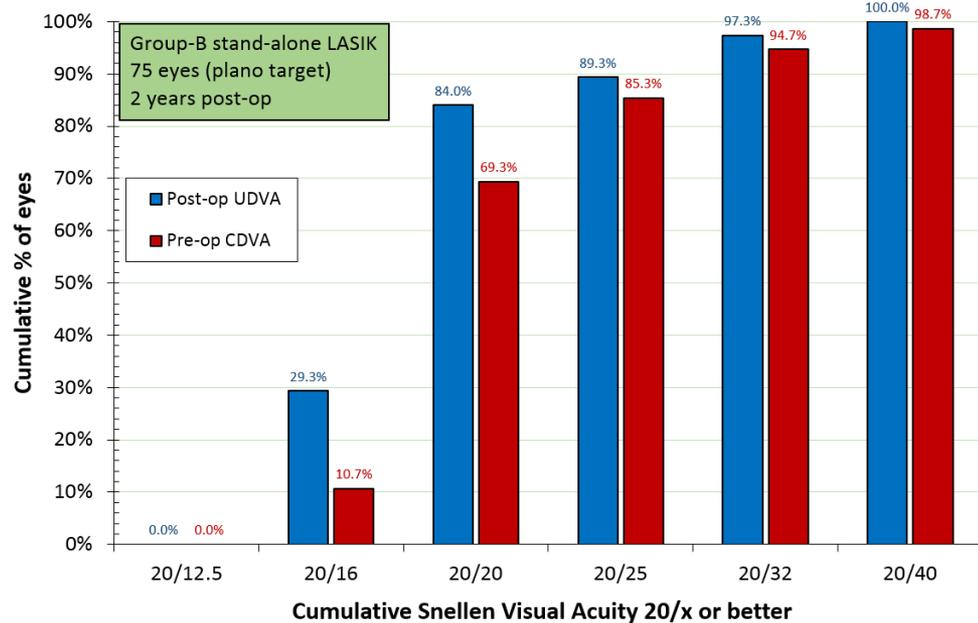
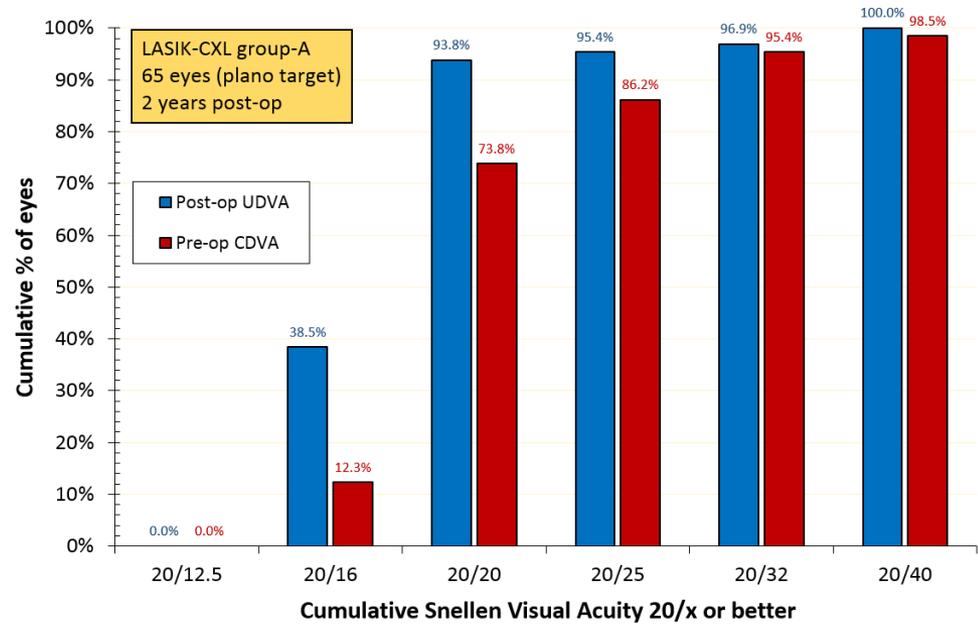


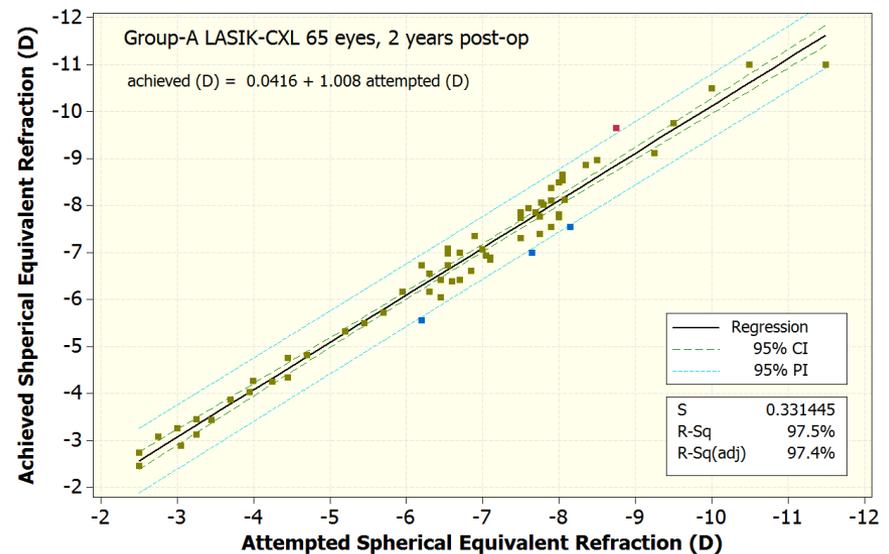
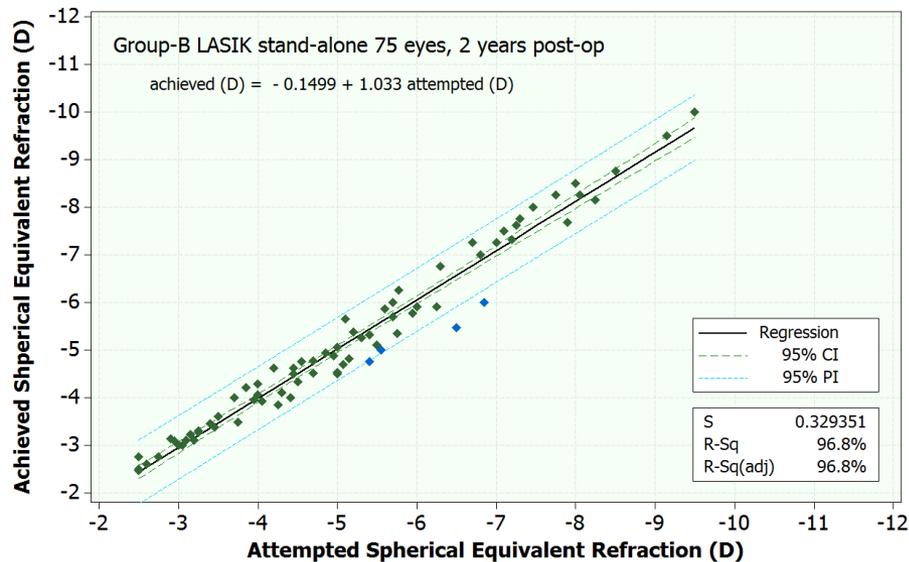
Figure 2. The correlation of increase in epithelial thickness at the center (green dots), on the mean over the 6-mm diameter (blue), and on the 5-mm mid-peripheral zone (yellow) 1 month following myopic LASIK correction. There were 4 cases between -8 and -9 diopters (D), 7 cases between -7 and -8 D, 10 cases between -6 and -7 D, 8 cases between -5 and -6 D, 15 cases between -4 and -5 D, 13 cases between -3 and -4 D, and 6 cases between -2 and -3 D. Error bars indicate standard deviation.



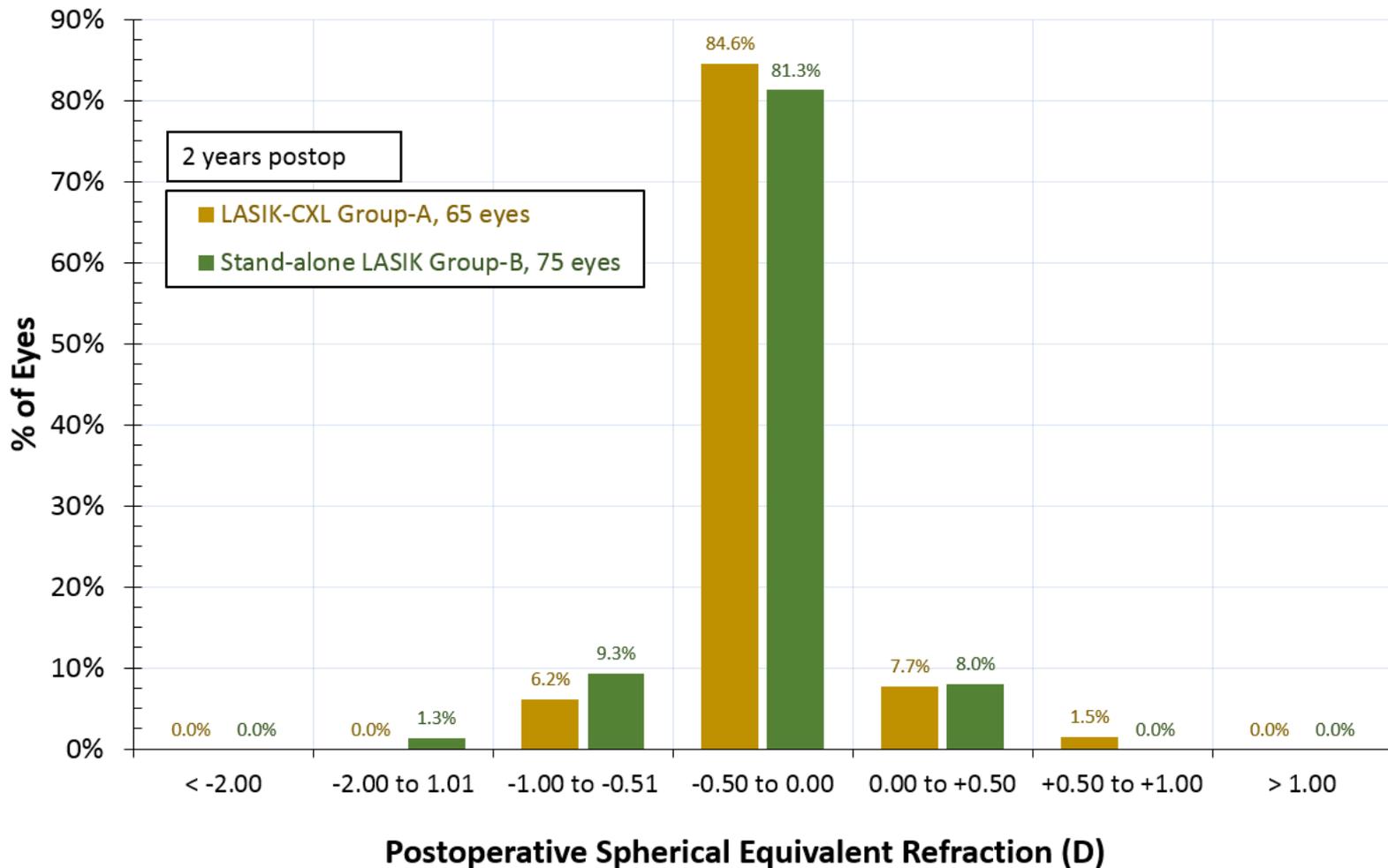
Cumulative Snellen acuity 2 y: LASIK Vs. LASIK + CXL



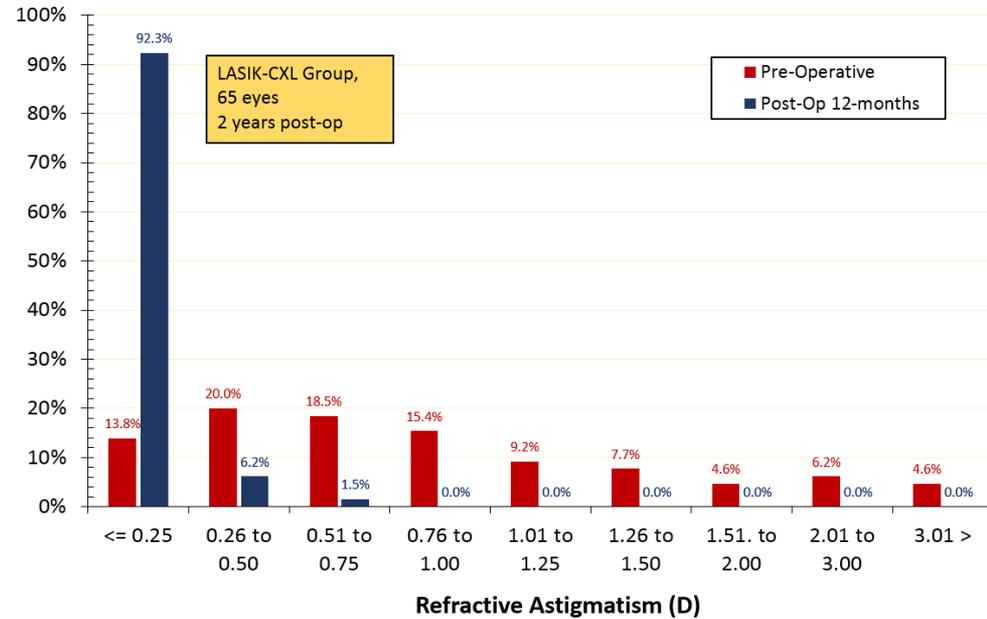
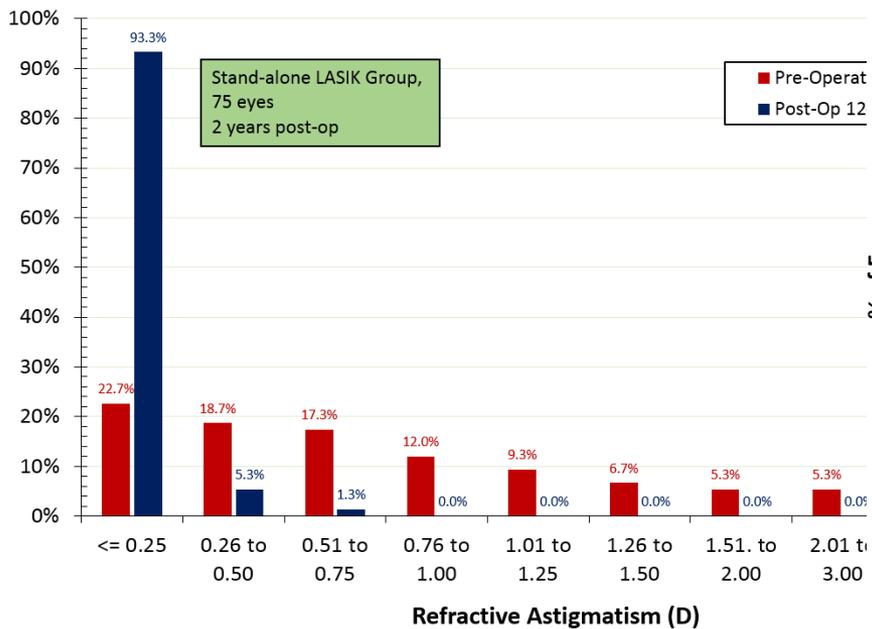
Predictability LASIK Vs. LASIK + CXL



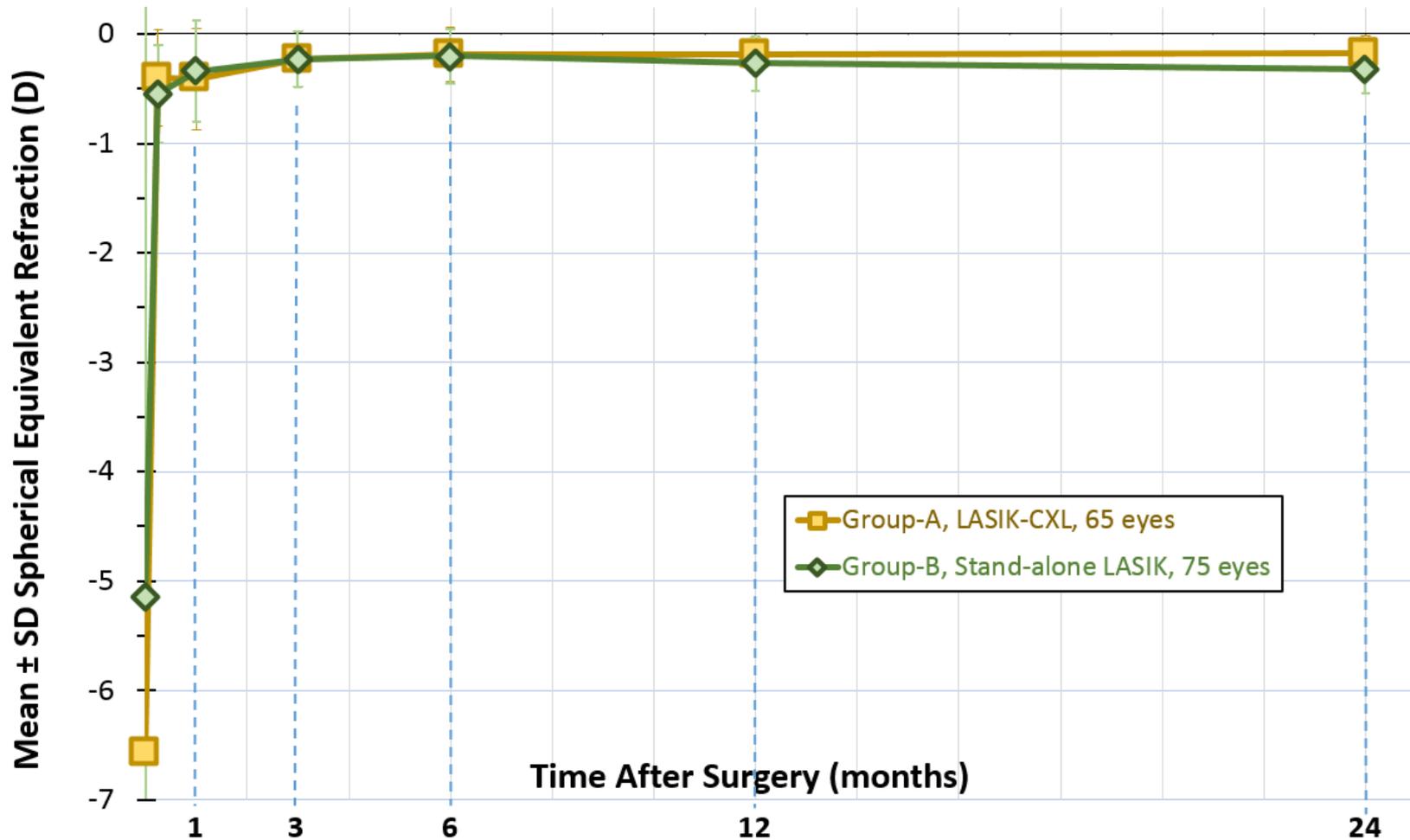
2 years MRSE: LASIK Vs. LASIK + CXL



2 years refractive astigmatism: LASIK Vs. LASIK + CXL



Spherical equivalent stability 2 y: LASIK Vs. LASIK + CXL



Keratometric stability 2 y: LASIK Vs. LASIK + CXL

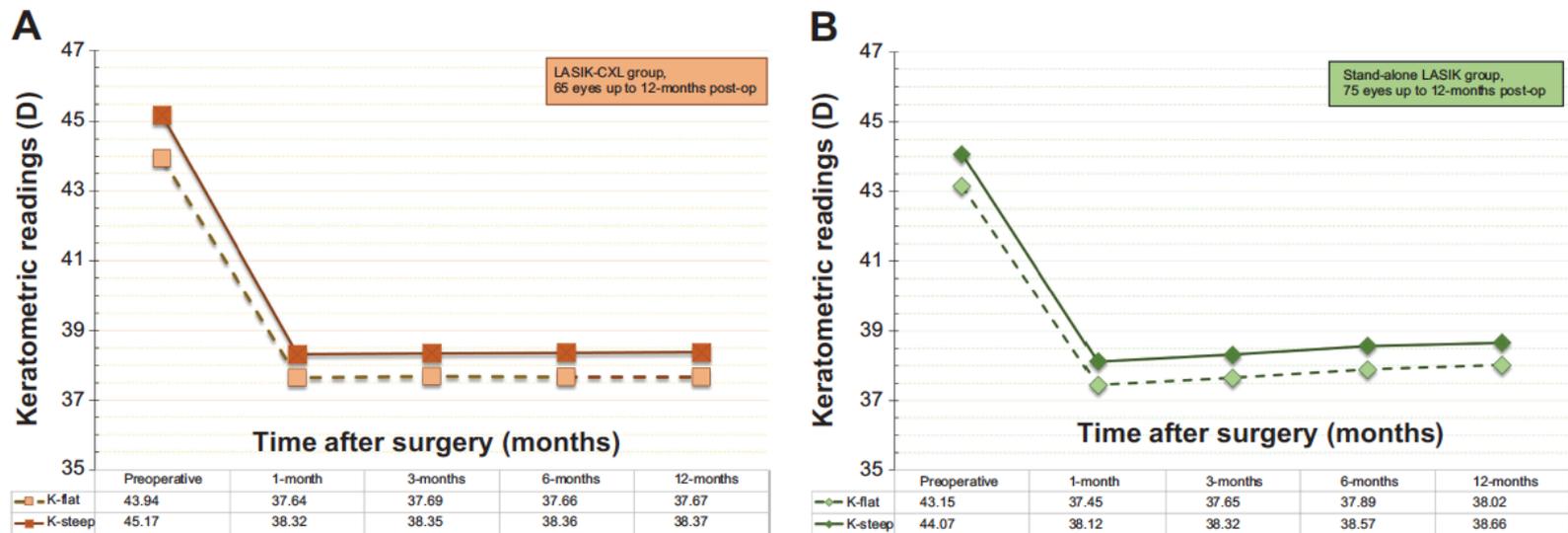


Figure 8 Stability of corneal keratometry for (A) the LASIK-CXL group and (B) the stand-alone LASIK group, expressed in diopters (D), up to 1-year postoperatively. Abbreviations: CXL, cross-linking; LASIK, laser-assisted in situ keratomileusis.



Conclusions

Application of prophylactic cross-linking concurrently with high-myopic LASIK operation appears to:

- contribute to improved refractive,
- keratometric stability and
- epithelial profiles in comparison to the stand-alone LASIK.

We have shown that it may be a necessity in hyperopic LASIK

We have shown its biomechanical effect ex-vivo

