

Post Cross-Linking Refit Extravaganza: Corneal GP, Piggyback, Scleral

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Introduction

Keratoconic corneas tend to stabilize when patients are in their 40's, however stabilization through cross-linking (CXL) surgery may still be warranted if corneas continue to progress despite this age threshold.

Immediately post CXL surgery, the cornea cannot support contact lens wear, however healthy corneal GP wear has been documented after 1-3 months^{1,2} afterward.

Case

- JG was a 42-year-old Hispanic male patient with a history of severe, progressive, bilateral keratoconus who had right eye corneal cross linking at the end of February 2023.
- Prior to surgery, he wore corneal GP lenses bilaterally for 18 hours daily and heavily depended on his lenses for restoration of vision. JG has high need for lenses he can wear for extended periods, and thus prefers corneal GPs.
- JG was referred to be fit into contact lenses about 1 month post CXL, however fitting proved difficult due to corneal curvature instability and corneal defects (impression rings and SPK) with lens wear.

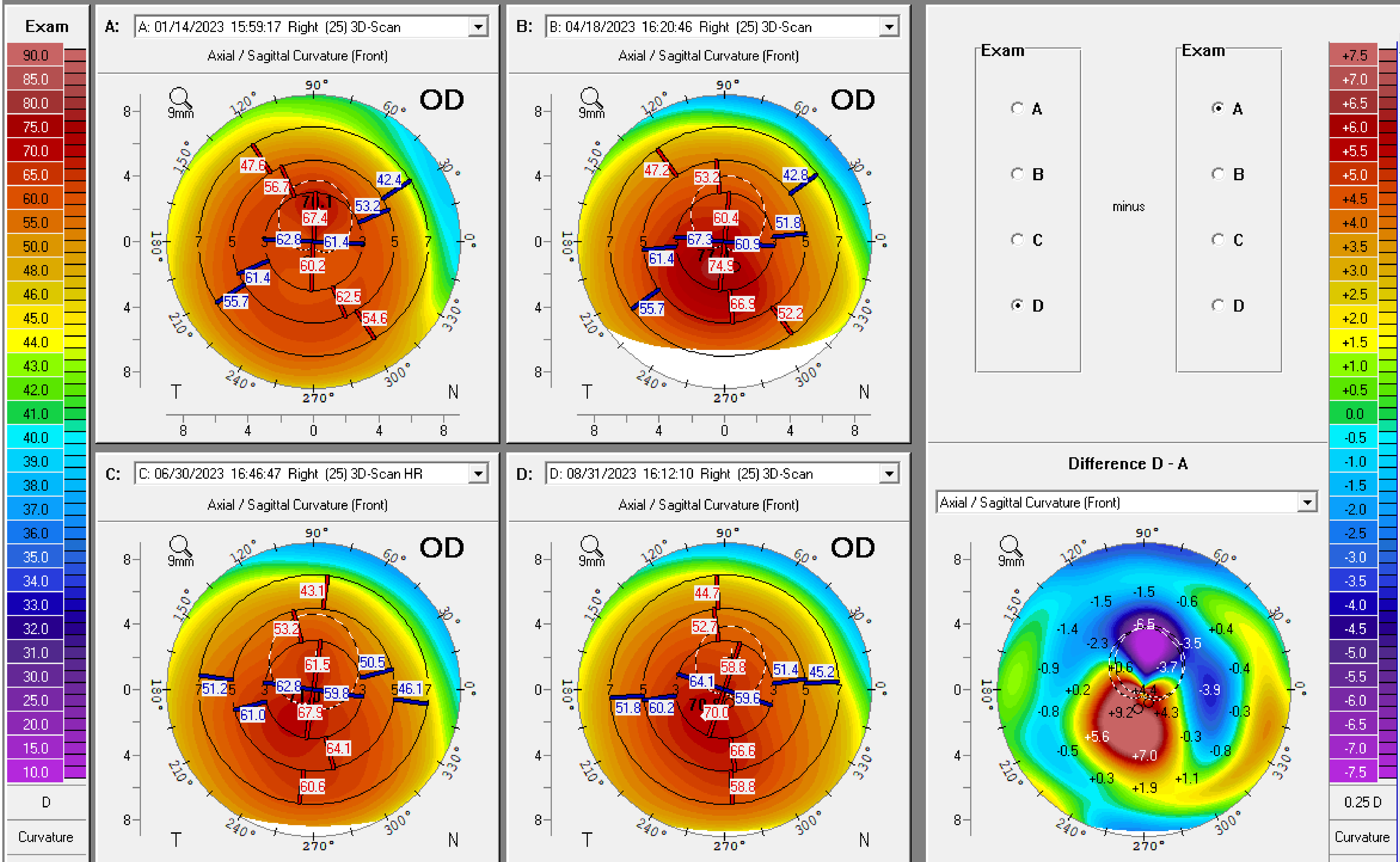


Figure 1: Immediately prior to CXL, JG's front corneal K values were 56.50 x 53.00D @146, about a month post CXL (4/18/23) the values were 67.50 x 64.37 @157, and 5 months post CXL the K values were 64.00 x 62.00 @150. Serial tomography shows a changing anterior corneal surface and overall steepening of the cornea post CXL.

OD Lens	Date	VA with CLs	Contact Lens Fit	Notable Corneal Findings Post-Wear in addition to (+) Vogt's striae (+) Fleischer's Ring (+) Scarring inferior to central visual axis	Contact Lens Plan
Habitual: Optimum Comfort 63.00 -19.00 8.6 6.6 7.50 x 0.3 8.50 x 0.5 12.00 x 0.02 gray thin as possible	2/18/23	20/50-1	Feathery AT/ Max PC @ 12 & 6, min PC @ 3 & 9	Mild 3-9 SPK	Continue wear until upcoming CXL surgery
	2/31/23				Discontinue Lens Wear due to CXL
	4/11/23	20/30-	Moderate AT/avg PC 3&9, max 12&6/small bubble/inf decentration	NA, Pt presents for refit post CXL	Order 0.75D steeper lens for future dispense
Trial 1: Optimum Comfort 63.75 -19.75 8.6 6.6 7.50 x 0.3 8.50 x 0.5 12.00 x 0.02 gray thin as possible -steepen habitual lens by 0.75D	4/18/23	20/30-	Feathery AT/avg PC 3&9, max 12&6/small bubble/inf decentration *when centered: AC	NA, lens dispensed at visit	Dispense
	4/25/23	Not worn into office	Pt did not present wearing lens, but reports wearing lens for several hours prior	Positive circular impression ring on cornea	Discontinue GP wear alone
Trial 2 with piggyback: Optimum Comfort 64.00 -20.25 8.6 6.6 7.50 x 0.3 8.50 x 0.5 12.00 x 0.02 gray thin as possible -steepen Trial 1 by 0.25, power change AND Oasys 1 Day 8.5 14.3 +0.50	4/25/23	20/40-	Bubble in visual axis		Attempted piggyback fit with ordered steeper lens, inadequate fit
Trial 1 with piggyback: Optimum Comfort 63.75 -19.75 8.6 6.6 7.50 x 0.3 8.50 x 0.5 12.00 x 0.02 gray thin as possible AND Oasys 1 Day 8.5 14.3 +0.50	4/25/23	20/40-	0.25 mm MOB/0.25 mm MOB upgaze/good coverage 360/GP inferiorly decentrated with 0.25 MOB		Dispensed piggyback system
	5/2/23	20/40-2	.25 mm MOB/0.25 mm MOB upgaze/good coverage 360/GP inferiorly decentrated with 0.25 MOB	2+ Central coalesced SPK, lens impression ring	Discontinue lens wear OD for 1 month (until about 4 months post CXL)
Re-dispense of Trial 1: Optimum Comfort 63.75 -19.75 8.6 6.6 7.50 x 0.3 8.50 x 0.5 12.00 x 0.02 gray thin as possible	6/9/23	20/30-	feathery touch/avg PC 12&6, min PC 3&9/ inf decentration/ inf edge lift	NA	Re-dispense
	6/16/23	20/50-1	feathery touch/avg PC 12&6, min PC 3&9/ inf decentration/ inf edge lift	Pt only wore lenses for 20 minutes prior to presenting to exam, no additional significant findings	Re-dispense
	6/30/23	20/70+2	feathery oval bearing centrally, then pooling and AC around/avg PC 12&6, min PC 3&9/ inf decentration/ inf edge lift	Impression ring and negative staining surrounding pattern of PC/ Circumferential 1-2+ staining in midperiphery (Likely from PC junctions)	Discontinue lens wear OD
Trial 3: Optimum Comfort 63.75 -19.75 8.6 6.6 7.50 x 0.3 8.20 x 0.2 9.1 x 0.3 12.00 x 0.02 gray heavy blend (5 curve lens) -attempt to reduce harsh bearing between curves by adding 5 th curve	7/21/23		Large bubble and excessive lens decentration	NA	Did not dispense. Proceeded with scleral lens diagnostic fitting
Trial 4: Alden Zenlens Z3 Prolate Boston Xo2 -6.25 7.1 BC 16.0 DIA Sag: 4850 +50 LC Steep 1 by Flat 2	8/3/23	20/40- (w/ OR -0.75 = 20/25-)	1:1 central clearance / 2.5:1 mid peripheral clearance inferior and superior and 1:1 temp and nasal / good limbal clearance 360 / marking at 5:30 and 11:30 / edge lift nasal + temp / no impingement	NA	Trained application and removal and dispensed
	8/17/23	20/30	0.75:1 central clearance / 2.5:1 mid peripheral clearance inferior and superior and 1:1 temp and nasal / good limbal clearance 360 / marking at 3&9 o'clock / edge lift nasal + temp / no impingement	No additional significant corneal sequelae	Re-dispense
Trial 5: Alden Zenlens Z3 Prolate Boston Xo2 -7.00 7.1 BC 16.0 DIA Sag: 4850 +50 LC Steep 3 by Flat 2 -steepened steep meridian by 2 steps, SOR -0.75	8/17/23	20/20	0.50:1 central clearance / 1:1 mid peripheral clearance inferior and superior and limited temp and nasal / limited LC 3-9/ marking at 3&9 o'clock / edge lift temp / no impingement	NA	Dispense
	8/31/23	20/25 (Plano OR)	0.25:1 central clearance / 1:1 mid peripheral clearance inferior and superior and limited temp and nasal / limited LC 3-9/ marking at 5&12 o'clock / minimal edge lift temp / no impingement	No additional significant corneal sequelae	Finalize. Return to Clinic 3-4 months for follow up

Table 1: Multiple attempts at lens fit were made to restore vision and promote corneal health. AT= Apical touch, AC= Apical Clearance, LC= Limbal Clearance

Discussion

Multiple attempts were made to restore vision with GP wear post CXL. Ultimately, the cornea continued to remodel and the epithelium was fragile and more easily injured. Corneal health through GP's continued to be poor despite change in fit, piggybacking with soft lenes, and taking a prolonged break to allow further healing. In retrospect, despite the corneal epithelium being healed post CXL and clearance given from the surgeon, given the changing corneal topography, it would have been more prudent to wait until stabilization of the cornea to proceed with corneal GP fitting. Ultimately, the patient was able to be refit into a scleral lens without corneal damage. The patient was heavily counseled on risk of over-wear and to wear his scleral lens no more than 10 hours daily. He heavily relies on his OS corneal GP, through which he can see 20/20 and which he can wear for more prolonged daily hours.

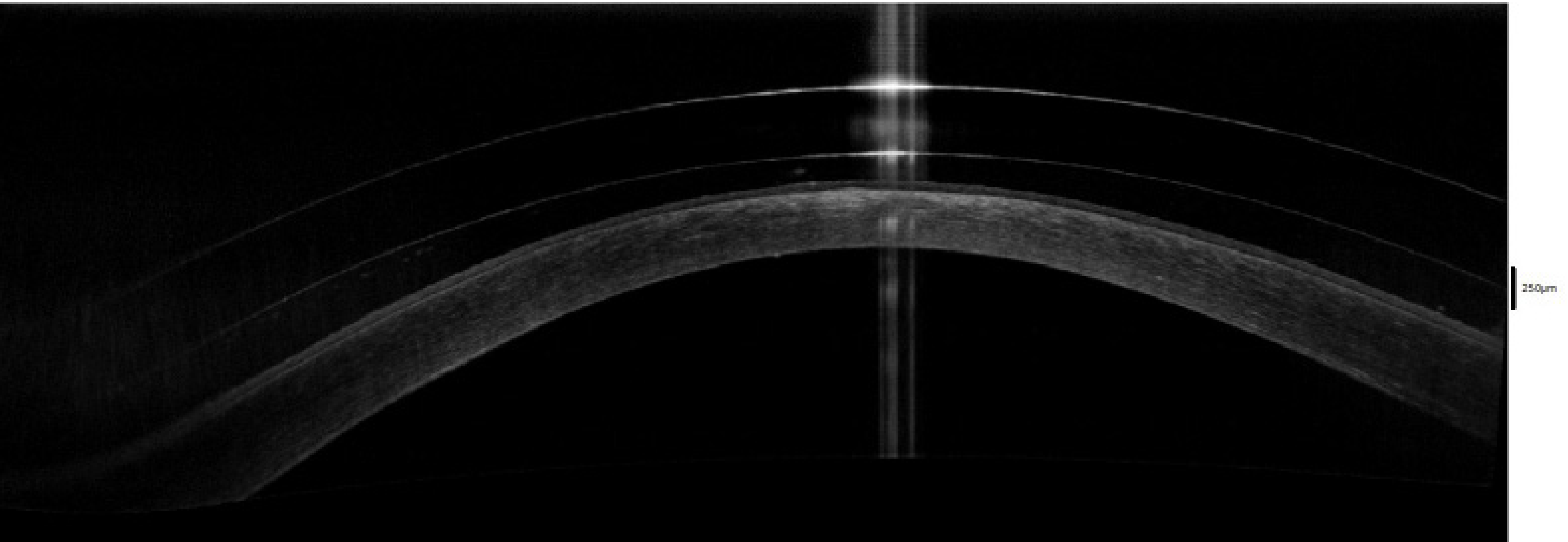


Figure 2: OCT image of finalized scleral lens fit. Tear lake is purposely left thin to promote higher oxygen transmissibility given JG's propensity for long contact lens wear time.

Conclusions

Prognosis of corneal GP wear after cross linking surgery is guarded and the ideal timeline is unknown. Sehra et al. (2014) found that corneal GP lenses interfered with sub-basal corneal nerve plexus healing even 3 months after surgery. Scleral lenses can restore vision and be supported by a post-corneal cross linked cornea in the months after surgery.

References

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- Ünlü, M., Yüksel, E., & Bilgihan, K. (2017). Effect of corneal cross-linking on contact lens tolerance in keratoconus. *Clinical and Experimental Optometry*, 100(4), 369-374.
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