

# Visual Recovery and Corneal Remodeling Using a Hyper Dk Freeform Scleral Lens for HZO Scarring

Nathan Schramm, OD, FSLs; Laura Belle Morel

## Introduction

Scleral lenses (SLs) have been shown to facilitate regression of corneal neovascularization and resolution of corneal opacity.<sup>1,2,3,4</sup> In this case, **corneal densitometry (CD)** measurements from Pentacam® AXL Wave tomography were used to quantify corneal changes over three months in a scleral lens patient with stromal scarring from a herpes zoster ophthalmicus (HZO) infection.

## Case Background

48-year-old female presented with a history of stromal scarring due to an HZO infection in the left eye two years prior. Using autologous serum tears (AST) 7x/day and started varenicline nasal spray BID upon SL fitting.

	OD	OS
Entering VA sc	20/40	20/400
Subjective refraction	+0.25 -1.75 x 020 VA: 20/25	<b>-3.25 -1.50 x 165</b> VA: <b>20/80</b>
Lids/lashes	clear	punctal plug LL
Conjunctiva	clear	1+ injection
Tear film	scant tear meniscus	scant tear meniscus
Cornea	LASIK scars, 1+ SPK	LASIK scars, superior pannus extending 2.5mm onto cornea, diffuse anterior stromal scarring, trace endothelial scarring, 4+SPK
AC, Iris, Lens	unremarkable	unremarkable
Posterior pole	unremarkable	unremarkable

## Scleral Lens Parameters

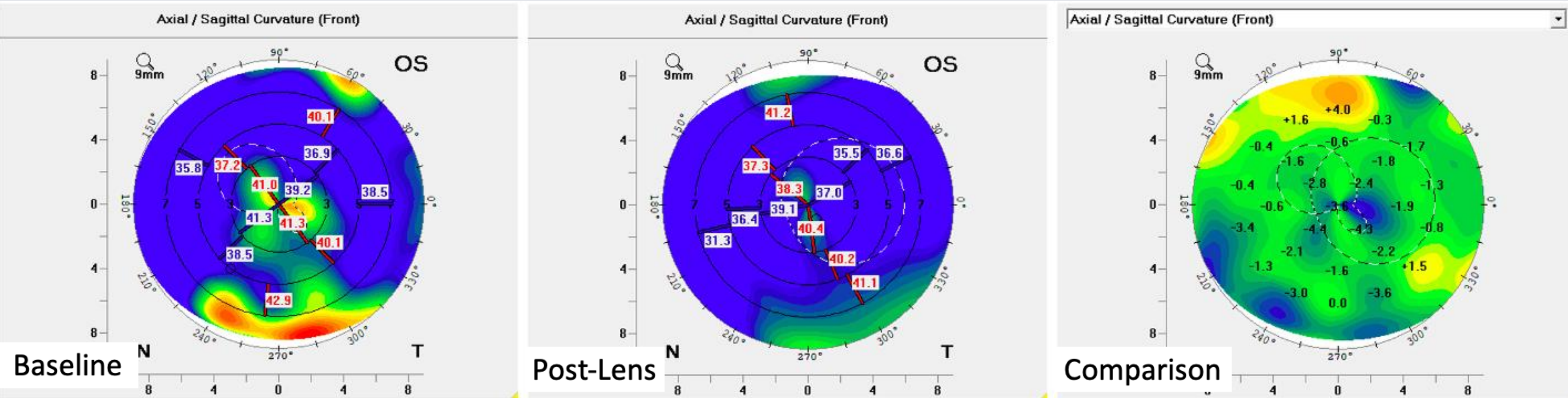
**Lens 1:** Front & Back Toric Europa, HydraPEG, 16.0 9.06 (37.25D), +0.25 -1.12 x 080, CT 0.3, VA: 20/80  
PH: 20/80

**Lens 2:** Front & Back Toric Europa, HydraPEG, 16.0 9.85 (34.25D), +3.25 -1.12 x 080, CT 0.35, VA: 20/100  
PH: 20/70

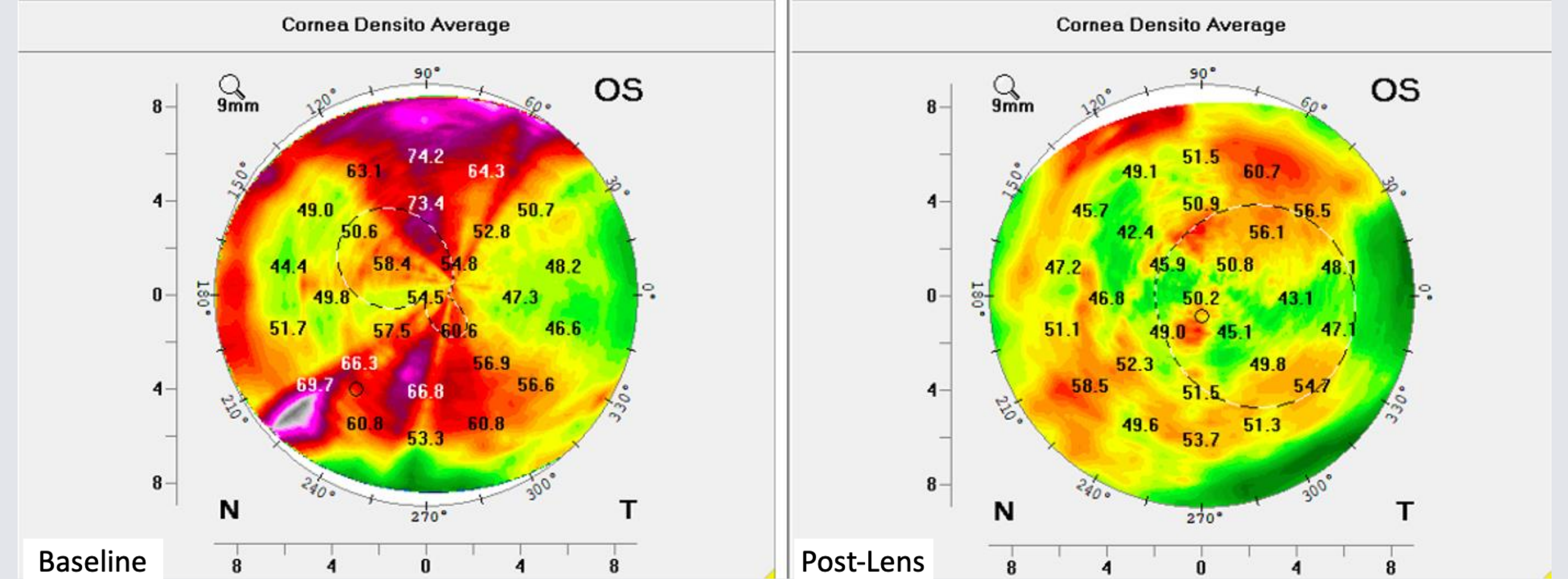
- Changed material from Hexa100 to Acuity200 due to corneal edema 580µm to 680µm
- Changed to profilometry-based freeform lens design due to misaligned haptic edge in standard scleral

**Final Lens:** Latitude freeform designed by sMap3D™, HydraPEG, 16.5 8.43 (40.04D), -2.50 -1.12 x 080, CT 0.35, VA: **20/20-**

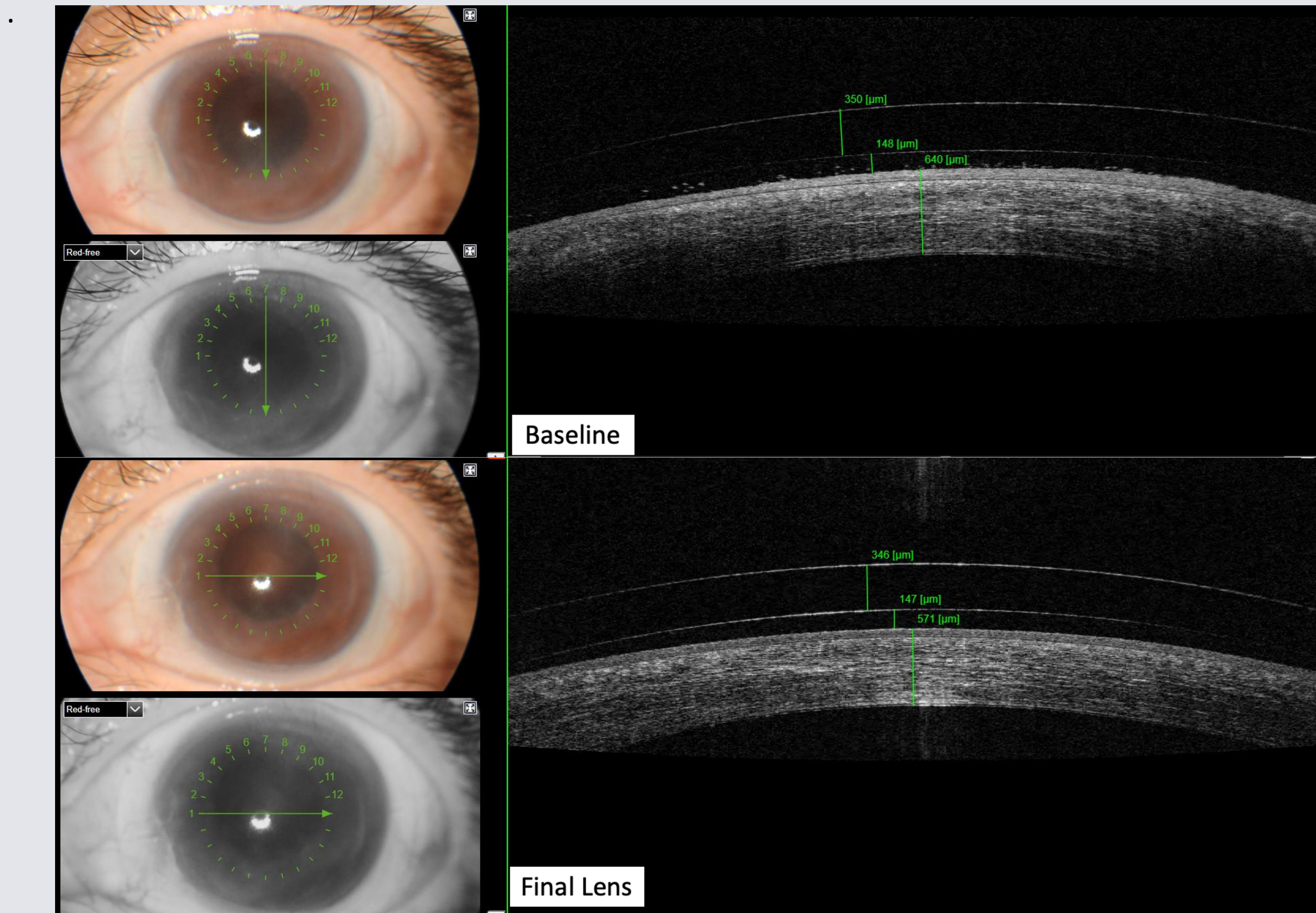
## Diagnostic Imaging



**Figure 1:** comparison between pre and post-lens topography. Left: baseline with central island. Middle: 3 months of Hyper Dk freeform scleral lens wear. Right: difference map. Note **3 Diopters of flattening** (hyperopic shift) with 6 month of SL wear Subjective **Refraction OS: -0.50 DS VA: 20/50-**



**Figure 2:** pre (central 57.2 GSU) & post-tx (central 48.2 GSU) CD. Left: baseline. Right: 3 months of Hyper Dk freeform scleral lens wear, ~16% improvement. Normative: 16 to 24 grayscale units.<sup>5</sup>



**Figure 3:** anterior segment OCT of scleral lens fit. Top: Baseline with Hyper Dk in standard scleral. Bottom: 3 month treatment with Hyper Dk in freeform scleral.

## Discussion

Quantification of resolution of corneal opacity can be challenging. Photographic evidence of increased clarity is compelling but difficult to quantify. Improvements in corneal scarring can cause a hyperopic shift<sup>6</sup> as noted in Figure 1. Regression of corneal opacity following scleral lens therapy gives rise to the enticing possibility that some corneal opacity is not permanent scarring.

Concomitant usage of AST could have played a role in improving translucence but did not improve haze in a 2022 Corneal Cross-linking study.<sup>7</sup> CD GSU is 0 (maximum transparency) to 100 (completely opaque cornea), based on the degree of backscattering light from the cornea<sup>5</sup>. Acquisition of images in a dark room reduces glare to allow for image analysis & minimize artifact with CD.

## Conclusion

Corneal tomographic imaging can be utilized to quantify changes in corneal parameters over time. As of 2023, there is not sufficient evidence to suggest that scleral wear can be expected to result in improvements in corneal clarity. This case report demonstrates that corneal tomographic imaging and densitometry may be a useful component of future investigations into quantifying corneal changes with scleral lens therapy.

## References

1. Yin J, Jacobs DS. Long-term outcome of using Prosthetic Replacement of Ocular Surface Ecosystem (PROSE) as a drug delivery system for bevacizumab in the treatment of corneal neovascularization. *Ocul Surf.* 2018.
2. Liao J, Asghari B, Carrasquillo KG. Regression of corneal opacity and neovascularization in Stevens-Johnson syndrome and Toxic Epidermal Necrolysis with the use of prosthetic replacement of the ocular surface ecosystem (PROSE) treatment. *Am J Ophthalmol Case Rep.* 2022;26:101520.
3. Cressey A, Jacobs DS, Remington C, Carrasquillo KG. Improvement of chronic corneal opacity in ocular surface disease with prosthetic replacement of the ocular surface ecosystem (PROSE) treatment. *Am J Ophthalmol Case Rep.* 2018;10:108-13.
4. Meka A, Moezzi C, Brocks D. Case report: Utilization of neutral density filters for densitometry analysis of dense corneal opacities. *Am J Ophthalmol Case Rep.* 2022 Jul 31;27:101672.
5. Ni Dhubghaill, Sorcha et al. "Normative values for corneal densitometry analysis by Scheimpflug optical assessment." *Investigative ophthalmology & visual science* vol. 55,1 162-8. 7 Jan. 2014, doi:10.1167/iovs.13-13236
6. Dupps WJ Jr, Wilson SE. Biomechanics and wound healing in the cornea. *Exp Eye Res.* 2006 Oct;83(4):709-20. doi: 10.1016/j.exer.2006.03.015. Epub 2006 May 23.
7. Roldan AM, De Arrigunaga S, Ciolino JB. Effect of Autologous Serum Eye Drops on Corneal Haze after Corneal Cross-linking. *Optom Vis Sci* 2022;99(2):95-100.