

Free-Form Designed Corneal GP lens for a Penetrating Keratoplasty

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BACKGROUND

Penetrating keratoplasty (PK) is one of the most common surgical techniques used for keratoconus patients¹. Often times after a PK, patients have irregular astigmatism with various peaks and valleys leading to a difficult contact lens fitting process. Corneal gas permeable (GP) contact lenses are the lens of choice for post PK fitting due tear exchange and less concern about causing endothelial compromise compared to scleral lenses. Can new technology such as corneo-scleral profilometry be used to design a free-form GP lens that leads to improved patient outcomes compared to diagnostic fitting.

CASE

- A 39-year-old Middle Eastern Male presented for a contact lens fitting.
- ocular history: keratoconus OU, penetrating keratoplasty (PK) OD (2003), intra corneal ring segment OS (2007)
- VA: OD cc: 20/30; OS sc: 20/60 pinhole improved to 20/20.
- He reported the GP lens frequently ejected from the eye.
- Manifest refraction: -1.75-4.75x095 with a VA of 20/20 OD; +1.75-0.50x165 with a VA of 20/25 OS.
- Tomography: high amounts of against the rule astigmatism OD, inferior steepening and thinning consistent with keratoconus OS
- Keratometry: 42.8D/48.1D @ 170 OD, 41.5D/47.2D @ 062 OS
- Current GP lens showed a flat fitting lens with apical bearing, excessive midperipheral pooling and excessive edge lift.
- Slit lamp: Clear PK with no sutures OD and one inferior intra corneal ring segment OS.
- A corneo-scleral profilometry scan was done OD and a free-form corneal GP lens was designed based off the scan. His OS was fit with a daily disposable soft contact lens allowing him to achieve VA of 20/25. Over the course of 3 months and 2 lens exchanges, he has successfully worn the free-form corneal GP lens OD with improved comfort and vision compared to his previous GP lens.

FIGURE 1

Axial map showing against-the-rule astigmatism after a corneal transplant. Front elevation showing different levels of elevation in each quadrant.

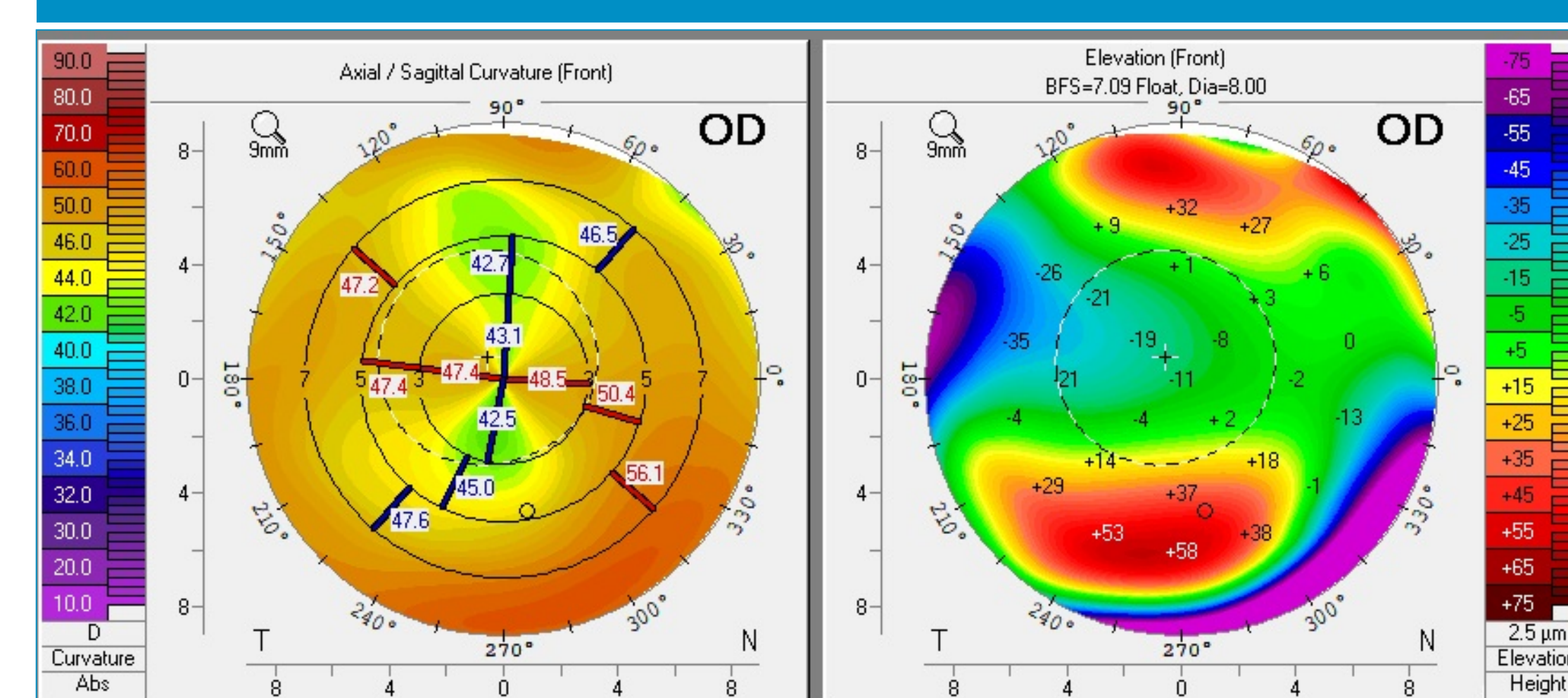


FIGURE 3

Final GP lens fit showing adequate fluorescein pattern.

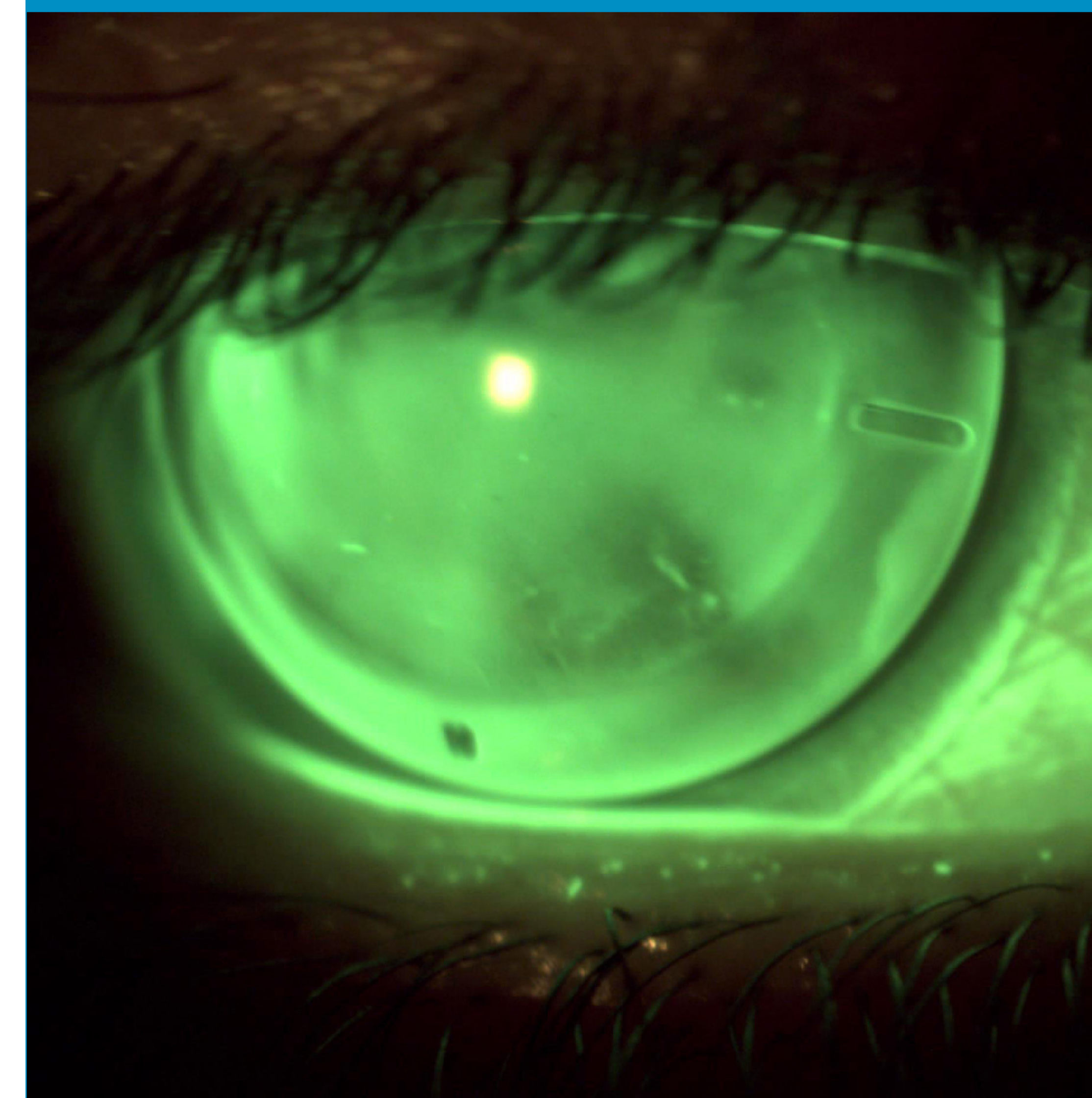


FIGURE 2

CSP report showing moderate scan quality with some missing data. Enough data was obtained to design a free-form GP lens.

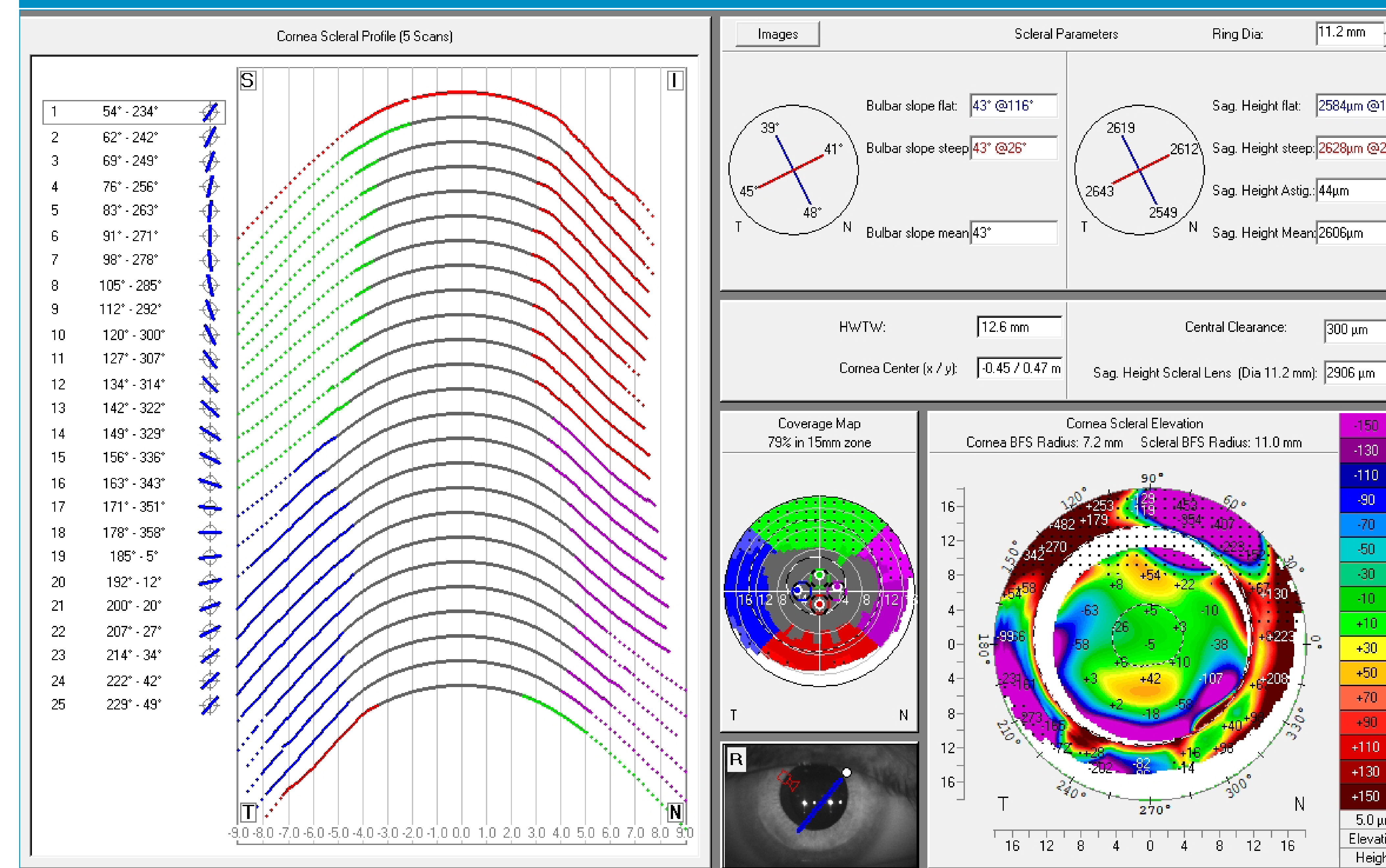


TABLE 1

Final free-form lens parameters.

power	OAD	BC	CT	ET
-3.89 +/- 4.64	11.0	7.55 +/- 0.78	0.22	0.18

CONCLUSION

Free-form corneal GP lenses should be considered in post PK patients. This technology has the potential to improve patient outcomes with corneal GP lenses and not have to make the switch to scleral lenses.

REFERENCES

1. Santodomingo-Rubido, J., Carracedo, G., Suzuki, A., Villa-Collar, C., Vincent, S. J., & Wolffsohn, J. S. (2022). Keratoconus: An updated review. Contact lens & anterior eye : the journal of the British Contact Lens Association, 45(3), 101559. <https://doi.org/10.1016/j.clae.2021.101559>

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