Wavefront Guided Extended Depth of Focus Scleral Lenses in a Presbyopic Patient

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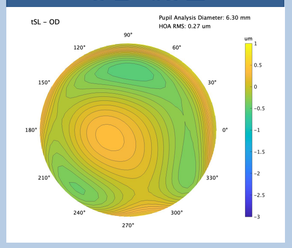
Introduction

- Wavefront-guided scleral lenses (wfgSLs) can lead to improvements in visual acuity and reduce residual higher-order aberrations (HOAs).[1]
- Spherical aberrations have been shown to increase depth of focus in presbyopic patients.[2]
- This case reports on the use of wavefront-guided (wfg) extended depth of focus (EDOF) optics on a scleral lens (SL) for visual improvement in a presbyopic patient with compound myopic astigmatism (CMA).

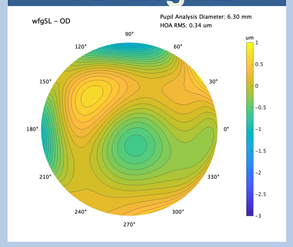
Case Description

- A 54-year-old male with CMA and presbyopia reported blurry near vision with his habitual SL (hSL). He had previously worn RGPs and soft multifocals, and had been using hSL for 5 years.
- He was was re-fit with a traditional optics SL (tSL) for distance correction (EyeFitPro, EyePrint Prosthetics, Lakewood, CO).
- A wfgSL was created using a comprehensive system (Ovitz, xWave, Rochester NY) that included a dot matrix on the SL and a wavefront aberrometer with iris and dot registration with direct data transfer.
- Once finalized, a novel wfgedofSL was manufactured.
- Distance visual acuity (DCLVA), near visual acuity (NCLVA), and total higher-order root mean square (HORMS) with pupil diameter matching were measured with each lens.
- Data was collected after 2 weeks of lens wear and a minimum of 3 hours wear prior to examination.

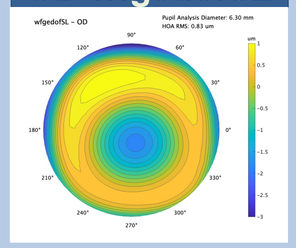
OD tSL



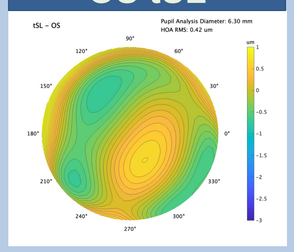
OD wfgSL



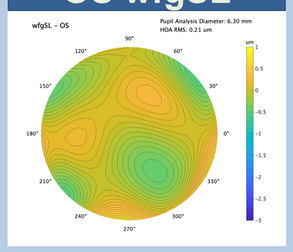
OD wfgedofSL



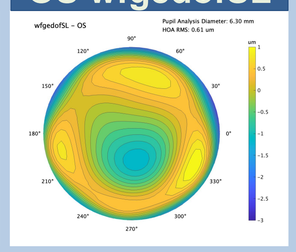
OS tSL



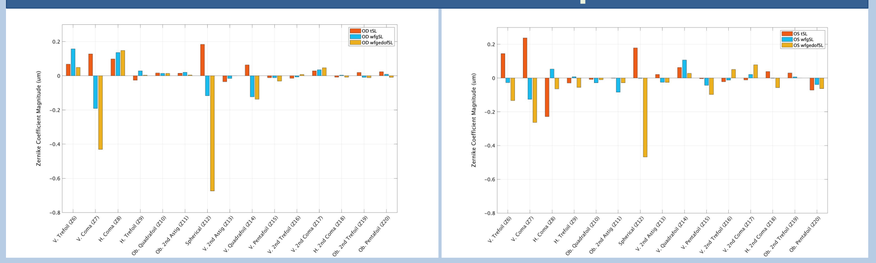
OS wfgSL



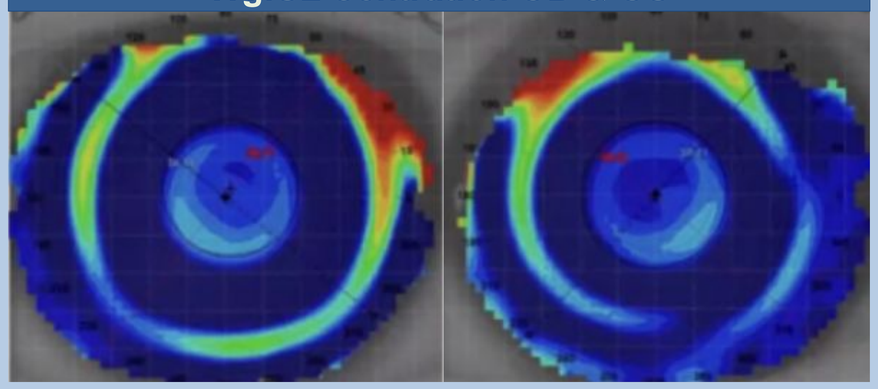
OS wfgedofSL



Zernike Coefficient Comparison



WgfSL Centration OD & OS



Results

- DCLVA with tSL was 20/20 OD and OS and NCLVA was 20/30 OD and 20/40 OS.
- HORMS with tSL of 0.27 µm OD and 0.42 µm OS (at 6.3mm pupil diameter).
- DCLVA with wfgSL was still 20/20 OD and OS. NCLVA with wfgSL was reduced to 20/40 OD and 20/60 OS.
- HORMS with wfgSL was 0.34 µm OD and 0.21 µm OS, an increase of 18% OD, and a decrease/improvement of 51% OS compared to tSL.
- DCLVA and NCLVA with wfgedofSL was 20/20 OD and OS.
- HORMS with wfgedofSL was 0.81µm OD and 0.61µm OS. The increase in HORMS from the wfgSL to the wfgedofSL is expected due to the nature of the EDOF correction.
- The patient reported the wfgedofSL met his visual expectations at all distances.

Conclusions

- When compared to tSL, the wfgedofSL improved visual performance at all distances and optimized HORMS.
- Future larger prospective studies are required to corroborate this data.

References

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2. Fernández J, Rodríguez-Vallejo M, Burguera N, Rocha-de-Lossada C, Piñero D. Spherical aberration for expanding depth of focus. *Journal of Cataract & Refractive Surgery.* 2021; 47 (12): 1587-1595. doi: 10.1097/j.jcrs.0000000000000713.

Disclosures

Gelles, JD has received research support, devices, or honoraria from Ovitz and EyePrint Prosthetics. Brown, N is an employee of Ovitz. All other authors have no relevant financial disclosures.

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