Scleral Lens with Novel Wavefront Guided Extended Depth of Focus Optics for Visual Improvement in a Presbyopic Patient with Keratoconus

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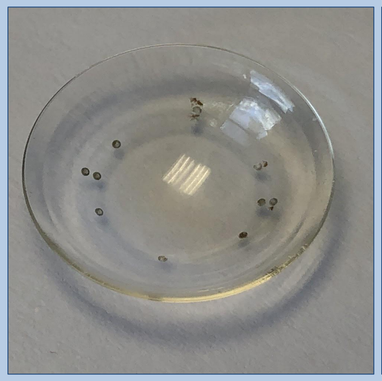
Introduction

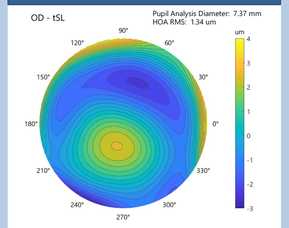
- This case reports on the use of wavefront-guided (wfg) extended depth of focus (EDOF) optics on a scleral lens (SL) for visual improvement in a presbyopic patient with keratoconus (KC).

Case Description

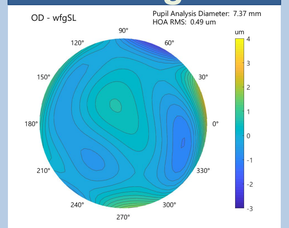
- A 49-year-old female with keratoconus (KC) was fit with a traditional optics SL (tSL) for distance correction.
- A wfgSL was created using a comprehensive system (Ovitz, xWave, Rochester NY) that included a dot matrix on the SL and a wavefront aberrometer with iris and dot registration with direct 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.



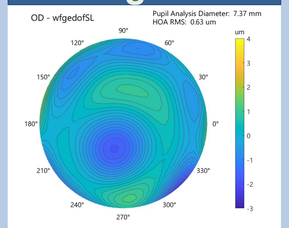
OD tSL



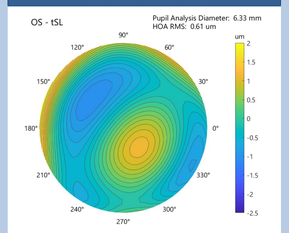
OD wfgSL



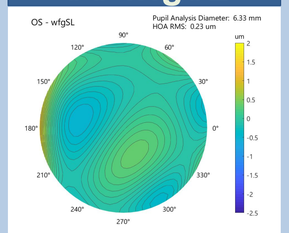
OD wfgedofSL



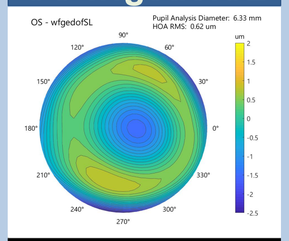
OS tSL



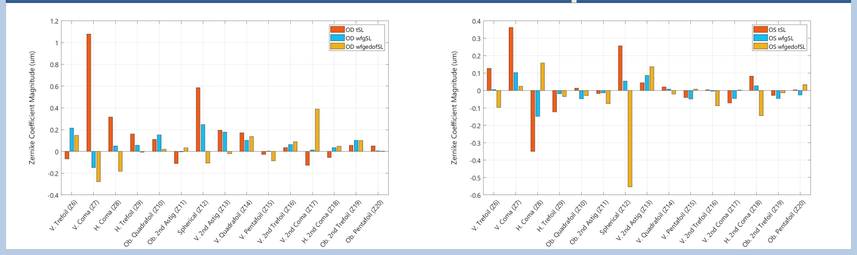
OS wfgSL



OS wfgedofSL



Zernike Coefficient Comparison



Results

- DCLVA for OD, OS, OU were 20/20, 20/20, 20/20 for tSL, 20/15, 20/15, 20/15+ for wfgSL, and 20/15, 20/20, 20/15+ for wfgedofSL.
- NCLVA was 20/30, 20/30, 20/25 for tSL, 20/30, 20/25-, 20/25 for wfgSL, and 20/20, 20/20, 20/20 for wfgedofSL.
- HORMS for OD and OS was 1.34um and 0.61um for tSL, 0.49um 0.23um for wfgSL, and 0.63um and 0.62um for wfgedofSL. OD values are reported at a pupil diameter of 7.4 mm; OS at 6.3 mm.
- Comparison of tSL to wfgSL HORMS was reduced by 63% and 62%, resulting in a DCLVA improvement of 1 line OD, OS and OU and NCLVA improved of 0.5 lines OS and no improvement OS and OU.
- Comparison of tSL to wfgedofSL, HORMS was reduced by 52% and 0%, resulting in a DCLVA improvement of 1 line OD and OU and 0.5 OS and NCLVA improvement of 2 lines OD and OS and 1 line OU. The increase in HORMS from the wfgSL to the wfgedofSL is expected due to the nature of the EDOF correction.

Conclusions

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

Disclosures

Gelles, JD has received research support, devices, or honoraria from Ovitz. Guevara, A and Brown, N are employed by Ovitz. All other authors have no relevant financial disclosures.