“Dual Efficiency" - Utilizing Dual Sagittal Depth Lens Design to Ensure On-Eye Stability of Front Toric Scleral Contact Lenses

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Background:

- Previously described options for stabilization in scleral contact lenses include profilometry-based toric haptic-based surfaces, dual slab-off stabilization, or prism-ballasted.
- Dual sagittal height (DSH) scleral lenses may be indicated when the front corneal surface has noticeable differences in elevation between meridians.
  - This elevation difference translates to variable thicknesses of tear reservoir between the lens and cornea in a mono-sagittal scleral lens.
  - Uneven reservoir depth may cause lens decentration and lack of stability, thereby degrading best corrected visual acuity (BCVA).
- DSH lenses offer greater stability and improved vision when placed on eyes with significant astigmatic correction, such as in keratoconus.

Case Description:

- 59-year-old black male
- Advanced keratoconus OU
- CXL OU 2020
- **OS s/p cataract extraction with 5.0DC toric intraocular lens (IOL) 12/2021**

★ Corneal GPs not an option due to significant corneal surface asymmetry
★ OD candidate for standard scleral lens
★ OS has significant front corneal elevation differences and residual astigmatism of 5.50DC due to toric IOL, requiring a more complex fitting solution

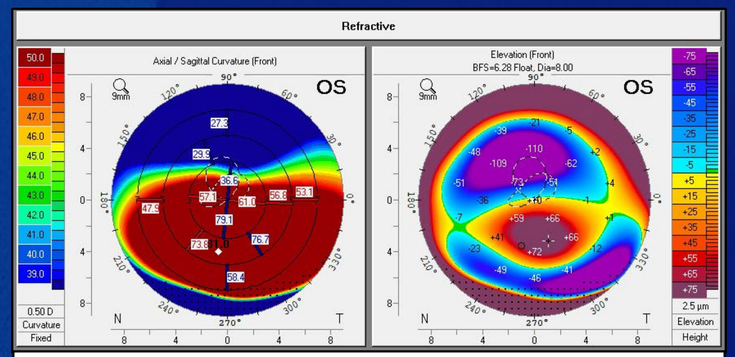

Figure 1: Pentacam scans highlight significant front elevation differences in the left eye. From the front elevation scan we were able to determine the shallow meridian at axis 95.

Lens Specifications:

- Alden Optical Bi-Elevation Zenlens scleral lens design with a dual sagitta of 4700/4950.
- First fitted lens power of +0.75 -5.00 x 104 was ordered based on spherical lens over-refraction
- Minimal haptic toricity <90um
- We predicted lens rotation to be 10 degrees counterclockwise based on the location of the shallow meridian of front corneal elevation by Pentacam scan. **(Figure 1)**
- At dispense the lens was stable with rotation within 5 degrees of the predicted value, and the lens corrected visual acuity was 20/25. **(Figure 2)**

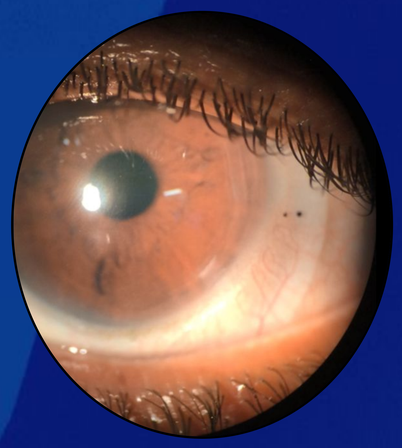

Figure 2 (left): An example of the dual sagitta lens on the eye. Rotation in our case was 10 degrees counterclockwise, which was 5 degrees from the Pentacam-estimated shallow meridian.

Discussion:

When front toric optics are required, predicting rotation and gaining stability of the contact lens enables the practitioner to efficiently factor in over-refractions, reducing chair time and lens remakes. While many scleral lens designs rely on toric haptics or prismatic ballast for stabilization, predicting lens rotation might be challenging. In such cases bi-elevational lenses may be applied to obtain stability by utilizing the differences in ocular surface elevation.

Conclusion:

Scleral lens stabilization is more easily achieved in highly toric eyes when using dual sagitta design. Localizing the shallow meridian of the front corneal elevation by Pentacam scan predicts stability and allows the practitioner to supplement the toric over-refraction into the contact lens, providing the patient with steady, clear vision. This technique may be implemented in patients who need front toric optics to correct for toric IOL-induced residual astigmatism.

References:

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