Fitting Scleral Lenses in the Presence of Significant Scleral Toricity

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Introduction
With recent advances in the fabrication of scleral contact lenses, more precise fits can be achieved. In particular, toric scleral lenses can be accurately manufactured and consistently reproduced.

Toric lenses are of particular interest because of their ability to decrease localized pressure, limit bubble formation, prevent excessive tear exchange, and reduce debris inflow. Additionally, because these asymmetrical lenses follow the shape of the anterior ocular surface, they may also aid in stabilizing the lens on the eye. This added stability is vital for the success of front surface toric scleral lenses.

Objectives
- To fit scleral contact lenses that improve vision and adequately align with the sclera.
- To achieve a contact lens fitting that maintains corneal graft health.

Case Report
Patient LB is a 40-year-old African American female who presented to the UC Berkeley School of Optometry for a specialty contact lens fitting. She habitually wore corneal gas permeable contact lenses that repeatedly ejected from her eyes and was interested in other contact lens options to improve her vision.

LB self-reported a personal ocular history as follows:
- Keratoconus OU, diagnosed in 1995
- Penetrating keratoplasty OD in 2000 and OS in 2012
- Keratoplasty OS in 2012.

LB’s medical history was significant for:
- Borderline diabetes mellitus
- Hypertension
- Atrial fibrillation
- Depression
- Headaches
- Asthma
- windshield wiper
- Hyperuricemia
- Chronic pancreatitis
- Depression
- Headaches
- Hypothyroidism
- Hypercholesterolemia
- Glucophage

Anterior segment evaluation was as follows:
- OD: PKP with clear center, no residual sutures
- OS: PKP with trace anterior stromal central haze, running suture
- OU: significant with-the-rule scleral toricity

Subjective Refraction (as determined by the UC Berkeley Low Vision Department):
- OD: +0.50 -2.00 x060 DVA 12.5/20- (20/32)
- OS: -2.00 -9.00 x045 DVA 12.5/30- (20/48)

Clinical Findings

Pentacam Tomography (Oculus, Arlington, WA, USA)

Table 1. Pentacam tomography of the corneal topography.

Visante OCT (Carl Zeiss Meditec, Inc., Dublin, CA, USA)

Table 2. OCT images of the corneal thickness and pachymetry.

Scleral Toricity and the Horizontal X

Figure 1. Right eye: Steep K: 45.3D, Flat K: 42.7D, pachymetry: 543 μm

Figure 2. Left eye: Steep K: 49.0D, Flat K: 40.5D, pachymetry: 493 μm

Figure 3. Right eye: 90° view of the corneo-scleral junction

Figure 4. Right eye: 180° view of the corneo-scleral junction

Table 3. OCT images of the corneal thickness and pachymetry.

Final Scleral Lens Parameters

- Lens Design: Zerisens (Aiden Optical, Lancaster, NY, USA)
- Distance visual acuity: 20/15-1 OD, 20/20-2 OS

Table 4. Final scleral lens parameters.

Outcomes

Discussion
To fit scleral lenses, knowledge of the corneo-scleral junction and anterior scleral shape is necessary. Several studies have demonstrated that the ocular surface beyond the cornea is typically asymmetric. In the average eye, the nasal quadrant is the flattest, while the temporal quadrant is the steepest.

After diagnostic fitting, it was clear a lens with a toric periphery was required for this patient. The design of these lenses was guided by the expertise of our lab consultants. Because they are trained to handle difficult fits, their experience was invaluable and should be utilized whenever necessary.

This case highlights the challenges in fitting conventional diagnostic lenses on patients with atypical scleral anatomy. Future advances in research and technology to image and assess scleral anatomy will be beneficial. As our knowledge of the cornea and sclera expands, we will be able to serve a greater portion of our patients with scleral lenses.

Clinical Pearls
- Toric or quadrant specific scleral lenses should be considered with high amounts of scleral toricity or when fitting large diameter lenses.
- Scleral lenses are a good alternative if ejection with corneal lenses is an issue.
- Utilize lab consultants’ expertise with difficult fits.
- Further research about scleral toricity and the corneo-scleral junction is required.

References

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