Difficulties of Sclerals with Decentered Transplants

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BACKGROUND

Specialty contact lenses have become a main source of vision correction for people with corneal ectasia that is not correctable in spectacles. Patients with severe corneal ectasia may need a full thickness corneal transplant leading to an increased amount of irregular astigmatism requiring scleral lenses to improve visual acuity. In cases of a decentered transplant, it becomes difficult to ensure total vaulting of the entire cornea when fitting a scleral lens over the area where the transplant is decentered.

CASE DESCRIPTION

A 26 yo black female presented for a contact lens fitting with a complaint of reduced vision in the past 4 years. She was a previous scleral lens wearer since she was 13 years old. Her ocular history was significant for keratoconus OU and a penetrating keratoplasty OU x 10 years ago. Slit lamp revealed corneal grafts decentered superior nasal in both eyes with no neovascularization or signs of rejection. The first trial lenses ordered were Zenlens Toric scleral lenses.

Lens Parameters at First Visit

	Lens	Overall Diameter	Sagittal Depth	Base Curve	Power	CT	APS
OD Initial	Zen	17.0 mm	4.90 µ	7.80	-2.00 sph	350 µ	Flat 3/ Steep 3
OS Initial	Zen	17.0 mm	5.20 µ	7.30	-2.00 sph	350 µ	standard

After 10 minutes of settling, the lens fit showed good centration in both eyes , 300-400 um of central clearance, good clearance over graft-host junction 360, and aligned edges with no impingement or blanching of blood vessels. Lens over refractions obtained OU improved best corrected visual acuity to 20/20 OU.

Lens Parameters Dispensed at Follow up Visit

	Lens	Overall Diameter	Sagittal Depth	Base Curve	Power	CT	APS
OD	Zen	17.0 mm	4.90 µ	9.33	+2.75-0.75 x 022	450 µ	flat3/steep3
OS	Zen	17.0 mm	5.20 µ	7.30	-7.00 sph	350 µ	standard

After 4 hours of wear prior to follow up, patient reported uncomfortable fit and redness with OS lens.
Both lenses showed 250 um central clearance, good clearance over G-H junction OD, touch over G-H junction OS, thin SN limbal edges OD and very thin SN limbal edge OS towards the direction of graft decentration. Due to difficulties with limbal clearance OS, a dual sagittal depth lens design was considered to resolve the issue and increase patient comfort.

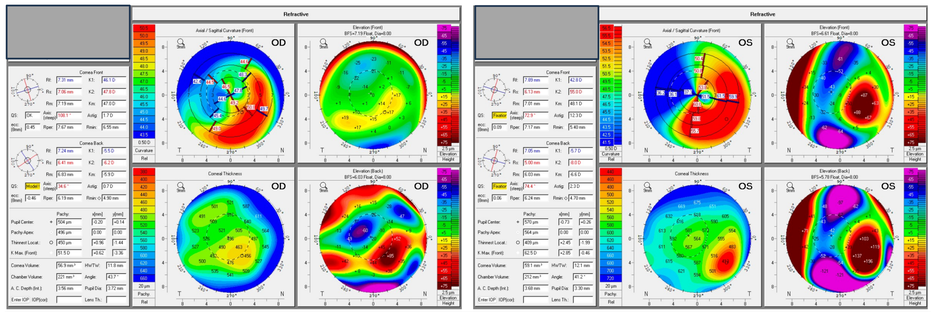

Figure 1: Topography shows irregular astigmatism across the surface of the corneal transplants and very flat areas ST-T OD, SN-N OS to very steep areas SN-I OD and ST-I OS.

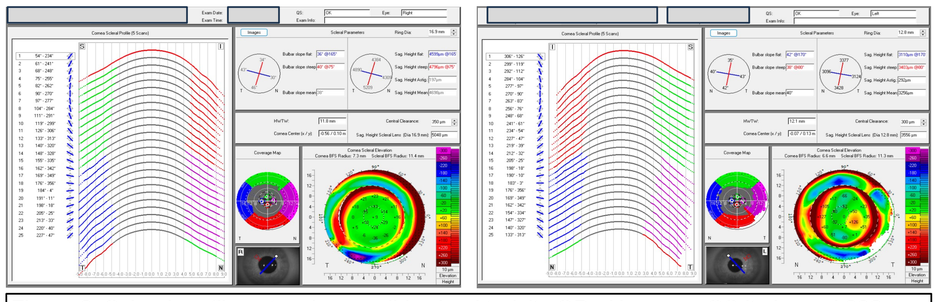

Figure 2: Scleral profilometry shows mild scleral toricity OD. However, OS it showed 292 microns of elevation difference at 12.8 mm chord, suggesting bielevation would be helpful.

Figure 3: Anterior segment imaging shows the very thin superior nasal limbal clearance in both eyes at first follow up visit. OD (left), OS (right).

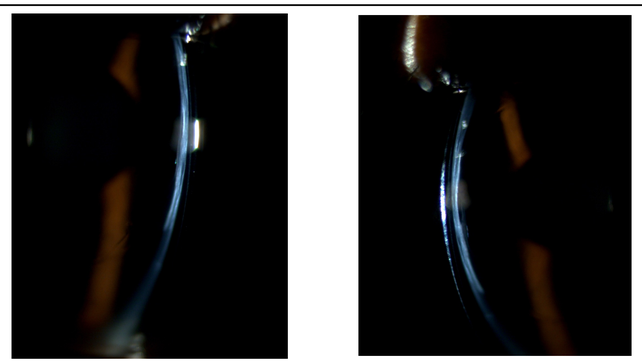

Figure 4: Anterior segment imaging shows adequate superior nasal limbal clearance in both eyes at final visit with redesigned lenses. OD (left), OS (right).

RESULTS

New lenses were ordered and dispensed to the patient. The redesigned final lens parameters are shown in the table below.

Final Lens Parameters

	Lens	Overall Diameter	Sagittal Depth	Base Curve	Power	CT	APS
OD	Zen	17.0 mm	4.90 µ	9.33	+2.75 - 0.75 x 022	450 µ	flat3/steep3
OS	Zen	16.0 mm	5.05/4.95 µ	7.30	-7.00 sph	350 µ	st1/st2/f3/st4

After redesigning the lenses, the patient reported good comfort and no redness or irritation after lenses were fully settled. After these corrections, the lenses had improved centration, adequate limbal clearance especially SN, and appropriately aligned edges. A spherocylindrical over-refraction was performed OD, and a spherical over-refraction was performed OS. BCVA was 20/20 OD and 20/25 OS. The lens edges OS were chosen based on profilometry data.

DISCUSSION

In order to correct for limbal blanching, the limbal clearance or the overall sag can be increased. However, in this case, just altering those parameters was not enough to improve limbal clearance and comfort. Decentered transplants make it difficult to ensure adequate clearance and centration across a lens due to increased irregular astigmatism across the corneal surface. The initial follow up for the first set of lenses showed good central clearance but thin SN limbal clearance OS >> OD and touch at G-H junction OS. Profilometry was then used to determine if bi-elevation would be helpful and what the optimal edge design could be. The OS scan in Figure 2 showed significant elevation difference at the 12.8 mm chord which indicates the need for bielevation with a 16 mm lens. The 100 microns of bielevation gave optimal clearance over the SN GHJ. The data farther out was useful to come up with a custom quad edge design. Both of these features improved fit, comfort and centration of the lens, which resulting in resolution of redness with wear.

CONCLUSION

Scleral lenses are an excellent option for patients with increased irregular astigmatism post-transplant. Dual sagittal depth adjustments to lens designs can improve centration and resolve touch over the graft-host junction in such patients. Close monitoring of patients wearing scleral lenses post-transplant at follow up visits is required to decrease likelihood of patients experiencing ocular redness, irritation, or signs of transplant rejection.

Acknowledgments

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