Scleral Lens Fit for Keratoconus Status Post Penetrating Keratoplasty.

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INTRODUCTION

Keratoconus is a progressive corneal ectasia that causes the cornea to lose its structural integrity and deform into a conical shape. This process induces many vision problems including irregular astigmatism and higher order aberrations. In many patients with keratoconus spectacles are not a viable means of visual correction as these cannot adequately correct for irregular astigmatism or higher order aberrations. Traditionally patients with keratoconus are fit in contact lenses and scleral lenses offer an excellent mode of vision correction for this form of corneal ectasia. Scleral lenses can vault a warped or irregular cornea and create a new spherical refractive surface at the front of the eye correcting both irregular astigmatism and higher order aberrations. Furthermore, a significant percentage of patients with keratoconus must undergo corneal transplant procedures such a penetrating keratoplasty (PK) when contact lenses can no longer be tolerated. This often leaves an irregular corneal surface after the procedure is complete. Patients who have undergone PK benefit from scleral lenses for the same reasons mentioned above. In this case we see a patient with keratoconus OU and status post PK OD successfully fit in scleral lenses with dramatic improvement in visual acuity.

CASE STUDY

OJ is a 39 year old Caucasian male veteran. OJ's medical history is significant for keratoconus OU and he is status post PK OD in 1996. He also has type II diabetes mellitus for
which he takes metformin 1000mg PO BID. OJ was referred to the specialty contact lens clinic for scleral lens fit due to poor best corrected visual acuity with spectacles. The findings of his exam with the referring doctor can be seen below (the patient’s posterior segment findings were unremarkable for the purposes of this case study and have been left out):

POH:  Keratoconus OU s/p PK 1996 OD  
corneal graft OD

Ocular meds: None  
PMH: Diabetes

VAcc: OD: 20/400 PH 20/80-1  
OS: 20/30-2

MRx: no improvement

IOP: Tp: 11, 15  
Ext: wn1 OU  
EOM: Full OU  
Pupils: pharm dilated

SLE:  
L/L: wn1 OU  
C/S: white and quiet OU  
K: OD: PK w/ areas of sub epithelial scarring temporally and nasally. Slight neovascularization of graft temporally and nasally  
AC: deep and quiet OU  
I: Round and Regular OU  
L: ts NS OU

A/P:  
Keratoconnus OU s/p PK 1996 OD  
- some epithelial scarring and neovascularization of the graft  
- Possible that contact lens will improve vision and will refer for fit

RTC to specialty CL clinic for possible contact lens fitting

The patient presented in the specialty contact lens clinic. The patient stated that he had tried RGPs in the past but was unable to tolerate them due to discomfort. The patient was educated about the benefits of scleral lens technology and the fitting was performed using an Essilor Jupiter fitting set, the findings can be seen below:

C/C: Pt here for scleral lens fit.

DIAGNOSIS: KCN OU s/p PK OD 1996

Previous form of correction used: specs/RGPs

O: VA  
OD: 20/150-1  
OS: 20/30-2  cc habitual specs
Habitual Rx OD: -4.50 -1.50 x 128
OS: -0.50 -1.25 x 085

Subjective Rx OD: -5.50 -1.50 x 130  20/100-1  PH: 20/50
OS: -1.00 -1.75 x 080  20/30  niph

SLE
L/L: clear ou
CONJ: clear ou
CORNEA: PK w/ areas of sub epithelial scarring temporally and nasally.
Fine neovascularization of graft superior and inferior
A/C: deep/quiet   ANGLES:4
IRIS: normal ou, -nvi

PREVIOUS CL INFORMATION:  None

TRIAL LENS #1
OD: Lens company: Essilor Jupiter
Power: -8.00
Base Curve: 48.01
Diameter: 15.6
Assessment: Good corneal vaulting approx 1 CCT, shallow vaulting nasal limbus and will want to use reverse geometry on order, temporal edge lift and need to steepen periph curves
Over-refraction: -0.25 sph  20/25-2
over Ks: 41.50/42.00 @180

OS: Lens company: Essilor Jupiter
Power:-8.00
Base Curve: 48.01
Diameter: 15.6
Assessment: Good corneal vaulting approx 1+ corneal thickness, acceptable limbal
Clearance, notable blanching inf/temp/nasal
Over-refraction: -1.50 sph  20/25+1

A: Good comfort and visual improvement with Scleral Lenses.
P: Pt very motivated to be fit. Contact Essilor with trial lens parameters and adjustments to order custom lens. Will contact patient when order arrives from lab.

When the custom lens order arrived back from the lab the patient returned for the fit to be assessed. The lens parameters and the exam findings were as seen below:
O: VA OD: 20/150-1 cc with glasses
OS: 20/30-2

Habitual Rx OD: -4.50 -1.50 x 128
OS: -0.50 -1.25 x 085

SLE
L/L: clear ou
CONJ: clear ou
CORNEA: PK w/ areas of sub epithelial scarring temporally and nasally.
Fine neovascularization of graft superior and inferior
A/C: deep/quiet ANGLES:4
IRIS: normal ou, -nvi

CL INFORMATION:
OD: Lens company: Jupiter Reverse Geometry
   Power:-6.25
   Base Curve:7.34
   Diameter:15.6
   Over Ks: +40.00/40.50 x 077
   Over ref: plano 20/40 +1.25 sph 20/25
   Assessment: Good corneal clearance, good limbal clearance, no significant blanching.

OS: Lens company: Jupiter
   Power:-9.50
   Base Curve: 7.03
   Diameter: 15.6
   Over Ks: +40.75/41.25 x 015; second measurement +41.00/41.25 x 040
   Over ref: plano 20/30-1 ; +1.25 -1.00 x 030 20/25+2
   Assessment: Good corneal clearance, good limbal clearance, no significant blanching.

EDUCATION DISCUSSION INCLUDED:
[x] Importance of cleanliness, hand washing, clean storage case, etc
A: Good fit/comfor/vision in scleral CLs. Insertion and removal training completed, solution ordered and samples of Boston and Clear Care given.

P: Will contact lab to re-order with over-refraction adjustment. Discussed making polycarbonate specs at next visit with the astigmatic component of the over-refraction OS (if repeatable with new CLs), patient agrees this is a good idea.

The patient was sent home wearing the initial pair of lenses. The lab was contacted and a remake was ordered to compensate for the findings of the initial fit. The lens parameters and exam findings of the final fit can be seen below.

<table>
<thead>
<tr>
<th>Quantity</th>
<th>Code</th>
<th>Design</th>
<th>Material</th>
<th>R</th>
<th>Rs</th>
<th>Ab</th>
<th>Sph</th>
<th>Cyl</th>
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<tbody>
<tr>
<td>OD</td>
<td>1</td>
<td>SCL1</td>
<td>Jupiter 15.6 / 8.6 Rev</td>
<td>Tyro-97 SCL Light Blue</td>
<td>5.50</td>
<td>5.00</td>
<td>15.60</td>
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OD: Lens company: Jupiter Reverse Geometry
Power:-5.00
Base Curve:7.34
Diameter:15.6
Over ref: plano 20/25+2
Assessment: Good corneal clearance, good limbal clearance, no significant blanching. Patient states good comfort.

OS: Lens company: Jupiter
Power:-8.50
Base Curve: 7.03
Diameter: 15.6
Over ref: plano 20/20
Assessment: Good corneal clearance, good limbal clearance, no
significant blanching. Patient states good comfort.

Near vision through CLs 20/20 OU

Safety specs for over CLs:
OD: plano sph
OS: plano sph Polycarb/Transitions

Rx specs: (based on 07/11 refraction)
OD: -5.00 -1.50 x 130
OS: -0.75 -1.75 x 080 DVO/trivex/trans/AR

EDUCATION DISCUSSION INCLUDED:
[x] Importance of cleanliness, hand washing, clean storage case, etc
[x] Insertion of contact lens and removal
[x] Cleaning regimen
[x] Contact lens replacement schedule
[x] Contact information in case of emergency or concerns.
[x] Limitations of contact lenses

A: Good fit/comfor/vision in scleral CLs.

P: Release todays scleral CLs, previous pair to be used as backup. RTC 3 mo for anterior seg check or earlier if needed, CL hygiene reviewed.

At the three month follow up the patient was happy with his scleral lenses and noted comfortable wear time of 12 hours or more per day. The patient also noted dramatic improvement of his visual acuity. There were no adverse effects noted on examination. Photographs of the scleral lens fit for this patient are seen here:
DISCUSSION

This case exemplifies how scleral lenses can be successfully fit on eyes with keratoconus and eyes that are status post PK. OJ experienced dramatic visual improvement in scleral lenses when compared to spectacle correction. Scleral lenses can correct for irregular astigmatism and higher order aberrations where spectacle lenses cannot. It is also notable that in this case RGP fits had been attempted in the past and had failed due to the discomfort of the lenses. When RGPs cannot be tolerated scleral lenses can offer superior comfort and prove effective.5

CONCLUSION

Scleral lenses are an excellent mode of vision correction for keratoconic and post keratoplasty corneas. Scleral lenses can be used to achieve a comfortable fit when RGPs are not tolerated.

REFERENCES