Case Report: Successful Semi-Scleral contact lens fitting after Penetrating Keratoplasty

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Abstract

Rigid gas permeable scleral contact lenses are a unique tool in the visual correction of corneal irregularities. This case shows how a scleral contact lens was used to best correct vision after Penetrating Keratoplasty (PKP).

Case History

A 67 year old white male presented to the Salt Lake City VA Hospital for a contact lens fitting of his right eye. He was referred to our clinic by the Ophthalmology services at the VA hospital after Penetrating Keratoplasty of the same eye.

The ocular history for this patient was extensive and intriguing. He underwent cataract extraction with anterior chamber intraocular lens (AC IOL) implantation in 1981. He later suffered a retinal detachment in the same eye in 1998 that was successfully repaired. In 2008 he was diagnosed with Psuedophakic Bullous Keratopathy (PBK) secondary to AC IOL complications. After extensive follow up and medical therapy without resolution, an IOL exchange surgery was performed and an iris sutured IOL was inserted. Complications from the surgery caused hyphema and elevated intra ocular pressures that reached up to 50 mm hg. Maximum IOP lowering medical therapy was introduced and the pressure was stabilized. Non-resolving descement’s folds and corneal edema persisted for months. Descement’s Stripping Endothelial Keratoplasty (DSEK) was then performed the same year with no significant improvement in corneal swelling. Therefore, a Penetrating Keratoplasty (PKP) was performed followed by stitch replacement one month later due to non healing corneal defects.

The patient’s ocular medications included Pred Forte, Dorzolamide, Brimonidine, and Travatan. Significant systemic health history showed previous myocardial infarction and bypass surgery.

Pertinent Findings

The patient’s entrance visual acuity's with spectacles was 20/400 OD and 20/40-OS. Manifest refraction produced visual acuity's of 20/50 OD and 20/20 OS, but revealed extreme anisometropia of 7.5 diopters. Significant ocular findings from the
initial visit included a clear 7 mm round graft with mild neovascularization encroaching the graft superior nasally. 2+ SPK was seen centrally. A surgical pupil was noted with an iris stitch nasally to hold the IOL.

Corneal topography measurements revealed 1.75 Diopters of astigmatism OD with a very irregular surface. A Dyna Intralimbal rigid gas permeable (RGP) trial contact lens was chosen for the initial fit. The fit showed central apical touch with slight touch superiorly and temporally to the edge. The lens de-centered temporally, with the visual axis within the optic zone (OZ). Greater than average edge lift including edge standoff was seen inferior and nasal. The unique Quad-Sym design of the Dyna lens was utilized to steepen and flatten quadrants 1 through 4 to create a better peripheral fit. A new lens was ordered with the proper changes to the lens power from the spherical over refraction.

At the dispense visit the contact lens showed mild inferior temporal centration. Apical touch was seen centrally with excessive edge lift inferiorly, temporally and nasally. The lens fell out 3 times during the exam. A spherical over refraction of -1.25 demonstrated visual acuity of 20/40+. The base curve was subsequently steepened and diameter decreased. Again, the 4 quadrants were adjusted to improve the peripheral curve fit.

The new lens again showed slight inferior temporal centration. There was moderate pooling mid-peripherally. Adequate edge lift was seen superior and nasal with light apical touch on the central cornea. By observing the 3-9 o’clock markings of the lens it was observed that there was about 30 degrees nasal rotation. Overall the fit was acceptable. 1+ SPK was seen throughout the graft. Visual acuity was still 20/40 with the over refraction. The lens was dispensed to the patient but fell out in the parking lot and was lost.

Diagnosis

Due to the difficulties of keeping the lens in the eye and the severe irregularity of the cornea causing uncorrectable edge lift, the decision was made to attempt a larger diameter lens to vault the irregularities of the cornea while decreasing the risk of the lens falling out. The patient was trial-fit with a 14.5 diameter semi-scleral RGP lens with a 7.90 (42.62) B.C. The fit showed inferior edge standoff, hard apical touch, and limbal pooling. The second trial was about 2.5 diopters steeper with B.C of 7.50 (45.00). Inferior stand-off was still present but only light apical touch centrally. The third trial was steepened another 2.5 diopters to 47.50 (7.10mm). This fit demonstrated light apical clearance, no standoff 360 degrees, moderate edge clearance, and no blanching of the conjunctival vessels. A spherical OR of -12.75 DS gave a VA of 20/30-2. The patient was very enthusiastic about the vision and comfort of the scleral lens and was excited to try the lens.
Discussion

Penetrating Keratoplasty (PKP) has become the most frequent form of transplantation in the United States over the past 30 years.\(^3\) Many advancements in technology have increased the efficacy and longevity of this procedure. It has been shown that PKP is an effective and safe long-term treatment for anterior segment pathology with graft survival rates over 10 years up to 85\%.\(^3\)

One of the most common primary indications for PKP in the U.S is pseudophakic bullous keratopathy.\(^2\)-\(^4\) Although the overall survival rate is good, the visual improvement is often poor.\(^2\) Resultant visual acuity after PKP is affected the most when the procedure is performed secondary to PBK from AC IOL. In fact, studies show that the most important negative prognostic factors for visual acuity after PKP were concomitant ocular pathology, history of AC IOL, and long interval between AC IOL surgery and the development of bullous keratopathy.\(^2\)

Treatment

There are limited options for the correction of poor residual visual acuity after PKP surgery. Surgical options include repeat PKP or refractive surgery. The only non-surgical option is the use of rigid gas permeable contact lenses which have been shown to be very successful.

Scleral contact lenses are an excellent tool in the treatment of corneal irregularity and corneal surface disorders including corneal grafts. These lenses offer two unique advantages. One is the fact that they are supported by the sclera and can therefore be fitted on eyes with extreme corneal irregularity. Secondly, the aqueous reservoir between the lens and the cornea neutralizes most of the irregular astigmatism and protects the corneal surface.\(^1\)

Conclusion

Today’s varied representation of ophthalmic refractive procedures has presented unique challenges to the contact lens prescriber that is given the task to manage irregular and often extreme corneal topographies. This often requires the trial of several different contact designs with some providing success on one patient while not being successful on another. Scleral contact lenses are a powerful tool to help patients see better and improve quality of life.\(^1\) In the case of our patient, a better than expected outcome was found. He was at high risk of poor visual acuity due to previous ocular pathology, AC IOL removal and a long period of time between the AC IOL surgery and PBK. It is becoming increasingly important for eye care professionals to understand the benefits to scleral contact lenses for PKP as well as many other corneal irregularities.

