

Case Study: Contact Lens Fitting in the Presence of Corneal Ectasia Post Penetrating Keratoplasty and Cataract Surgery

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Abstract

Keratoglobus (KG) is a bilateral corneal ectasia characterised by overall protrusion of the cornea associated with diffuse thinning from limbus to limbus. Differential diagnosis includes pellucid marginal degeneration (PMD) and keratoconus (KC). KG is rare in comparison to the prevalence of KC and PMD. Refractive error management in patients with corneal ectasia post penetrating keratoplasty should aim to achieve a best corrected visual acuity better than 6/12. Spectacles, soft lenses, hard lenses and scleral lenses are all viable options for refractive error management in the presence of corneal ectasia. A smooth regular refractive surface is important for one to obtain good VA. The use of intraocular lens implants to correct the ametropia allows for more options in post-surgery management of patients with corneal irregularities as less complex prescriptions are more affordable and available in more options compared to high toric prescriptions. It is important for practitioners to continue to try new methods of managing the non-standard patient for best visual outcomes. It will be beneficial for additional research to be carried out in the management of patients with corneal ectasias post cataract surgery to document what methods give best visual outcomes and high patient satisfaction.

Keywords: Hard lenses; Rose K2 IC; Keratoglobus, Corneal ectasia

Introduction

A 54 year old female patient attended our optometry practice for an eye exam having been referred by her Ophthalmologist (Oph) for refractive error management post right eye (RE) cataract extraction. She is complaining of poor near vision and discomfort out of her left eye (LE). She is a married mother of three and works in the judicial system. Her working life does not leave much time for hobbies but she does enjoy spending time with her family and does a lot of reading.

Case history

- Documented history of Keratoglobus diagnosed in her mid-20's.

- Recurrent ocular allergies and anterior uveitis flare-ups which have been managed with topical and subconjunctival steroids.
- Successful bilateral penetrating keratoplasty; RE in 2004 and LE in 2005.
- Uneventful cataract extractions; RE 2016 LE 2005
- Patient has had YAG laser treatments in both eyes post cataract removal
- Currently using a rigid gas permeable lens in the LE
- Patient is otherwise in good health and not taking any other medications.

Refraction

	RE	LE
Unaided VA	0.05	CF
Subjective Rx	+2.00/-6.00 X 15	-0.75/-5.25 X 60
Aided VA	0.2 ⁺²	0.4 ⁺²

*Best corrected binocular VA is 0.4⁺¹

*Reads N6 with a +2.50ADD at 25cm

*No improvement with pinhole OU

*VA measured using an LCD decimal chart

Slit-lamp examination

	RE	LE
HVID	12mm	12mm
IPAH	10mm	10mm
Pupil diameter	5mm photopic; 7mm mesopic	5mm photopic; 7mm mesopic
Conjunctiva	G2 hyperaemia	Mild Giant papillary conjunctivitis
Tear assessment	2 sec TBUT; 0.2mm TMH	3 sec TBUT; 0.2mm TMH
Cornea	KP's, graft scars visible, G2 Fluorescein staining	KP's, graft scars visible, G1 Fluorescein staining
Keratometry (Automated Huvitz HRK 7000A)	7.88/42.75 along 18 6.85/49.25 along 108 Distorted mires	6.05/55.75 along 19 7.21/46.75 along 109 Distorted mires
Average K's	7.37/46.00	6.63/51.25
IOL	Pseudophakic	Pseudophakic
I-CARE Tonometry at 13:26	11mmHg	15mmHg

*Patient topography maps and measurements have been stable for the last six years showing no progression of the condition.

Management Differential

1. **Spectacles:** the aided visual acuity achieved of 0.4⁺¹ is unsatisfactory for her daily needs

and falls short of the minimum driving standard of 0.5 best corrected visual acuity (BCVA). In addition, the use of separate pairs was not an option and the patient was also not keen on working through the adaptive learning period required for the use of progressive lenses.

2. **Soft contact lenses:** the noted dry eyes, history of recurrent infections and susceptibility to ocular allergies makes them an unsuitable candidate for soft lens use. The steep Keratometry readings and high cylindrical requirement in the prescription also rule out the use of readily available soft contact lenses. Although conventional specialised soft lenses made for steep corneas such as the Soflex Soft-K are available on the market, the higher cost and the relative increased risk of infection associated with soft lenses¹ leaves them unsuitable for this patient.
3. **Hard lenses:** the availability of many different types ranging from regular rigid gas permeable lenses to specialised toric lenses makes hard lenses the most viable option. The fact that the patient is familiar with the use of hard lenses is an added advantage as it reduces the adaptation time required compared to first time wearers.
4. **Scleral lenses:** scleral lenses are available in many different parameters and offer added comfort and protection to the ocular surface making them another viable option for this patient. However scleral lenses are considered high maintenance due to the need of daily saline vials in addition to the cleaning system.

Contact Lens Fitting

Specialised hard lenses made for corneal irregularities were considered first due to availability. The Rose K2 IC fitting set was used as the large diameter and larger optical zone was expected to give the best visual performance in a patient with Keratoglobus. The large total diameter would also serve best to vault the host/donor junction.

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- RE first lens choice was 0.2mm steeper than avg. K at base curve 7.20
- LE first lens choice was equal to avg. K at Base curve 6.60

The first lens choice was made per Rose K fitting guidelines. An optimum fit was achieved in both eyes with the following parameters;

	RE	LE
Power	+0.50DS	-9.00DS
Base curve	7.10	7.0
Total diameter	11.4	10.8
Edge lift	Standard reduced	Standard reduced
BCVA	0.8 ⁺¹	1.2 ⁻¹

The above mentioned Rose K2 IC lenses were dispensed. The patient was able to read N5 print at 40cm with +2.00DS reading glasses.

Discussion

Keratoglobus (KG) is a bilateral corneal ectasia characterised by overall protrusion of the cornea associated with diffuse thinning from limbus to limbus. Differential diagnosis includes pellucid marginal degeneration (PMD) and keratoconus (KC). KG is rare in comparison to the prevalence of KC and PMD. It is present from birth whilst KC tends to present in the early teens and PMD presents much later. To accurately differentiate KG from KC a slit lamp exam, full corneal thickness map, anterior curvature map and anterior tomography elevation map is required^{2,3}. Histopathologic findings are similar in KC and KG both being characterised by higher levels of degradative enzymes and reduced levels of protease inhibitors^{2,4}. KG often has disruption of

the Bowman's layer; it may even be absent, and maximal thinning at the periphery⁴. KC is characterised by para-central corneal thinning.

A previous publication on fitting corneas post-keratoplasty stated that scleral lenses, small diameter RGP's and reverse geometry hydrogel lenses were the only contact lens options suitable for corneas exhibiting extreme protrusion⁵. The good visual outcome achieved with the use of specialised hard lenses such as the Rose K2 IC used above suggests that there are now more options available to manage patients with corneal ectasias post-surgery. The large diameter resulted in good lens centration on the cornea and good comfort.

Although this patient could have been dispensed a pair of glasses as her BCVA was significantly better than her unaided VA, it was important that we tried to achieve a better VA not only to meet the driving standards but to help the patient maintain a higher quality of life (QoL). A previous study which related measured BCVA to QoL found that the participants that measured the lowest in QoL also had the lowest BCVA and it was particularly significant when the BCVA was less than 6/126. It was therefore important for us to achieve a BCVA better than 0.5.

It was interesting to note that the RE VA significantly improved with the introduction of the contact lens despite it having very little corrective power. This further highlights the importance of a smooth regular refractive surface for one to obtain good VA. The use of intraocular lens implants to correct the ametropia allows for more options in post-surgery management of patients with corneal irregularities as less complex prescriptions are more affordable and available in more options compared to high toric prescriptions.

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Conclusion

It is important for practitioners to continue to try new methods of managing the non-standard patient cases for best visual outcomes. It will be beneficial for additional research to be carried out in the management of patients with corneal ectasias post cataract surgery to document what methods give best visual outcomes and high patient satisfaction.

Disclosure

The authors have no proprietary or commercial interest in any materials discussed in this article.