



Transitioning from Small Diameter Gas Permeable to Scleral Lenses

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Background

Keratoconus is a progressive corneal irregularity characterized by central steepening and consequent irregular astigmatism and visual distortions that reduce acuity. In some cases, the condition leads to deep scarring, acute corneal hydrops, intolerance of contact lenses and poor candidacy for intrastromal ring segments, resulting in the need for a penetrating keratoplasty (PKP).¹⁻² After the procedure, irregular astigmatism and anisometropia often remain in many patients as a result of trephination misalignment, scarring, suture tension or irregular corneal shape.³ Scleral lenses made of polymethmethacrylate (PMMA) were first attempted in the 1960s but fell out of favour due to the poor oxygen transmission of that is critical for corneal health.³ With the advent of more oxygen permeable lens materials, there has been an increased use of scleral lenses for post-PKP corneas.⁴

Case Summary

History:

CW is a 67 year old white male presenting as a referral to be refit in contact lenses. He has a longstanding history of wearing small diameter rigid gas permeable (RGP) lenses OU to correct his keratoconus and the irregular astigmatism that resulted from PKPs OU in 2003. Cataract surgery was performed OU in 2007.

Manifest Refraction:

OD: -10.00-4.00x120 20/100
OS: -1.75-4.25x010 20/60

Habitual RGP Vision

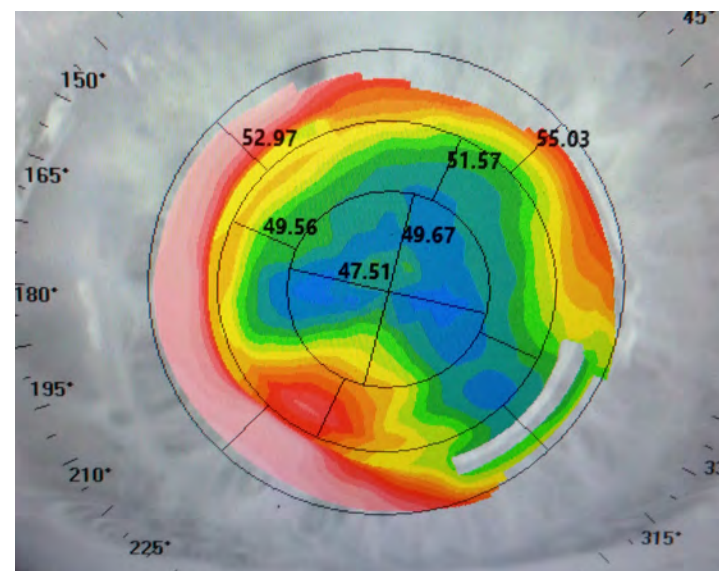
OD: 20/200
OS: 20/30

Slit Lamp and Fundus Exams:

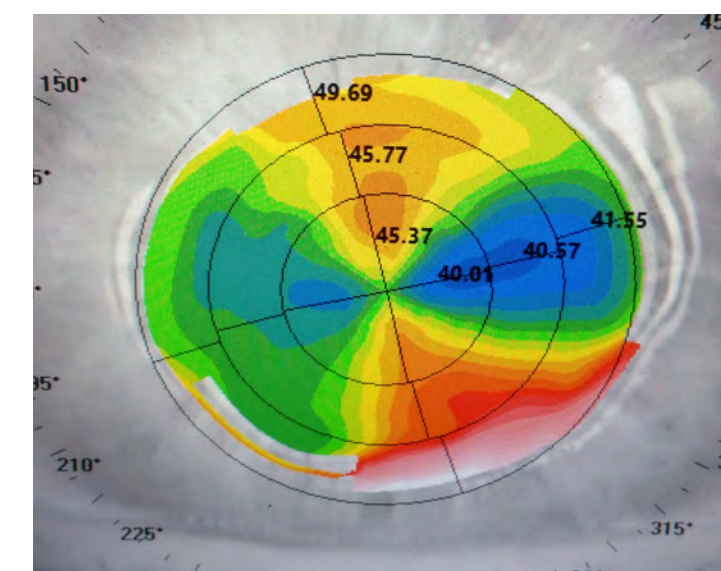
Clear corneal grafts OU, superior laser peripheral iridotomy OD and centred posterior chamber intraocular lens OU with a 3+ posterior capsular opacification (PCO) OD only.

Corneal Topography (Axial View):

OD: 47.51/49.67 @078



OS: 40.01/45.37 @103



Contact Lens Fitting:

CW reported issues with vision and comfort in his current lenses, including frequent occurrences where the lenses fell out of his eyes. After assessing the RGP's, both had many scratches, the right lens had excessive movement and edge lift and the left lens had apical bearing. An appointment was made to address the PCO and we started a scleral lens fit to address his complaints in the meantime. An oblate design *Zenlens* was chosen to address the post-PKP plateau-shape corneas OU. Diagnostic lenses were examined for adequate limbal and graft-host junction clearance in addition to central vault. The right lens fit adequately except for minimal central clearance. The left lens fit well with trace edge lift nasally, which CW did not feel. After over-refraction (ORx), his BCVA's were 20/60 OD and 20/20 OS. CW reported significantly improved comfort and vision compared to his old RGPs. Lens powers were adjusted OU and central clearance was raised OD. At **dispense**, vision was 20/30⁻² with plano ORx OD and 20/25 with +0.50DS ORx OS. The lenses fit well and were released. After **two-weeks**, CW remained content with vision and comfort all day but BCVA was 20/50 OD, 20/30 OS with plano ORx's. Nasal limbal touch was seen OU, so limbal clearance was raised. At **five-weeks**, CW started to notice debris build up after 12 hours of wear time. BCVA was 20/60 OD, 20/25-2 OS and limbal clearance was now adequate. Mild internal debris seen on examination but no adjustments were made since debris was only noticed near the time of lens removal and the lenses were finalized. However, he was instructed to remove, rinse and re-insert the lenses should the debris affect vision or bother him. **Two months** later, CW returned after the Nd:YAG Capsulotomy procedure with a new BCVA of 20/30 OD. No over-refraction was performed, as he was very happy with the vision. We discussed biannual follow-ups to monitor the health of his grafts under the lenses.

Discussion

This case demonstrates the importance of discussing all available correction options with patients, especially if there are complaints with their current lens modality or they have not heard of newer methods like scleral lenses which was the case with CW. Fitting small diameter RGPs onto irregular corneas have a greater chance of mechanical interactions that can lead to trauma and inflammation.⁴ Use of refractive surgery can cause perforation, haze, rejection and scarring due to the amount of energy needed for treatment.⁴ Scleral lenses are commonly cited as a great method of correction for post-PKP irregular astigmatism compared to hydrogel lenses.⁴ The *Zenlens* was chosen for its availability as an oblate design, larger diameter and ease of fitting. Limbal and graft junction vault adjustments are easily made, which is critical in these patients. Boston XO2 material was chosen for its high oxygen permeability to minimize risk of graft failure from corneal hypoxia.⁴ The decrease in BCVA at later visits was likely due to eccentric viewing or squinting. The improvement in BCVA OD after CW's YAG Capsulotomy shows that lenses can be fit prior to this procedure being done without needing subsequent lens changes.

Conclusion

Despite CW having severe KCN that necessitated PKPs OU, he was successfully fit into a lens modality that offered an improvement in vision and comfort as compared to his habitual lenses. Although small diameter RGP lenses remain a viable option to correct oblate corneas, the increased possibility of graft complications warrants the discussion for a potential switch to scleral lens correction. In an ideal fit of a scleral lens, the patient would be happy with both vision and comfort, there would be optimal clearance above the graft-host junction balanced with adequate central clearance to lower chances of edema, hypoxia and mechanical trauma. A bonus benefit from scleral lenses is the ability to treat any iatrogenic ocular surface disease from the PKP procedure.

References

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