

Customized Rigid Gas Permeable lens fitting for keratoconus

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Abstract: Keratoconus, a non-inflammatory ectatic disorder of the cornea, with corneal thinning and distortion resulting high degree of irregular myopic astigmatism. To best correct patients' vision with keratoconus, one would require Rigid Gas Permeable contact lens. Due to the distorted shape of cornea, the correction of keratoconus remains one of the most difficult challenges in the art of contact lens fitting. In this paper, we trialed and fitted a newly diagnosed bilateral keratoconus patient with many different parameters in order to reach a final appropriate lens design for maintaining the patient's minimum binocularity and improving his visual acuity as much as possible. The patient was in his early 30's with no previous knowledge of keratoconus and came in to our center for a pre-Lasik evaluation. Diagnosis of the disorder was confirmed by axial map and ring verification of corneal topography. The final treatment of course included special designs of rigid gas permeable lenses for both eyes. Patient was very impressed with result which allows his vision to improve 4 lines in both OD and OS on the vision test chart.

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1. Introduction

Keratoconus is a slowly progressive non-inflammatory disease of the central cornea which causes central stromal thinning, apical protrusion, and irregular astigmatism.¹ The loss in vision can range from mild to severe. The management for keratoconus can be spectacle correction, rigid gas permeable contact lens fitting or penetrating keratoplasty. The mode of management depends on the severity of the condition. The spectacle correction is for early stage of the condition when the protrusion of the cornea is still insignificant, whereas penetrating keratoplasty is the final option when rigid gas permeable contact lens can no longer provide adequate vision or tolerated by the patient. With the advanced technology in contact lens design today, we can now fit successfully for most of keratoconic eyes.

This report discusses the management of rigid gas permeable lens fitting for a newly diagnosed bilateral keratoconus patient.

2. Material and Methods

Best corrected visual acuity was done by using Topcon phoropter. Documenting ectatic condition was done by Dicon topographer (Paradigm Medical, USA) and keratometry reading via Topcon keratometer. Contact lenses used are keratoconus lens and traditional 4-curve spherical rigid gas-permeable lens, both from Hiline Optical Company in Taiwan.

3. Results

A 30 year old Asian male with unremarkable health condition presented for a pre-Lasik evaluation. The patient never wore any spectacle or contact lens. There was no chief complain except that he noticed his vision is not as good as it used to be. The test result was as follows:

Manifest refraction:

OD: -1.25-3.00X090 20/400 Pinhole: 20/60-

OS: -3.25-3.50 X100 20/40 Pinhole: 20/30+

HVID 12.2, OU, Palpebral Aperture 8.5 mm, OU

Keratometry:

OD: 56.75 @039/62.75@129 corneal astigmatism: 6.00 D.

OS: 38.50@104/41.87@014 corneal astigmatism: 3.37 D.

Corneal topography were done to both eyes and the maps revealed inferior protrusion in the lower 1/3 of both corneas, with OD being much worse than OS (Fig. 1).

Keratoconus were diagnosed for both eyes. After several trial lens fittings, the following lens specifications were determined.

• OD:

6.15/-13.75/8.7 20/50 Hine Keratoconus lens, with peripheral curve loosen by 0.1mm in radius (Fig. 2).

• OS:

7.55/-7.00/9.0 20/30 Hine 4-curve spherical lens, with peripheral curve loosen by 0.4 mm in radius (Fig. 3).

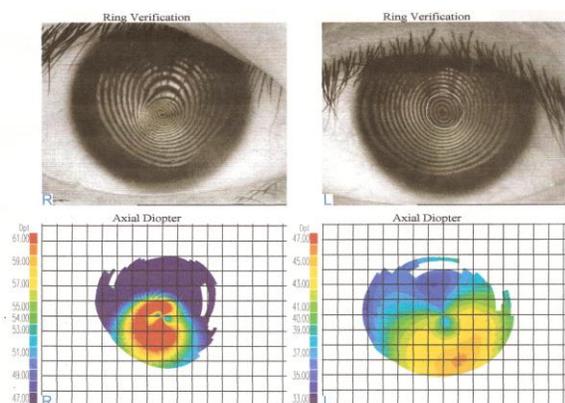


Fig. 1 keratoconus OU, OD worse than OS.

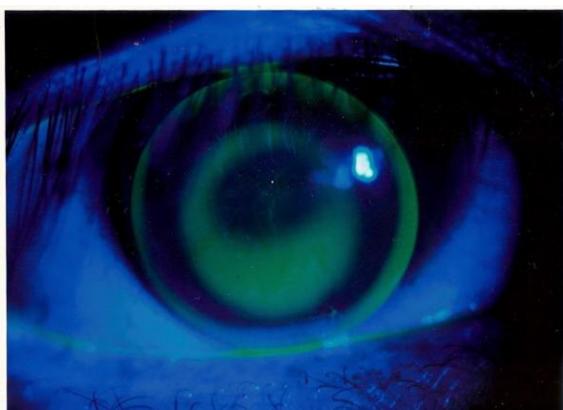


Fig. 2 OD with lens parameter of 6.15/-13.75/8.7 PC -0.1mm

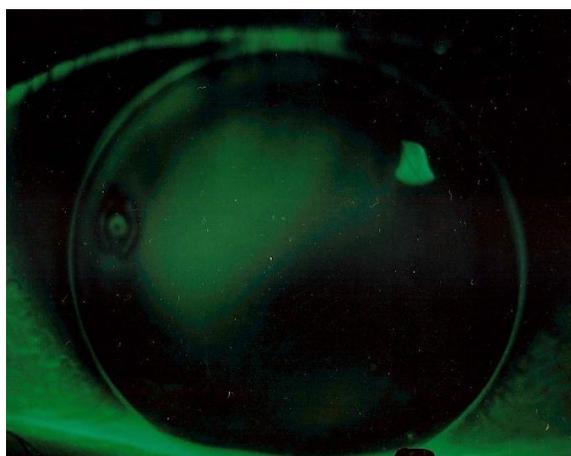


Fig. 3 OS with lens parameter 7.55/-7.00/9.0, PC -0.4mm

First follow up visit:

3 days after the initial lens fitting, the patient returned for the 1st follow up. The fluorescein pattern of OD showed too much apical compression, whereas OS had very narrow edge lift. Both the fit were

unacceptable to the examiner, although the patient was satisfied with the corrected visual acuities, 20/50 for OD and 20/30+ for OS. The designs of the lenses were changed to

- OD:
6.05/-14.00/8.5 20/50⁺ Hine Keratoconus lens, with peripheral curve loosen by 0.1mm in radius (Fig. 4).
- OS:
7.55/-7.00/9.0 20/30 Hine 4-curve spherical lens, with peripheral curve loosen by 0.7 mm in radius (Fig. 5).

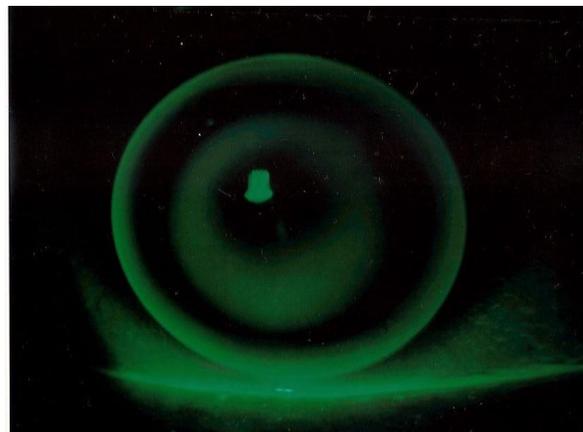


Fig. 4 OD with lens parameter 6.05/-14.00/8.5. PC -0.1mm

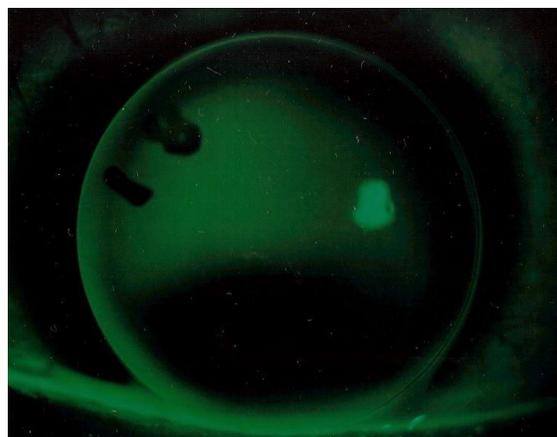


Fig. 5 OS with lens parameter 7.55/-7.00/9.0, PC -0.7mm.

Upon the second follow up visit, both the fit and visual acuity of OD lens was acceptable. The OS fit, however, continued to show an insufficient edge lift at the peripheral curves. A bigger diameter, slightly flatter base curve and much flatter peripheral curves of rigid lens was redesigned to increase the edge lift as much as possible. The new OS lens parameter was 7.65/-7.00/9.2 Hine 4-curve spherical lens, with peripheral curve loosen by 0.9 mm in radius (Fig. 6).

At the 3rd follow up visit, both the OD and OS revealed acceptable fit, with adequate movement, minor decentration, and sufficient edge lift. The rule of three-point-touch was used to finalize the best fit for both eyes. The visual acuities were further improved to 20/40 for OD and 20/25 for the OS. The patient was instructed to continue the lens wear.

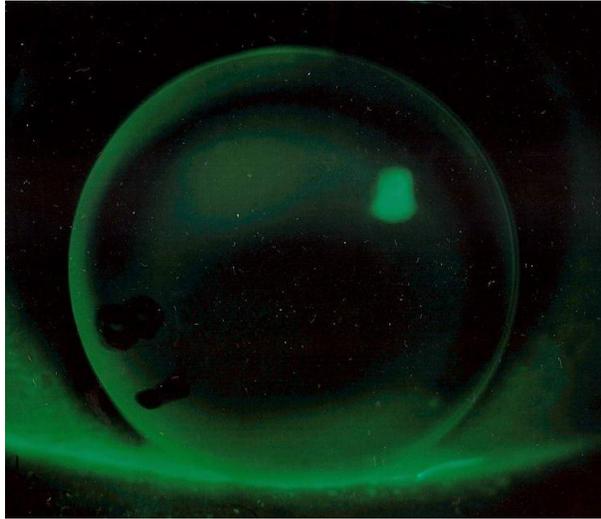


Fig. 6 OS with lens parameter 7.65/-7.00/9.2, PC -0.9mm.

4. Discussion

Keratoconus is a progressive non-inflammatory disease of cornea characterized by thinning, ectasia, distortion and increased curvature of the cornea.^{2,3} The abnormal curvature affects the refractive power of the cornea, resulting in myopia or irregular astigmatism.⁴ Individuals with keratoconus in the advanced stage require a rigid gas-permeable (RGP) contact lens to reduce distortion and provide better vision.^{5,6}

Correction of Keratoconus by rigid lens remains one of the most difficult challenges in the art of contact lens fitting. Given the ectatic condition, to fit the lens on a keratoconic eye, one must overcome the challenges of lens decentration, insufficient or too much edge lift, vaulting of the lens and over-compression at the corneal apex. Any of the area mentioned above is crucial to the success of the lens fitting. For example, decentration of the lens would induce glare and poor visual acuity, insufficient or too much edge lift would cause corneal epithelial desiccation, inadequate tear exchange and air bubble trapped under the lens, over-compression at the corneal apex would no doubt lead to corneal scarring and loss of best corrected visual acuity. In this paper, we described the details the lens fitting parameters at different stages of time in order to show the reader

how important one must try to achieve the best fit possible when it comes to keratoconus fitting.

5. Conclusion

Keratoconus, with incidence of approximately 50 to 230 per 100,000, is seen more often than most eye care practitioners can expect. Due to poor vision of the disorder by spectacle, rigid contact lens fitting remains one the most common mode of treatment for keratoconus. Although the fitting of such disease can be quite difficult, one should not be afraid to try and modify the lens wherever possible until the best fit can be determined.

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