Review of monitoring and management of a progressing monocular keratoconus patient over 5 years

Kuo-Chen Su[1,2], John Ching-Jen Hsiao[1,2,*]

[1] School of Optometry, Chung Shan Medical University, Taichung City, Taiwan
[2] Department of Ophthalmology, Chung Shan Medical University Hospital, Taichung City, Taiwan

johncjhsiao@yahoo.com.tw

Abstract: Keratoconus is a slowly progressive non-inflammatory disease of the central cornea which causes central stromal thinning, apical protrusion, and irregular astigmatism.[1] This paper is the review and follow up article of the management of over 5 years of a 25 years old monocular keratoconic Asian male whose condition continuing worsen during that time. During the 5 years period, the patient's flat K increased by 4.00 diopters and his steep K increased by 5.75 diopters in his keratoconic eye. The corneal topographies revealed the continuing of corneal protrusion and our lens design at different stages of the ectasia are detailed described in this paper. Patient is still under yearly monitoring for his lens treatment and keratoconus condition. [Kuo-Chen Su, John Ching-Jen Hsiao. **Review of monitoring and management of rapidly progressing monocular keratoconus over 5 years.** *Life Sci J.* 2012, 9(4):5247-5250] (ISSN:1097-8135). http://www.lifesciencesite.com.781

Keywords: Keratoconus, Rigid gas-permeable lens, Special lens, Rose- K, Irregular astigmatism

1. Introduction

Keratoconus, with incidence of approximately 50 to 230 per 100,000, is seen more often than most eye care practitioners can expect. The symptoms and clinical sings include distorted vision, monocular diplopia, frequent prescription change, increase myopia astigmatism, distorted keratometry mires, Fleisher's ring, Munson's sign, Vogt's lines, and most important of all, reduced best corrected visual acuity by spectacle. In other words, Keratoconus is a progressive, often asymmetric, non-inflammatory disease characterized by the thinning, protrusion, and scarring of the cornea.[2.]

This report discusses a remarkably rapid progressing keratoconic male, whose ecatatic condition monitored by corneal topographies is detailed here in this paper. Special lens treatment at different stages of keratoconus is given to the patient for maintaining binocularity and improving visual acuity.

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 Rose K design rigid gas-permeable lens for keratoconic eye and traditional tri-curve rigid gas-permeable lens for non-keratoconic eye.

3. Results

July 2004

A 25 year old Asian male with unremarkable health condition visited our center for a complete ocular-visual examination. His chief complaint was seeing blur in his OD. The test result was as follows:

• Manifest refraction:
OD –7.25 –2.75 x 015 6/15^{-} (20/50^{-});
OS –5.75 –1.50 x 160 6/7.5 (20/25)
• Keratometry:
OD 42.25@035 /46.25@125; corneal cylinder: –4.00 DC x 035;
OS 40.25@165 /42.00@075; corneal cylinder: –1.75 DC x 165

The corneal topography showed an inferior area of protrusion of the cornea in the right eye (Fig. 1)[3], and a regular astigmatic pattern in the left eye (Fig. 2)[3]. Keratoconus was revealed at OD. After many RGP trail lens fittings, the following lens parameters were finalized:

OD: 7.45/–7.00/8.90 6/7.5^{-} (20/25^{-}) Rose K rigid gas-permeable lens
OS: 8.25/–5.75/9.80 6/7.5^{+} (20/25^{+}) tri-curve lens.

The parameters specify the lens' base curve, back vertex power, and total lens diameter, respectively. The lenses were ordered and dispensed one week later to the patient together with proper instruction on lens compliance.

Patient was pleased with corrected vision with contact lenses.

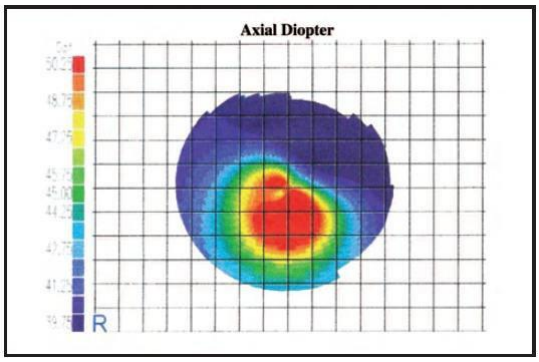

Fig. 1 July 2004: right eye topography at initial presentation, showing keratoconus.

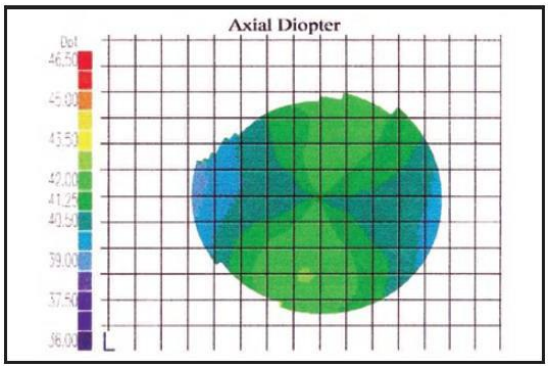

Fig. 2 July 2004: left eye topography at initial presentation.

June 2005

One year later, the patient came back for monitoring of his keratoconus condition and lens refitting because he lost his OD lens. He noticed that prior to losing the lens, the lens does not feel as comfortable as before and it seems to fell out frequently.

The examination data was as follows:

• Manifest refraction:

OD –8.25 –4.00 x 018 6/18– (20/60–);

OS –5.75 –1.25 x 158 6/7.5 (20/25)

• Keratometry:

OD 43.25@032 / 48.75@122; corneal cylinder: –5.50 DC x 032;

OS 40.25@162 /41.75@072; corneal cylinder: –1.50 DC x 162

It was surprised to see that the patient's right eye flat-K was increased by 1.00 D, and his steep-K by 2.50 D as compared to his visit 1 year ago.

Topography was performed OD (Fig. 3)[3]. The result was consistent with the keratometry findings which demonstrated a progressing ectasia in his right eye.

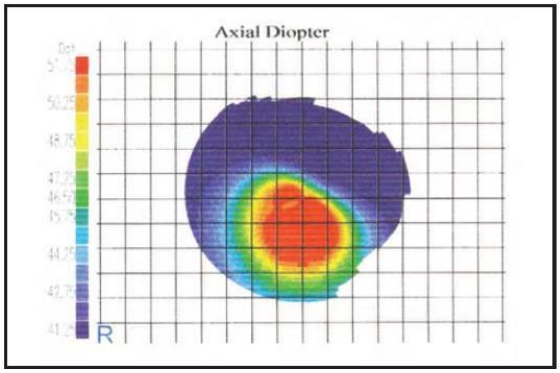

Fig. 3 June 2005: right eye topography showing keratoconus.

The following gas-permeable lens was refitted for his right eye:

• OD: 7.20/–8.50/8.90 6/7.5⁻ (20/25⁻) Rose K gas permeable lens

As one can see, the base curve radius was steeper by 0.25 mm and the back vertex power was higher by 1.25 D with respect to his previous lens in order to accommodate for the eye's steeper curvature. The left eye's lens was left unchanged.

October 2006

The patient returned for follow up and described the recent discomfort with his right RGP lens. The test results were:

• Manifest refraction:

OD –9.50 –3.75 x 013 6/24+ (20/80+);

OS –5.75 –1.50 x 160 6/7.5 (20/25)

• Keratometry:

OD 45.25@035 / 50.25@125; corneal cylinder: –5.00 DC x 035;

OS 40.50@165 /42.00@075; corneal cylinder: –1.50 DC x 165

The topography map revealed a stable astigmatic left cornea (Fig. 4)[3], but further progression of the keratoconus in patient's OD. In comparison to the last visit, OD's flat-K was increased by 2.00 diopters and steep-K by 1.50 diopters (Fig. 5)[3]. The eye was then needed to be refittrf a RGP lens with a different parameter.

OD: 7.00/–12.25/8.90 6/7.5– (20/25–) Rose K gas permeable lens.

The base curve radius was steeper by 0.2 mm and the back vertex power was higher by 3.75 D with respect to his previous lens. The left eye lens remained unchanged. The patient was told to not to rub the eye and making sure to keep up his yearly visit to our center.

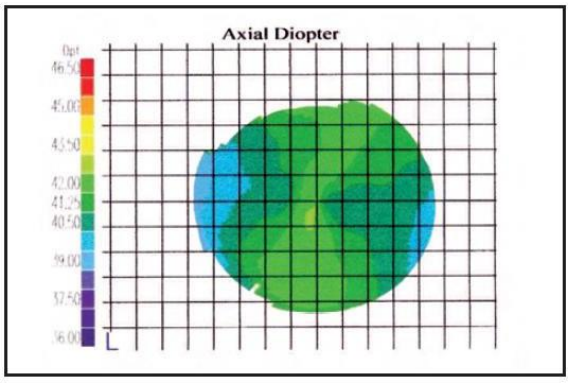

Fig. 4 October 2006: left eye topography.

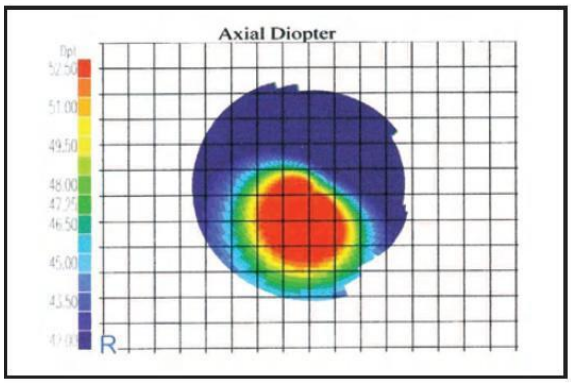

Fig. 5 October 2006: right eye topography showing keratoconus.

November 2008

The patient returned to the clinic 2 years later complaining of slightly reducing wearing time in this OD. The examination data was as follows:

• Manifest refraction:

OD –10.00 –3.75 x 013 6/30+(20/100+);

OS –5.75 –1.50 x 160 6/7.5 (20/25)

• Keratometry:

OD 45.50@040 / 51.00@130; corneal cylinder: –5.50DC x 040;

OS 40.50@165 /41.75@075; corneal cylinder: –1.25 DC x 165

This time the result continued to show the progression of the patient's keratoconus, but much less change was found. Compared to the last visit, flat-K was steeper by 0.25 diopters and steep-K was steeper by 0.75 diopters. The topography map continues to show a stable with-the- rule astigmatic left cornea. In the right eye, we witnessed another but smaller increasing protrusion of the cornea (Fig.6). The eye was again needed to refit with the following lens:

• OD: 6.95/–12.50/8.90 6/7.5⁻ (20/25⁻) Rose K gas permeable lens

The base curve radius was steeper by 0.05 mm and the back vertex power was higher by 0.25 D with respect to his previous lens. The left eye lens was left unchanged. The patient was told that the progression has slowed down and returns for follow up in 1 year time.

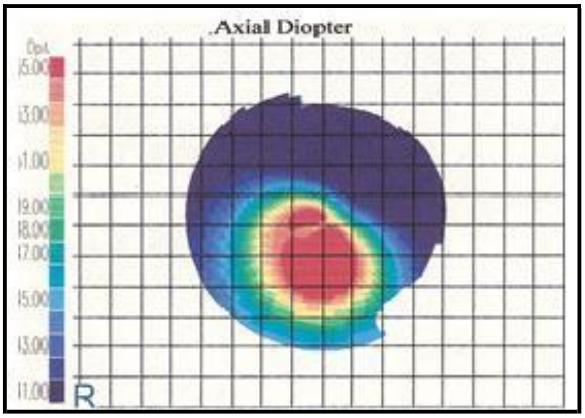

Fig. 6 November 2008: right eye topography showing keratoconus.

October 2009

The patient returned to the clinic the following year complaining of discomfort due to excessive lens movement upon blinking of his right lens. The examination data was as follows:

• Manifest refraction:

OD –11.00–4.25x 013 6/40-(20/200+);

OS –5.75 –1.50 x 160 6/7.5 (20/25)

• Keratometry:

OD 46.25@035 /52.00@125; corneal cylinder: –5.75 DC x 035;

OS 40.50@165 /41.75@075; corneal cylinder: –1.25 DC x 165

Again, the result continued to show the progression of the patient's keratoconic condition with more change than that of last year. Compared to the last visit, flat-K was steeper by 0.75 diopters and steep-K was steeper by 1.00 diopters. The topography map continues to show a regular astigmatic left cornea. In the right eye, we noticed another increasing area of protrusion of the cornea (Fig.7). The eye was thus again needed to refit with the following lens:

OD: 6.85/–13.25/8.90 6/7.5⁻ (20/25⁻) Rose K gas permeable lens

The base curve radius was steeper by 0.10 mm and the back vertex power was higher by 0.75 D with respect to his previous lens. The left eye lens was left unchanged. The patient was made aware of his progressing condition.

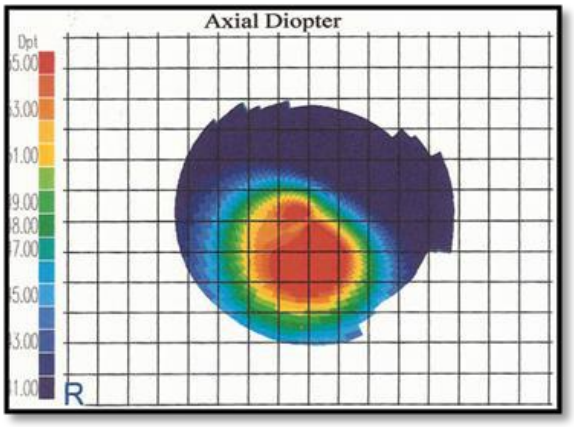

Fig. 7 August 2009: right eye topography showing keratoconus.

4. Discussion

It is not uncommon to see the disease progression of keratoconus, especially in young adults such as our patient. What is unusual about this case is that the patient's ectasia progression was remarkably fast. Fitting of an RGP lens improves visual acuity and many such lenses have been developed for management of keratoconus patients.[4] During the 5 year of monitoring, the patient's flat K increased by 4.00 diopters, from 42.25 D to 46.25 D, and his steep K increased by 5.75 diopters, from 46.25 D to 52.00 D, in his keratoconic eye. The significant changes in patient corneal shape required us to redesign the contact lens fitting from time to time. The design of lenses used is as follows:

The right eye:

In 2004, the keratoconic eye, the right eye, was fitted with a Rose K rigid gas permeable lens, which is designed for kerotoconic cornea. After many trial lenses fitting, using fluorescein stain and 3 point touch method, the final base curve of the lens used was 7.45 mm with the diameter of 8.9 and the vertex power of -7.00 D.

As patient's keratoconic eye progressed and became steepen during the following visits, the base curve and vertex power of lens used was steeper and more myopic every time. For example, in 2005, the lens base curve and power used was 7.20 mm and -8.50 D. In 2006, the lens base curve and power used was 7.00 mm and –12.25 D. In 2008, it was 6.95 mm and –12.50 D and finally in 2009, it was 6.85 mm and –13.25 D.

The left eye:

The left eye, without presence of keratoconus, was easily fitted with standard Tri-curve rigid gas permeable lens. By compare the cornea's Flat K and corneal astigmatism, we fitted the eye with a lens that was 0.62 D steeper than flat K. Since flat K was 40.25 D, we fitted a lens with an 8.25 mm base curve which corresponds to 40.87 in diopter.

All these fittings of contact lenses were done with trial lenses on eye to determine the suitability. With the aids of fluorescein, corneal topography and proper trial lenses, we were able to design the proper lenses for patient for the minimum level of comfort and adequate acuity for him. For the designs of the keratoconic lens, the peripheral curves were specially requested to flatten further to increase edge lift, because the manufacturer's original designs weren't enough to provide sufficient tear exchange in order to maintain the health of corneal epithelium.

5. Conclusion

Due to fact that Patient's keratoconus condition is still under progression, we believe the management of this patient is not yet over. The corneal shape, the suitability of rigid gas permeable lens and the rate of keratoconus progression should all be carefully documented and monitored in following visits, and of course the redesign of contact lens will be done whenever necessary. We will also continue to observe his left eye for any signs of incipient keratoconus since the disease affects bilaterally.[5]

Corresponding Author:
John Ching-Jen Hsiao, OD, FIACLE.
School of Optometry, College of Medical Sciences and Technology, Chung Shan Medical University, No. 110, Jianguo N. Rd., Taichung City 402, Taiwan.
E-mail:johncjhsiao@yahoo.com.tw

References

1. Hwang JS, Lee JH, Wee WR, Kin MK. Effects of Multicurve RGP Contact Lens Use on Topographic Change in Keratoconus. Korean J Ophthalmol.2010；24(4)：201-206
2. Krachmer JH, Feder RS, Belin MW. Keratoconus and related non-inflammatory corneal thinning disorders. Surv Ophthalmol 1984; 28(4): 293-322.
3. Hsiao J, Tseng S. Case report of a rapidly progressing monocular keratoconus over two years. Clinical & Refractive Optometry 2007; 18(5):141-144.
4. Betts AM, Mitchell GL, Zadnik K. Visual performance and comfort with the Rose K lens for keratoconus. Optom Vis Sci, 2002;79:493-501.
5. Edwards M, McGhee CN, Dean S. The genetics of keratoconus. Clin Experiment Ophthalmol 2001; 29(6): 345-351.

10/19/2012