

Successful Ortho-K Treatment with a Toric Lens Design in a Patient with Significant Myopia and Astigmatism

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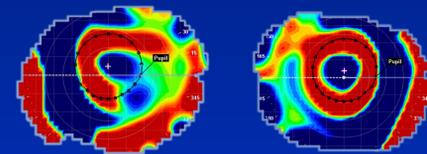
Introduction

Uncorrected astigmatism has been shown to reduce visual quality and decrease efficiency at activities such as reading and using the computer.¹ It is evident that spherical orthokeratology has been effective at treating myopia and low amounts (<1.50D) of WTR astigmatism, but there are very little options for the highly astigmatic myope. This case evaluates the relative success of the off-label use of BE Free toric ortho-k lenses in overnight ortho-k treatment in a patient with high myopia and astigmatism.

Case Report

MV is a 15-year-old Caucasian female interested in ortho-K lens wear.

- Spectacle Rx:
 - Right Eye: -5.50-2.50x180; BCVA 20/20
 - Left Eye: -5.50-2.50x180; BCVA 20/20
- Original ortho-K lens fit: Custom Toric OK
 - Right Eye: 8.9 BC/+2.00D/10.2 mm; sc VA 20/30⁻
 - Left Eye: 8.8 BC/+2.00/10.2 mm; sc VA 20/40⁺²
 - Toric lens design details available upon request



Right Eye **Left Eye**
Figure 1 (above). Right and left eye tangential maps with original custom lens design. The left eye is relatively centered, but VA was decreased.

Despite initial treatment zone centration, topography at three weeks revealed lens decentration and decreased VA (Figure 1). MV discontinued treatment and returned for new composite topographies two weeks later.

Another toric lens design was trialed:

- Right Eye: 8.39 BC/Flat R₀ 7.22/Steep R₀ 7.16/+0.50D/10.6 mm
- Left Eye: 8.39 BC/Flat R₀ 7.26/Steep R₀ 7.21/+0.50D/10.6 mm
- The patient returned for a 1-day follow-up and a 10-day follow-up

Baseline Topographies and New Toric Ortho-K Lens Fit

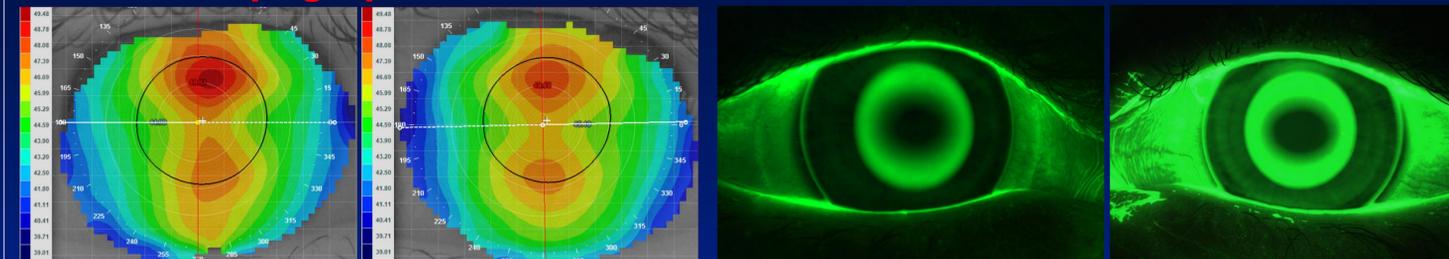


Figure 2. Right eye baseline composite topography
K's: 44.90/49.32 @ 090
Sag Differential at 8mm: 78 um

Figure 3. Left eye baseline composite topography
K's: 45.10/48.65 @ 091
Sag Differential at 8mm: 75 um

Figure 4. Right eye lens dispense. **Figure 5.** Left eye lens dispense.
Both **Figures 4 and 5** show well-centered lenses with adequate alignment with a toric lens design on initial lens dispense.

Note (below): One topographer uses infrared mires while the other uses white light mires, affecting pupil size slightly.

Follow-up Topographies

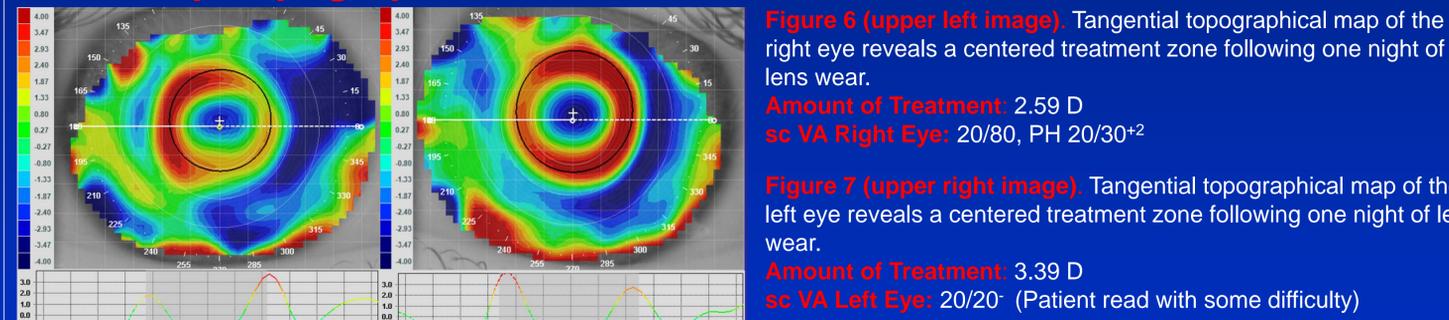


Figure 6 (upper left image). Tangential topographical map of the right eye reveals a centered treatment zone following one night of lens wear.
Amount of Treatment: 2.59 D
sc VA Right Eye: 20/80, PH 20/30⁺²

Figure 7 (upper right image). Tangential topographical map of the left eye reveals a centered treatment zone following one night of lens wear.
Amount of Treatment: 3.39 D
sc VA Left Eye: 20/20⁻ (Patient read with some difficulty)

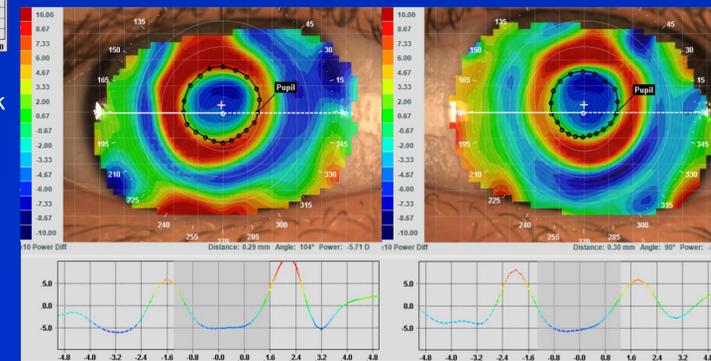


Figure 8 (lower left image). Tangential topographical map of the right eye reveals a centered treatment zone after ten nights of ortho-k lens wear.
Amount of Treatment: 5.71 D
sc VA Right Eye: 20/15⁻²

Figure 9 (lower right image). Tangential topographical map of the left eye reveals a centered treatment zone after ten nights of ortho-k lens wear. .
Amount of Treatment: 5.44 D
Sc VA Right Eye: 20/20⁺

Implications for Myopia Control

Astigmatism may cause decreased image contrast and retinal image blur, leading to potential myopia progression.¹ Although there is no significant evidence that determines that uncorrected astigmatism is a cause of axial elongation, there is a documented association between higher amounts of WTR astigmatism and increased myopia.¹

Conclusion

Some important considerations when designing an ortho-k lens are the patient's age and activities of daily life. The goal of lens design outside of myopia control is to ensure clear and comfortable vision for activities such as driving or sports. MV has recently received her learner's permit for driving and reported glare and halos in dimmer lighting situations.

To decrease the patient's awareness of glare, we rebuilt the lens to have a larger OZD of 6.0 mm compared to the original 5.0 mm zone. The patient has not returned for follow-up after receiving the newly designed lenses, but reports doing well.

Building a toric lens when the sagittal differential of the cornea at an 8 mm chord is 30 microns or greater, often will allow for an optimized fit and improved efficacy of the ortho-k lens in a patient with or without refractive astigmatism.² The TO-SEE study determined that toric ortho-k lens wear may decrease the odds of fast myopia progression by almost 15 times compared to single-vision spectacle wear.³ Studies indicate the possibility for a clear retinal image with the formation of a myopic image shell in a patient with significant myopia and astigmatism.

References

- 1) Read SA, Vincent SJ, Collins MJ. The visual and functional impacts of astigmatism and its clinical management. *Ophthalmic & Physiol Optics.* 2014;34: 267-294.
- 2) Kojima R, Caroline P, et al. Should all orthokeratology lenses be toric? *Poster presented at the 2016 GSLS, Jan. 2016, Las Vegas.*
- 3) Chen C, Cheung SW, Cho P. Myopia control using toric orthokeratology (TO-SEE study). *Invest Ophthalmol Vis Sci.* 2013;54: 6510-6517.