

# Hybrid Contact Lens Orthokeratology for High Astigmatism

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## Background

Orthokeratology (Ortho-K) is a nonsurgical method that temporarily reshapes the cornea resulting in myopic refractive error reduction. Currently, the most common types of orthokeratology lenses are rigid, gas permeable contact lenses with spherical reverse geometry design.<sup>2,3</sup> During lens wear of the ortho-K lens, the tears under the lens flatten the central cornea in accordance with hydraulic forces principle.<sup>1</sup> In order for effective myopia reduction, the ortho-k lens must be placed at the corneal center. Spherical lens design has been found to present challenges for good centration on eyes with moderate astigmatism.<sup>3</sup> Indications for common rigid, gas permeable ortho-k lenses are overnight wear for temporary reduction of myopia up to 6.00 diopters in eyes with astigmatism up to 1.75 diopters.<sup>4</sup>

## Purpose

The case study describes the efficacy of a new design of hybrid contact lens for orthokeratology for reduction of both myopic and high astigmatic refractive errors.

## Significance

The new design of hybrid lens described in the case study was effective in reducing myopic and astigmatic errors up to 3.0 diopters. This provides an alternative approach for orthokeratology and improvement for treatment of high astigmatism.

## Case Study

A 34-year-old female presented with the measurements detailed in Table 1 Pre-Treatment.

The new design of ortho-k hybrid contact lens is a 5-curve, reverse geometry and tangential landing design incorporating patient's eccentricity, HVID, and central corneal measurements. Overall lens diameter is 14.5mm with treatment zone of 5mm.

Patient was instructed to wear the ortho-k lens during the day like a standard hybrid lens. At 1 week follow up, the lens provided a central treatment zone. No corneal staining was observed with slit lamp evaluation. The patient continued to wear the lenses full time for 4 weeks with a weekly follow up. No corneal staining was observed with slit lamp at 4 weeks follow up. Topography of both eyes indicated mid-peripheral cornea steep area surrounding a central corneal flattened area. Patient is still being monitored for progress and stability.

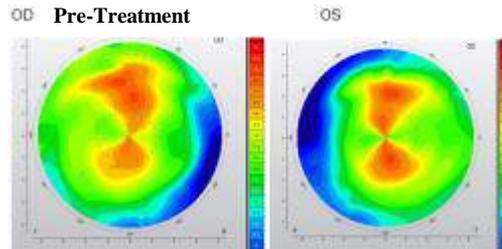
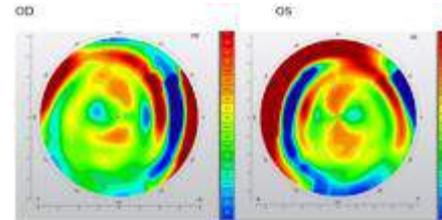


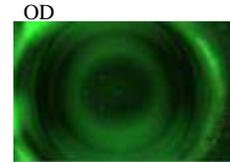
Table 1: Patient's measurements

|                            | Pre-Treatment                               | 1 Week Follow up                            | 4 weeks Follow up                           |
|----------------------------|---|---|---|
| <b>Manifest Refraction</b> | OD: -2.25 -3.50x170<br>OS: -1.50-3.50x010   | OD: -0.75-0.25x165<br>OS: -0.75 sph         | OD: -0.50 sph<br>OS: -0.50 sph              |
| <b>K-Readings</b>          | OD: 44.2/47.0 @ 81°<br>OS: 43.9/ 47.5 @ 96° | OD: 43.0/45.9 @ 82°<br>OS: 43.3/46.8 @ 100° | OD: 41.7/43.7 @ 77°<br>OS: 43.7/46.6 @ 113° |
| <b>Eccentricity</b>        | OD: 0.39 OS: 0.48                           | OD: -0.16 OS: -0.03                         | OD: -0.08 OS: 0.23                          |
| <b>HVID (mm)</b>           | OD: 11.9 OS: 11.9                           | OD: 11.9 OS: 11.9                           | OD: 11.9 OS: 11.9                           |
| <b>Best Corrected DVA</b>  | OD: 20/25 OS: 20/25 <sup>-2</sup>           | OD: 20/20 OS: 20/25                         | OD: 20/20 OS: 20/25                         |

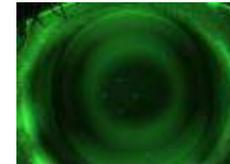
## Week 1 Follow-up



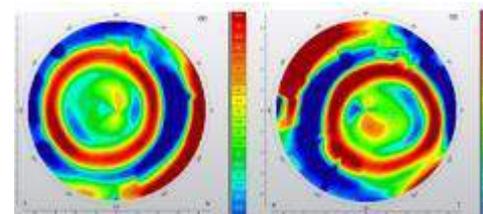
## 5 mins After Lens Insertion



## OS



## Week 4 Follow-up



1. Li J.,Dong P., Liu H. Effect of Overnight Wear Orthokeratology lenses on Corneal Shape and Tears. Eye& Contact Lens. 2018;44: 304-307.

2. Sridharan R, Swarbrick H. Corneal Response to Short-Term Orthokeratology Lens Wear. Optom Vis Sci 2003;80:200-206.

3. Lyu B, Hwang KY, Kim SY, et al. Effectiveness of Toric Orthokeratology in the Treatment of Patients with Combined Myopia and Astigmatism. Korean J Ophthalmol 2016; 30:434-442.

4. Paragon CRT Fitting Guide <https://www.paragonvision.com/ecp/assets/uploads/Documents/CRT-Fitting-Guide-ZQF100001E.pdf>