

BACKGROUND

Centration of the fit and treatment zone is often an early predictor of successful visual outcome for Orthokeratology (Orthok). Effective treatment with Orthok can be a challenge for patients who suffer from high amounts of myopia and corneal astigmatism. When assessing the potential for a patient to do Orthok and choosing a lens design, it is important to take several factors into consideration, in particular the amount of myopia, astigmatism, and corneal eccentricity. In order to achieve success in visual correction with these particularly challenging patients, it is important to have the ability to design a highly customizable lens to ensure good alignment and adequate treatment zone.

CASE DESCRIPTION

A 17-year-old black female was referred by pediatric optometrist for myopia management after a 2 diopter increase in prescription OD and OS within the past 3 years. Patient was referred to contact lens department for myopia management. Patient's subjective spectacle refraction was OD: -5.50-2.25x180, OS: -5.50-2.50x167. Patient's BCVA w/ spectacles was: 20/20-2 OD/OS. Patient and parent were educated on the likelihood of orthokeratology no longer being successful in stopping progression of myopia due to advanced age, but patient decided to proceed with orthokeratology for overnight correction.

METHODS

Topographic scans were taken with the Medmont® and the patient was found to have about 2.42D of with the rule corneal astigmatism with flat e 0.93 and steep e 0.23 for the right eye, and 2.60D of with the rule corneal astigmatism and Flat e 0.71 and Steep e of 0.25 for the left eye. Scans were sent to Art Optical and lenses with the following parameters were designed:

Lens Parameters												
	Diam	BC	Pwr	OZ	Flat e	Flat Ro	Steep e	Steep Ro	RCD	AZA	RCD St	AZA St
OD	10.60 mm	9.40	+0.50	5.50	0.93	8.12	0.54	7.68	.591	28.51	.682	32.60
OS	10.60 mm	9.53	+0.50	5.50	0.89	8.22	0.55	7.59	.590	28.46	.701	32.94

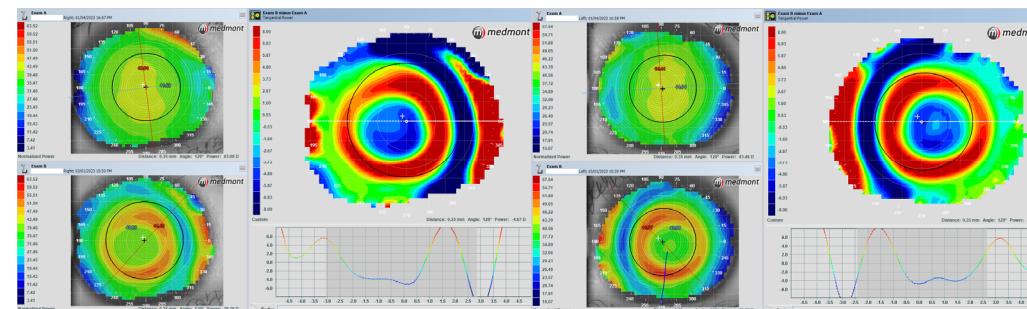


Figure 1 & 2 : 4 week follow up (@5:15PM) OD (left) and OS (right); VA 20/20- OD, 20/25- OS. Patient reports continued success with contact lens wear. Patient reports no issues with glare or haloes and good vision for the entire day.



MOONLENS Flex Calculator

OD	OS	
Patient Rx	-5.50	-5.50
Diameter	10.6	10.6
OZ	5.5	5.5
Flat Ro / Flat K	41.54	41.04
Flat Eccentricity	0.930	0.890
Steep Ro / Steep K	43.94	44.44
Steep Eccentricity	0.540	0.550

Specified lens is FDA approved for daily wear only when the refraction exceeds -5.00D or 1.50D astigmatism.

Results

	OD	OS
Design File	MOONLENS Flex Toric	MOONLENS Flex Toric
Base	9.40	9.53
Diameter	10.6	10.6
BOZD	5.5	5.5
Flat Ro	8.12	8.22
Flat Eccentricity	0.930	0.890
RCD	0.591	0.590
AZA	28.51	28.46
Steep Ro	7.68	7.59
Steep Eccentricity	0.540	0.550
RCD Steep	0.682	0.701
AZA Steep	32.60	32.94
Lens Power	+0.50	+0.50
Vertex Rx	-5.12	-5.12
Design	Toric	Toric

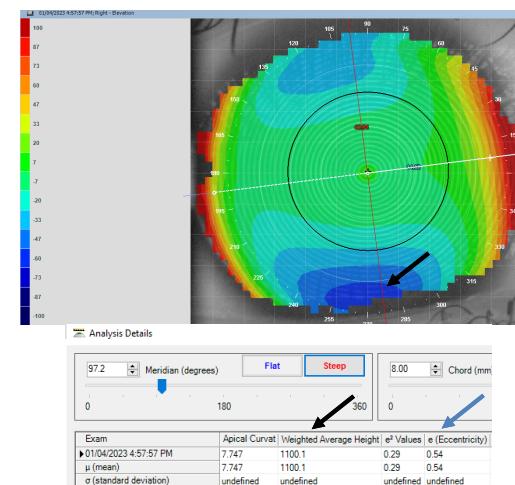


Figure 3: Differences in keratometric and eccentricity values between the flat and steep meridians lead to corneal elevation differences. These data are used in the Moonlens® calculator to determine sagittal differences and toricity along the reverse curve and alignment zone parameters. There is approximately 90 microns of toricity in the right eye of this example.

RESULTS

The best visual outcomes in orthokeratology are often linked to good centration and formation of the treatment zone on the eye. Many orthok designs use physiologic data (HVID, Ks, Rx) to empirically design custom lenses. The alignment curve stabilizes the lenses in the periphery where the cornea can have a different fit from the central zone. This is a result of eccentricity, or rate of corneal flattening. New orthok designs can account for this value, measured by topography. In this example, eccentricity and keratometric data were used to empirically design custom lenses that centered well and fully corrected a highly myopic astigmatic patient. Using unique measurements derived from the topography, a highly customized design with individual specific parameters can be generated with the Moonlens® Flex calculator. This eccentricity-based design gave good alignment in the periphery so that fluid forces could completely reshape the central treatment zone.

CONCLUSION

Orthok proved to be a successful treatment option despite the challenges this particular fit posed for the patient. Eccentricity was used to achieve even alignment throughout the periphery despite the patient's high amounts of astigmatism. The Moonlens calculator was able to design an accurate custom fit that led to a first lens success fit. Full correction of the high myopia was achieved through a complete and well centered treatment zone, giving 20/20 VA OU, uncorrected.

Acknowledgments

Thank you to Art Optical for their support of our research and educational programs to allow our students to experience the benefits of orthokeratology and empirically designed lenses.