DECENTRATION SOLVED!

AUTHOR: **JAGRUT LALLU** MSC SPECIALTY CONTACT LENSES (HONS), BOPTOM (HONS), FIAOMC

BACKGROUND:

Lens decentration is a common and avoidable side effect following Orthokeratology treatment[1]. Corneal elevation difference is routinely used when fitting toric lenses to toric cornea virtually. Typically, the threshold to determine the need for a toric design is an elevation difference between two meridians at the 8mm chord exceeding 30 microns[2]. When virtual fitting contact lenses it is common to use the corneal elevation to predict where a lens will come to rest when placed on eye. The following case review will describe a solution to this common occurrence when being fit with rotationally symmetric lenses.

CASE DESCRIPTION

The following case description chronicles a left (OS) decentred contact lens following Orthokeratology fitting. A 26YO White female attended Orthokeratology Fitting. Her spectacle prescription was:

OD:	-5.25/-0.75x107	VA: 6/6 (20/20)
OS:	-5.75/-0.25x25	VA: 6/6 (20/20)

BASELINE CORNEAL TOPOGRAPHY SHOWED:

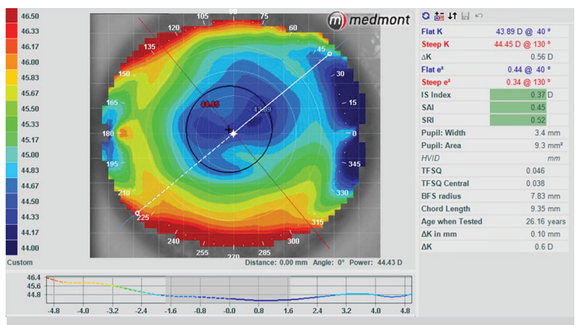

Figure 1. Baseline Refractive Power map that shows 0.56D of apical corneal astigmatism.

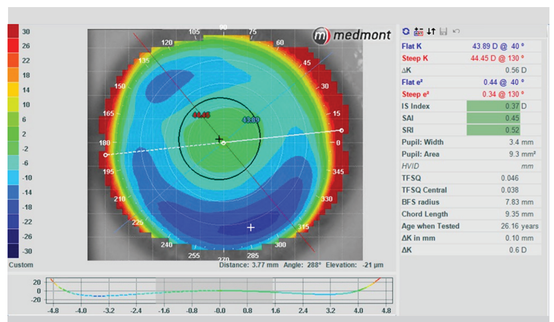

Figure 2. Baseline elevation which shows inferior elevation greater than superior. This indicates that when a spherical lens is placed on the eye, (unless accounted for in initial design) the lens will decentre inferiorly.

THE INITIAL LENS DESIGN USING THE EYESPACE LENS SIMULATION AND DESIGN SOFTWARE WAS:

Figure 3. The EyeSpace lens simulation software parameters of note for this case are the Total Diameter (95% of HVID), Edge Radius and Alignment Curve Eccentricity (AC e).

THE INITIAL LENS, WHEN DELIVERED, SHOWED A SMALL AMOUNT OF INFERIOR DECENTRATION.

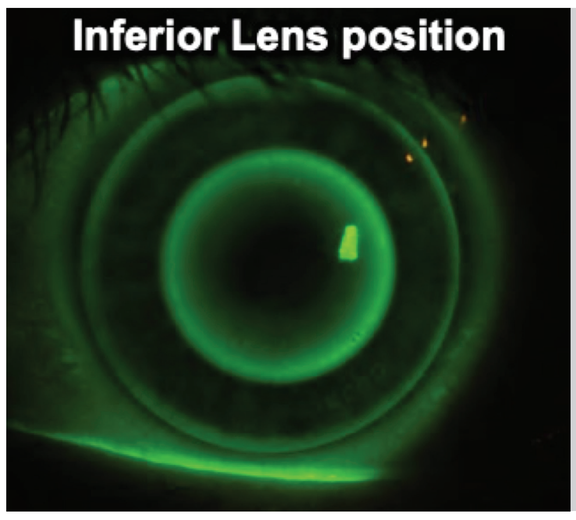

Figure 4. Initial lens locating slightly inferiorly, when assessed in comparison to the limbus.

FIVE WEEKS POST ORTHOKERATOLOGY WEAR SHOWED INFERIOR DECENTRATION AND A REDUCED POWER EFFECT AS DESCRIBED BY THE POST WEAR REFRACTIVE DIFFERENCE MAPS AND TANGENTIAL POWER MAPS.

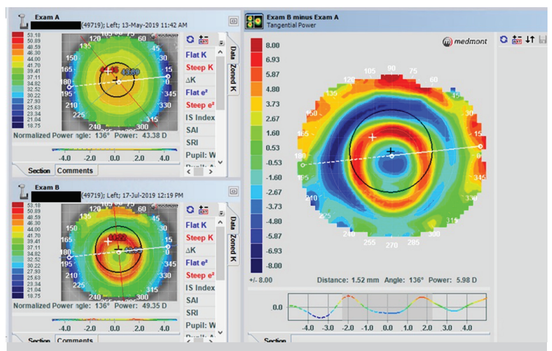

Figure 5. Tangential power difference map showing a classic "Frowny face" or inferiorly decentred effect.

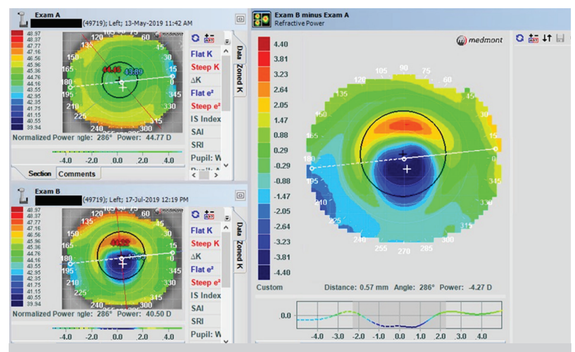

Figure 6. Refractive power difference map showing a small inferiorly centred Bulls eye with an overall refractive power correction of -4.27D. The target refraction was: -5.75/-0.25x25.

Design changes were made to the overall diameter, alignment curve eccentricity and edge radius. The overall diameter was increased to 97% of the HVID. This allows more corneal coverage and allows the lens designer to achieve more bearing on the cornea in the alignment zone of the lens. The alignment curve eccentricity was increased along with the edge radius. These changes allow for upper lid attachment and clearance of the limbus which both aid centration and helps to avoid limbal impingement during overnight wear. The design was manipulated to achieve at least 80um of edge clearance in the horizontal meridian and greater than 100um of clearance in the vertical meridian.

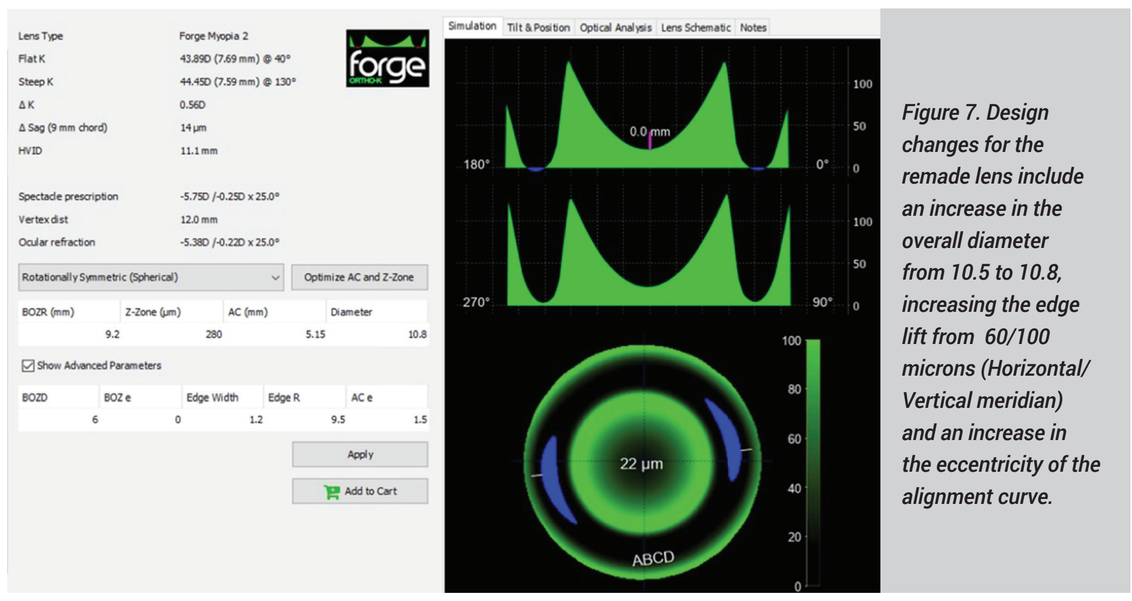

Figure 7. Design changes for the remade lens include an increase in the overall diameter from 10.5 to 10.8, increasing the edge lift from 60/100 microns (Horizontal/ Vertical meridian) and an increase in the eccentricity of the alignment curve.

The new lens was dispensed without a washout period and reviewed a further six weeks later. The post-refractive power and tangential power maps showed a well-centred reshaping treatment.

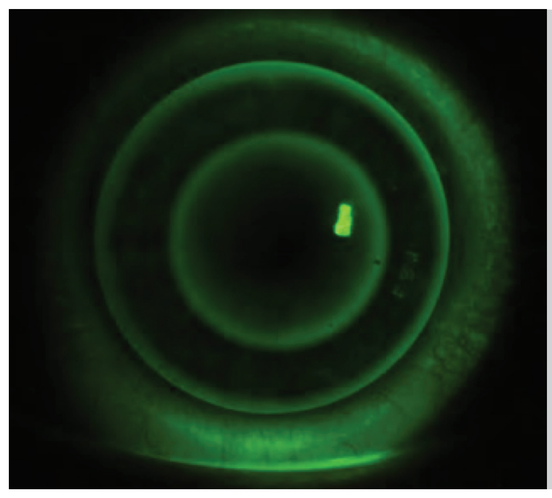

Figure 8. Well centred second lens at dispensing appointment.

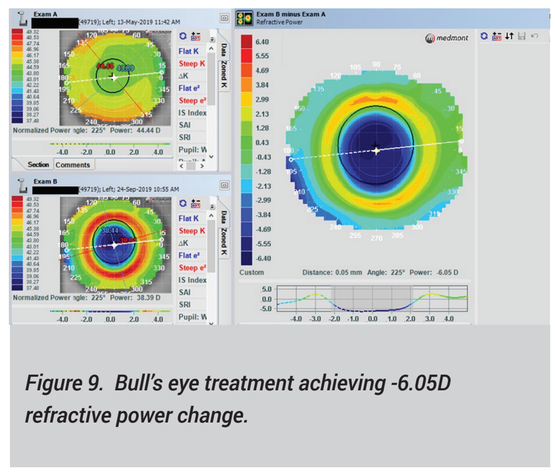

Figure 9. Bull's eye treatment achieving -6.05D refractive power change.

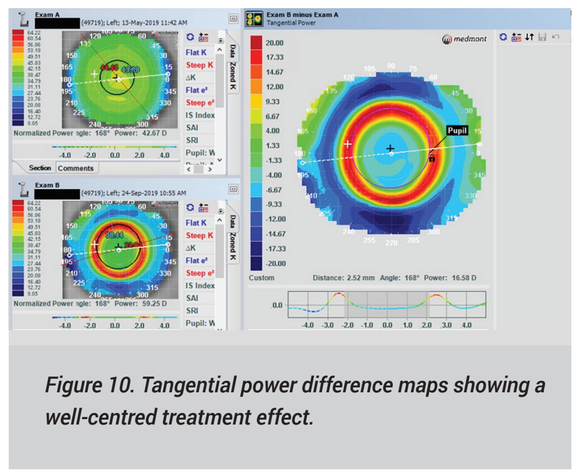

Figure 10. Tangential power difference maps showing a well-centred treatment effect.

CONCLUSION:

This case highlights the parameters of virtual lens design that can be manipulated and used in all lens designs to improve fitting outcomes that are less than ideal. The case example used demonstrates this and the key take-homes are:

- Pre-treatment corneal topography assessment is critical in virtual lens fitting
- Total diameter and the peripheral lens design are critical to achieve better centration and power effect
- Consideration must be taken when making corneal lenses close to the size of the HVID so as not to impact limbal health

References:
1. Chen Z, Xue F, Zhou J, Qu X, Zhou X, Shanghai Orthokeratology and Study (SOS) Group. Prediction of Orthokeratology Lens Decentration with Corneal Elevation. Optom Vis Sci. Optometry and Vision Science; 2017 Jul 24; Publish Ahead of Print:1.
2. Li Z, Cui D, Long W, Hu Y, He L, Yang X. Predictive Role of Paracentral Corneal Toricity Using Elevation Data for Treatment Zone Decentration During Orthokeratology. Curr Eye Res. Taylor & Francis; 2018 Sep;43(9):1083–9.