Case Report:

Profilometry Based Orthokeratology

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Dr. Morrison received her Doctorate, Masters in Vision Science with focus on scleral lenses, and Residency in Cornea and Contact Lens from Pacific University College of Optometry. She served on faculty at the University of Houston College of Optometry where she facilitated education and research in the Contact Lens and Cornea service. Now she is back in Canada where she practices at Mission Eye Care Center for Dry Eye and Corneal Disease in Calgary, is a clinical rotation site instructor for the University of Waterloo College of Optometry.

Introduction

A 28-year-old female presented as a new patient with a history of dry eye and daily wear soft lens intolerance due to her dry eye: OD: -2.75-1.25x001
OS: -4.50-1.50x177

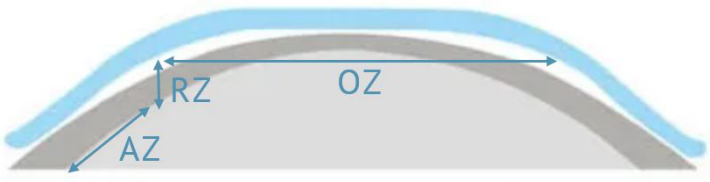
After thorough examination and various tests, orthokeratology (OrthoK) was selected as the treatment of choice, using Paragon CRT™ contact lenses (CooperVision Specialty EyeCare). This case report presents the contact lens fit and follow up of the left eye.

Background

Successful orthokeratology means matching the sagittal height (SAG) of the eye with the SAG of the OrthoK lens. The current empirical fitting methods extrapolate data from the central SimK values, so may not be precise enough. Empircal SAG-based fitting however, includes SAG data from over the full size of the lens.

Typical OrthoK lens designs have three parameters to control:

- Optical zone: creating negative suction forces.
- Return zone: controlling apical clearance.
- Alignment zone: stabilizing and centering the lens.



The Eye Surface Profiler (ESP) (Eaglet Eye, Houten, The Netherlands) uses Profilometry to directly measure SAG of the entire cornea; neither translation from curvature to SAG nor data extrapolation are required for a complete and accurate corneal scan.

First Lens Fit

A height map of the ocular surface was obtained using the ESP (Figure 1). This first mesaurement will be set as baseline for later comparisons. The initial fit was done using the new First Lens Fit OrthoK module from the ESP. The integrated OrthoK algorithm automatically calculates each variable of the Paragon CRT lens individually:

- the base curve (BC) is calculated using the Jessen formula,
- the return zone depth (RZD) is calculated from of the SAG values of the eye,
- and the landing zone angle (LZA) is defined from calculating the best aligning tangent angle.

The predicted Paragon CRT lenses were ordered, for the left eye: OS 87-575/600-34/34.

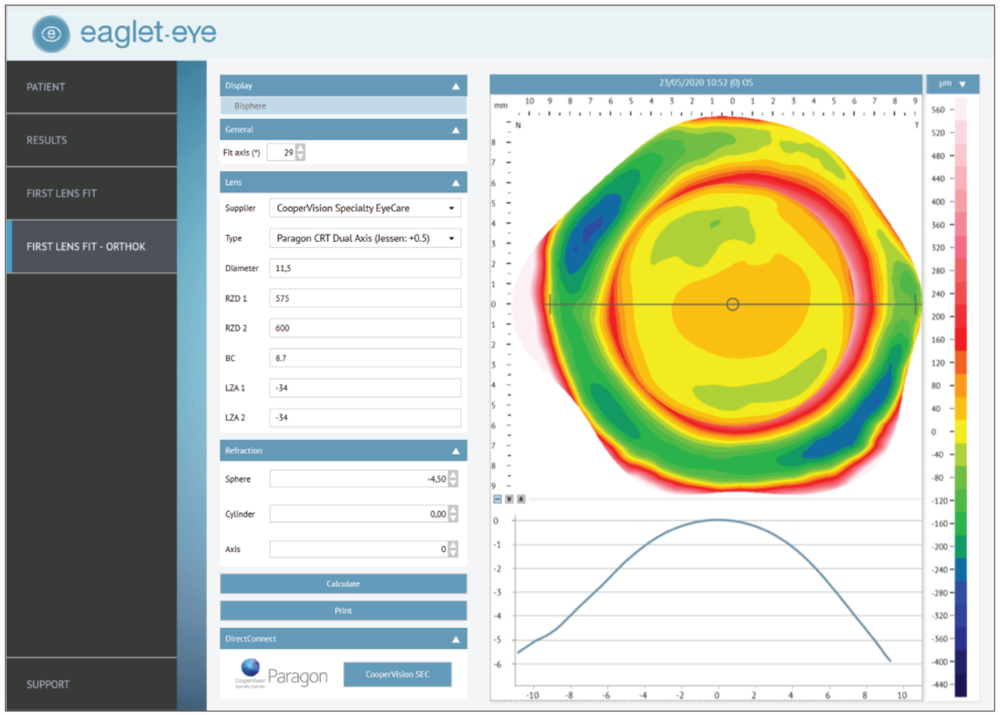


Figure 1 Pre-fitting Bisphere elevation map of the cornea (right) and irst Lens Fit OrthoK lens prediction (left).

One-week follow up

By the one-week follow up, the Tangential curvature difference map (Figure 2) showed good centration, but the power was 1.5D undercorrected. This can be seen on the Axial curvature difference map as well as on the Power profile which shows a correction of about -3 Diopters (see Figure 3).

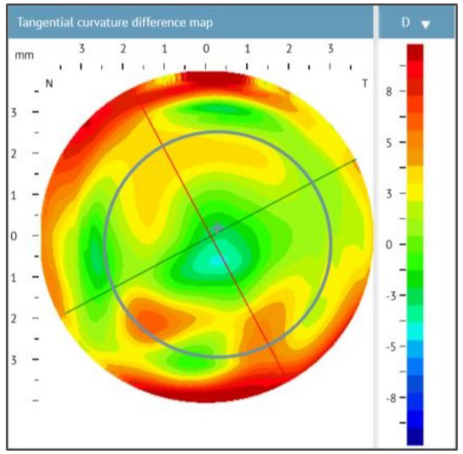


Figure 2 Tangential curvature difference map.

The most critical variable to vision correction and patient satisfaction is centration. As the lens is well-centered, the required adjustments can be made to achieve the desired zone of applanation. In this case, a new lens with 0.3mm BC flattening was ordered to increase the corrective power of the lens.

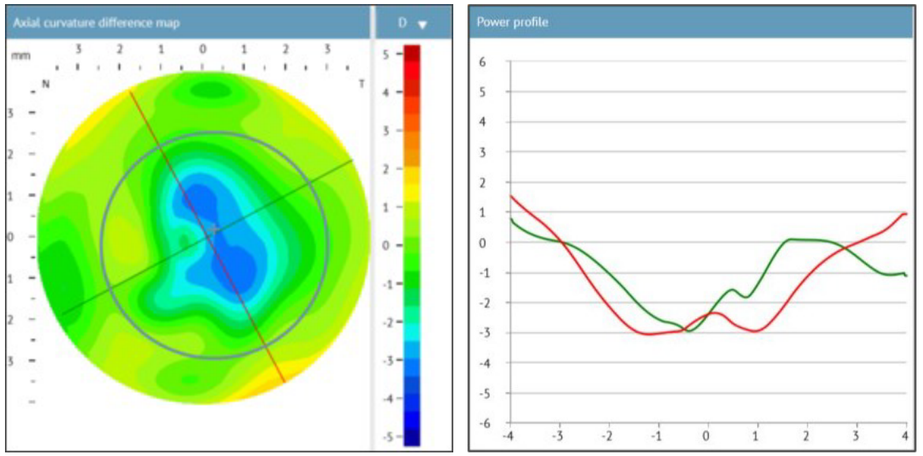


Figure 3 Axial curvature difference map (left) and Power profle:(right) both showing a correction of 3 Diopters.

Three-week follow up

Figure 4 shows the changes in corneal Profilometry over the course of 3 weeks treatment (see Bisphere elevation map, top left). The second lens with the flatter BC brought the expected effect on creating a higher power correction of around 4.5 Diopters (see Axial curvature difference map and Power profile) while maintaining the initial good centration (see Tangential curvature difference map).

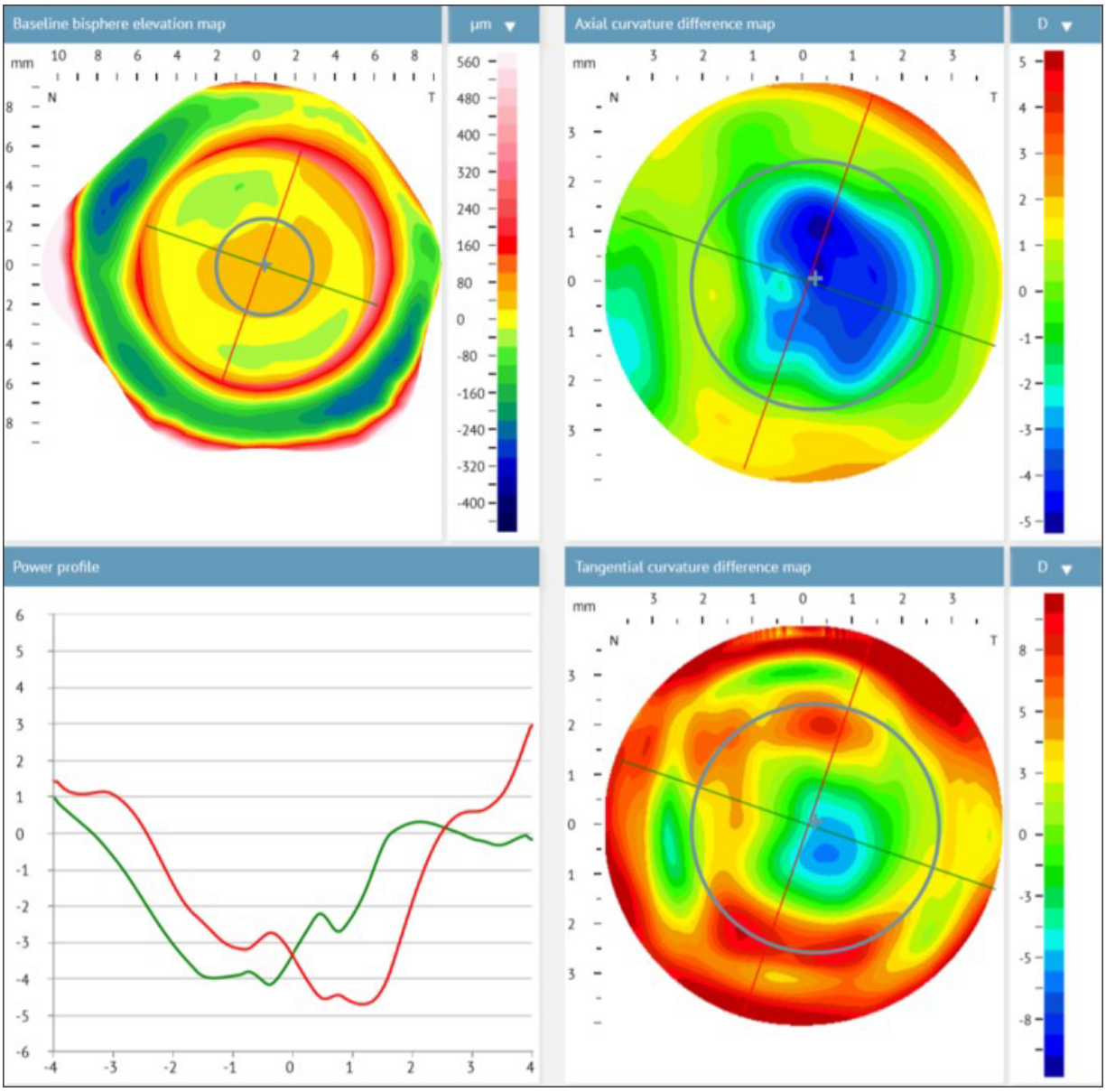


Figure 4 Three-week follow up maps with the ESP.

Conclusion

Orthokeratology is one of the important instruments available for the eye care professional for myopia management. Sagittal height (SAG) driven fitting is the future for orthokeratology. Profilometry with the ESP allows to capture the full cornea and therefore allows to fit the peripheral alignment area of the ortho-k lens precisely.