Elevating the OrthoK Fit

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Introduction and Background

Traditional orthokeratology (OrthoK) guidelines are intended to optimize lens centration, refractive outcomes, and safety. However, advanced, profilometry-guided lens designs may enable successful treatment in eyes traditionally considered poor candidates. This case series highlights how data-driven customized OrthoK designs expand the boundaries of treatment to successfully manage complex cases that challenge conventional fitting principles.

Methods

Corneo-scleral profilometry was performed using the Eye Surface Profiler (ESP) (Eaglet Eye, NL). Precise sagittal height measurements were captured beyond the limbus to characterize the individual ocular surface and design customized or freeform OrthoK lenses.

Depending on the treatment objectives and clinical findings, lenses were prescribed for overnight or daytime wear. The profilometry data were used to optimize lens geometry, centration, and alignment.

Conclusions

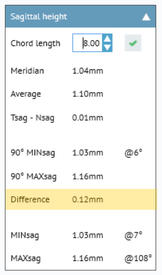
These cases illustrate how profilometry-guided orthokeratology and modern freeform lens designs successfully expand the treatable patient range.

Utilizing precise sagittal height data extending beyond the limbus allows for stable centration, effective treatment zones, and excellent visual outcomes in eyes traditionally considered poor candidates for OrthoK.

Case 1 | High Myopia and Astigmatism

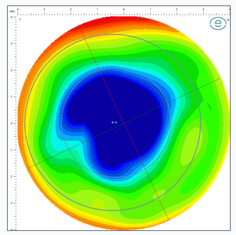
A 31-year-old male neophyte presented with a baseline refraction of OD −5.75 −3.75 × 177° and OS −5.75 −3.25 × 178° (BCVA 20/20 OU) and axial lengths were 26.37 OD and 26.26 OS.

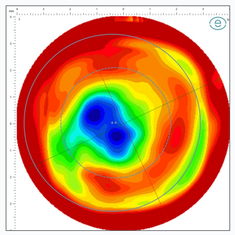
Evaluating landing zone toricity across modalities revealed very distinct measurements: Anterior Segment OCT and Placido-disc topography measured ~60 µm of toricity at an 8 chord, whereas the ESP captured 120 µm (see image on the right). While ESP profilometry provided complete coverage out to 11 to accurately capture peripheral shape, OCT and Placido devices under-estimated toricity due to lid-squinting artifacts and data loss beyond 8.



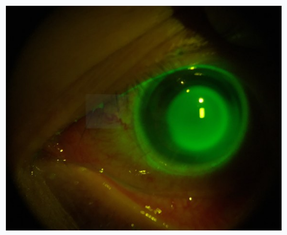
Considering his age, high refractive error, and highly toric cornea, a custom translimbal OrthoK lens (NewVision, AccuLens, USA) was fitted for overnight wear plus an evening refresh (2h). This novel lens incorporated a larger optical zone and extended alignment zones to optimize centration and visual quality.

After 1 month of wear, the patient achieved 20/20 VA with excellent comfort but reported some halos. Increasing the optical zone broadened central corneal moulding, completely resolving the halos, keeping the 20/20 VA OU with superb centration.





1 week Axial and Tangential curvature difference maps (ESP) (OD).



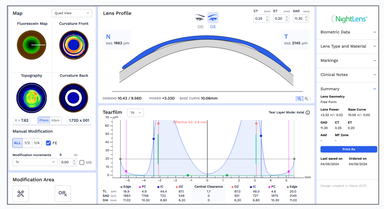
Fluo pattern of the final lens with bigger OZ.

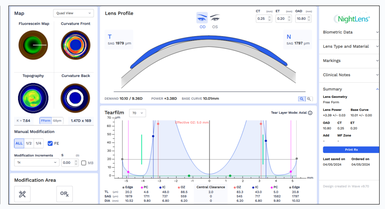
Case 2 | Pediatric Myopia Control

A 12-year-old female competitive swimmer presented with cycloplegic refraction of OD −7.00 −1.50 × 25° and OS −7.50 −1.25 × 5°, with BCVA of 20/25. Axial lengths were 26.31 OD and 26.50 OS.

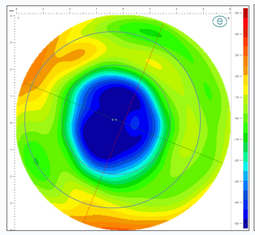
As part of her myopia control treatment, and given her active swimming lifestyle, overnight OrthoK lenses were the selected lens option. Custom night lenses (NightLens, WAVE Eye Care, USA) were designed directly from Eye Surface Profiler (ESP) data. To optimize myopia control for her severe prescription, combination therapy was initiated with 0.05% atropine daily.

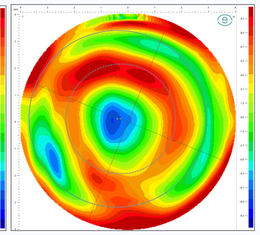
After some lens adjustments at the endpoint, she achieved stable VA 20/25 OU with low-power spectacles (−0.50 D) for late-evening wear if needed.

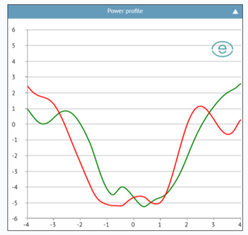




WAVE Lens Design Software, NightLens.





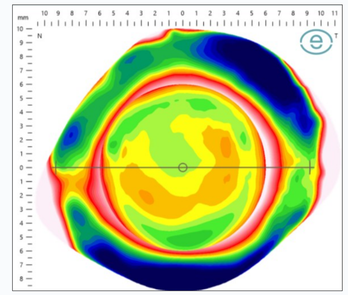


5-day Follow Up: ESP axial and tangential curvature difference maps, and Power profile (OD).

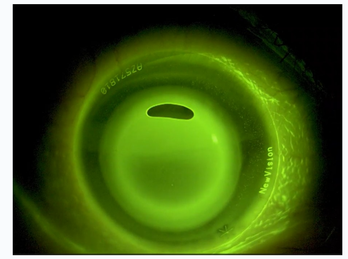
Case 3 | Post-SMILE Myopia Regression

A 42-year-old female presented with myopic regression following SMILE surgery. Baseline uncorrected VA was 20/40 OU, with subjective refraction of −1.00D OD and −1.00 −0.25 × 65° OS, BCVA 20/20- OU and a +1.00 D presbyopic add. She previously failed soft contact lenses and conventional overnight OrthoK due to persistent discomfort with both lens types and suboptimal vision after lens removal with OrthoK.

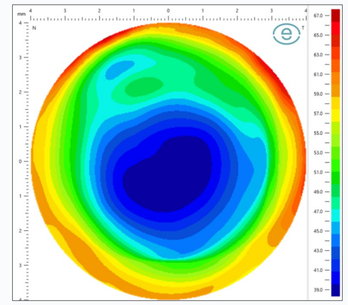
To overcome prior fitting failures, she was fitted with a customized daily-wear corneo-limbal OrthoK design (NewVision, AccuLens, USA) based on complete ESP Profilometry data. With the lenses, over-refraction was plano OU and VA was 20/20- OU while on eye, alongside excellent comfort. Even when removing lenses mid-day, residual corneal molding maintained functional unaided vision of OD 20/30+ and OS 20/25 with minimal residual error (OD −0.75 −0.25 × 45° and OS -0.50) and BCVA 20/20- OU. The lenses demonstrated stable positioning and functional visual rehabilitation despite the surgically modified corneal profile.



Baseline Bisphere elevation map with the ESP (OS).



Slitlamp fluo image (OS).



ESP tangential curvature map post treatment (OS).

Dr. Patrick Simard, Clinique d'Optometry Belanger, Canada; conflict of interest: Bausch and Lomb, Zilia, Contamac, OCULUS, Wave Contact Lenses, Eaglet Eye, Nordic Pharma, Sun Pharma, Labtician, Neurolens, Rimonchi Capital (Fitlens).
Dr. Andrea Lasby, Mission Eye Care, Canada; no conflict of interest.
Jeff Kwong-Yau Tang, Berlin Optical Hong Kong; no conflict of interest.