Reshaping the Future: Soft Contact Lenses Can Induce Orthokeratology-Like Topographical Effects

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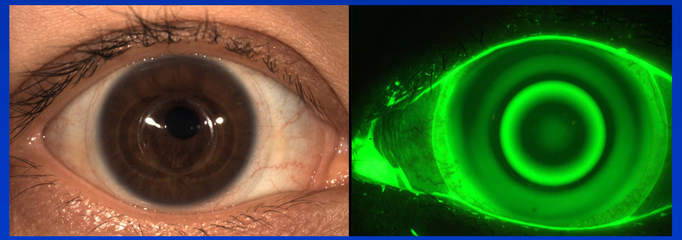
Introduction

In the last decade, orthokeratology (ortho-k) has evolved tremendously with advancements in technology and lens materials. Worldwide, the proportion of pediatric contact lens fits for myopia management increased from 0.2% of all fits in 2011 to 6.8% in 2019. This trend is largely attributed to the increase in rigid gas permeable (RGP) lens fits. Ortho-k lenses, however, are more challenging to fit compared to soft contact lenses (SCL), the latter of which provides greater comfort and ease of handling for children.

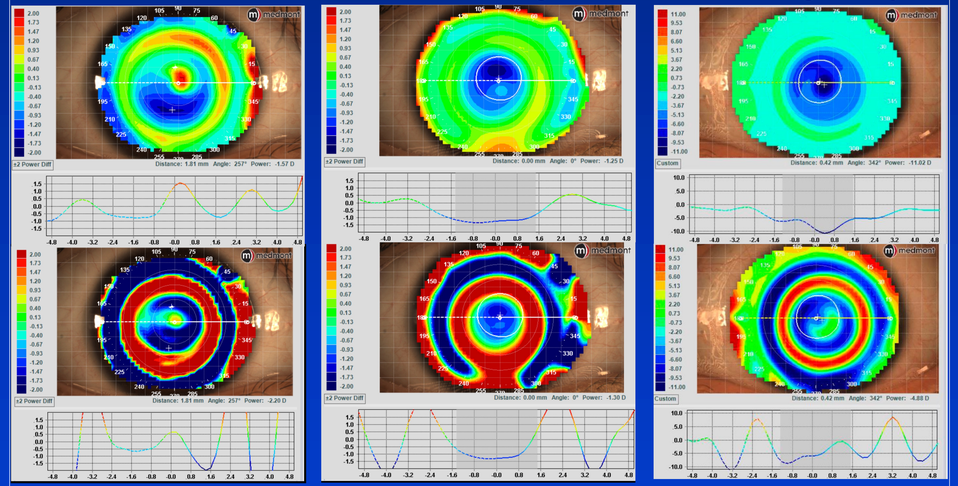


Methods

A series of pilot studies was performed on three subjects. We investigated the topographical changes associated with SCL wear in three phases: I) everted high minus SCL, II) everted high minus multifocal SCL, and III) reverse geometry custom SCL. Corneal topography and visual acuity measurements were obtained at baseline and following lens wear.

Results

#1 Everted -10.00DS SV | #2 Everted -9.50DS high add MF | #3 Reverse geometry



-1.50D flattening with distinct central island

-1.25D flattening with centered treatment zone

-11.00D flattening with central island

The difference maps above illustrate changes after eight hours overnight wear in everted lens #1 and #2, and after five hours daily wear in lens #3. The subject achieved uncorrected visual acuity of 20/20 in lens #2 with good overall comfort.

Discussion

We found that each lens design was capable of inducing profound corneal changes similar to orthokeratology. High modulus lenses were key in providing rigidity. However, the distinct central island in some designs limited the effectiveness of treatment for myopia correction.

We found great success with the everted center near multifocal SCL in eliminating the central island and improving uncorrected visual acuity. Our pilot studies demonstrate its ability to correct for low amounts of spherical myopia between -1.00 and -2.00 diopters.

However, we shifted away from the everted lens design due to limited parameters and unconventional clinical approach. Utilizing a reverse geometry design also allows for a similar fitting philosophy to traditional ortho-k.

Conclusions

Despite the limitations of these pilot studies, we demonstrate that SCL may be a viable alternative for corneal reshaping. Future studies will optimize this novel lens design and further evaluate the efficacy of this potential treatment option for myopia management.

References

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1/2023