What Topographical Indices Influence Orthokeratology Outcomes?

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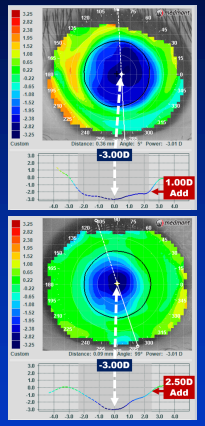
Introduction

Myopia control research suggests that delivering plus power through the pupil plays a role in reducing axial growth in children[1]. The magnitude of "add" power is partially controlled by the size of the treatment zone which in turn determines the degree of spherical aberration[2]. This combination has an effect on the effectiveness of orthokeratology treatment for myopia control. The higher the spherical aberration, the smaller the treatment zone size. The smaller the treatment zone size, the higher the amount of plus power or add is delivered to the retina. Orthokeratology results in a wide range of treatment zone sizes from one patient to the next. Does the eye shape or size influence which patients will have a small or large treatment area and therefore better or worse myopia control outcomes?



Methods

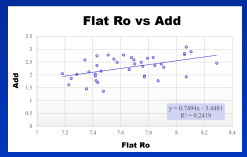
A retrospective review of orthokeratology patients fit in the BE Retainer lens was performed (BE Enterprises). Inclusion criteria required that all patients were fitted with a 6mm back optical zone and have a resultant 3.00D myopic reduction (±0.12D). 40 subjects met the inclusion criteria. Pre and post fitting topographies were evaluated using the Medmont E300 Corneal Topographer (Medmont International).

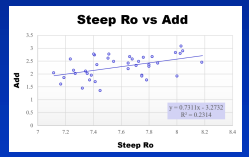
Data Collection

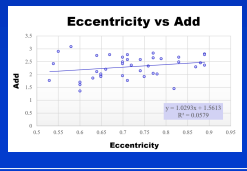
The pre-fitting apical corneal radius of both the flat and steep meridian were collected (Flat Ro and Steep Ro). The eccentricity of the flat meridian was also recorded along with the visible iris diameter (VID) of the eye. Post orthokeratology lens wear, power readings were taken along the flat meridian of the eye at 2.5mm from the corneal apex in both hemispheres. These two power readings were averaged to determine the add power effect within a 5mm pupil across all subjects. Each topographic indice was compared to the resultant add power to determine any correlation.

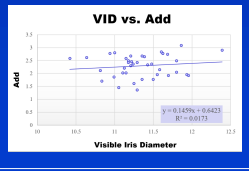
Results

The corneal radius of the flat (Flat Ro) and steep meridians (Steep Ro) showed a weak correlation relative to the add power with R^2 values of 0.2419 and 0.2314 respectively. The eccentricity and visible iris diameter (VID) showed an even weaker correlation with R^2 values of 0.0579 and 0.0173 respectively.









Discussion

The topographic indices evaluated in this study do not appear to contribute to the resultant add power effect created by orthokeratology lenses. There is a weak correlation indicating that eyes with a flatter pre-fitting corneal radius may have more add power in the pupil. However, in general, the typical pre-orthokeratology corneal topography measurements collected will not indicate which patients may have the higher or lower add power effects. Why then do some patients in orthok lenses have smaller treatment zones with high add power effects? Why do some have large treatment zones with low add power effects? If corneal shape and size do not play a dominant role, what does? Other factors to consider are lens design effects, corneal hysteresis/rigidity, corneal thickness, interocular pressure, post lens tear film thickness or wearing time, just name a few.

Conclusion

This study suggests that baseline corneal topography data cannot predict which patients will have low, medium of high add power in the pupil. More research is required to determine which orthokeratology patients may achieve the best myopia controlling outcomes and which may require modifications to the lens construction to achieve a higher add effect.

1 Walline, JJ, Myopia Control: A Review, Eye Contact Lens. 2016 Jan;42(1):3-8. doi: 10.1097/ICL.0000000000000207.
2 Kojima, R, et al., Orthokeratology Treatment Zone Size and its Relationship to High Order Aberrations, Poster, Global Specialty Lens Symposium, January 2018