Can We Predict the Centration of Orthok Lenses?

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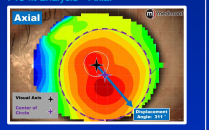
Introduction

Orthokeratology lenses are worn during sleep in order to flatten the central cornea and provide quality vision during waking hours. Practitioners attempt to achieve the ideal "bulls-eye" topographical response which defines a well centered orthok effect[1]. Even with optimization of lens parameters, orthok treatment is often decentered to some degree[2]. This study set out to determine if pre-fitting topography analysis can predict the centration of orthokeratology lenses and their post wear effect.

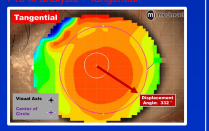
Methods

This retrospective analysis reviewed the case files of 51 consecutive orthok patients with a successful one month follow-up visit. All subjects were wearing the BE Free orthok lens and all were imaged pre and post wear using the Medmont topographer. The baseline topography was assessed in both axial and tangential displays. A novel circle tool was aligned, as best possible, to the peripheral corneal contours in order to define the direction (axis) of corneal displacement in relationship to the visual axis. Similarly, the circle tool was used on the post wear tangential map to define the position of paracentral steepening which follows orthok treatment. The pre and post fit axis of displacement was compared to determine the magnitude of differential. The Axial analysis is presented on Graph 1 and the Tangential results on Graph 2.

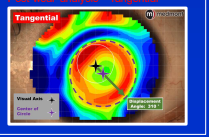
Pre fit analysis - Axial



Pre fit analysis - Tangential

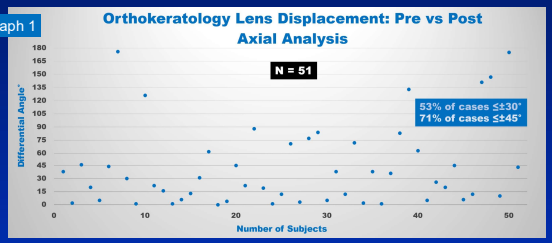


Post wear analysis - Tangential



Results

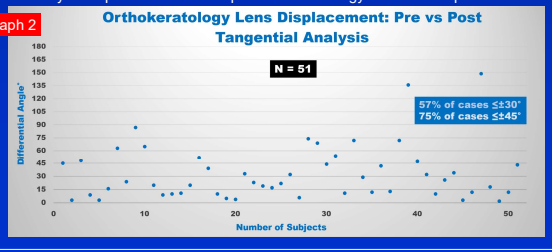
Graph 1



Graph 1 displays the difference in angle between the pre-fitting axial analysis displacement and the post orthokeratology lens wear displacement

Graph 2 displays the difference in angle between the pre-fitting tangential analysis displacement and the post orthokeratology lens wear displacement

Graph 2



Discussion

Axial analysis indicates that in 53% of cases the post wear treatment decenters to within ±30° of the pre-fitting axis of displacement. This extends to 71% of cases when including displacement of ±45°. Similarly, the Tangential analysis shows that 57% of outcomes decentered to within ±30° of the baseline displacement while 75% were within ±45°.

In this study a novel circle tool was employed to analyze displacement both pre and post treatment. However, practitioners can perform this analysis by simply estimating the displacement of the color contours using any corneal topographer.

Additionally, the findings would suggest that the pre fitting eye shape influences orthok lens centration. But in approximately 1 in 4 cases, the lenses do no follow the baseline topographical displacement. Further study is warranted to explore why lenses position counter to eye shape.

Conclusions

This study suggests the pre-fitting corneal topography can be assessed to predict the centration of orthok lenses. In this study, the tangential analysis was slightly more accurate than the axial map although both are useful to estimate lens displacement.

References

1. Mountford J, Ruston D, Dave T, Orthokeratology: Principles and Practice, Butterworth-Heinemann, 2004
2. Gu T, Gong B, Lu D, et al. Influence of Corneal Topographic Parameters in the Decentration of Orthokeratology. *Eye Contact Lens*. 2018;45(6):372-376.

Disclosures

Randy Kojima and Patrick Caroline are research partners in the KATT Design Group. Randy is also a clinical advisor for Medmont International. The other authors have no relevant disclosures.