

Do Spherical Soft Lenses for Myopia Induce Peripheral Hyperopic Defocus?

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Introduction

Myopia prevalence has been on the rise in the last decade. As a result, more of the pediatric population are in need of corrective lenses. Current evidence indicates that peripheral hyperopic defocus is a stimulus for myopia progression. Spectacle lenses have been shown by multiple studies to cause peripheral hyperopic defocus and therefore are not the ideal choice for primary correction for a pediatric patient with myopia.¹

Soft contact lenses are another common choice of correction for pediatric patients since they are easy to fit, have a large range of powers, and are convenient modality for sports and outdoor activities. The concern of fitting soft contact lenses in the pediatric patient mainly lies in the risk of microbial keratitis. Though the risk of infection is only 2.2 to 4.2 per 100,000 for daily wear lenses, most practitioners will agree that it is important to minimize this risk as much as possible by using a daily disposable lens.

The impact of single vision soft contact lenses on myopia progression and peripheral hyperopic defocus is still in debate. Some studies have shown that there is some induced peripheral myopic refractive error with soft lenses but none have evaluated or compared the measured peripheral powers of the most commonly prescribed spherical soft lenses.^{2,3}

Material and Methods

Nine daily disposable lenses from the major four soft contact lens companies were included in this study: Dailies Total One, Dailies Aqua Comfort Plus, Biotrue, Clariti, MyDay, Proclear 1 Day, Acuvue Moist, Acuvue Oasys 1 Day, and Acuvue TruEye. Bausch and Lomb markets two lenses with aspheric optics (Ultra and Purevision 2) so those lenses were also measured. Lens powers of -0.50, -3.00, -6.00, -9.00, and -12.00 (if available) were measured twice with the Rotlex ConTest II and analyzed. If the lens powers were not equivalent, a third lens was measured.

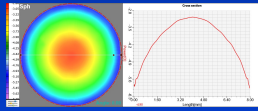
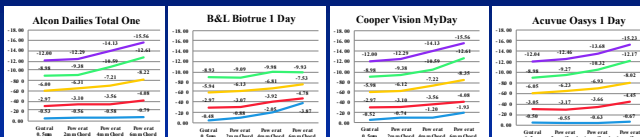


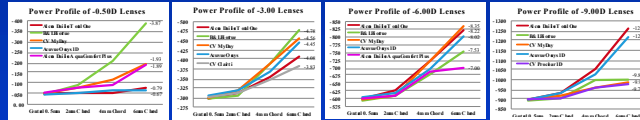
Figure 1: Rotlex image of a -3.00 Acuvue Oasys 1 Day lens, showing that the lens has more minus power in the periphery relative to the center power over an 8mm chord.

Results

The nine daily disposable lenses and two monthly aspheric lenses from Bausch and Lomb all exhibited excess minus power at 2mm, 4mm, and 6mm chord lengths relative to center power. We chose to analyze up to a 6mm chord to simulate the size of a pediatric pupil. The amount of peripheral minus power varied between lenses and no lens product was consistent in having the lowest excess peripheral power across all powers measured.



Figures 2-5: Graphs showing the newest daily disposable lens from each major contact lens company with their respective central power and their peripheral powers at 2mm, 4mm, 6mm chord lengths.

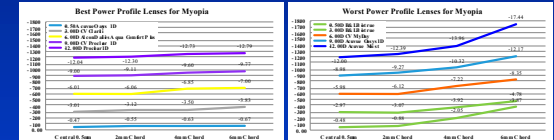


Figures 6-11: Comparison graphs showing the newest lenses from each lens company for each power measured. The lens with the least and most peripheral powers was also added to the graphs. The lowest peripheral power for a -0.50D lens was seen in the Acuvue Oasys 1 Day. For a -3.00D lens, Cooper Vision Clariti has the least peripheral power. For a -6.00D lens, it is Alcon Dailies Aqua Comfort Plus. And for -9.00D and -12.00 lenses, Cooper Vision Proclear 1 Day had the least peripheral power.

Discussion/Conclusion

Based on the results of this study, all spherical soft contact lenses have the potential to cause some amount of peripheral hyperopic defocus, which is suspected stimulus for myopia progression. Therefore like spectacle lenses, single vision soft contact lenses may not be the optimal choice for primary correction for a pediatric patient, especially if their myopia is progressing. If a pediatric patient is in single vision soft lenses it is critical to monitor myopia progression more closely.

If a soft single vision contact lens is found to be the best option for the patient. It is critical that the selected lens has the potential to cause the least amount of peripheral hyperopic defocus based on the patient's prescription. It is important to realize that the best lens product/brand for an individual patient may change if their myopia progresses. The graphs below show the best and worst choices for the powers we measure in our study.



Another important takeaway is that many myopia control studies use spectacle and soft lenses as a controls assuming that they have a neutral effect on myopia progression, while that might not be the case based on our findings. It is possible that the effectiveness of myopia control treatments such as orthokeratology and multifocals have been overestimated in studies that used spectacles and soft contact lenses as controls.

References

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